CORONAVIRUS VACCINES AND METHODS OF USE

CROSS-REFERENCE

[0001] This application claims the benefit of U.S. Provisional Application No. 62/992,666, filed on March 20, 2020; U.S. Provisional Application No. 63/026,559, filed on May 18, 2020; U.S. Provisional Application No. 63/059,582, filed on July 31, 2020; U.S. Provisional Application No. 63/086,519, filed on October 1, 2020; and U.S. Provisional Application No. 63/122,904, filed on December 8, 2020, each of which is incorporated herein by reference in its entirety.

BACKGROUND

[0002] Newly emerging acute respiratory virus infections caused by novel coronavirus is a significant public health concern. Importantly, there are no vaccines or specific antivirals at the time of an outbreak, specifically, for example the MERS-CoV of 2015, or 2019 SARS CoV-2 infections. The 2019 SARS CoV-2 infection outbreak in December of 2019 claimed more than 2000 lives in less than 2 months from the first reported case. Accordingly, novel and easily scalable therapeutics are necessary to combat a disease caused by such a viral infection.

SUMMARY

[0003] Coronaviruses are single positive stranded RNA viruses that have emerged occasionally from zoonotic sources to infect human populations. Most of the infections in humans cause mild respiratory symptoms, though some recent coronavirus infections in the last decade have resulted in severe morbidity and mortality. These include the severe acute respiratory syndrome coronavirus (SARS-CoV), middle east respiratory syndrome coronavirus (MERS-CoV) and the currently ongoing pandemic of SARS-CoV-2. Infection with these viruses can lead to acute respiratory distress resulting in a high mortality rate. SARS-CoV originated in 2002 in South China and its global spread led to 8096 cases and 774 deaths. The first case of MERS-CoV emerged in 2012 in Saudi Arabia and since then a total of 2494 cases and 858 associated deaths have been reported. 2019 SARS CoV-2 emerged in Wuhan, China at the end of December 2019 and by March 8th 2020 had resulted in 118,096 cases including 4262 deaths globally. The rapid spread of 2019 SARS-CoV2 resulted in the World Health Organization declaring a global pandemic of international concern.

[0004] All three coronaviruses SARS-CoV, MERS-CoV and the recently emergent SARS CoV-2 belong to the genus beta coronaviridae. SARS CoV-2 has a genome size of 30 kilobases that encodes for at least four (4) structural (spike [S], envelope [E], membrane [M], and nucleocapsid [N])and at least fifteen (15) non-structural (NSP 1-15) proteins. The structural proteins are the spike protein (S), the membrane protein (M), the envelope protein (E) and the nucleocapsid protein (N). The S protein facilitates viral entry into target cells and entry depends on binding of the spike protein to a cellular receptor ACE2 for both SARS-

CoV and SARS-CoV-2. Both viruses share a 76% amino acid identity across the genome that could help leverage the previous research on protective immune responses to SAR-CoV to aid in vaccine development for SARS-CoV-2

[0005] Given the high morbidity and mortality rate of these infections, there have been various reports investigating the immune responses to such infections. Both innate as well as adaptive immune responses have been shown to be important. Studies in mice infected with SARS-CoV demonstrated that the severity of SARS correlated with the ability to develop a virus specific immune response. In another study, it was demonstrated that dysregulation of the type I interferon and inflammatory monocyte macrophage response led to lethal pneumonia in SARS-CoV infected mice. A protective role for both humoral as well as cellular immune responses have been demonstrated in the case on SARS-CoV. Antibody responses generated against the S and the N protein have shown to protect from SARS-CoV infection in mice and have been detected in SARS-CoV infected patients. However, these antibody responses detected against the S protein were short-lived and undetectable 6 years post recovery suggesting that CD4 and CD8 responses may be involved in the control of this virus.

[0006] Both $CD4^+$ and $CD8^+$ T cell responses have-been detected in SARS-CoV infected patients. Virus-specific memory CD8 T cells persisted up to 11 years post-infection in recovered patients and were demonstrated to provide protection against a lethal SARS-CoV infection in aged mice. In addition, studies in mice have shown adoptive transfer of virus specific effector $CD4^+$ and $CD8^+$ T cells resulted in rapid virus clearance and improvement of clinical disease. These studies point to an important role for T cell responses in controlling the disease severity as well as providing protective immunity to SAR-CoV infection. Given the high degree of genomic homology between SARS-CoV and SARS-CoV-2, it was reasoned that similar immune mechanisms might play a critical role in providing protection against SARS-CoV-2.

[0007] The field of the present invention relates to immunotherapeutic peptides, nucleic acids encoding the peptides, peptide binding agents, and their use, for example, in the immunotherapy of a viral disease. In one aspect, the invention provides viral epitopes expressed in virus infected cells, useful alone or in combination with other anti-viral, or immunomodulatory agents to treat viral infection. The present invention is useful in immunotherapy for a coronavirus infection.

[0008] Provided herein is a composition comprising: (i) a polypeptide comprising at least two of the following (a) a sequence comprising an epitope sequence from ORF1ab, (b) a sequence comprising an epitope sequence from membrane glycoprotein (M) and (c) a sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N); (ii) a polynucleotide encoding a polypeptide, wherein the polypeptide comprises at least two of the following (a) a sequence comprising an epitope sequence from ORF1ab, (b) a sequence comprising an epitope sequence from membrane glycoprotein (M) and (c) a sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N); (iii) a T cell receptor

(TCR) or a T cell comprising the TCR, wherein the TCR binds to an epitope sequence of the polypeptide in complex with a corresponding HLA class I or class II molecule; (iv) an antigen presenting cell comprising (i) or (ii); or (v) an antibody or B cell comprising the antibody, wherein the antibody binds to an epitope sequence of the polypeptide; and a pharmaceutically acceptable excipient.

[0009] In some embodiments, the polypeptide comprises (a) a sequence comprising an epitope sequence from ORF1ab, (b) a sequence comprising an epitope sequence from membrane glycoprotein (M) and (c) a sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N). In some embodiments, the sequence comprising an epitope sequence from ORF1ab is C-terminal to the sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N). In some embodiments, the sequence comprising an epitope sequence from ORF1ab is N-terminal to the sequence comprising an epitope sequence from membrane glycoprotein (M). In some embodiments, the sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N) is N-terminal to the sequence comprising an epitope sequence from membrane glycoprotein (M).

[00010] In some embodiments, the polypeptide comprises at least two of the following (a) a sequence comprising an epitope sequence from ORF1ab, (b) a sequence comprising an epitope sequence from membrane glycoprotein (M) and (c) a sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N)

[00011] In some embodiments, the polypeptide comprises (a) 2, 3, 4, 5, 6, 7, 8, 9 or 10 or more epitope sequence from ORF1ab, (b) a sequence comprising an epitope sequence from membrane glycoprotein (M) and (c) a sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N).

[00012] In some embodiments, the epitope sequence from ORF1ab is an epitope sequence from a non-structural protein. In some embodiments, the non-structural protein is selected from the group consisting of NSP1, NSP2, NSP3, NSP4 and combinations thereof. In some embodiments, the polypeptide comprises a sequence comprising an epitope sequence from NSP1, a sequence comprising an epitope sequence from NSP2, a sequence comprising an epitope sequence from NSP3 and a sequence comprising an epitope sequence from NSP4.

[00013] In some embodiments, the epitope sequence from ORF1ab is selected from the group consisting of YLFDESGEFKL, YLFDESGEF, FGDDTVIEV, QLMCQPILL, TTDPSFLGRY, PTDNYITTY, PSFLGRY, AEAELAKNV, KTIQPRVEK and any combination thereof.

[00014] In some embodiments, the epitope sequence from nucleocapsid glycoprotein (N) is LLLDRLNQL. In some embodiments, the epitope sequence from membrane phosphoprotein (M) is VATSRTLSY. In some embodiments, the polypeptide comprises an epitope sequence from nucleocapsid glycoprotein (N) that is LLLDRLNQL and an epitope sequence from membrane phosphoprotein (M) that is VATSRTLSY.

[00015] In some embodiments, the polypeptide comprises (a) each of the following epitope sequences from ORF1ab: YLFDESGEFKL, YLFDESGEF, FGDDTVIEV, QLMCQPILL, TTDPSFLGRY, PTDNYITTY, PSFLGRY, AEAELAKNV, KTIQPRVEK; (b) an epitope sequence from nucleocapsid glycoprotein (N) that is LLLDRLNQL; and (c) an epitope sequence from membrane phosphoprotein (M) that is VATSRTLSY.

[00016] In some embodiments, the sequence comprising an epitope sequence from ORF1ab is selected from the group consisting of the following sequences or fragments thereof: MVTNNTFTLKVPHVGEIPVAYRKVLLKTIQPRVEKYLFDESGEFKLSEVGPEHSLAEYYIFFASFY Y; MVTNNTFTLKVPHVGEIPVAYRKVLLKTIQPRVEKYLFDESGEFKLSEVGPEHSLAEY; APKEIIFLEGETLFGDDTVIEVAIILASFSAST; APKEIIFLEGETLFGDDTVIEV; HTTDPSFLGRYMSALFADDLNQLTGYHTDFSSEIIGYQLMCQPILLAEAELAKNVSLILGTVSWN L;

TTDPSFLGRYMSALFADDLNQLTGYHTDFSSEIIGYQLMCQPILLAEAELAKNVSLILGTVSWNL; LLSAGIFGAITDVFYKENSYKVPTDNYITTY; and combinations thereof.

[00017] In some embodiments, the sequence comprising an epitope sequence from membrane glycoprotein (M) is selected from the group consisting of the following sequences or fragments thereof: ADSNGTITVEELKKLLEQWNLVIGFLFLTWICLLQFAYANRNRFLYIIKLIFLWLLWPVTLACFVL AAVYRINWITGGIAIAMACLVGLMWLSYFIASFRLFARTRSMWSFNPETNILLNVPLHGTILTRPL LESELVIGAVILRGHLRIAGHHLGRCDIKDLPKEITVATSRTLSYYKLGASQRVAGDSGFAAYSR YRIGNYKLNTDHSSSSDNIALLVQ;

FAYANRNRFLYIIKLIFLWLLWPVTLACFVLAAVYRINWITGGIAIAMACLVGLMWLSYFIASFR LF; LGRCDIKDLPKEITVATSRTLSYYKLGASQRVA; KLLEQWNLVIGF;

NRNRFLYIIKLIFLWLLWPVTLACFVLAAVY; SELVIGAVILRGHLRIAGHHLGR;

VATSRTLSYYKLGASQRV; GLMWLSYF; and combinations thereof.

[00018] In some embodiments, the sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N) is selected from the group consisting of the following sequences or fragments thereof:

KDLSPRWYFYYLGTGPEAGLPYGANKDGIIWVATEGALNTPKDHIGTRNPANNAAIVLQLPQGT TLPKGFYAEGSRGGSQASSRSSSRSRNSSRNSTPGSSRGTSPARMAGNGGDAALALLLLDRLNQL ESKMSGKGQQQQGQTVTKKSAAEASKKPRQKRTATKAYNVTQAFGRRGPEQTQGNFGDQELI RQGTDYKHWPQIAQFAPSASAFFGMSRIGMEVTPSGTWLTYTGAIKLDDKDPNFKDQVILLNKH IDAYKTFPPTEPKKDKKKKADETQALPQRQKKQQTVTLLPAADLDDFSKQLQQSMSSADSTQA;

RMAGNGGDAALALLLLDRLNQLESKMSGKGQQQ;

YKHWPQIAQFAPSASAFFGMSRIGMEVTPSGTWLTYTGAIKLDDKDPNFKDQVILLNKHIDAYK TFP;

SPARMAGNGGDAALALLLLDRLNQLESKMSGKGQQQQGQTVTKKSAAEASKKPRQKRTATKA YNVTQAFGRRGPEQTQGNFGDQELIRQGTDYKHWPQIAQFAPSASAFFGMSRIGMEVTPSGTWL TYTGAIKLDDKDPNFKDQVILLNKHIDAYKTFPPTEPKKDK and combinations thereof.

[00019] In some embodiments, the polypeptide comprises one or more linker sequences. In some embodiments, the one or more linker sequences are selected from the group consisting of GGSGGGGSGG, GGSLGGGGSG. In some embodiments, the one or more linker sequences comprise cleavage sequences. In some embodiments, the one or more cleavage sequences are selected from the group consisting of FRAC, KRCF, KKRY, ARMA, RRSG, MRAC, KMCG, ARCA, KKQG, YRSY, SFMN, FKAA, KRNG, YNSF, KKNG, RRRG, KRYS, and ARYA.

[00020] In some embodiments, the polypeptide comprises a transmembrane domain sequence. In some embodiments, the transmembrane sequence is C-terminal to the sequence comprising an epitope sequence from ORF1ab, the sequence comprising an epitope sequence from membrane glycoprotein (M) and the sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N). In some embodiments, the transmembrane sequence is EQYIKWPWYIWLGFIAGLIAIVMVTIMLCCMTSCCSCLKGCCSCGSCCKFDEDDSEPVLKGVKL HYT.

[00021] In some embodiments, the polypeptide comprises an SEC sequence. In some embodiments, the SEC sequence is N-terminal to the sequence comprising an epitope sequence from ORF1ab, the sequence comprising an epitope sequence from membrane glycoprotein (M) and the sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N). In some embodiments, the SEC sequence is MFVFLVLLPLVSSQCVNLT.

[00022] In some embodiments, the composition comprises the polynucleotide encoding the polypeptide. In some embodiments, the polynucleotide is an mRNA. In some embodiments, the polynucleotide comprises a codon optimized sequence for expression in a human.

[00023] In some embodiments, the polynucleotide comprises a dEarI-hAg sequence. In some embodiments, the dEarI-hAg sequence is ATTCTTCTGGTCCCCACAGACTCAGAGAGAACCC, optionally wherein each T is a U.

[00024] In some embodiments, the polynucleotide comprises a Kozak sequence. In some embodiments, the a Kozak sequences is GCCACC.

[00025] In some embodiments, the polynucleotide comprises an F element sequence. In some embodiments, the F element sequence is a 3 UTR of amino-terminal enhancer of split (AES). In some embodiments, the F element sequence is CTGGTACTGCATGCACGCAATGCTAGCTGCCCCTTTCCCGTCCTGGGTACCCCGAGTCTCCC CCGACCTCGGGTCCCAGGTATGCTCCCACCTCCACCTGCCCCACTCACCACCTCTGCTAGTTC CAGACACCTCC, optionally wherein each T is a U.

[00026] In some embodiments, the polynucleotide comprises an I element sequence. In some embodiments, the I element sequence is a 3' UTR of mitochondrially encoded 12S rRNA (mtRNR1). In some embodiments, the I element sequence is CAAGCACGCAGCAATGCAGCTCAAAACGCTTAGCCTAGCCACACCCCCACGGGAAACAGCAGTGATTAACCTTTAGCAATAAACGAAAGTTTAACTAAGCTATACTAACCCCAGGGTTGGTCAATTTCGTGCCAGCCACACC, optionally wherein each T is a U.

[00027] In some embodiments, the polynucleotide comprises a poly A sequence. In some embodiments, the poly A sequence is AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGCATATGACTAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA, optionally wherein each T is a U.

[00028] In some embodiments, each of the epitope sequences from the ORF1ab, the membrane glycoprotein, and the nucleocapsid phosphoprotein are from 2019 SARS-CoV-2.

[00029] In some embodiments, one or more or each epitope elicits a T cell response.

[00030] In some embodiments, one or more or each epitope has been observed by mass spectrometry as being presented by an HLA molecule.

[00031] In some embodiments, the composition comprises (i) a polypeptide with at least 70%, 80%, 90% or 100% sequence identity to a sequence selected from the group consisting of RS C1p1full, RS C2p1full, RS C3p1full, RS C4p1full, RS C5p1, RS C5p2, RS C5p2full, RS C6p1, RS C6p2, RS C6p2full, RS C7p1, RS C7p2, RS C7p2full, RS C8p1, RS C8p2 and RS C8p2full; (ii) a polynucleotide encoding a polypeptide with at least 70%, 80%, 90% or 100% sequence identity to a sequence selected from the group consisting of RS C1p1full, RS C2p1full, RS C3p1full, RS C4p1full, RS C5p1, RS C5p2, RS C5p2full, RS C6p1, RS C6p2, RS C6p2full, RS C7p1, RS C7p2, RS C7p2full, RS C8p1, RS C8p2 and RS C8p2full; or (iii) a polynucleotide with at least 70%, 80%, 90% or 100% sequence identity to a sequence selected from the group consisting of SEQ ID NOs: RS C1n1, RS C2n1, RS C3n1, RS C4n1, RS C5n1, RS C6n1, RS C7n1, RS C8n1, RS C5n2, RS C6n2, RS C7n2, RS C8n2, RS C5n2full, RS C6n2full, RS C7n2full and RS C8n2full.

[00032] Also provided herein is a pharmaceutical composition comprising any of the compositions described herein.

[00033] Also provided herein is a pharmaceutical composition comprising: (i) a polypeptide comprising an epitope sequence of Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B and/or Table 16; (ii) a polynucleotide encoding the polypeptide; (iii) a T cell receptor (TCR) or a T cell comprising the TCR, wherein the TCR binds to the epitope sequence in complex with a corresponding HLA class I or class II molecule; (iv) an antigen presenting cell comprising (i) or (ii); or (v) an antibody or B cell

comprising the antibody, wherein the antibody binds to the epitope sequence; and a pharmaceutically acceptable excipient.

[00034] In some embodiments, the epitope sequence comprises one or more or each of the following: YLFDESGEFKL, YLFDESGEF, FGDDTVIEV, LLLDRLNQL, QLMCQPILL, TTDPSFLGRY, PTDNYITTY, PSFLGRY, AEAELAKNV, VATSRTLSY and KTIQPRVEK. In some embodiments, the epitope sequence comprises one or more or each of the following: SAPPAQYEL, AVASKILGL, EYADVFHLY, DEFTPFDVV, VRIQPGQTF, SFRLFARTR, KFLPFQQF, VVQEGVLTA, RLDKVEAEV, FGADPIHSL, NYNYLYRLF, KYIKWPWYI, KWPWYIWLGF, LPFNDGVYF, QPTESIVRF, IPFAMQMAY, YLQPRTFLL and RLQSLQTYV.

[00035] In some embodiments, the epitope sequence is from an orf1ab protein. In some embodiments, the epitope sequence is from an orf1a protein In some embodiments, the epitope sequence is from a surface glycoprotein (S) or a shifted reading frame thereof. In some embodiments, the epitope sequence is from a nucleocapsid phosphoprotein (N). In some embodiments, the epitope sequence is from an ORF3a protein. In some embodiments, the epitope sequence is from a membrane glycoprotein (M). In some embodiments, the epitope sequence is from an ORF7a protein. In some embodiments, the epitope sequence is from an ORF8 protein. In some embodiments, the epitope sequence is from an envelope protein (E). In some embodiments, the epitope sequence is from an ORF6 protein. In some embodiments, the epitope sequence is from an ORF7b protein. In some embodiments, the epitope sequence is from an ORF10 protein. In some embodiments, the epitope sequence is from an ORF9b protein.

[00036] Also provided herein is a pharmaceutical composition comprising: a polypeptide having an amino acid sequence with at least 70%, 80%, 90% or 100% sequence identity to a sequence of any one of the sequences depicted in column 2 of Table 11, column 2 of Table 12 or column 3 of Table 15; or a recombinant polynucleotide encoding a polypeptide having an amino acid sequence with at least 70%, 80%, 90% or 100% sequence identity to a sequence of any one of the sequences depicted in column 2 of Table 11, column 2 of Table 12 or column 3 of Table 15.

[00037] In some embodiments, the pharmaceutical composition comprises a polypeptide with at least 70%, 80%, 90% or 100% sequence identity to a sequence selected from the group consisting of RS C1p1full, RS C2p1full, RS C3p1full, RS C4p1full, RS C5p1, RS C5p2, RS C5p2full, RS C6p1, RS C6p2, RS C6p2full, RS C7p1, RS C7p2, RS C7p2full, RS C8p1, RS C8p2 and RS C8p2full; or a polynucleotide encoding a polypeptide with at least 70%, 80%, 90% or 100% sequence identity to a sequence selected from the group consisting of RS C1p1full, RS C2p1full, RS C3p1full, RS C4p1full, RS C5p1, RS C5p2, RS C5p2full, RS C6p1, RS C6p2, RS C6p2full, RS C7p1, RS C7p2, RS C7p2full, RS C8p1, RS C8p2 and RS C8p2full. In some embodiments, the pharmaceutical composition comprises a polynucleotide with at least 70%, 80%, 90% or 100% sequence identity to a sequence selected from the group consisting of SEQ ID NOs: RS C1n1, RS C2n1, RS C3n1, RS C4n1, RS C5n1, RS C6n1, RS

C7n1, RS C8n1, RS C5n2, RS C6n2, RS C7n2, RS C8n2, RS C5n2full, RS C6n2full, RS C7n2full and RS C8n2full.

[00038] In some embodiments, the polynucleotide is an mRNA.

[00039] In some embodiments, the pharmaceutical composition further comprises one or more lipid components. In some embodiments, the one or more lipids comprise a lipid nanoparticle (LNP). In some embodiments, the LNP encapsulates the recombinant polynucleotide construct.

[00040] In some embodiments, the polypeptide is synthetic. In some embodiments, the polypeptide is recombinant.

[00041] In some embodiments, the polypeptide is from 8-1000 amino acids in length.

[00042] In some embodiments, the epitope sequence binds to or is predicted to bind to an HLA class I or class II molecule with a K_D of 1000 nM or less. In some embodiments, the epitope sequence binds to or is predicted to bind to an HLA class I or class II molecule with a K_D of 500 nM or less.

[00043] In some embodiments, the epitope sequence comprises a sequence of a viral protein expressed by a virus-infected cell of a subject.

[00044] Also provided herein is a method of treating or preventing a infection by a virus or treating a respiratory disease or condition associated with an infection by a virus comprising administering to a subject in need thereof a pharmaceutical composition described herein.

[00045] In some embodiments, the virus is a coronavirus. In some embodiments, the virus is 2019 SARS-CoV 2. In some embodiments, an HLA molecule expressed by the subject is unknown at the time of administration. In some embodiments, the ability of the virus to avoid escape of recognition by an immune system of the subject is less compared to the ability of the virus to avoid escape of recognition by an immune system of a subject administered a pharmaceutical composition containing an epitope from a single protein or epitopes from fewer proteins than in a pharmaceutical composition described herein. In some embodiments, the subject express an HLA molecule encoded by an HLA allele of any one of Table 1A, Table 1B, Table 1C, Table 2Ai or Table 2Aii, Table 2B or Table 16 and the epitope sequence is an HLA allele-matched epitope sequence.

[00046] In some embodiments, the epitope sequence comprises one or more or each of the following: SAPPAQYEL, AVASKILGL, EYADVFHLY, DEFTPFDVV, VRIQPGQTF, SFRLFARTR, KFLPFQQF, VVQEGVLTA, RLDKVEAEV and FGADPIHSL.

[00047] Also provided herein is a method of treating or preventing a 2019 SARS-CoV 2 infection in a subject in need thereof, comprising administering to the subject a pharmaceutical composition described herein.

[00048] In some embodiments, the pharmaceutical composition is administered in addition to one or more therapeutics for the 2019 SARS-CoV 2 viral infection in the subject. In some embodiments, the pharmaceutical composition is administered in combination with (a) a polypeptide having an amino acid

sequence of a 2019 SARS-CoV 2 spike protein or fragment thereof; (b) a recombinant polynucleotide encoding a 2019 SARS-CoV 2 spike protein or fragment thereof; or a 2019 SARS-CoV 2 spike protein pharmaceutical composition comprising (a) or (b). In some embodiments, the 2019 SARS-CoV 2 spike protein or fragment thereof is a SARS-CoV-2 spike protein or a fragment thereof.

[00049] In some embodiments, the pharmaceutical composition is administered 1-10 weeks after a first administration of the 2019 SARS-CoV 2 spike protein pharmaceutical composition. In some embodiments, the pharmaceutical composition is administered 1-6 weeks, 1-6 months or 1-2 years or later after a first administration of the 2019 SARS-CoV 2 spike protein pharmaceutical composition. In some embodiments, the pharmaceutical composition is administered on the same day or simultaneously with an administration of the 2019 SARS-CoV 2 spike protein pharmaceutical composition. In some embodiments, the pharmaceutical composition is co-formulated with the polypeptide having an amino acid sequence of a 2019 SARS-CoV 2 spike protein or fragment thereof or the recombinant polynucleotide encoding a 2019 SARS-CoV 2 spike protein or fragment thereof. In some embodiments, the pharmaceutical composition is administered before an administration of the 2019 SARS-CoV 2 spike protein pharmaceutical composition, such as 2-10 weeks before an administration of the 2019 SARS-CoV 2 spike protein pharmaceutical composition. In some embodiments, the pharmaceutical composition is administered prophylactically. In some embodiments, the pharmaceutical composition is administered once every 1, 2, 3, 4, 5, 6 or more weeks; or once every 1-7, 7-14, 14-21, 21-28, or 28-35 days; or once every 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, or 35 days.

[00050] Also provided herein is a use of a composition described herein for preparing a therapeutic for treating or preventing a respiratory viral infection caused by 2019 SARS CoV-2 virus.

[00051] Also provided herein is a composition described herein or a pharmaceutical composition described herein for use as a medicament.

[00052] Also provided herein is a composition described herein or a pharmaceutical composition described herein for use in the treatment or prevention of a respiratory viral infection caused by 2019 SARS CoV-2 virus.

[00053] Provided herein is an antigenic peptide comprising an epitope sequence from Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii or Table 2B. Also provided herein is a polynucleotide encoding and antigenic peptide comprising an epitope sequence from Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii or Table 2B. The antigenic peptide and/or polynucleotide may be recombinant. The antigenic peptide and/or polynucleotide may be isolated or purified. The antigenic peptide may be synthetic or expressed from a polynucleotide.

[00054] Also provided herein is an antibody or B cell comprising an antibody that binds to an antigenic peptide comprising an epitope sequence from Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii or Table 2B.

[00055] Also provided herein is a T cell receptor (TCR) or T cell comprising a TCR that binds an epitope sequence from Table 1A or Table 1B in complex with a corresponding MHC class I molecule according to Table 1A or Table 1B. For example, the TCR can bind to an epitope sequence from column 2 (set 1) of Table 1A in complex with a corresponding MHC class I molecule from column 3 (set 1) in the same row of Table 1A. For example, the TCR can bind to an epitope sequence from column 4 (set 2) of Table 1A in complex with a corresponding MHC class I molecule from column 5 (set 2) in the same row of Table 1A. For example, the TCR can bind to an epitope sequence from column 6 (set 3) of Table 1A in complex with a corresponding MHC class I molecule from column 7 (set 3) in the same row of Table 1A. For example, the TCR can bind to an epitope sequence from column 2 (set 1) of Table 1B in complex with a corresponding MHC class I molecule from column 3 (set 1) in the same row of Table 1B. For example, the TCR can bind to an epitope sequence from column 4 (set 2) of Table 1B in complex with a corresponding MHC class I molecule from column 5 (set 2) in the same row of Table 1B.

[00056] Also provided herein is a T cell receptor (TCR) or T cell comprising a TCR that binds to an epitope sequence from Table 2Ai or Table 2Aii in complex with a corresponding MHC class II molecule according to Table 2Ai or Table 2Aii. For example, the TCR can bind to an epitope sequence from column 2 (set 1) of Table 2Ai in complex with a corresponding MHC class II molecule from column 3 (set 1) in the same row of Table 2Ai. For example, the TCR can bind to an epitope sequence from column 4 (set 2) of Table 2Ai in complex with a corresponding MHC class II molecule from column 5 (set 2) in the same row of Table 2Ai. Likewise, a TCR can bind to an epitope sequence from the left column of Table 2Aii in complex with a corresponding MHC class II molecule from the right column of Table 2Aii.

[00057] Provided herein is a method of treating or preventing viral infection in a subject in need thereof comprising administering to the subject an antigenic peptide comprising an epitope sequence from Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii or Table 2B. Also provided herein is a method of treating or preventing viral infection in a subject in need thereof comprising administering to the subject a polynucleotide encoding and antigenic peptide comprising an epitope sequence from Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii or Table 2B.

[00058] Also provided herein is a method of treating or preventing a viral infection in a subject in need thereof comprising administering to the subject an antibody or B cell comprising an antibody that binds to an antigenic peptide comprising an epitope sequence from Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii or Table 2B.

[00059] Also provided herein is a method of treating or preventing viral infection in a subject in need thereof comprising administering to the subject a T cell receptor (TCR) or T cell comprising a TCR that that binds

an epitope sequence from Table 1A or Table 1B in complex with a corresponding MHC class I molecule according to Table 1A or Table 1B.

[00060] For example, the method can comprise administering to the subject a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 2 (set 1) of Table 1A in complex with a corresponding MHC class I molecule from column 3 (set 1) in the same row of Table 1A. For example, the method can comprise administering to a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 2 (set 1) of Table 1A in complex with a corresponding MHC class I molecule from column 3 (set 1) in the same row of Table 1A to a subject that expresses the corresponding MHC class I molecule from column 3 (set 1). For example, the method can comprise administering to the subject a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 4 (set 2) of Table 1A in complex with a corresponding MHC class I molecule from column 5 (set 2) in the same row of Table 1A. For example, the method can comprise administering to a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 4 (set 2) of Table 1A in complex with a corresponding MHC class I molecule from column 5 (set 2) in the same row of Table 1A to a subject that expresses the corresponding MHC class I molecule from column 5 (set 2). For example, the method can comprise administering to the subject a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 6 (set 3) of Table 1A in complex with a corresponding MHC class I molecule from column 7 (set 3) in the same row of Table 1A. For example, the method can comprise administering to a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 6 (set 3) of Table 1A in complex with a corresponding MHC class I molecule from column 7 (set 3) in the same row of Table 1A to a subject that expresses the corresponding MHC class I molecule from column 7 (set 3).

[00061] For example, the method can comprise administering to the subject a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 2 (set 1) of Table 1B in complex with a corresponding MHC class I molecule from column 3 (set 1) in the same row of Table 1B. For example, the method can comprise administering to a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 2 (set 1) of Table 1B in complex with a corresponding MHC class I molecule from column 3 (set 1) in the same row of Table 1B to a subject that expresses the corresponding MHC class I molecule from column 3 (set 1). For example, the method can comprise administering to the subject a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 4 (set 2) of Table 1B in complex with a corresponding MHC class I molecule from column 5 (set 2) in the same row of Table 1B. For example, the method can comprise administering to a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 4 (set 2) of Table 1B in complex with a corresponding MHC class I molecule from column 5 (set 2) in the same row of Table 1B to a subject that expresses the corresponding MHC class I molecule from column 5 (set 2).

[00062] For example, the method can comprise administering to the subject a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 2 (set 1) of Table 2Ai in complex with a corresponding MHC class II molecule from column 3 (set 1) in the same row of Table 2Ai. For example, the method can comprise administering to a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 2 (set 1) of Table 2Ai in complex with a corresponding MHC class II molecule from column 3 (set 1) in the same row of Table 2Ai to a subject that expresses the corresponding MHC class II molecule from column 3 (set 1). For example, the method can comprise administering to the subject a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 4 (set 2) of Table 2Ai in complex with a corresponding MHC class II molecule from column 5 (set 2) in the same row of Table 2Ai. For example, the method can comprise administering to a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 4 (set 2) of Table 2Ai in complex with a corresponding MHC class II molecule from column 5 (set 2) in the same row of Table 2Ai to a subject that expresses the corresponding MHC class II molecule from column 5 (set 2). For example, the method can comprise administering to the subject a TCR or T cell comprising a TCR that can bind to an epitope sequence from the left column of Table 2Aii in complex with a corresponding MHC class II molecule from the right column in the same row of Table 2Aii.

[00063] In one embodiment, the antigenic peptide is a viral antigen. In another embodiment, the antigenic peptide is a non-mutated overexpressed antigen. In some embodiments, the viral antigen is derived from publicly disclosed information on the viral genetic information. In some embodiments, the viral antigen is derived from analysis of the viral genome to predict suitable epitopes for T cell activation. In some embodiments, the viral antigen is derived from analysis of the sequence of the viral genome in a MHC-peptide presentation prediction algorithm implemented in a computer processor. In some embodiments, the viral antigen is derived from analysis of the viral sequences in an MHC-peptide presentation prediction algorithm implemented in a computer processor that has been trained by a machine learning software, which predicts the likelihood of binding and presentation of an epitope by an MHC class I or an MHC class II antigen. In some embodiments, the MHC-peptide presentation predictor is *neonmhc2*.

[00064] In some embodiments, the MHC-peptide presentation prediction algorithm or MHC-peptide presentation predictor is NetMHCpan or NetMHCIIpan and in addition, further analyzed in MHC-peptide presentation predictor NetMHCpan or NetMHCIIpan for comparison. In some embodiments, a skilled artisan may use hidden markov model approach for MHC-peptide presentation prediction. In some embodiments, the peptide prediction model MARIA may be utilized. In some embodiments, the MHC-peptide presentation prediction algorithm or MHC-peptide presentation predictor used is not NetMHCpan or NetMHCIIpan. In some embodiments, the viral sequences are analyzed in MHC-peptide presentation prediction algorithm implemented in a computer processor where the MHC-peptide presentation predictor is *neonmhc 1* or *neonmhc2*, that refer respectively to class I and class II binding prediction. In some

embodiments, the MHC-peptide presentation predictor model is RECON, which offers high quality MHC-peptide presentation prediction based on expression, processing and binding capabilities.

[00065] In one aspect, provided herein is a method of treating a viral disease in a subject caused by a coronavirus, comprising: administering to the subject a composition comprising one or more viral peptide antigens, wherein the viral peptide antigens are predicted to bind to an MHC class I or an MHC class II peptide of the subject, and are predicted to be presented by an antigen presenting cell to a T cell of the subject such that an antiviral response is initiated in the subject. In some embodiments, the viral antigen is derived from analysis of the sequence of the viral genome in a MHC-peptide presentation prediction algorithm implemented in a computer processor. In some embodiments, the viral antigen is derived from analysis of the viral sequences in an MHC-peptide presentation prediction algorithm implemented in a computer processor that has been trained by a machine learning software, which predicts the likelihood of binding and presentation of an epitope by an MHC class I or an MHC class II antigen. In some embodiments, the MHC-peptide presentation predictor is *neonmhc2*. In some embodiments, the method further comprises analyzing nucleic acid sequence derived from viral genome in an MHC-peptide presentation prediction model, comprising an algorithm implemented in a computer processor that has been trained by a machine learning software, wherein the MHC-peptide presentation prediction model predicts the likelihood of binding and presentation of an epitope encoded by the viral genome by an MHC class I or an MHC class II antigen. In some embodiments, the method further comprises analyzing a biological sample from a subject for identification of the MHC class I and MHC class II repertoire, wherein the analyzing comprises analyzing by genome or whole exome sequencing or by analysis of proteins encoded by an HLA gene. In some embodiments, the method further comprises matching the epitopes predicted by the MHC-peptide presentation prediction model that have a high affinity for an MHC class I or an MHC class II peptide encoded by an HLA gene of the subject, and selecting one or more peptides that are predicted to bind an MHC peptide encoded by an HLA gene of the subject with a high affinity ranked by the MHC-peptide presentation prediction model. In some embodiments, the one or more peptides that are selected have been predicted to bind an MHC peptide encoded by an HLA gene of the subject with an affinity of at least 1000 nM. In some embodiments, the one or more peptides that are selected have been predicted to bind an MHC class I peptide encoded by an HLA gene of the subject with an affinity of at least 500 nM. In some embodiments, the one or more peptides that are selected have been predicted to bind an MHC class II peptide encoded by an HLA gene of the subject with an affinity of at least 1000 nM.

[00066] In some embodiments, the MHC-peptide presentation prediction model is programmed to provide a ranking order in decreasing order of a likelihood for a particular epitope or antigenic peptide to bind to an HLA allele that would present the peptide to a T cell receptor. In some embodiments, epitope sequences that have the highest likelihood of binding and being presented by an HLA are selected for preparing a therapeutic. In some embodiments, the selection of the HLA may be restricted by HLA expressed in a

subject. In some embodiments, the selection of the HLA may be based on the prevalence (e.g., higher prevalence) of the allele in a population. In some embodiments the epitopes may be selected for preparing a therapeutic based on the higher likelihood for the peptide (epitope) of binding to and being presented by an HLA allele, e.g., an HLA allele of interest. In some embodiments, this % rank value may be determined by evaluating the percentile in which a query peptide scores for a specific allele compared to a fixed set of reference peptides (with a different set of reference peptides for class I and class II). In some embodiments the top 10% of the epitopes that have the highest likelihood of binding to an HLA allele may be selected. In some embodiments the top 2% of the epitopes that have the highest likelihood of binding to an HLA allele may be selected. In some embodiments the top 5% of the epitopes that have the highest likelihood of binding to an HLA allele may be selected. In some embodiments the top 8% of the epitopes that have the highest likelihood of binding to an HLA allele may be selected. In some embodiments the top 1% of the epitopes that have the highest likelihood of binding to an HLA allele may be selected. In some embodiments the top 0.5 % of the epitopes that have the highest likelihood of binding to an HLA allele may be selected. In some embodiments the top 0.1 % of the epitopes that have the highest likelihood of binding to an HLA allele may be selected. In some embodiments the top 0.01 % of the epitopes that have the highest likelihood of binding to an HLA allele may be selected. In some embodiments the selection of the cut off may be dependent on the availability and number of epitopes predicted to have a high likelihood of binding to an HLA allele as determined by the prediction model.

[00067] In some embodiments, the subject may be infected by the virus. In some embodiments, the subject may be at risk of infection by the virus. In some embodiments, the virus is a coronavirus. In some embodiments, the coronavirus is selected from a SARS virus, a MERS coronavirus or a 2019 SARS CoV-2 virus. In some embodiments, the one or more viral peptide antigen comprises a peptide comprising at least 8 contiguous amino acids of a sequence in Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B, Table 15 or Table 16. In some embodiments, the one or more viral peptide antigen comprises a peptide comprising at least 7 contiguous amino acids of a sequence in Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B, Table 15 or Table 16. In some embodiments, the one or more viral peptide antigen comprises a peptide comprising at least 6 contiguous amino acids of a sequence in Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B, Table 15 or Table 16.

[00068] In one embodiment, the antigenic peptide is between about 5 to about 50 amino acids in length. In another embodiment, the antigenic peptide is between about 15 to about 35 amino acids in length. In another embodiment, the antigenic peptide is about 15 amino acids or less in length. In another embodiment, the antigenic peptide is between about 8 and about 11 amino acids in length. In another embodiment, the antigenic peptide is 9 or 10 amino acids in length. In one embodiment, the antigenic

peptide binds major histocompatibility complex (MHC) class I. In another embodiment, the antigenic peptide binds MHC class I with a binding affinity of less than about 500 nM.

In one embodiment, the antigenic peptide is about 30 amino acids or less in length. In another embodiment, the antigenic peptide is between about 6 and about 25 amino acids in length. In another embodiment, the antigenic peptide is between about 15 and about 24 amino acids in length. In another embodiment, the antigenic peptide is between about 9 and about 15 amino acids in length. In one embodiment, the antigenic peptide binds MHC class II. In another embodiment, the antigenic peptide binds MHC class II with a binding affinity of less than about 1000 nM.

[00069] In one embodiment, the antigenic peptide further comprises flanking amino acids. In another embodiment, the flanking amino acids are not native flanking amino acids. In one embodiment, the antigenic peptide is linked to at least a second antigenic peptide. In another embodiment, the peptides are linked using a poly-glycine or poly-serine linker. In another embodiment, the second antigenic peptide binds MHC class I or class II with a binding affinity of less than about 1000 nM. In another embodiment, the second antigenic peptide binds MHC class I or class II with a binding affinity of less than about 500 nM. In another embodiment, both of the epitopes bind to human leukocyte antigen (HLA) -A, -B, -C, -DP, -DQ, or -DR**.** In another embodiment, the antigenic peptide binds a class I HLA and the second antigenic peptide binds a class II HLA. In another embodiment, the antigenic peptide binds a class II HLA and the second antigenic peptide binds a class I HLA.

[00070] In one embodiment, the antigenic peptide further comprises modifications which increase in vivo half-life, cellular targeting, antigen uptake, antigen processing, MHC affinity, MHC stability, or antigen presentation. In another embodiment, the modification is conjugation to a carrier protein, conjugation to a ligand, conjugation to an antibody, PEGylation, polysialylation HESylation, recombinant PEG mimetics, Fc fusion, albumin fusion, nanoparticle attachment, nanoparticulate encapsulation, cholesterol fusion, iron fusion, acylation, amidation, glycosylation, side chain oxidation, phosphorylation, biotinylation, the addition of a surface active material, the addition of amino acid mimetics, or the addition of unnatural amino acids, for example, synthetic amino acids, or f-moc amino acids, D-amino acids N-methyl amino acids. In one embodiment, the cells that are targeted are antigen presenting cells. In another embodiment, the antigen presenting cells are dendritic cells. In another embodiment, the dendritic cells are targeted using DEC205, XCR1, CD197, CD80, CD86, CD123, CD209, CD273, CD283, CD289, CD184, CD85h, CD85j, CD85k, CD85d, CD85g, CD85a, CD141, CD11 c, CD83, TSLP receptor, or CD1a marker. In another embodiment, the dendritic cells are targeted using the CD141, DEC205, or XCR1 marker.

[00071] In one embodiment, provided herein is an *in vivo* delivery system comprising an antigenic peptide described herein. In another embodiment, the delivery system includes cell-penetrating peptides, nanoparticulate encapsulation, virus like particles, or liposomes. In another embodiment, the cell-penetrating peptide is TAT peptide, herpes simplex virus VP22, transportan, or Antp.

[00072] In one embodiment, provided herein is a cell comprising an antigenic peptide described herein. In another embodiment, the cell is an antigen presenting cell. In another embodiment, the cell is a dendritic cell.

[00073] In one embodiment, provided herein is a composition comprising an antigenic peptide described herein. In another embodiment, the composition comprises at least 2, at least 3, at least 4, at least 5, at least 6, at least 7, at least 8, at least 9, at least 10, at least 11, at least 12, at least 13, at least 14, at least 15, at least 16, at least 17, at least 18, at least 19, at least 20, at least 21, at least 22, at least 23, at least 24, at least 25, at least 26, at least 27, at least 28, at least 29, or at least 30 of the antigenic peptides comprising an epitope of Table 1A. In another embodiment, the composition comprises at least 2, at least 3, at least 4, at least 5, at least 6, at least 7, at least 8, at least 9, at least 10, at least 11, at least 12, at least 13, at least 14, at least 15, at least 16, at least 17, at least 18, at least 19, at least 20, at least 21, at least 22, at least 23, at least 24, at least 25, at least 26, at least 27, at least 28, at least 29, or at least 30 of the antigenic peptides comprising an epitope of Table 1B. In another embodiment, the composition comprises at least 2, at least 3, at least 4, at least 5, at least 6, at least 7, at least 8, at least 9, at least 10, at least 11, at least 12, at least 13, at least 14, at least 15, at least 16, at least 17, at least 18, at least 19, at least 20, at least 21, at least 22, at least 23, at least 24, at least 25, at least 26,at least 27, at least 28, at least 29, or at least 30 of the antigenic peptides comprising an epitope of Table 2B. In another embodiment, the composition comprises between 2 and 20 antigenic peptides. In another embodiment, the composition further comprises at least 1, at least 2, at least 3, at least 4, at least 5, at least 6, at least 7, at least 8, at least 9, at least 10, at least 11, at least 12, at least 13, at least 14, at least 15, at least 16, at least 17, at least 18, at least 19, at least 20, at least 21, at least 22, at least 23, at least 24, or at least 25, at least 26, at least 27, at least 28, at least 29, or at least 30 additional antigenic peptides. In another embodiment, the composition comprises between about 4 and about 20 additional antigenic peptides. In another embodiment, the additional antigenic peptide is specific for coronavirus.

[00074] In one embodiment, provided herein is a polynucleotide encoding the antigenic peptide described herein. In another embodiment, the polynucleotide is RNA, optionally a self-amplifying RNA. In some embodiments the polynucleotide is DNA. In another embodiment, the RNA is modified to increase stability, increase cellular targeting, increase translation efficiency, adjuvanticity, cytosol accessibility, and/or decrease cytotoxicity. In another embodiment, the modification is conjugation to a carrier protein, conjugation to a ligand, conjugation to an antibody, codon optimization, increased GC-content, incorporation of modified nucleosides, incorporation of 5'-cap or cap analog, and/or incorporation of a poly-A sequence e.g., an unmasked poly-A sequence, or a disrupted poly-A sequence in which two segments of contiguous A sequences linked by a linker.

[00075] In one embodiment, provided herein is a cell comprising a polynucleotide described herein.

[00076] In one embodiment, provided herein is a vector comprising a polynucleotide described herein. In another embodiment, the polynucleotide is operably linked to a promoter. In another embodiment, the vector is a self-amplifying RNA replicon, plasmid, phage, transposon, cosmid, virus, or virion. In another embodiment, the vector is an adeno-associated virus, herpesvirus, lentivirus, or pseudotypes thereof

[00077] In one embodiment, provided herein is an in vivo delivery system comprising an polynucleotide described herein. In another embodiment, the delivery system includes spherical nucleic acids, viruses, virus-like particles, plasmids, bacterial plasmids, or nanoparticles.

[00078] In one embodiment, provided herein is a cell comprising a vector or delivery system described herein. In another embodiment, the cell is an antigen presenting cell. In another embodiment, the cell is a dendritic cell. In another embodiment, the cell is an immature dendritic cell.

[00079] In some embodiments, provided herein is a composition comprising at least one polynucleotide described herein. In some embodiments, provided herein is a composition comprising one or more antigenic peptides described herein in combination with one or more 2019 SARS CoV-2 vaccines (e.g., mRNA-based vaccines, DNA-based vaccines, AAV-based vaccines, protein-based vaccines). In some embodiments, provided herein is a composition comprising one or more polynucleotides encoding at least one antigenic peptide described herein in combination with one or more 2019 SARS CoV-2 vaccines (e.g., mRNA-based vaccines, DNA-based vaccines, AAV-based vaccines, protein-based vaccines). In some embodiments, provided herein is a single polynucleotide encoding more than one antigenic peptide as described herein. In some embodiments, provided herein is a single polynucleotide encoding (i) at least one antigenic peptide as described herein and (ii) a 2019 SARS CoV-2 protein (e.g., S protein) and/or immunogenic fragments thereof (e.g., receptor binding domain (RBD) of S protein). In another embodiment, the composition comprises at least 2, at least 3, at least 4, at least 5, at least 6, at least 7, at least 8, at least 9, at least 10, at least 11, at least 12, at least 13, at least 14, at least 15, at least 16, at least 17, at least 18, at least 19, at least 20, at least 21, at least 22, at least 23, at least 24, at least 25, at least 26, at least 27, at least 28, at least 29, or at least 30 of the polynucleotides. In another embodiment, the composition comprises between about 2 and about 20 polynucleotides. In another embodiment, the composition further comprises at least 1, at least 2, at least 3, at least 4, at least 5, at least 6, at least 7, at least 8, at least 9, at least 10, at least 11, at least 12, at least 13, at least 14, at least 15, at least 16, at least 17, at least 18, at least 19, at least 20, at least 21, at least 22, at least 23, at least 24, at least 25, at least 26, at least 27, at least 28, at least 29, or at least 30 additional antigenic polynucleotides encoding for additional antigenic peptides. In another embodiment, the composition comprises between about 4 and about 20 additional antigenic polynucleotides. In another embodiment, the polynucleotides and the additional antigenic polynucleotides are linked. In another embodiment, the polynucleotides are linked using nucleic acids that encode a poly-glycine or poly-serine linker.

[00080] In one embodiment, provided herein is a T cell receptor (TCR) capable of binding at least one antigenic peptide described herein. In another embodiment, the TCR is capable of binding the antigenic peptide in the context of MHC class I or class II.

[00081] In one embodiment, provided herein is a chimeric antigen receptor comprising: (i) a T cell activation molecule; (ii) a transmembrane region; and (iii) an antigen recognition moiety capable of binding an antigenic peptide described herein. In another embodiment, CD3-zeta is the T cell activation molecule. In another embodiment, the chimeric antigen receptor further comprises at least one costimulatory signaling domain. In another embodiment, the signaling domain is CD28, 4-1BB, ICOS, OX40, ITAM, or Fc epsilon RI-gamma. In another embodiment, the antigen recognition moiety is capable of binding the antigenic peptide in the context of MHC class I or class II. In another embodiment, the chimeric antigen receptor comprises the CD3-zeta, CD28, CTLA-4, ICOS, BTLA, KIR, LAG3, CD137, OX40, CD27, CD4OL, Tim-3, A2aR, or PD-1 transmembrane region.

[00082] In one embodiment, provided herein is a T cell comprising the T cell receptor or chimeric antigen receptor described herein. In one embodiment, the T cell is a helper or cytotoxic T cell.

[00083] In one embodiment, provided herein is a nucleic acid comprising a promoter operably linked to a polynucleotide encoding a T cell receptor described herein. In another embodiment, the TCR is capable of binding the at least one antigenic peptide in the context of major histocompatibility complex (MHC) class I or class II. In one embodiment, the nucleic acid comprises a promoter operably linked to a polynucleotide encoding a chimeric antigen receptor described herein. In another embodiment, the antigen recognition moiety is capable of binding the at least one antigenic peptide in the context of major histocompatibility complex (MHC) class I or class II.

[00084] In one embodiment, provided herein is an antibody capable of binding a peptide comprising an epitope of Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B, Table 15 or Table 16. In one embodiment, provided herein is an antibody capable of binding a peptide comprising an epitope of Table 1B. In one embodiment, provided herein is an antibody capable of binding a peptide comprising an epitope of Table 2Ai or Table 2Aii.

[00085] In one embodiment, provided herein is a modified cell transfected or transduced with a nucleic acid described herein. In one embodiment, the modified cell is a T cell, tumor infiltrating lymphocyte, NK-T cell, TCR-expressing cell, CD4+ T cell, CD8+ T cell, or NK cell.

[00086] In one embodiment, provided herein is a composition comprising a T cell receptor or chimeric antigen receptor described herein. In another embodiment, a composition comprises autologous patient T cells containing a T cell receptor or chimeric antigen receptor described herein. In another embodiment, the composition further comprises an immune checkpoint inhibitor. In another embodiment, the composition further comprises at least two immune checkpoint inhibitors. In another embodiment, each of the immune checkpoint inhibitors inhibits a checkpoint protein selected from the group consisting of

CTLA-4, PDL1, PDL2, PD1, B7-H3, B7-H4, BTLA, HVEM, TIM3, GAL9, LAG3, VISTA, KIR, 2B4, CD160, CGEN-15049, CLIK 1, CHK2, A2aR, and B-7 family ligands or a combination thereof. In another embodiment, each of the immune checkpoint inhibitors interacts with a ligand of a checkpoint protein selected from the group consisting of CTLA-4, PDL1, PDL2, PD1, B7-H3, B7-H4, BTLA, HVEM, TIM3, GAL9, LAG3, VISTA, KIR, 2B4, CD160, CGEN-15049, CHK 1, CHK2, A2aR, and B-7 family ligands or a combination thereof.

[00087] In one embodiment, the composition further comprises an immune modulator or adjuvant. In another embodiment, the immune modulator is a co-stimulatory ligand, a TNF ligand, an Ig superfamily ligand, CD28, CD80, CD86, ICOS, CD4OL, OX40, CD27, GITR, CD30, DR3, CD69, or 4-1BB. In another embodiment, the immune modulator is at least one an infected cell extract. In another embodiment, the infected cell is autologous to the subject in need of the composition. In another embodiment, the infected cell has undergone lysis or been exposed to UV radiation. In another embodiment, the composition further comprises an adjuvant. In another embodiment, the adjuvant is selected from the group consisting of: Poly(I:C), Poly-ICLC, STING agonist, 1018 ISS, aluminum salts, Amplivax, AS15, BCG, CP-870,893, CpG7909, CyaA, dSLIM, GM-CSF, IC30, IC31, Imiquimod, ImuFact IMP321, IS Patch, ISS, ISCOMATRIX, JuvImmune, LipoVac, MF59, monophosphoryl lipid A, Montanide IMS 1312 VG, Montanide ISA 206 VG, Montanide ISA 50 V2, Montanide ISA 51 VG, OK-432, OM-174, OM-197-MP-EC, ISA-TLR2 agonist, ONTAK, PepTel®. vector system, PLG microparticles, resiquimod, SRL172, virosomes and other virus-like particles, YF-17D, VEGF trap, R848, beta-glucan, Pam3Cys, Pam3CSK4, acrylic or methacrylic polymers, copolymers of maleic anhydride, and QS21 stimulon. In another embodiment, the adjuvant induces a humoral when administered to a subject. In another embodiment, the adjuvant induces a T helper cell type 1 when administered to a subject.

[00088] In one embodiment, provided herein is a method of inhibiting infection by a virus by administering to a subject who has a likelihood of getting infected by the virus, a vaccine composition comprising one or more peptides comprising at least 8 contiguous amino acids from the epitopes defined in Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii or Table 2B, comprising contacting a cell with a peptide, polynucleotide, delivery system, vector, composition, antibody, or cells of the invention.

[00089] In one embodiment, provided herein is a method of treating a viral infection specifically, a coronaviral infection, for example a 2019 SARS CoV-2 infection by enhancing, or prolonging an antiviral response in a subject in need thereof comprising administering to the subject the peptide, polynucleotide, vector, composition, antibody, or cells described herein.

[00090] In one embodiment, the subject is a human. In another embodiment, the subject has a viral infection. In one embodiment, the subject is infected by a respiratory virus, such as an acute respiratory virus, for example, a SARS-like virus or a MERS or MERS-like virus, or more specifically, a coronavirus of the 2019 SARS CoV-2 strain. In some embodiments, the subject is infected with a 2019 SARS CoV-2

coronavirus. In some embodiments, the subject has been detectably infected with the 2019 SARS CoV-2 coronavirus. In some embodiments, the subject is asymptomatic. In some embodiments, the subject is symptomatic. In some embodiments, the subject is not detected to have been infected by a 2019 SARS CoV-2 virus or a related virus, but the subject is in close proximity of an infected person, in an infected area or otherwise at risk of infection.

[00091] In one embodiment of the method, a peptide is administered. In another embodiment, the administration is systemic. In another embodiment of the method, a polynucleotide, optionally RNA, is administered. In one embodiment, the polynucleotide is administered parenterally. In one embodiment, the polynucleotide is administered intravenously. In another embodiment, the polynucleotide is administered intradermally or intramuscularly, or subcutaneously. In one embodiment, the polynucleotide is administered intramuscularly. In one embodiment of the method, a cell is administered. In another embodiment, the cell is a T cell or dendritic cell. In another embodiment, the peptide or polynucleotide comprises an antigen presenting cell targeting moiety.

[00092] In one embodiment, the peptide, polynucleotide, vector, composition, or cells is administered prior to administering concurrent with another therapy, such as another antiviral therapy. In another embodiment, the peptide, polynucleotide, vector, composition, or cells is administered before or after the another antiviral therapy. In another embodiment, administration of the another antiviral therapy is continued throughout antigen peptide, polynucleotide, vector, composition, or cell therapy.

[00093] In one embodiment of the method, an additional agent is administered. In another embodiment, the agent is a chemotherapeutic agent, an immunomodulatory drug, an immune metabolism modifying drug, a targeted therapy, radiation an anti-angiogenesis agent, or an agent that reduces immune-suppression. In another embodiment, the administration of a pharmaceutical composition described herein elicits or promotes a CD4+ T cell immune response. In another embodiment, the administration of a pharmaceutical composition described herein elicits or promotes a CD4+ T cell immune response and a CD8+ T cell immune response.

[00094] In another embodiment, the patient received a chemotherapeutic agent, an immunomodulatory drug, an immune metabolism modifying drug, targeted therapy or radiation prior to and/or during receipt of the antigen peptide or nucleic acid vaccine. In another embodiment, the autologous T cells are obtained from a patient that has already received at least one round of T cell therapy containing an antigen. In another embodiment, the method further comprises adoptive T cell therapy. In another embodiment, the adoptive T cell therapy comprises autologous T cells. In another embodiment, the autologous T cells are targeted against viral antigens. In another embodiment, the adoptive T cell therapy further comprises allogenic T cells. In another embodiment, the allogenic T cells are targeted against viral antigens.

[00095] In one embodiment, provided herein is a method for evaluating the efficacy of treatment comprising: (i) measuring the number or concentration of target cells in a first sample obtained from the

subject before administering the modified cell, (ii) measuring the number or concentration of target cells in a second sample obtained from the subject after administration of the modified cell, and (iii) determining an increase or decrease of the number or concentration of target cells in the second sample compared to the number or concentration of target cells in the first sample. In another embodiment, the treatment efficacy is determined by monitoring a clinical outcome; an increase, enhancement or prolongation of antiviral activity by T cells; an increase in the number of antiviral T cells or activated T cells as compared with the number prior to treatment; B cell activity; CD4 T cell activity; or a combination thereof. In another embodiment, the treatment efficacy is determined by monitoring a biomarker. In another embodiment, the treatment effect is predicted by presence of T cells or by presence of a gene signature indicating T cell inflammation or a combination thereof.

[00096] Provided herein a pharmaceutical composition comprising: one or more polypeptides having an amino acid sequence of any one of the sequences depicted in column 2 of Table 11 and 12; or one or more recombinant polynucleotide constructs each encoding a polypeptide having an amino acid sequence of any one of the sequences depicted in column 2 of Table 11 and 12.

[00097] In some embodiments, the one or more polypeptides comprises at least 2, 3, 4, 5, 6, 7 or 8 different polypeptides having an amino acid sequence of any one of the sequences depicted in column 2 of Table 11 and 12; or wherein the one or more recombinant polynucleotide constructs comprises at least 2, 3, 4, 5, 6, 7 or 8 recombinant polynucleotide constructs each encoding a different polypeptide having an amino acid sequence of any one of the sequences depicted in column 2 of Table 11 and 12. In some embodiments, the pharmaceutical composition comprises at least 8 recombinant polynucleotide strings. In some embodiments, the one or more recombinant polynucleotide strings encoding a plurality of coronavirus peptide antigens, comprises a sequence selected from a group of sequences depicted in SEQ ID RS C1n, RS C2n, RS C3n, RSC4n, RS C5n, RS C6n, RS C7n, and RS C8n, or a sequence that is at least 70% sequence identity to any one of the above. In some embodiments, the recombinant polynucleotide construct comprises an mRNA. In some embodiments, the recombinant polynucleotide construct is an mRNA. In some embodiments, the pharmaceutical composition further comprises one or more lipid components. In some embodiments, the one or more lipids comprise a lipid nanoparticle (LNP). In some embodiments, the LNP encapsulates the recombinant polynucleotide construct. In some embodiments, the pharmaceutical composition is administered to a subject in need thereof.

[00098] Provided herein is a method of treating COVID in a subject in need thereof, comprising administering to the subject a pharmaceutical composition described above. In some embodiments, the pharmaceutical composition is administered in addition to one or more therapeutic for COVID. In some embodiments, the pharmaceutical composition is administered in combination with one or more polypeptides having an amino acid sequence of a 2019 SARS CoV-2 spike protein or fragment thereof; or one or more recombinant polynucleotide constructs encoding a 2019 SARS CoV-2 spike protein or

fragment thereof. In some embodiments, the 2019 SARS CoV-2 spike protein or fragment thereof is a SARS-CoV-2 spike protein or a fragment thereof. In some embodiments, the pharmaceutical composition is administered 2-10 weeks after a first administration of the 2019 SARS CoV-2 spike protein or fragment thereof. In some embodiments, the pharmaceutical composition is administered 1-6 months after a first administration of the 2019 SARS CoV-2 spike protein or fragment thereof. In some embodiments, the pharmaceutical composition is administered simultaneously with an administration of the 2019 SARS CoV-2 spike protein or fragment thereof. In some embodiments, the pharmaceutical composition is administered 2-10 weeks before an administration of the 2019 SARS CoV-2 spike protein or fragment thereof. In some embodiments, the pharmaceutical composition is administered 2-10 weeks after the first administration of vaccine comprising a SARS-CoV-2 spike protein or polynucleotide encoding the same. In some embodiments, the pharmaceutical composition is administered 1-6 months after the first administration of a SARS-CoV-2 spike protein or polynucleotide encoding the same. In some embodiments, the pharmaceutical composition is administered simultaneously with the administration of a SARS-CoV-2 spike protein or polynucleotide encoding the same. In some embodiments, the pharmaceutical composition is administered prophylactically. In some embodiments, the pharmaceutical composition is administered once every 1, 2, 3, 4, 5, 6 or more weeks.

[00099] Provided herein is an use of any one of the compositions described herein for preparing a therapeutic for treating or preventing a respiratory viral infection caused by 2019 SARS CoV-2 virus.

[000100] Where aspects or embodiments of the invention are described in terms of a Markush group or other grouping of alternatives, the present invention encompasses not only the entire group listed as a whole, but also each member of the group individually and all possible subgroups of the main group, and also the main group absent one or more of the group members. The present invention also envisages the explicit exclusion of one or more of any of the group members in the embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[000101] **FIG. 1** depicts an exemplary flow diagram of a method to identify peptides most relevant to the generation of CD8+ T cell responses against the viral epitopes described herein.

[000102] **FIG. 2** depicts exemplary graphs of results obtained using a T cell epitope prediction algorithm applied to class I peptide-MHC allele pairs in a validation dataset and comparison of the computed percent-ranks of these pairs with reported MHC-binding assay results. The percent-ranks of peptide-MHC allele pairs which had a binary “Positive” result in the MHC-binding assay were significantly lower than pairs with a “Negative” result. In the more granular positive results, stronger assay results (low <intermediate < high) were associated with significantly lower percent-ranks.

[000103] **FIG. 3** depicts experimental validation of HLA-A02:01 predicted epitopes from 2019 SARS CoV-2 in human T cell induction assays. 23 peptides that were predicted to be high binders to HLA-A02:01 (see

Table 4 of Example 8) were synthesized and assayed in T cell inductions using PBMCs from three human donors. Epitopes were considered to be immunogenic if at least one donor raised a T cell response to the peptide as determined by pMHC multimer technology. Representative flow cytometry plots of pMHC staining using peptides from Table 4 of Example 8 are shown. Multimer positive populations are circled, with the frequency of multimer positive CD8+ T cells shown in the upper right-hand corner of each plot.

[000104] FIG. 4A depicts exemplary graphs of cumulative USA population coverage of HLA alleles for the indicated peptides predicted to be MHC class I epitopes (left) and the cumulative USA population coverage of HLA alleles for 25mer peptides predicted to be MHC class II epitopes (right).

[000105] FIG. 4B depicts a small number of predicted multi-allele binding epitopes from individual 2019 SARS- CoV-2 proteins (alternatively termed 2019-CoV-2 proteins) can achieve broad population coverage. The upper panel shows cumulative HLA-I coverage for USA, EUR, and API populations versus the number of included prioritized HLA-I epitopes for M, N, and S proteins, respectively. Peptide sequences corresponding to the upper panel are shown in Table 6. The lower panel shows cumulative HLA-II coverage for each population versus the number of included prioritized HLA-II 25mers for M, N, and S proteins, respectively. Peptide sequences corresponding to the lower panel are shown in Table 7.

[000106] FIG. 5 depicts results from analysis of publicly available proteomic datasets showing relative 2019 SARS CoV-2 protein expression levels that can be leveraged to prioritize potential vaccine targets. Three datasets examining the proteomic response to 2019 SARS CoV-2 infection (alternatively termed 2019 SARS CoV-2 infection) were re-analyzed and protein abundance was estimated by spectral counts normalized to protein length. Any annotated ORF not shown in the figure was not detected in these proteomic studies. Across all three studies, the nucleocapsid protein is the most abundant protein during 2019 SARS CoV-2 infection.

[000107] FIG. 6A depicts a graphical representation of a string construct described as group 1, also described in Tables 9 and 11.

[000108] FIG. 6B provides a detailed and expanded view of the constructs in **FIG. 6A**.

[000109] FIG. 7A depicts a graphical representation of a string construct described as group 2, also described in Tables 10 and 12.

[000110] FIG. 7B provides a detailed and expanded view of the constructs in **FIG. 7A**.

[000111] FIG. 8Ai-8Aii show characterization of BNT mRNA vaccine-induced T cells on a single epitope level. Included data shows epitope responsive T cells for the indicated epitopes in three different participants. The vaccine comprises mRNA encoding a SARS-CoV-2 spike protein of 2019 SARS COV-2 encapsulated in a lipid nanoparticle.

[000112] FIG. 8B shows multimer positive CD8+ cells analysed by flow cytometry for cell surface markers, CCR7, CD45RA, CD3, PD-1, CD38, HLA-DR, CD28 and CD27.

[000113]FIG. 8C shows a polypeptide vaccine including the spike proteins S1 and S2, with indicated epitope regions that can bind to specific MHC molecules indicated by the solid shapes along the length, corresponding HLA allele to which it binds is indicated below.

[000114]FIG. 8D shows time course of T cell responses after vaccination of patients with Spike protein mRNA vaccines at different doses (10, 20 and 30 micrograms as indicated). Upper panel shows CD4+ T cell responses, indicated by IFN-g expression using ELISPOT assay. Lower panel shows CD8+ T cell responses, indicated by IFN-g expression using ELISPOT assay. CEF and CEFT are controls CMV, EBV and influenza pools.

[000115]FIG. 8E shows time course of CD4+ T cells and CD8+ T cell responses in older adult population who are administered Spike protein mRNA vaccine (10 microgram each).

[000116]FIG. 9 shows design of vaccine strings comprising ORF-1ab epitopes, with specific use of MS-based HLA-I cleavage predictor information in ordering the epitopes. The design utilizes minimum number of linker sequences.

[000117]FIG. 10A shows experimental design for validating immunogenicity of the string vaccine compositions in an animal model.

[000118]FIG. 10B shows experimental design for validating immunogenicity of the string vaccine compositions in an animal model, and comparing vaccines with spike protein mRNA vaccine composition alone, a string vaccine composition alone, or various combinations of the two as shown in the figure. In some sets coformulations of the two vaccines are dosed to mice, where exemplary coformulation ratios are: spike protein mRNA vaccine: string vaccine (e.g., 9:1, 3:1, or 1:1).

[000119]FIG. 11 demonstrates sequence variants and mutants across the spike protein in various SARS CoV-2 isolates, and the respective mapping of the vaccine epitope sequences.

[000120]FIG. 12 demonstrates sequence variants and mutants across the nucleocapsid protein in various SARS CoV-2 isolates, and the respective mapping of the vaccine epitope sequences.

[000121]FIG. 13 demonstrates sequence variants and mutants across the membrane protein in various SARS CoV-2 isolates, and the respective mapping of the vaccine epitope sequences.

[000122]FIG. 14 demonstrates sequence variants and mutants across the NSP1 protein in various SARS CoV-2 isolates, and the respective mapping of the vaccine epitope sequences.

[000123]FIG. 15 demonstrates sequence variants and mutants across the NSP2 protein in various SARS CoV-2 isolates, and the respective mapping of the vaccine epitope sequences.

[000124]FIG. 16 demonstrates sequence variants and mutants across the NSP3 protein in various SARS CoV-2 isolates, and the respective mapping of the vaccine epitope sequences.

[000125]FIG. 17 demonstrates sequence variants and mutants across the NSP4 protein in various SARS CoV-2 isolates, and the respective mapping of the vaccine epitope sequences.

DETAILED DESCRIPTION

[000126]Described herein are novel therapeutics and vaccines based on viral epitopes. Accordingly, the invention described herein provides peptides, polynucleotides encoding the peptides, and peptide binding agents that can be used, for example, to stimulate an immune response to a viral antigen, to create an immunogenic composition or vaccine for use in treating or preventing a viral infection.

Definitions

[000127]To facilitate an understanding of the present invention, a number of terms and phrases are defined below.

[000128]"Viral antigens" refer to antigens encoded by a virus. They include, but are not limited to, antigens of coronaviruses, such as COVID19.

[000129]Throughout this disclosure, "binding data" results can be expressed in terms of "IC50." IC50 is the concentration of the tested peptide in a binding assay at which 50% inhibition of binding of a labeled reference peptide is observed. Given the conditions in which the assays are run (i.e., limiting HLA protein and labeled reference peptide concentrations), these values approximate K_D values. Assays for determining binding are well known in the art and are described in detail, for example, in PCT publications WO 94/20127 and WO 94/03205, and other publications such Sidney et al., Current Protocols in Immunology 18.3.1 (1998); Sidney, et al., J. Immunol. 154:247 (1995); and Sette, et al., Mol. Immunol. 31:813 (1994). Alternatively, binding can be expressed relative to binding by a reference standard peptide. For example, can be based on its IC_{50}, relative to the IC_{50} of a reference standard peptide. Binding can also be determined using other assay systems including those using: live cells (e.g., Ceppellini et al., Nature 339:392 (1989); Christnick et al., Nature 352:67 (1991); Busch et al., Int. Immunol. 2:443 (1990); Hill et al., J. Immunol. 147:189 (1991); del Guercio et al., J. Immunol. 154:685 (1995)), cell free systems using detergent lysates (e.g., Cerundolo et al., J. Immunol 21:2069 (1991)), immobilized purified MHC (e.g., Hill et al., J. Immunol. 152, 2890 (1994); Marshall et al., J. Immunol. 152:4946 (1994)), ELISA systems (e.g., Reay et al., EMBO J. 11:2829 (1992)), surface plasmon resonance (e.g., Khilko et al., J. Biol. Chem. 268:15425 (1993)); high flux soluble phase assays (Hammer et al., J. Exp. Med. 180:2353 (1994)), and measurement of class I MHC stabilization or assembly (e.g., Ljunggren et al., Nature 346:476 (1990); Schumacher et al., Cell 62:563 (1990); Townsend et al., Cell 62:285 (1990); Parker et al., J. Immunol. 149:1896 (1992)).

[000130]The term "derived" when used to discuss an epitope is a synonym for "prepared." A derived epitope can be from a natural source, or it can be synthesized according to standard protocols in the art. Synthetic epitopes can comprise artificial amino acid residues "amino acid mimetics," such as D isomers of natural occurring L amino acid residues or non-natural amino acid residues such as cyclohexylalanine. A derived or prepared epitope can be an analog of a native epitope.

[000131]A "diluent" includes sterile liquids, such as water and oils, including those of petroleum, animal, vegetable or synthetic origin, such as peanut oil, soybean oil, mineral oil, sesame oil and the like. Water is

also a diluent for pharmaceutical compositions. Saline solutions and aqueous dextrose and glycerol solutions can also be employed as diluents, for example, in injectable solutions.

[000132] An "epitope" is the collective features of a molecule, such as primary, secondary and tertiary peptide structure, and charge, that together form a site recognized by, for example, an immunoglobulin, T cell receptor, HLA molecule, or chimeric antigen receptor. Alternatively, an epitope can be a set of amino acid residues which is involved in recognition by a particular immunoglobulin, or in the context of T cells, those residues necessary for recognition by T cell receptor proteins, chimeric antigen receptors, and/or Major Histocompatibility Complex (MHC) receptors. Epitopes can be prepared by isolation from a natural source, or they can be synthesized according to standard protocols in the art. Synthetic epitopes can comprise artificial amino acid residues, "amino acid mimetics," such as D isomers of naturally-occurring L amino acid residues or non-naturally-occurring amino acid residues such as cyclohexylalanine. Throughout this disclosure, epitopes may be referred to in some cases as peptides or peptide epitopes.

[000133] It is to be appreciated that proteins or peptides that comprise an epitope or an analog described herein as well as additional amino acid(s) are still within the bounds of the invention. In certain embodiments, the peptide comprises a fragment of an antigen.

[000134] In certain embodiments, there is a limitation on the length of a peptide of the invention. The embodiment that is length-limited occurs when the protein or peptide comprising an epitope described herein comprises a region (i.e., a contiguous series of amino acid residues) having 100% identity with a native sequence. In order to avoid the definition of epitope from reading, e.g., on whole natural molecules, there is a limitation on the length of any region that has 100% identity with a native peptide sequence. Thus, for a peptide comprising an epitope described herein and a region with 100% identity with a native peptide sequence, the region with 100% identity to a native sequence generally has a length of: less than or equal to 600 amino acid residues, less than or equal to 500 amino acid residues, less than or equal to 400 amino acid residues, less than or equal to 250 amino acid residues, less than or equal to 100 amino acid residues, less than or equal to 85 amino acid residues, less than or equal to 75 amino acid residues, less than or equal to 65 amino acid residues, and less than or equal to 50 amino acid residues. In certain embodiments, an "epitope" described herein is comprised by a peptide having a region with less than 51 amino acid residues that has 100% identity to a native peptide sequence, in any increment down to 5 amino acid residues; for example 50, 49, 48, 47, 46, 45, 44, 43, 42, 41, 40, 39, 38, 37, 36, 35, 34, 33, 32, 31, 30, 29, 28, 27, 26, 25, 24, 23, 22, 21, 20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2 or 1 amino acid residues.

[000135] "Human Leukocyte Antigen" or "HLA" is a human class I or class II Major Histocompatibility Complex (MITC) protein (see, e.g., Stites, et al., IMMUNOLOGY, 8TH ED., Lange Publishing, Los Altos, Calif. (1994).

An "HLA supertype or HLA family", as used herein, describes sets of HLA molecules grouped on the basis of shared peptide-binding specificities. HLA class I molecules that share somewhat similar binding affinity for peptides bearing certain amino acid motifs are grouped into such HLA supertypes. The terms HLA superfamily, HLA supertype family, HLA family, and HLA xx-like molecules (where "xx" denotes a particular HLA type), are synonyms.

[000136]The terms "identical" or percent "identity," in the context of two or more peptide sequences or antigen fragments, refer to two or more sequences or subsequences that are the same or have a specified percentage of amino acid residues that are the same, when compared and aligned for maximum correspondence over a comparison window, as measured using a sequence comparison algorithm or by manual alignment and visual inspection.

[000137]An "immunogenic" peptide or an "immunogenic" epitope or "peptide epitope" is a peptide that comprises an allele-specific motif such that the peptide will bind an HLA molecule and induce a cell-mediated or humoral response, for example, cytotoxic T lymphocyte (CTL), helper T lymphocyte (HTL) and/or B lymphocyte response. Thus, immunogenic peptides described herein are capable of binding to an appropriate HLA molecule and thereafter inducing a CTL (cytotoxic) response, or a HTL (and humoral) response, to the peptide.

[000138]As used herein, a "chimeric antigen receptor" or "CAR" refers to an antigen binding protein in that includes an immunoglobulin antigen binding domain (e.g., an immunoglobulin variable domain) and a T cell receptor (TCR) constant domain. As used herein, a "constant domain" of a TCR polypeptide includes a membrane-proximal TCR constant domain, and may also include a TCR transmembrane domain and/or a TCR cytoplasmic tail. For example, in some embodiments, the CAR is a dimer that includes a first polypeptide comprising a immunoglobulin heavy chain variable domain linked to a TCR-beta constant domain and a second polypeptide comprising an immunoglobulin light chain variable domain (e.g., a lc or 2\., variable domain) linked to a TCRα constant domain. In some embodiments, the CAR is a dimer that includes a first polypeptide comprising a immunoglobulin heavy chain variable domain linked to a TCRα constant domain and a second polypeptide comprising an immunoglobulin light chain variable domain linked to a TCRβ constant domain.

[000139]The phrases "isolated" or "biologically pure" refer to material which is substantially or essentially free from components which normally accompany the material as it is found in its native state. Thus, peptides described herein do not contain some or all of the materials normally associated with the peptides in their in situ environment. An "isolated" epitope refers to an epitope that does not include the whole sequence of the antigen from which the epitope was derived. Typically, the "isolated" epitope does not have attached thereto additional amino acid residues that result in a sequence that has 100% identity over the entire length of a native sequence. The native sequence can be a sequence such as a viral antigen from which the epitope is derived. Thus, the term "isolated" means that the material is removed from its original

environment (e.g., the natural environment if it is naturally occurring). For example, a naturally-occurring polynucleotide or peptide present in a living animal is not isolated, but the same polynucleotide or peptide, separated from some or all of the coexisting materials in the natural system, is isolated. Such a polynucleotide could be part of a vector, and/or such a polynucleotide or peptide could be part of a composition, and still be "isolated" in that such vector or composition is not part of its natural environment. RNA molecules include in vivo or in vitro RNA transcripts of the DNA molecules described herein, and further include such molecules produced synthetically.

[000140] "Major Histocompatibility Complex" or "MHC" is a cluster of genes that plays a role in control of the cellular interactions responsible for physiologic immune responses. In humans, the MHC complex is also known as the human leukocyte antigen (HLA) complex. For a detailed description of the MHC and HLA complexes, see, Paul, FUNDAMENTAL IMMUNOLOGY, 3.sup.RD ED., Raven Press, New York (1993).

[000141] A "native" or a "wild type" sequence refers to a sequence found in nature. Such a sequence can comprise a longer sequence in nature.

[000142] A "T cell epitope" is to be understood as meaning a peptide sequence which can be bound by the MHC molecules of class I or II in the form of a peptide-presenting MHC molecule or MHC complex and then, in this form, be recognized and bound by cytotoxic T-lymphocytes or T-helper cells, respectively.

[000143] A "receptor" is to be understood as meaning a biological molecule or a molecule grouping capable of binding a ligand. A receptor may serve, to transmit information in a cell, a cell formation or an organism. The receptor comprises at least one receptor unit, for example, where each receptor unit may consist of a protein molecule. The receptor has a structure which complements that of a ligand and may complex the ligand as a binding partner. The information is transmitted in particular by conformational changes of the receptor following complexation of the ligand on the surface of a cell. In some embodiments, a receptor is to be understood as meaning in particular proteins of MHC classes I and II capable of forming a receptor/ligand complex with a ligand, in particular a peptide or peptide fragment of suitable length.

[000144] A "ligand" is to be understood as meaning a molecule which has a structure complementary to that of a receptor and is capable of forming a complex with this receptor. In some embodiments, a ligand is to be understood as meaning a peptide or peptide fragment which has a suitable length and suitable binding motifs in its amino acid sequence, so that the peptide or peptide fragment is capable of forming a complex with proteins of MHC class I or MHC class II.

[000145] In some embodiments, a "receptor/ligand complex" is also to be understood as meaning a "receptor/peptide complex" or "receptor/peptide fragment complex", including a peptide- or peptide fragment-presenting MHC molecule of class I or of class II.

[000146] "Proteins or molecules of the major histocompatibility complex (MHC)", "MHC molecules", "MHC proteins" or "HLA proteins" are to be understood as meaning proteins capable of binding peptides

resulting from the proteolytic cleavage of protein antigens and representing potential lymphocyte epitopes, (e.g., T cell epitope and B cell epitope) transporting them to the cell surface and presenting them there to specific cells, in particular cytotoxic T-lymphocytes, T-helper cells, or B cells. The major histocompatibility complex in the genome comprises the genetic region whose gene products expressed on the cell surface are important for binding and presenting endogenous and/or foreign antigens and thus for regulating immunological processes. The major histocompatibility complex is classified into two gene groups coding for different proteins, namely molecules of MHC class I and molecules of MHC class II. The cellular biology and the expression patterns of the two MHC classes are adapted to these different roles.

[000147]The terms "peptide" and "peptide epitope" are used interchangeably with "oligopeptide" in the present specification to designate a series of residues connected one to the other, typically by peptide bonds between the a-amino and carboxyl groups of adjacent amino acid residues.

[000148]"Synthetic peptide" refers to a peptide that is obtained from a non-natural source, e.g., is man-made. Such peptides can be produced using such methods as chemical synthesis or recombinant DNA technology. "Synthetic peptides" include "fusion proteins."

[000149]A "PanDR binding" peptide, a "PanDR binding epitope" is a member of a family of molecules that binds more than one HLA class II DR molecule.

[000150]"Pharmaceutically acceptable" refers to a generally non-toxic, inert, and/or physiologically compatible composition or component of a composition.

[000151]A "pharmaceutical excipient" or "excipient" comprises a material such as an adjuvant, a carrier, pH-adjusting and buffering agents, tonicity adjusting agents, wetting agents, preservatives, and the like. A "pharmaceutical excipient" is an excipient which is pharmaceutically acceptable. The term "motif' refers to a pattern of residues in an amino acid sequence of defined length, for example, a peptide of less than about 15 amino acid residues in length, or less than about 13 amino acid residues in length, for example, from about 8 to about 13 amino acid residues (e.g., 8, 9, 10, 11, 12, or 13) for a class I HLA motif and from about 6 to about 25 amino acid residues (e.g., 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, or 25) fora class II HLA motif, which is recognized by a particular HLA molecule. Motifs are typically different for each HLA protein encoded by a given human HLA allele. These motifs differ in their pattern of the primary and secondary anchor residues. In some embodiments, an MHC class I motif identifies a peptide of 9, 10, or 11 amino acid residues in length.

[000152]A "supermotif' is a peptide binding specificity shared by HLA molecules encoded by two or more HLA alleles. In some embodiments, a supermotif-bearing peptide described herein is recognized with high or intermediate affinity (as defined herein) by two or more HLA antigens.

[000153]The term "naturally occurring" as used herein refers to the fact that an object can be found in nature. For example, a peptide or nucleic acid that is present in an organism (including viruses) and can be

from a source in nature and which has not been intentionally modified by man in the laboratory is naturally occurring.

[000154] According to the invention, the term "vaccine" relates to a pharmaceutical preparation (pharmaceutical composition) or product that upon administration induces an immune response, for example, a cellular or humoral immune response, which recognizes and attacks a pathogen or a diseased cell such as a cell infected with a virus. A vaccine may be used for the prevention or treatment of a disease.

[000155] A "protective immune response" or "therapeutic immune response" refers to a CTL and/or an HTL response to an antigen derived from an pathogenic antigen (e.g., a viral antigen), which in some way prevents or at least partially arrests disease symptoms, side effects or progression. The immune response can also include an antibody response which has been facilitated by the stimulation of helper T cells.

[000156] "Antigen processing" or "processing" refers to the degradation of a polypeptide or antigen into procession products, which are fragments of said polypeptide or antigen (e.g., the degradation of a polypeptide into peptides) and the association of one or more of these fragments (e.g., via binding) with MHC molecules for presentation by cells, for example, antigen presenting cells, to specific T cells.

[000157] "Antigen presenting cells" (APC) are cells which present peptide fragments of protein antigens in association with MHC molecules on their cell surface. Some APCs may activate antigen specific T cells. Professional antigen-presenting cells are very efficient at internalizing antigen, either by phagocytosis or by receptor-mediated endocytosis, and then displaying a fragment of the antigen, bound to a class II MHC molecule, on their membrane. The T cell recognizes and interacts with the antigen-class II MHC molecule complex on the membrane of the antigen presenting cell. An additional co-stimulatory signal is then produced by the antigen presenting cell, leading to activation of the T cell. The expression of co-stimulatory molecules is a defining feature of professional antigen-presenting cells.

[000158] The main types of professional antigen-presenting cells are dendritic cells, which have the broadest range of antigen presentation, and are probably the most important antigen presenting cells, macrophages, B-cells, and certain activated epithelial cells.

[000159] Dendritic cells (DCs) are leukocyte populations that present antigens captured in peripheral tissues to T cells via both MHC class II and I antigen presentation pathways. It is well known that dendritic cells are potent inducers of immune responses and the activation of these cells is a critical step for the induction of antiviral immunity.

[000160] Dendritic cells are conveniently categorized as "immature" and "mature" cells, which can be used as a simple way to discriminate between two well characterized phenotypes. However, this nomenclature should not be construed to exclude all possible intermediate stages of differentiation.

[000161] Immature dendritic cells are characterized as antigen presenting cells with a high capacity for antigen uptake and processing, which correlates with the high expression of Fey receptor and mannose receptor. The mature phenotype is typically characterized by a lower expression of these markers, but a

high expression of cell surface molecules responsible for T cell activation such as class I and class II MHC, adhesion molecules (e. g. CD54 and CD11) and costimulatory molecules (e. g., CD40, CD80, CD86 and 4-1 BB).

[000162]The term "residue" refers to an amino acid residue or amino acid mimetic residue incorporated into a peptide or protein by an amide bond or amide bond mimetic, or nucleic acid (DNA or RNA) that encodes the amino acid or amino acid mimetic.

[000163]The nomenclature used to describe peptides or proteins follows the conventional practice wherein the amino group is presented to the left (the amino- or N-terminus) and the carboxyl group to the right (the carboxy- or C-terminus) of each amino acid residue. When amino acid residue positions are referred to in a peptide epitope they are numbered in an amino to carboxyl direction with position one being the residue located at the amino terminal end of the epitope, or the peptide or protein of which it can be a part.

[000164]In the formulae representing selected specific embodiments of the present invention, the amino- and carboxyl-terminal groups, although not specifically shown, are in the form they would assume at physiologic pH values, unless otherwise specified. In the amino acid structure formulae, each residue is generally represented by standard three letter or single letter designations. The L-form of an amino acid residue is represented by a capital single letter or a capital first letter of a three-letter symbol, and the D-form for those amino acid residues having D-forms is represented by a lower case single letter or a lower case three letter symbol. However, when three letter symbols or full names are used without capitals, they can refer to L amino acid residues. Glycine has no asymmetric carbon atom and is simply referred to as "Gly" or "G". The amino acid sequences of peptides set forth herein are generally designated using the standard single letter symbol. (A, Alanine; C, Cysteine; D, Aspartic Acid; E, Glutamic Acid; F, Phenylalanine; G, Glycine; H, Histidine; I, Isoleucine; K, Lysine; L, Leucine; M, Methionine; N, Asparagine; P, Proline; Q, Glutamine; R, Arginine; S, Serine; T, Threonine; V, Valine; W, Tryptophan; and Y, Tyrosine.)

[000165]The terms "polynucleotide" and "nucleic acid" are used interchangeably herein and refer to polymers of nucleotides of any length, and include DNA and RNA, for example, mRNA. The nucleotides can be deoxyribonucleotides, ribonucleotides, modified nucleotides or bases, and/or their analogs, or any substrate that can be incorporated into a polymer by DNA or RNA polymerase. In some embodiments, the polynucleotide and nucleic acid can be in vitro transcribed mRNA. In some embodiments, the polynucleotide that is administered is mRNA.

[000166]The terms "identical" or percent "identity" in the context of two or more nucleic acids or polypeptides, refer to two or more sequences or subsequences that are the same or have a specified percentage of nucleotides or amino acid residues that are the same, when compared and aligned (introducing gaps, if necessary) for maximum correspondence, not considering any conservative amino acid substitutions as part of the sequence identity. The percent identity can be measured using sequence

comparison software or algorithms or by visual inspection. Various algorithms and software that can be used to obtain alignments of amino acid or nucleotide sequences are well-known in the art. These include, but are not limited to, BLAST, ALIGN, Megalign, BestFit, GCG Wisconsin Package, and variations thereof. In some embodiments, two nucleic acids or polypeptides described herein are substantially identical, meaning they have at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, and in some embodiments at least 95%, 96%, 97%, 98%, 99% nucleotide or amino acid residue identity, when compared and aligned for maximum correspondence, as measured using a sequence comparison algorithm or by visual inspection. In some embodiments, identity exists over a region of the sequences that is at least about 10, at least about 20, at least about 40-60 residues, at least about 60-80 residues in length or any integral value 2between. In some embodiments, identity exists over a longer region than 60-80 residues, such as at least about 80-100 residues, and in some embodiments the sequences are substantially identical over the full length of the sequences being compared, such as the coding region of a nucleotide sequence.

[000167] A "conservative amino acid substitution" is one in which one amino acid residue is replaced with another amino acid residue having a similar side chain. Families of amino acid residues having similar side chains have been defined in the art, including basic side chains (e.g., lysine, arginine, histidine), acidic side chains (e.g., aspartic acid, glutamic acid), uncharged polar side chains (e.g., glycine, asparagine, glutamine, serine, threonine, tyrosine, cysteine), nonpolar side chains (e.g., alanine, valine, leucine, isoleucine, proline, phenylalanine, methionine, tryptophan), beta-branched side chains (e.g., threonine, valine, isoleucine) and aromatic side chains (e.g., tyrosine, phenylalanine, tryptophan, histidine). For example, substitution of a phenylalanine for a tyrosine is a conservative substitution. Methods of identifying nucleotide and amino acid conservative substitutions which do not eliminate peptide function are well-known in the art.

[000168] The term "vector" as used herein means a construct, which is capable of delivering, and usually expressing, one or more gene(s) or sequence(s) of interest in a host cell. Examples of vectors include, but are not limited to, viral vectors, naked DNA or RNA expression vectors, plasmid, cosmid, or phage vectors, DNA or RNA expression vectors associated with cationic condensing agents, and DNA or RNA expression vectors encapsulated in liposomes.

[000169] A polypeptide, antibody, polynucleotide, vector, cell, or composition which is "isolated" is a polypeptide, antibody, polynucleotide, vector, cell, or composition which is in a form not found in nature. Isolated polypeptides, antibodies, polynucleotides, vectors, cells, or compositions include those which have been purified to a degree that they are no longer in a form in which they are found in nature. In some embodiments, a polypeptide, antibody, polynucleotide, vector, cell, or composition which is substantially pure. In one embodiment, a "polynucleotide" encompasses a PCR or quantitative PCR reaction comprising the polynucleotide amplified in the PCR or quantitative PCR reaction.

[000170] The term "substantially pure" as used herein refers to material which is at least 50% pure (i.e., free from contaminants), at least 90% pure, at least 95% pure, at least 98% pure, or at least 99% pure.

[000171]The term "subject" refers to any animal (e.g., a mammal), including, but not limited to, humans, non-human primates, canines, felines, rodents, and the like, which is to be the recipient of a particular treatment. Typically, the terms "subject" and "patient" are used interchangeably herein in reference to a human subject.

[000172]The terms "effective amount" or "therapeutically effective amount" or "therapeutic effect" refer to an amount of a therapeutic effective to "treat" a disease or disorder in a subject or mammal. The therapeutically effective amount of a drug has a therapeutic effect and as such can prevent the development of a disease or disorder; slow down the development of a disease or disorder; slow down the progression of a disease or disorder; relieve to some extent one or more of the symptoms associated with a disease or disorder; reduce morbidity and mortality; improve quality of life; or a combination of such effects.

[000173]The terms "treating" or "treatment" or "to treat" or "alleviating" or "to alleviate" refer to both 1) therapeutic measures that cure, slow down, lessen symptoms of, and/or halt progression of a diagnosed pathologic condition or disorder and 2) prophylactic or preventative measures that prevent or slow the development of a targeted pathologic condition or disorder. Thus, those in need of treatment include those already with the disorder; those prone to have the disorder; and those in whom the disorder is to be prevented.

[000174] As used in the present disclosure and embodiments, the singular forms "a", "an" and "the" include plural forms unless the context clearly dictates otherwise.

[000175]The term "therapeutic" refers a composition that is used to treat or prevent a disease or a condition, such as viral infect, e.g. coronaviral infection. For example, a therapeutic is may be vaccine. A therapeutic may be a drug, e.g., a small molecule drug. A therapeutic may be administered to a subject in need thereof, to prevent a disease or an infection, or to reduce or ameliorate one or more symptoms associated with a disease. A therapeutic may also be considered to treat at least a symptom of the disease.

[000176]It is understood that terms such as "comprises", "comprised", "comprising" and the like can have the meaning attributed to it in U.S. Patent law; e.g., they can mean "includes", "included", "including", and the like; and that terms such as "consisting essentially of and "consists essentially of have the meaning ascribed to them in U.S. Patent law, e.g., they allow for elements not explicitly recited, but exclude elements that are found in the prior art or that affect a basic or novel characteristic of the invention. Nothing herein is intended as a promise.

[000177]The term "and/or" as used in a phrase such as "A and/or B" herein is intended to include both A and B; A or B; A (alone); and B (alone). Likewise, the term "and/or" as used in a phrase such as "A, B, and/or C" is intended to encompass each of the following embodiments: A, B, and C; A, B, or C; A or C; A or B; B or C; A and C; A and B; B and C; A (alone); B (alone); and C (alone).

[000178]The term "2019 SARS-CoV 2" when, for example, referring to a virus, includes, but is not limited to, the 2019 SARS-CoV 2 virus and any mutant or variant thereof.

[000179]In some embodiments, sequencing methods may be used to identify virus specific epitopes. Any suitable sequencing method can be used according to the invention, for example, Next Generation Sequencing (NGS) technologies. Third Generation Sequencing methods might substitute for the NGS technology in the future to speed up the sequencing step of the method. For clarification purposes: the terms "Next Generation Sequencing" or "NGS" in the context of the present invention mean all novel high throughput sequencing technologies which, in contrast to the "conventional" sequencing methodology known as Sanger chemistry, read nucleic acid templates randomly in parallel along the entire genome by breaking the entire genome into small pieces. Such NGS technologies (also known as massively parallel sequencing technologies) are able to deliver nucleic acid sequence information of a whole genome, exome, transcriptome (all transcribed sequences of a genome) or methylome (all methylated sequences of a genome) in very short time periods, e.g. within 1-2 weeks, for example, within 1-7 days or within less than 24 hours and allow, in principle, single cell sequencing approaches. Multiple NGS platforms which are commercially available or which are mentioned in the literature can be used in the context of the invention e.g. those described in detail in WO 2012/159643.

[000180]In certain embodiments a viral epitope peptide described herein molecule can comprise, but is not limited to, about 5, about 6, about 7, about 8, about 9, about 10, about 11, about 12, about 13, about 14, about 15, about 16, about 17, about 18, about 19, about 20, about 21, about 22, about 23, about 24, about 25, about 26, about 27, about 28, about 29, about 30, about 31, about 32, about 33, about 34, about 35, about 36, about 37, about 38, about 39, about 40, about 41, about 42, about 43, about 44, about 45, about 46, about 47, about 48, about 49, about 50, about 60, about 70, about 80, about 90, about 100, about 110, about 120 or greater amino acid residues, and any range derivable therein. In specific embodiments, a viral epitope peptide molecule is equal to or less than 100 amino acids.

[000181]In some embodiments, viral epitope peptides described herein for MHC Class I are 13 residues or less in length and usually consist of between about 8 and about 11 residues, particularly 9 or 10 residues. In some embodiments, viral epitope peptides described herein for MHC Class II are 9-24 residues in length.

[000182]A longer viral protein epitope peptide can be designed in several ways. In some embodiments, when HLA-binding peptides are predicted or known, a longer viral protein epitope peptide could consist of (1) individual binding peptides with extensions of 2-5 amino acids toward the N- and C-terminus of each corresponding peptide; or (2) a concatenation of some or all of the binding peptides with extended sequences for each. In some embodiments, use of a longer peptide is presumed to allow for endogenous processing by patient cells and can lead to more effective antigen presentation and induction of T cell responses. In some embodiments, two or more peptides can be used, where the peptides overlap and are tiled over the long viral epitope peptide.

[000183]In some embodiments, the viral epitope peptides and polypeptides bind an HLA protein (e.g., HLA class I or HLA class II). In specific embodiments the viral epitope peptide or polypeptide has an IC_{50} of at

least less than 5000 nM, at least less than 500 nM, at least less than 100 nM, at least less than 50 nM or less.

[000184]In some embodiments, a viral protein epitope peptide described herein can be in solution, lyophilized, or can be in crystal form.

[000185]In some embodiments, a viral protein epitope peptide described herein can be prepared synthetically, by recombinant DNA technology or chemical synthesis, or can be from natural sources such as native viruses. Epitopes can be synthesized individually or joined directly or indirectly in a peptide. Although a viral epitope peptide described herein will be substantially free of other naturally occurring host cell proteins and fragments thereof, in some embodiments the peptide can be synthetically conjugated to be joined to native fragments or particles.

[000186]In some embodiments, a viral protein epitope peptide described herein can be prepared in a wide variety of ways. In some embodiments, the peptides can be synthesized in solution or on a solid support according to conventional techniques. Various automatic synthesizers are commercially available and can be used according to known protocols. (See, for example, Stewart & Young, Solid Phase Peptide Synthesis, 2D. ED., Pierce Chemical Co., 1984). Further, individual peptides can be joined using chemical ligation to produce larger peptides that are still within the bounds of the invention.

[000187]Alternatively, recombinant DNA technology can be employed wherein a nucleotide sequence which encodes a peptide inserted into an expression vector, transformed or transfected into an appropriate host cell and cultivated under conditions suitable for expression. These procedures are generally known in the art, as described generally in Sambrook et al., MOLECULAR CLONING, A LABORATORY MANUAL, Cold Spring Harbor Press, Cold Spring Harbor, N.Y. (1989). Thus, recombinant peptides, which comprise or consist of one or more epitopes described herein, can be used to present the appropriate T cell epitope.

[000188]In one aspect, the invention described herein also provides compositions comprising one, at least two, or more than two viral epitope peptides. In some embodiments a composition described herein contains at least two distinct peptides. In some embodiments, the at least two distinct peptides are derived from the same polypeptide. By distinct polypeptides is meant that the peptide vary by length, amino acid sequence or both. The peptides are derived from any polypeptide known to or have been found to contain a viral-specific epitope.

Viral epitope polynucleotides

[000189]Polynucleotides encoding each of the peptides described herein are also part of the invention. As appreciated by one of ordinary skill in the art, various nucleic acids will encode the same peptide due to the redundancy of the genetic code. Each of these nucleic acids falls within the scope of the present invention. This embodiment of the invention comprises DNA and RNA, for example, mRNA, and in certain embodiments a combination of DNA and RNA. In one embodiment, the mRNA is a self-amplifying

mRNA. (Brito et al., Adv. Genet. 2015; 89:179-233). It is to be appreciated that any polynucleotide that encodes a peptide described herein falls within the scope of this invention.

[000190]The term "RNA" includes and in some embodiments relates to "mRNA". The term "mRNA" means "messenger-RNA" and relates to a "transcript" which is generated by using a DNA template and encodes a peptide or polypeptide. Typically, an mRNA comprises a 5'-UTR, a protein coding region, and a 3'-UTR. mRNA only possesses limited half-life in cells and in vitro. In one embodiment, the mRNA is self-amplifying mRNA. In the context of the present invention, mRNA may be generated by in vitro transcription from a DNA template. The in vitro transcription methodology is known to the skilled person. For example, there is a variety of in vitro transcription kits commercially available.

[000191]The stability and translation efficiency of RNA may be modified as required. For example, RNA may be stabilized and its translation increased by one or more modifications having a stabilizing effects and/or increasing translation efficiency of RNA. Such modifications are described, for example, in PCT/EP2006/009448 incorporated herein by reference. In order to increase expression of the RNA used according to the present invention, it may be modified within the coding region, i.e. the sequence encoding the expressed peptide or protein, without altering the sequence of the expressed peptide or protein, so as to increase the GC-content to increase mRNA stability and to perform a codon optimization and, thus, enhance translation in cells.

[000192]The term "modification" in the context of the RNA used in the present invention includes any modification of an RNA which is not naturally present in said RNA. In one embodiment of the invention, the RNA used according to the invention does not have uncapped 5'-triphosphates. Removal of such uncapped 5'-triphosphates can be achieved by treating RNA with a phosphatase. The RNA according to the invention may have modified ribonucleotides in order to increase its stability and/or decrease cytotoxicity. For example, in one embodiment, in the RNA used according to the invention cytidine may be substituted by 5-methylcytidine; 5-methylcytidine is substituted partially or completely, for example, completely, for cytidine. Alternatively, or additionally, in one embodiment, in the RNA used according to the invention uridine may be substituted by pseudouridine or 1-methyl pseudouridine; pseudouridine or 1-methyl pseudouridine is substituted partially or completely, for example, completely, for uridine.

[000193]In one embodiment the term "modification" relates to providing an RNA with a 5'-cap or 5'- cap analog. The term "5'-cap" refers to a cap structure found on the 5'-end of an mRNA molecule and generally consists of a guanosine nucleotide connected to the mRNA via an unusual 5' to 5' triphosphate linkage. In one embodiment, this guanosine is methylated at the 7-position. The term "conventional 5'-cap" refers to a naturally occurring RNA 5'-cap, to the 7-methylguanosine cap (m G). In the context of the present invention, the term "5'-cap" includes a 5'-cap analog that resembles the RNA cap structure and is modified to possess the ability to stabilize RNA and/or enhance translation of RNA if attached thereto, in vivo and/or in a cell.

[000194]In certain embodiments, an mRNA encoding a viral epitope is administered to a subject in need thereof. In one embodiment, the invention provides RNA, oligoribonucleotide, and polyribonucleotide molecules comprising a modified nucleoside, gene therapy vectors comprising same, gene therapy methods and gene transcription silencing methods comprising same. In one embodiment, the mRNA to be administered comprises at least one modified nucleoside.

[000195]The polynucleotides encoding peptides described herein can be synthesized by chemical techniques, for example, the phosphotriester method of Matteucci, et al., J. Am. Chem. Soc. 103:3185 (1981). Polynucleotides encoding peptides comprising or consisting of an analog can be made simply by substituting the appropriate and desired nucleic acid base(s) for those that encode the native epitope.

[000196]A large number of vectors and host systems suitable for producing and administering a viral epitope peptide described herein are known to those of skill in the art, and are commercially available. The following vectors are provided by way of example. Bacterial: pQE70, pQE60, pQE-9 (Qiagen), pBS, pD10, phagescript, psiX174, pBluescript SK, pbsks, pNH8A, pNH16a, pNH18A, pNH46A (Stratagene); ptrc99a, pKK223-3, pKK233-3, pDR540, pRIT5 (Pharmacia); pCR (Invitrogen). Eukaryotic: pWLNEO, pSV2CAT, pOG44, pXT1, pSG (Stratagene) pSVK3, pBPV, pMSG, pSVL (Pharmacia); p75.6 (Valentis); pCEP (Invitrogen); pCEI (Epimmune). However, any other plasmid or vector can be used as long as it is replicable and viable in the host.

[000197]As representative examples of appropriate hosts, there can be mentioned: bacterial cells, such as *E. coli, Bacillus subtilis, Salmonella typhimurium* and various species within the genera *Pseudomonas, Streptomyces,* and *Staphylococcus;* fungal cells, such as yeast; insect cells such as Drosophila and Sf9; animal cells such as COS-7 lines of monkey kidney fibroblasts, described by Gluzman, Cell 23:175 (1981), and other cell lines capable of expressing a compatible vector, for example, the C127, 3T3, CHO, HeLa and BHK cell lines or Bowes melanoma; plant cells, etc. The selection of an appropriate host is deemed to be within the scope of those skilled in the art from the teachings herein.

[000198]Thus, the present disclosure is also directed to vectors, and expression vectors useful for the production and administration of the viral epitope peptides described herein, and to host cells comprising such vectors.

[000199]Host cells are genetically engineered (transduced or transformed or transfected) with the vectors which can be, for example, a cloning vector or an expression vector. The vector can be, for example, in the form of a plasmid, a viral particle, a phage, etc. The engineered host cells can be cultured in conventional nutrient media modified as appropriate for activating promoters, selecting transformants or amplifying the polynucleotides. The culture conditions, such as temperature, pH and the like, are those previously used with the host cell selected for expression, and will be apparent to the ordinarily skilled artisan.

[000200]For expression of the viral epitope peptides described herein, the coding sequence will be provided operably linked start and stop codons, promoter and terminator regions, and in some embodiments, and a

replication system to provide an expression vector for expression in the desired cellular host. For example, promoter sequences compatible with bacterial hosts are provided in plasmids containing convenient restriction sites for insertion of the desired coding sequence. The resulting expression vectors are transformed into suitable bacterial hosts.

[000201] Generally, recombinant expression vectors will include origins of replication and selectable markers permitting transformation of the host cell, e.g., the ampicillin resistance gene of E. coli and S. cerevisiae TRP1 gene, and a promoter derived from a highly-expressed gene to direct transcription of a downstream structural sequence. Such promoters can be derived from operons encoding glycolytic enzymes such as 3-phosphoglycerate kinase (PGK), acid phosphatase, or heat shock proteins, among others. The heterologous structural sequence is assembled in appropriate phase with translation initiation and termination sequences, and in some embodiments, a leader sequence capable of directing secretion of translated protein into the periplasmic space or extracellular medium. Optionally, the heterologous sequence can encode a fusion protein including an N-terminal identification peptide imparting desired characteristics, e.g., stabilization or simplified purification of expressed recombinant product.

[000202] Yeast, insect or mammalian cell hosts can also be used, employing suitable vectors and control sequences. Examples of mammalian expression systems include the COS-7 lines of monkey kidney fibroblasts, described by Gluzman, Cell 23:175 (1981), and other cell lines capable of expressing a compatible vector, for example, the C127, 3T3, CHO, HeLa and BHK cell lines. Mammalian expression vectors will comprise an origin of replication, a suitable promoter and enhancer, and also any necessary ribosome binding sites, polyadenylation site, splice donor and acceptor sites, transcriptional termination sequences, and 5' flanking non-transcribed sequences. Such promoters can also be derived from viral sources, such as, e.g., human cytomegalovirus (CMV-IE promoter) or herpes simplex virus type-1 (HSV TK promoter). Nucleic acid sequences derived from the SV40 splice, and polyadenylation sites can be used to provide the non-transcribed genetic elements.

[000203] Polynucleotides encoding viral epitope peptides described herein can also comprise a ubiquitination signal sequence, and/or a targeting sequence such as an endoplasmic reticulum (ER) signal sequence to facilitate movement of the resulting peptide into the endoplasmic reticulum.

[000204] Polynucleotides described herein can be administered and expressed in human cells (e.g., immune cells, including dendritic cells). A human codon usage table can be used to guide the codon choice for each amino acid. Such polynucleotides comprise spacer amino acid residues between epitopes and/or analogs, such as those described above, or can comprise naturally-occurring flanking sequences adjacent to the epitopes and/or analogs (and/or CTL, HTL, and B cell epitopes).

[000205] In some embodiments, a viral epitope peptide described herein can also be administered/expressed by viral or bacterial vectors. Examples of expression vectors include attenuated viral hosts, such as vaccinia or fowlpox. As an example of this approach, vaccinia virus is used as a vector to express nucleotide

sequences that encode the viral epitope peptides described herein. Vaccinia vectors and methods useful in immunization protocols are described in, e.g., U.S. Pat. No. 4,722,848. Another vector is BCG (Bacille Calmette Guerin). BCG vectors are described by Stover et al., Nature 351:456-460 (1991). A wide variety of other vectors useful for therapeutic administration or immunization of the viral epitope polypeptides described herein, e.g. adeno and adeno-associated virus vectors, retroviral vectors, Salmonella typhi vectors, detoxified anthrax toxin vectors, Sendai virus vectors, poxvirus vectors, canarypox vectors, and fowlpox vectors, and the like, will be apparent to those skilled in the art from the description herein. In some embodiments, the vector is Modified Vaccinia Ankara (VA) (e.g. Bavarian Nordic (MVA-BN)).

[000206]Standard regulatory sequences well known to those of skill in the art can be included in the vector to ensure expression in the human target cells. Several vector elements are desirable: a promoter with a downstream cloning site for polynucleotide, e.g., minigene insertion; a polyadenylation signal for efficient transcription termination; an E. coli origin of replication; and an E. coli selectable marker (e.g. ampicillin or kanamycin resistance). Numerous promoters can be used for this purpose, e.g., the human cytomegalovirus (hCMV) promoter. See, e.g., U.S. Pat. Nos. 5,580,859 and 5,589,466 for other suitable promoter sequences. In some embodiments, the promoter is the CMV-IE promoter.

[000207]Polynucleotides described herein can comprise one or more synthetic or naturally-occurring introns in the transcribed region. The inclusion of mRNA stabilization sequences and sequences for replication in mammalian cells can also be considered for increasing polynucleotide expression.

[000208]In addition, a polynucleotide described herein can comprise immunostimulatory sequences (ISSs or CpGs). These sequences can be included in the vector, outside the polynucleotide coding sequence to enhance immunogenicity.

Viral epitopes

[000209]Coronaviruses are enveloped positive-stranded RNA viruses that belong to the family Coronaviridae and the order Nidovirales. Coronaviruses frequently infect people around the globe. There are a large number of coronaviruses, most of which circulate among peridomestic animals including pigs, camels, bats and cats. Of the seven coronaviruses identified in human so far, Coronaviruses 229E, NL63 were classified as Group 1 antigenic viruses, OC43 and HKU1 were classified as Group 2 antigenic viruses. They typically infect upper respiratory tract in human, and can bring about acute respiratory syndrome and can be fatal. Coronaviruses may be zoonotic in origin. The SARS-CoV, MERS-CoV and 2019 SARS CoV-2 have human transmission and infective capability and have caused major public health concern worldwide over a short period within the century. The expansion of genetic diversity among coronaviruses and their consequent ability to cause disease in human beings is mainly achieved through infecting peridomestic animals, which serve as intermediate hosts, nurturing recombination and mutation events. The spike glycoprotein (S glycoprotein), which attaches the virion to the host cell membrane, is postulated

to play a dominant role in host range restriction. While SARS-CoV and 2019 SARS CoV-2 infect type 2 pneumocytes and ciliated bronchial epithelial cells utilizing angiotensin converting enzyme 2 (ACE2) as a receptor, MERS-CoV exploits dipeptidyl peptidase 4 (DPP4), a transmembrane glycoprotein, to infect type 2 pneumocytes and unciliated bronchial epithelial cells.

[000210] Coronaviruses first replicate in epithelial cells of the respiratory and enteric cells. Human airway epithelial cells facilitate high growth rate for the 2019 SARS CoV-2 virus. Coronavirus infected human beings can present with influenza-like symptoms and can develop pneumonia. Associated symptoms with the disease include cough, fever, dyspnea, myalgia or fatigue. Some human patients present with mild clinical manifestation of the disease. However, the manifestation of the disease in human population can span a wide range from asymptomatic to fatal. In some cases, human coronavirus has an incubation period of 2–4 days; 2019 SARS CoV-2 is estimated to be 3-6 days, and SARS-CoV can be 4-6 days. SARS coronavirus was identified in 2003 and may have originated from an animal reservoir, and first infected humans in Guangdong province in southern China in 2002. Patients presented respiratory distress and diarrhea. MERS-CoV was identified in Saudi Arabia in 2012. Dromedary camels may have been the major reservoirs of MERS-CoV. Typical MERS symptoms include fever, cough, shortness of breath, pneumonia, gastrointestinal symptoms including diarrhea. 2019 SARS CoV-2 is also called SARS CoV-2 or simply CoV-2.

[000211] Human-to-human transmission of SARS-CoV occurred after early importation of cases were Toronto in Canada, Hong Kong Special Administrative Region of China, Chinese Taipei, Singapore, and Hanoi in Viet Nam during the global epidemic of 2003; at least four resurgences have since been reported. MERS is reported to have spread to countries, including at least Algeria, Austria, Bahrain, China, Egypt, France, Germany, Greece, Islamic Republic of Iran, Italy, Jordan, Kuwait, Lebanon, Malaysia, the Netherlands, Oman, Philippines, Qatar, Republic of Korea, Kingdom of Saudi Arabia, Thailand, Tunisia, Turkey, United Arab Emirates, United Kingdom, United States, and Yemen during the 2012 outbreak. The 2019 SARS CoV-2 was first identified in Wuhan, China and spread worldwide between December 2019 and early 2020.

[000212] As of March 20, 2019, no vaccines had been approved for these viruses. Novel therapeutics against the virus are needed. The present disclosure comprises methods and compositions for developing immunotherapy using subject's own immune cells to activate immune response against the virus.

[000213] In one aspect the method comprises one or more of the following:

- Analyzing the virus genome sequence to obtain information on potential viral epitopes.
- Analyzing a subject's MHC class I and MHC class II expression profiles.
- Analyzing the viral sequences in MHC-peptide presentation prediction algorithm implemented in a computer processor wherein the MHC-peptide presentation prediction algorithm implemented in a computer processor has been trained by a machine learning training module that incorporates a large

number of characteristics related to the peptide and peptide MHC interactions in order to provide an output of a selection of peptides that are predicted to bind to a certain MHC molecule. In some embodiments, the MHC-peptide presentation predictor is *neonmhc2*. In some embodiments, a further analysis using MHC-peptide presentation predictor NetMHCpan or NetMHCpan II is performed for comparison. In some embodiments, the MHC-peptide presentation predictor is NetMHCpan. In some embodiments, the MHC-peptide presentation predictor is NetMHCpan II.

- Identifying which viral epitopes can bind to an MHC present in the subject.
- Ranking aided by a machine learning the viral peptides that bind to the subjects' MHC molecules according to the binding affinities, where higher rank infers higher binding affinity and presentation efficiency.
- Select at least one, at least two, at least three or at least four or more viral peptides from the ranked peptides that have high binding affinity to the subject's one or more MHC molecules and prepare a composition. The viral peptides that are selected, taken together may bind to one or more class I MHCs, or a class II MHCs or a mixture of class I and class II MHCs, wherein each of the MHCs is expressed by the subject.

[000214] Provided herein an antigenic peptide comprising an epitope sequence from Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B, Table 15 or Table 16. Also provided herein is a polynucleotide encoding and antigenic peptide comprising an epitope sequence from Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B, Table 15 or Table 16. The antigenic peptide and/or polynucleotide may be recombinant. The antigenic peptide and/or polynucleotide may be isolated or purified. The antigenic peptide may be synthetic or expressed from a polynucleotide.

[000215] Also provided herein is an antibody or B cell comprising an antibody that binds to an antigenic peptide comprising an epitope sequence from Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B, Table 15 or Table 16.

[000216] Also provided herein is a T cell receptor (TCR) or T cell comprising a TCR that that binds an epitope sequence from Table 1A or Table 1B in complex with a corresponding MHC class I molecule according to Table 1A or Table 1B. For example, the TCR can bind to an epitope sequence from column 2 (set 1) of Table 1A in complex with a corresponding MHC class I molecule from column 3 (set 1) in the same row of Table 1A. For example, the TCR can bind to an epitope sequence from column 4 (set 2) of Table 1A in complex with a corresponding MHC class I molecule from column 5 (set 2) in the same row of Table 1A. For example, the TCR can bind to an epitope sequence from column 6 (set 3) of Table 1A in complex with a corresponding MHC class I molecule from column 7 (set 3) in the same row of Table 1A. For example, the TCR can bind to an epitope sequence from column 2 (set 1) of Table 1B in complex with a corresponding MHC class I molecule from column 3 (set 1) in the same row of Table 1B. For example,

the TCR can bind to an epitope sequence from column 4 (set 2) of Table 1B in complex with a corresponding MHC class I molecule from column 5 (set 2) in the same row of Table 1B.

[000217] Also provided herein is a T cell receptor (TCR) or T cell comprising a TCR that that binds to an epitope sequence from Table 2Ai in complex with a corresponding MHC class II molecule according to Table 2Ai. For example, the TCR can bind to an epitope sequence from column 2 (set 1) of Table 2Ai in complex with a corresponding MHC class II molecule from column 3 (set 1) in the same row of Table 2Ai. For example, the TCR can bind to an epitope sequence from column 4 (set 2) of Table 2Ai in complex with a corresponding MHC class II molecule from column 5 (set 2) in the same row of Table 2Ai. Also provided herein is a T cell receptor (TCR) or T cell comprising a TCR that that binds to an epitope sequence from Table 2Aii in complex with a corresponding MHC class II molecule according to Table 2Aii. For example, the TCR can bind to an epitope sequence from column 2 (set 1) of Table 2Aii in complex with a corresponding MHC class II molecule from column 3 (set 1) in the same row of Table 2Aii.

[000218] Provided herein is a method of treating or preventing viral infection in a subject in need thereof comprising administering to the subject an antigenic peptide comprising an epitope sequence from Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B, Table 15 or Table 16. Also provided herein is a method of treating or preventing viral infection in a subject in need thereof comprising administering to the subject a polynucleotide encoding and antigenic peptide comprising an epitope sequence from Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B, Table 15 or Table 16.

[000219] Also provided herein is a method of treating or preventing a viral infection in a subject in need thereof comprising administering to the subject an antibody or B cell comprising an antibody that binds to an antigenic peptide comprising an epitope sequence from Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B, Table 15 or Table 16.

[000220] Also provided herein is a method of treating or preventing viral infection in a subject in need thereof comprising administering to the subject a T cell receptor (TCR) or T cell comprising a TCR that that binds an epitope sequence from Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B, Table 15 or Table 16 in complex with a corresponding MHC class I molecule according to Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B, Table 15 or Table 16.

[000221] For example, the method can comprise administering to the subject a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 2 (set 1) of Table 1A in complex with a corresponding MHC class I molecule from column 3 (set 1) in the same row of Table 1A. For example, the method can comprise administering to a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 2 (set 1) of Table 1A in complex with a corresponding MHC class I molecule from column 3 (set 1) in the same row of Table 1A to a subject that expresses the corresponding MHC class I

molecule from column 3 (set 1). For example, the method can comprise administering to the subject a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 4 (set 2) of Table 1A in complex with a corresponding MHC class I molecule from column 5 (set 2) in the same row of Table 1A. For example, the method can comprise administering to a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 4 (set 2) of Table 1A in complex with a corresponding MHC class I molecule from column 5 (set 2) in the same row of Table 1A to a subject that expresses the corresponding MHC class I molecule from column 5 (set 2). For example, the method can comprise administering to the subject a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 6 (set 3) of Table 1A in complex with a corresponding MHC class I molecule from column 7 (set 3) in the same row of Table 1A. For example, the method can comprise administering to a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 6 (set 3) of Table 1A in complex with a corresponding MHC class I molecule from column 7 (set 3) in the same row of Table 1A to a subject that expresses the corresponding MHC class I molecule from column 7 (set 3).

[000222]For example, the method can comprise administering to the subject a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 2 (set 1) of Table 1B in complex with a corresponding MHC class I molecule from column 3 (set 1) in the same row of Table 1B. For example, the method can comprise administering to a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 2 (set 1) of Table 1B in complex with a corresponding MHC class I molecule from column 3 (set 1) in the same row of Table 1B to a subject that expresses the corresponding MHC class I molecule from column 3 (set 1). For example, the method can comprise administering to the subject a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 4 (set 2) of Table 1B in complex with a corresponding MHC class I molecule from column 5 (set 2) in the same row of Table 1B. For example, the method can comprise administering to a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 4 (set 2) of Table 1B in complex with a corresponding MHC class I molecule from column 5 (set 2) in the same row of Table 1B to a subject that expresses the corresponding MHC class I molecule from column 5 (set 2).

[000223]For example, the method can comprise administering to the subject a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 2 (set 1) of Table 2Ai in complex with a corresponding MHC class II molecule from column 3 (set 1) in the same row of Table 2Ai. For example, the method can comprise administering to a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 2 (set 1) of Table 2Ai in complex with a corresponding MHC class II molecule from column 3 (set 1) in the same row of Table 2Ai to a subject that expresses the corresponding MHC class II molecule from column 3 (set 1). For example, the method can comprise administering to the subject a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 4 (set 2) of Table 2Ai in complex with a corresponding MHC class II molecule from column 5 (set 2) in the same row of

Table 2Ai. For example, the method can comprise administering to a TCR or T cell comprising a TCR that can bind to an epitope sequence from column 4 (set 2) of Table 2Ai in complex with a corresponding MHC class II molecule from column 5 (set 2) in the same row of Table 2Ai to a subject that expresses the corresponding MHC class II molecule from column 5 (set 2). Likewise, the method can comprise administering to the subject a TCR or T cell comprising a TCR that can bind to an epitope sequence from column on the left of Table 2Aii in complex with a corresponding MHC class II molecule from the respective column on the right in the same row of Table 2Aii. A protein encoded by the corresponding allele to the right adjacent column of a peptide in any single row of Table 2Ai or Table 2Aii is an MHC protein that binds to the peptide and is presented to T cells by APCs. A peptide listed on the immediate left column of an HLA allele(s) in each row is matched with the HLA in the row.

Table 1A. Peptides and Alleles

	Set 1	Set 1	Set 2	Set 2	Set 3	Set 3
	Peptide	**Allele**	**Peptide**	**Allele**	**Peptide**	**Allele**
1	AACCHLAKAL	L61	TPLVPFWI	L47	FLVLLPLV	L2;L47;L4
2	AADLDDFSKQL	L68	TPLVPFWITIA	L50	FLYENAFLP	L12;L2;L4
3	AADPAMHAAS	L68	TPLVPFWITIAY	L31	FMGRIRSVY	L14;L43;L69
4	AAGLEAPFLYL	L67	TPNNTDFSRV	L51	FNATRFASV	L3;L20;L73
5	AAISDYDY	L54	TPRDLGAC	L51	FNIDYDCVSF	L43;L71;L72
6	AAISDYDYYR	L15	TPSFKKGAKLL	L39	FPDLNGDVVAI	L68;L50;L49
7	AAITILDGI	L10	TPSKLIEYT	L49	FPFNKWGKA	L50;L51;L46
8	AAITILDGISQY	L14	TPVYSFLPGVY	L31	FPLCANGQVF	L31;L50;L32
9	AAKKNNLPFK	L13	TQEVFAQV	L48	FPLNSIIKT	L50;L31;L47
10	AALALLLLDR	L7	TQFNYYKK	L24	FPLNSIIKTI	L47;L50;L49
11	AALCTFLL	L74	TQGNFGDQEL	L34	FRIDGDMVP	L66;L35;L34
12	AALQIPFA	L50	TQGNFGDQELI	L34	FRKSNLKPF	L66;L30;L58
13	AALQPEEEQ	L67	TQHGKEDLKF	L26	FRLTLGVYDY	L66;L30;L12
14	AAMQRKLEK	L7	TQLPPAYTNSF	L8	FRSSVLHST	L66;L35;L64
15	AANTVIWDYKR	L15	TQLSTDTGV	L24	FSALEPLV	L48;L47;L70
16	AARDLICAQ	L43	TQLYLGGMSYY	L14	FSKLINIIIW	L52;L69;L70
17	AARDLICAQK	L13	TQQLIRAA	L48	FSSLPSYAAF	L59;L60;L43
18	AARVVRSIFSR	L15	TQRNFYEPQI	L48	FSTVFPPTSF	L43;L60;L59
19	AARYMRSLK	L13	TQSLLIVNN	L24	FTSLEIPRR	L19;L17;L21
20	AASGNLLLD	L69	TQYEYGTEDDY	L14	FTYICGFIQQK	L7;L6;L19
21	AASGNLLLDK	L7	TRAGCLIGA	L30	FVDGVPFVVS	L68;L5;L67
22	AAVDALCEKAL	L67	TRCLAVHEC	L35	FVDSDVET	L63;L68;L62
23	AAVINGDRWF	L52	TRCNLGGAV	L35	FVENPDILRV	L20;L5;L63
24	AAVNSVPW	L54	TRDIASTD	L65	FVENPDILRVY	L14;L1;L31
25	AAVYRINW	L54	TRDIASTDT	L35	FVETVKGL	L63;L68;L60
26	AAYSRYRIGNY	L14	TRDIASTDTCF	L34	FVETVKGLDY	L1;L12;L18
27	ACLVGLMWL	L4	TREVGFVV	L35	FVFKNIDGYF	L11;L58;L12
28	ACPLIAAVI	L57	TRFASVYAWNR	L30	FVKATCEF	L58;L59;L43
29	ACTDDNALA	L42	TRFQTLLALH	L30	FVLAAVYR	L17;L15;L21

30	ACTDDNALAYY	L14	TRFQTLLALHR	L30	FVRIIMRL	L74;L59;L23
31	ACVEEVTTTL	L36	TRGATVVIG	L65	FVRIIMRLW	L52;L49;L10
32	ACYNGSPSGV	L3	TRKLMPVCV	L64	FVTVYSHLLL	L74;L60;L61
33	ACYNGSPSGVY	L14	TRLQSLENVAF	L30	FYKGVITH	L71;L66;L72
34	ADAQSFLN	L33	TRNPANNAA	L35	FYLCFLAFLLF	L9;L12;L8
35	ADAQSFLNGF	L33	TRNPAWRKAVF	L65	FYPKLQSS	L71;L72;L66
36	ADDLNQLT	L33	TRQVVNVVT	L35	FYPKLQSSQ	L71;L72;L66
37	ADKFPVLHD	L65	TRSTNSRI	L35	FYTSKTTVA	L72;L71;L46
38	ADLKSFDL	L33	TRYVDNNFC	L34	FYVLGLAA	L50;L72;L71
39	ADLVYALR	L33	TSALLAGTI	L55	FYVLPNDDTL	L67;L9;L71
40	ADLVYALRH	L33	TSAMQTML	L74	FYYLGTGPEA	L50;L71;L72
41	ADLYKLMGH	L33	TSDLATNNLVV	L68	GADLKSFDL	L68;L63;L60
42	ADLYKLMGHF	L33	TSFGPLVRKIF	L52	GADPIHSLRV	L18;L63;L5
43	ADNKFALTC	L33	TSGDGTTS	L65	GAPTKVTF	L23;L63;L57
44	ADPAMHAA	L33	TSHTVMPL	L57	GAWNIGEQK	L13;L7;L19
45	ADPIHSLR	L33	TSITSAVLQ	L19	GCDGGSLY	L1;L18;L14
46	ADPIHSLRV	L33	TSLEIPRRNV	L13	GCDGGSLYV	L18;L2;L45
47	ADQAMTQM	L33	TSLLVLVQ	L48	GDDYVYLPY	L18;L1;L65
48	ADQAMTQMY	L14	TSNPTTFH	L43	GDFKLNEEI	L37;L24;L34
49	ADQLTPTW	L33	TSNPTTFHLD	L65	GDFSHSQL	L25;L33;L37
50	ADSFVIRG	L33	TSPDVDLGD	L65	GEAANFCALI	L45;L36;L41
51	ADSIIIGG	L33	TSQWLTNI	L48	GEAVKTQFN	L45;L36;L40
52	ADSIIIGGA	L33	TSQWLTNIF	L53	GEIKDATP	L38;L46;L37
53	ADSKIVQLS	L33	TSSIVITSG	L65	GEIPVAYRKVLL	L36;L40;L41
54	ADSTLIGD	L33	TSTDVVYRA	L20	GELGDVRETM	L36;L41;L37
55	ADVFHLYL	L33	TSWQTGDFVK	L7	GEVITFDNLKTL	L36;L37;L41
56	ADVFHLYLQ	L33	TTAAKLMV	L73	GEVPVSIINN	L36;L37;L41
57	ADVTKIKP	L33	TTADIVVFDEI	L20	GEYTFEKGD	L45;L46;L37
58	ADYNYKLPD	L65	TTAPAICHD	L20	GFELTSMKY	L12;L18;L1
59	ADYSVLYN	L33	TTAPAICHDGK	L19	GFFKEGSSV	L72;L24;L71
60	AEASKKPRQK	L46	TTAYANSV	L20	GFMGRIRSVY	L71;L14;L72
61	AECTIFKD	L33	TTDNTFVS	L1	GFNEKTHVQL	L8;L71;L62
62	AEETRKLM	L45	TTDPSFLGRYM	L1	GFNFSQIL	L62;L72;L71
63	AEGSRGGSQ	L40	TTEMLAKALR	L19	GFSTGVNL	L72;L71;L62
64	AEIRASAN	L45	TTETAHSC	L18	GHMLDMYSV	L35;L28;L34
65	AELAKNVS	L46	TTEVVGDIILK	L7	GHNLAKHCL	L35;L34;L28
66	AENVTGLFKDC	L40	TTFHLDGEV	L20	GHTDLMAAY	L27;L12;L14
67	AESHVDTD	L33	TTFHLDGEVI	L20	GHVETFYPKL	L28;L34;L35
68	AEVAVKMFD	L41	TTFHLDGEVITF	L52	GIATVREV	L48;L3;L64
69	AFACPDGVKHVY	L14	TTKGGRFV	L70	GIFGADPIHSL	L16;L2;L10
70	AFASEAARV	L24	TTLPVNVAFEL W	L52	GIIAMSAF	L43;L26;L59
71	AFDIYNDK	L62	TTNIVTRCLNR	L15	GINASVVNI	L24;L3;L4
72	AFDIYNDKV	L62	TTRQVVNV	L48	GLDSLDTY	L18;L1;L14
73	AFDKSAFVN	L62	TTSPISEHD	L20	GLEAPFLY	L1;L18;L12
74	AFEHIVYG	L62	TTTIQTIV	L48	GLIAIVMVTI	L3;L24;L2

75	AFFGMSRI	L48	TTTLNGLW	L52	GLNDNLLEIL	L4;L2;L3
76	AFGEYSHVVA	L42	TTTNIVTRCL	L20	GLNLEEAARY	L14;L12;L18
77	AFHTPAFDK	L7	TTTYKLNVGDY	L14	GLPGTILRT	L24;L5;L2
78	AFKQIVESC	L13	TTYKLNVGD	L19	GLVASIKNF	L10;L27;L26
79	AFLLFLVLIM	L71	TTYPGQGLN	L14	GMPSYCTGY	L26;L27;L12
80	AFLPFAMGIIAM	L71	TVAAFHQEC	L20	GNFGDQELI	L34;L24;L36
81	AFVNLKQLP	L46	TVAYFNMV	L20	GPFVDRQTA	L51;L50;L46
82	AFVNLKQLPFFY	L12	TVCTVCGMW	L10	GQVDLFRNA	L24;L13;L46
83	AGDSGFAAYSRY	L18	TVDNINLH	L1	GRCDIKDL	L66;L25;L64
84	AGFAKFLK	L7	TVDNINLHT	L68	GRVDGQVDLF	L30;L34;L65
85	AGGIVAIV	L48	TVDSSQGSEYDY	L18	GSSVELKHF	L53;L52;L26
86	AGLEAPFLYL	L67	TVFFDGRV	L20	GTAVLRQW	L52;L54;L55
87	AGLEAPFLYLY	L14	TVHTANKW	L54	GTDLEGNF	L1;L62;L63
88	AGSYKDWSY	L14	TVIEVQGYKSV	L10	GTDTTITV	L18;L63;L68
89	AHISTIGVCSM	L34	TVKGLDYKA	L51	GTGPEAGLPY	L18;L12;L7
90	AHVASCDAIM	L28	TVKNYFITD	L13	GTGTSTDVVYR	L7;L15;L19
91	AICHDGKAH	L43	TVKSVGKFCL	L39	GTITVEEL	L67;L55;L54
92	AIDAYPLTKH	L6	TVLKKCKSA	L23	GTITVEELK	L7;L13;L19
93	AIDGGVTRDI	L68	TVLKKCKSAF	L23	GTLMIERF	L54;L52;L53
94	AIFYLITPVHV	L20	TVLSFCAFAV	L4	GTLSYEQF	L54;L53;L52
95	AIKCVPQAD	L43	TVMFLARGI	L55	GTLSYEQFK	L7;L6;L13
96	AILTALRLC	L14	TVRTNVYLAVF	L52	GTNLPLQL	L73;L55;L60
97	AILTALRLCAY	L14	TVSALVYDNK	L7	GTSKFYGGW	L10;L54;L52
98	AIMQLFFSYF	L12	TVVIGTSK	L19	GVAGALNK	L7;L6;L19
99	AISSVLNDI	L24	TVVIGTSKFY	L14	GVEHVTFFIY	L12;L18;L1
100	AIVFITLCFTLK	L7	TVVVNAANV	L20	GVLTESNKK	L7;L13;L6
101	AKCWTETDL	L44	TVVVNAANVY	L14	GVYYHKNNK	L7;L6;L13
102	AKEIKESVQTF	L27	TVYEKLKPVL	L20	GWTAGAAAY	L12;L14;L27
103	AKFLKTNCC	L27	TVYSDVENP	L49	GYFCTCYF	L72;L71;L9
104	AKFLKTNCCRF	L27	TVYSHLLLVAA	L51	GYLPQNAV	L48;L71;L72
105	AKHCLHVVG	L44	TWICLLQFAY	L12	GYQPYRVV	L72;L71;L64
106	AKKNNLPFK	L13	TWLDMVDTSL	L8	HAEETRKLM	L32;L63;L49
107	AKKPTETIC	L27	TWLTYTGAI	L8	HDVSSAINR	L19;L17;L15
108	AKNRARTV	L48	TWLTYTGAIKL	L8	HEHEIAWYTE	L37;L46;L29
109	AKNVSLDNVL	L44	TYERHSLSH	L71	HEVLLAPLLSA	L46;L41;L38
110	AKPFLNKVV	L64	TYGQQFGPTYL	L9	HFAWWTAF	L72;L71;L62
111	AKRFKESPF	L27	TYKLNVGDYF	L9	HFDGQQGEV	L62;L68;L63
112	AKSASVYY	L27	TYNCCDDDY	L14	HFISNSWL	L72;L71;L62
113	AKVGILCIM	L44	TYTGAIKLD	L9	HFPREGVF	L62;L72;L71
114	ALAPNMMVTN	L3	TYYLFDESGEF	L9	HFPREGVFV	L62;L71;L72
115	ALGGSVAI	L24	VAAIFYLI	L47	HFVCNLLL	L62;L71;L72
116	ALGGSVAIKI	L24	VAAIVFITLCF	L52	HFVCNLLLLF	L8;L12;L9
117	ALGKLQDV	L24	VAALTNNVA	L50	HFVNLDNL	L71;L62;L72
118	ALHRSYLTP	L46	VADAVIKTLQ	L63	HFVNLDNLR	L17;L15;L19
119	ALITLATC	L3	VAEWFLAYIL	L67	HFYSKWYIR	L17;L15;L21

120	ALKGGKIVNNW	L16	VAFELWAKRN	L69	HGHVMVEL	L23;L25;L59
121	ALLADKFPVLH	L6	VAGDSGFAA	L50	HHANEYRLYL	L34;L28;L35
122	ALLAVFQSASK	L6	VAGFAKFLK	L7	HHSIGFDYV	L34;L28;L35
123	ALLLLDRLNQL	L4	VAGVSICST	L43	HIDAYKTF	L63;L62;L68
124	ALLTLQQIELK	L6	VAIDYKHYTP	L67	HLAKALNDF	L26;L11;L10
125	ALNKATNNA	L3	VAIHADQLTPTW	L52	HLYLQYIRK	L6;L13;L7
126	ALRANSAV	L3	VAKSHNIALI	L70	HPLADNKF	L32;L31;L47
127	ALTGIAVEQ	L24	VAKSHNIALIW	L52	HPNPKGFCD	L32;L49;L39
128	ALWEIQQVVD	L2	VALLAVFQSA	L50	HQKLLKSI	L48;L25;L23
129	ALWEIQQVVDA	L2	VAMKYNYEPL	L67	HQSDIEVT	L24;L35;L44
130	AMDEFIERYKL	L5	VANGDSEVVLK	L7	HSDKFTDGV	L18;L1;L63
131	AMPNMLRI	L48	VANYQKVGM	L58	HSMQNCVLK	L7;L13;L19
132	AMQMAYRF	L33	VAPGTAVLRQW	L52	HTDLMAAY	L18;L1;L68
133	AMRNAGIVGV	L3	VARDLSLQFK	L13	HTIDGSSGVV	L11;L20;L10
134	AMRPNFTI	L48	VASCDAIMTR	L19	HTPAFDKSAF	L57;L11;L10
135	AMSAFAMMF	L12	VASPNECNQM	L70	HTQVVDMSMTY	L18;L14;L1
136	ANFCALIL	L73	VAVLYQDVN	L67	HTSPDVDL	L53;L20;L54
137	ANFCALILA	L46	VAYSNNSIAI	L47	HVDILGPL	L68;L63;L62
138	ANFCALILAY	L12	VCRFDTRV	L48	HVDTDLTKPY	L18;L1;L14
139	ANGDSEVVLKK	L7	VCRFDTRVL	L39	HVSGTNGTK	L19;L7;L6
140	ANGGKGFCK	L7	VCRLMKTI	L48	HVYQLRAR	L17;L15;L21
141	ANLDSCKRV	L4	VCSVIDLL	L62	IADTTDAV	L68;L63;L67
142	ANLDSCKRVL	L65	VCTNYMPYF	L9	IAMSAFAM	L59;L61;L70
143	ANLGERVRQA	L65	VCTNYMPYFF	L9	IASFRLFAR	L17;L19;L15
144	ANNAAIVLQL	L73	VCVETKAI	L48	IAVLDMCASL	L67;L31;L60
145	ANNCTFEYV	L73	VDALCEKAL	L33	IAYIICISTK	L19;L47;L43
146	ANNTKGSL	L23	VDDIVKTD	L33	ICISTKHFY	L14;L12;L58
147	ANQFNSAIGK	L7	VDGQVDLF	L33	IDYVPLKSA	L46;L51;L43
148	ANQVIVNNL	L72	VDGVVQQL	L33	IEELFYSY	L29;L18;L1
149	ANRNRFLYI	L73	VDNSSLTI	L48	IEELFYSYA	L38;L42;L46
150	ANSIVCRF	L33	VDSDLNDF	L33	IELKFNPPA	L46;L38;L42
151	ANSIVCRFD	L65	VDSVTVKN	L33	IELKFNPPAL	L36;L37;L29
152	ANYQKVGM	L33	VDSYYSLL	L33	IELSLIDFYL	L40;L36;L41
153	ANYQKVGMQKY	L14	VDSYYSLLM	L33	IERFVSLAI	L45;L48;L46
154	APAHISTIG	L22	VDTDLTKPY	L43	IEYTDFATSA	L46;L38;L42
155	APFLYLYALVY	L31	VDTSLSGF	L33	IFFASFYY	L12;L71;L72
156	APHGVVFLH	L56	VDTVRTNVY	L29	IFYLITPVH	L72;L71;L48
157	APHGVVFLHVT	L56	VDTVSALV	L33	IGIVNNTVY	L26;L27;L29
158	APHGVVFLHVTY	L56	VDVELFENK	L7	IGVTQNVLY	L12;L52;L14
159	APISAMVRMY	L31	VDVVNFNL	L33	IHADQLTPTW	L28;L52;L54
160	APKEIIFLEG	L51	VEAEVQID	L29	IIAYTMSL	L59;L60;L61
161	APLIELCV	L47	VEAEVQIDR	L19	IKDATPSDF	L62;L27;L63
162	APLIELCVDEA	L50	VEAFEYYHT	L38	IKDLPKEI	L68;L62;L63
163	APLLSAGIFGA	L50	VEAFEYYHTT	L38	IKNFKSVLY	L27;L12;L18
164	APLTVFFD	L65	VECTTIVN	L29	IKWDLLKY	L27;L18;L66

165	APRITFGGP	L51	VECTTIVNGV	L45	ILAYCNKTV	L3;L2;L4
166	APRITFGGPSD	L22	VEEAKTVLK	L38	ILHCANFNV	L4;L2;L5
167	APRTLLTKGTL	L22	VEEVLSEA	L38	ILLLDQALV	L2;L4;L5
168	APTHLSVDT	L56	VEFLRDGW	L29	ILPDPSKPS	L57;L43;L5
169	APTKVTFGD	L56	VEGFNCYF	L33	ILQKEKVNI	L24;L2;L4
170	APTLVPQEHY	L31	VEIIKSQD	L45	ILSDDAVVC	L2;L26;L4
171	AQAAGTDTT	L44	VEIIKSQDLSV	L38	ILSPLYAFA	L3;L2;L5
172	AQFAPSASAFF	L27	VEKGIYQTS	L45	ILTLTRAL	L23;L59;L57
173	AQLPAPRT	L48	VELGTEVN	L29	IMSDRDLY	L18;L14;L1
174	AQLPAPRTLL	L44	VENPTIQK	L29	INIIIWFLL	L73;L9;L8
175	AQLPAPRTLLTK	L7	VENPTIQKDV	L45	INIIIWFLLL	L73;L8;L67
176	AQSFLNGFAV	L24	VENPTIQKDVL	L36	IPARARVEC	L56;L22;L39
177	AQTGSSKCV	L24	VESDDYIA	L38	IPCSVCLSGL	L56;L22;L39
178	AQVDVVNFNL	L44	VESSSKLW	L40	IPCTCGKQA	L51;L50;L39
179	AQVLSEMV	L48	VETKAIVS	L29	IPIGAGICA	L51;L50;L22
180	AQYELKHG	L48	VEVEKGVLPQL	L36	IPLMYKGL	L39;L47;L23
181	ARARVECF	L35	VEVQPQLEMEL	L36	IPMDSTVKN	L49;L31;L32
182	ARARVECFDK	L30	VEVVDKYF	L29	IPYNSVTSS	L51;L47;L50
183	ARDGCVPLNII	L34	VEWKFYDA	L46	IQASLPFGW	L52;L16;L54
184	ARDLICAQK	L30	VEYCPIFFITG	L46	IQLSSYSL	L44;L35;L25
185	ARDLSLQFK	L30	VFAFPFTI	L9	IRGWIFGTTL	L35;L30;L66
186	ARDLSLQFKR	L30	VFAFPFTIYSL	L8	IRKLHDEL	L25;L66;L67
187	ARFPKSDGT	L30	VFAQVKQI	L48	ISAARQGF	L54;L53;L52
188	ARFPKSDGTGT	L30	VFDEISMA	L62	ISAMVRMY	L55;L70;L52
189	ARFYFYTS	L65	VFDEISMATN	L62	ISQYSLRLI	L55;L48;L73
190	ARGIVFMC	L65	VFDGKSKCE	L62	ISSDVLVNN	L53;L54;L52
191	ARHINAQVAK	L30	VFDKNLYD	L62	ISTKHFYWFF	L53;L54;L52
192	ARIVYTACSH	L30	VFDKNLYDK	L62	ISTSHKLV	L48;L70;L73
193	ARLRAKHY	L66	VFDKNLYDKL	L62	ITEGSVKGL	L63;L60;L39
194	ARLRAKHYV	L30	VFITLCFTLK	L13	ITFELDER	L21;L15;L17
195	ARLTPCGTGT	L30	VFKNIDGYFK	L13	ITISSFKW	L54;L52;L53
196	ARLYYDSM	L66	VFKNIDGYFKI	L8	ITPVHVMSK	L57;L6;L7
197	ARQGFVDSD	L65	VFLGIITTVA	L8	ITSAVLQSGF	L52;L54;L53
198	ARSEDKRAK	L30	VFLHVTYVP	L8	IVAAIVFI	L20;L47;L74
199	ARSVSPKLFIR	L30	VFNATRFA	L71	IVDEPEEHVQI	L5;L68;L63
200	ARTAPHGHV	L30	VFNATRFASV	L71	IVFDGKSKC	L16;L11;L14
201	ARTVYDDGAR	L30	VFNATRFASVY	L71	IVMVTIML	L74;L68;L60
202	ARTVYDDGARR	L30	VFNGVSFS	L62	IVNGVRRSFY	L14;L12;L18
203	ARVECFDKFK	L30	VFNGVSFST	L8	IVNNATNVV	L58;L51;L73
204	ARVECFDKFKV	L30	VFPLNSIIK	L62	IVVFDEISM	L31;L32;L67
205	ARVVRSIF	L66	VFSAVGNICY	L12	IYDEPTTT	L62;L63;L68
206	ARVVRSIFSR	L30	VFTGYRVTK	L13	IYLYLTFY	L71;L72;L12
207	ASALGKLQD	L65	VFVLWAHGFEL	L71	IYSKHTPINL	L9;L8;L66
208	ASANIGCNH	L43	VGDFKLNEEI	L68	KAGQKTYER	L21;L15;L17
209	ASCTLSEQL	L53	VGEIPVAYR	L15	KAKKGAWNI	L55;L53;L70
210	ASDTYACWHH	L18	VGHTDLMAAY	L14	KASMPTTI	L55;L70;L54

211	ASEAARVV	L48	VGKPRPPLNR	L15	KCVPQADVEW	L54;L52;L16
212	ASEFSSLPS	L1	VGPEHSLAE	L57	KCYGVSPTK	L13;L6;L7
213	ASEYTGNYQC	L18	VGPKQASL	L57	KDFGGFNF	L33;L54;L65
214	ASFSASTS	L55	VGYLQPRT	L48	KDGHVETF	L33;L54;L65
215	ASFSTFKC	L54	VGYQPYRVVVL	L67	KDQVILLNK	L13;L7;L6
216	ASFYYVWKS	L69	VHFISNSW	L28	KEGFFTYIC	L42;L38;L37
217	ASHMYCSF	L43	VHFISNSWLM	L28	KEIIFLEG	L45;L37;L46
218	ASIKNFKSVLY	L18	VHFVCNLLLL	L34	KEIIFLEGE	L46;L37;L42
219	ASIKNFKSVLYY	L18	VHFVCNLLLLF	L34	KEIIFLEGETL	L36;L37;L41
220	ASIVAGGI	L55	VHNQDVNLH	L34	KEILVTYN	L33;L45;L29
221	ASIVAGGIVA	L42	VIDLLLDD	L68	KEITVATSRTL	L36;L37;L41
222	ASKIITLK	L13	VIGAVILR	L21	KEKVNINI	L45;L33;L37
223	ASKIITLKKR	L15	VIHFGAGSD	L43	KFCLEASF	L62;L71;L72
224	ASKIITLKKRW	L52	VIKVCEFQF	L26	KFKVNSTL	L71;L72;L62
225	ASKILGLPT	L43	VILLNKHI	L48	KFNPPALQD	L65;L13;L8
226	ASLVLARK	L7	VISTSHKL	L60	KFPVLHDI	L62;L71;L72
227	ASPNECNQM	L57	VIWDYKRD	L43	KGEDIQLL	L63;L55;L65
228	ASQGLVASIK	L7	VIYLYLTFYL	L67	KGLPWNVVR	L15;L21;L7
229	ASQSIIAYT	L14	VKDCVVLH	L62	KGLPWNVVRI	L8;L4;L16
230	ASQSIIAYTM	L55	VKGLDYKAF	L27	KGPKVKYL	L57;L64;L66
231	ASRELKVT	L43	VKIGPERTC	L27	KGTHHWLLL	L73;L69;L8
232	ASSRSSSRSR	L15	VKLQNNEL	L44	KGTLEPEYF	L54;L52;L9
233	ASTEKSNII	L55	VKNGSIHL	L66	KHFYWFFSNY	L27;L14;L16
234	ASTEKSNIIR	L7	VKNGSIHLYF	L27	KHLIPLMYK	L6;L13;L7
235	ASTSAFVET	L73	VKNKCVNF	L27	KHYTPSFKK	L6;L7;L13
236	ASVVNIQK	L7	VKPGGTSSG	L57	KIAEIPKEE	L16;L43;L3
237	ASVYAWNR	L15	VKPTVVVN	L66	KIFVDGVPFV	L13;L2;L4
238	ASVYAWNRK	L7	VKQGDDYVYL	L44	KIKACVEEV	L13;L3;L58
239	ASVYYSQLM	L54	VKRHTFSNY	L27	KIVDEPEEH	L16;L43;L54
240	ASWFTALTQ	L18	VKSREETGL	L44	KIYSKHTPI	L16;L24;L6
241	ASWVMRIM	L55	VKSREETGLL	L44	KKAGGTTEM	L27;L44;L66
242	ASYQTQTN	L48	VKSVGKFCL	L44	KKQQTVTL	L44;L27;L66
243	ATAEAELAKN	L10	VKYLYFIKGL	L27	KLALGGSVA	L51;L3;L46
244	ATALLTLQQI	L53	VLAAVYRI	L24	KLASHMYCSF	L16;L43;L26
245	ATAQEAYEQ	L53	VLCNSQTSLR	L21	KLDNDALNNI	L5;L2;L18
246	ATEGALNT	L18	VLDMCASLK	L1	KLFDRYFK	L13;L6;L21
247	ATEGALNTPK	L7	VLGSLAATVR	L21	KLIEYTDFA	L2;L5;L3
248	ATEVPANST	L18	VLHDIGNPKA	L2	KLINIIIW	L16;L54;L69
249	ATEVPANSTV	L18	VLHSTQDLFL	L57	KLKDCVMYA	L3;L13;L2
250	ATHGLAAVN	L14	VLKKCKSA	L23	KLLKSIAAT	L16;L2;L4
251	ATHSDKFTD	L53	VLKLKVDT	L23	KLMPVCVET	L2;L5;L4
252	ATKMSECVL	L70	VLKTGDLQPL	L3	KLMPVCVETK	L6;L16;L13
253	ATKYLVQQE	L13	VLLFLAFVVFL	L4	KLNDLCFTN	L16;L4;L21
254	ATNKATYK	L7	VLLILMTA	L23	KLNVGDYFV	L2;L4;L5
255	ATNYDLSV	L73	VLLPLVSS	L23	KLPDDFTGCV	L5;L2;L57
256	ATREAVGTN	L10	VLLRKNGNK	L6	KLRGTAVMSL	L16;L3;L2

257	ATREAVGTNL	L53	VLMDGSIIQ	L2	KLRSDVLLP	L6;L16;L13
258	ATRFASVYA	L13	VLMSNLGMPSY	L12	KMADQAMTQMY	L18;L14;L16
259	ATRFASVYAW	L52	VLPFNDGV	L57	KNLREFVFK	L13;L6;L7
260	ATRGATVV	L70	VLQKAAITIL	L74	KNNLPFKL	L73;L55;L33
261	ATRVECTTI	L53	VLQVRDVL	L23	KNSIDAFKL	L55;L53;L73
262	ATSACVLAA	L42	VLSDRELHLSW	L16	KPLEFGATS	L51;L56;L50
263	ATSRTLSYYK	L7	VLSEARQHLK	L6	KPRPPLNRN	L51;L22;L39
264	ATTAYANSVF	L52	VLSTFISAAR	L21	KPRQKRTA	L51;L39;L65
265	ATVCGPKK	L7	VLSVNPYV	L2	KPRQKRTAT	L22;L51;L39
266	ATYYLFDES	L67	VLTAVVIPTK	L6	KPTVVVNAA	L51;L50;L56
267	AVDAAKAYKDY	L18	VLTAVVIPTKK	L6	KQEILGTVSW	L16;L52;L18
268	AVDALCEK	L7	VLVPHVGEIPV	L2	KQQTVTLL	L48;L33;L44
269	AVDALCEKA	L5	VLYENQKLIA	L2	KQVEQKIAEI	L44;L3;L24
270	AVDALCEKALKY	L18	VLYNSASFSTF	L26	KQVVSDIDY	L26;L27;L14
271	AVDINKLCE	L18	VLYNSASFSTFK	L6	KRGDKSVY	L65;L66;L14
272	AVFISPYNS	L7	VLYQDVNCTEV	L2	KRSDARTA	L65;L66;L55
273	AVGTNLPLQL	L6	VLYYQNNV	L48	KRTIKGTHHW	L16;L54;L52
274	AVHECFVK	L7	VMAYITGGV	L3	KRVDFCGKGY	L30;L66;L14
275	AVHECFVKRV	L3	VMCGGSLYV	L2	KRWQLALSK	L30;L13;L6
276	AVILRGHL	L74	VMCGGSLYVK	L7	KSASVYYSQ	L54;L55;L53
277	AVILRGHLRI	L24	VMFTPLVPFW	L52	KSHFAIGL	L55;L73;L54
278	AVINGDRW	L54	VMHANYIFWR	L21	KSHFAIGLALY	L14;L18;L52
279	AVINGDRWFL	L16	VMLTNDNTSR	L15	KSVGKFCL	L65;L54;L55
280	AVITREVGFV	L3	VMLTNDNTSRY	L14	KSWMESEF	L53;L55;L54
281	AVKRTIKGTHHW	L52	VMPLSAPTLV	L5	KSYVHVVD	L55;L65;L54
282	AVKTQFNY	L14	VMRIMTWL	L48	KTDGTLMIER	L21;L18;L15
283	AVLQSGFRKM	L14	VMYASAVVLL	L74	KTFPPTEP	L54;L55;L73
284	AVSKGFFK	L7	VNAANVYL	L74	KTIQPRVEKK	L13;L7;L6
285	AVTAYNGY	L14	VNAANVYLK	L7	KTLLSLREVR	L21;L15;L52
286	AVTAYNGYL	L74	VNASSSEAF	L9	KTQSLLIV	L73;L70;L18
287	AVVLLILM	L74	VNEFYAYL	L62	KTQSLLIVN	L53;L13;L21
288	AVVLLILMT	L7	VNINIVGDF	L9	KTTEVVGDI	L55;L53;L54
289	AVVLLILMTA	L51	VNKGEDIQL	L39	KTTEVVGDII	L53;L54;L55
290	AWPLIVTA	L62	VNLHSSRLSF	L12	KTYERHSLSH	L16;L6;L18
291	AWPLIVTALR	L21	VNLKQLPFFY	L12	KVAGFAKFLK	L7;L6;L21
292	AWQPGVAMPNLY	L14	VNLKQLPFFYY	L12	KVEGCMVQV	L63;L5;L13
293	AWRKAVFISP	L42	VNLVAVPTGY	L12	KVFTTVDNI	L16;L54;L24
294	AWYTERSEKSY	L14	VNNATNKATY	L14	KVGGNYNY	L54;L14;L18
295	AYEQAVAN	L71	VNNATNVV	L48	KVKPTVVVNA	L13;L51;L3
296	AYFNMVYMPASW	L9	VNSFSGYLK	L7	KVLNEKCSAY	L14;L16;L6
297	AYSRYRIGNY	L14	VNSTLEQYVF	L9	KVNINIVGD	L16;L21;L65
298	AYTKRNVIP	L42	VNSVLLFL	L73	KVNSTLEQYVF	L16;L54;L52
299	AYTKRNVIPTI	L9	VNSVLLFLAF	L12	KVTLADAGF	L54;L52;L53
300	AYTNSFTR	L15	VNVVTTKI	L48	KVTSAMQTM	L54;L16;L53

301	AYTNSFTRG	L9	VPANSTVLS	L56	KVVSTTTNI	L54;L16;L24
302	AYTNSFTRGVY	L14	VPAQEKNF	L39	KWDLIISDMY	L18;L14;L1
303	AYTVELGTEV	L72	VPATVSVSSP	L51	KWGKARLY	L55;L14;L18
304	AYYFMRFR	L15	VPEVKILNN	L49	KWPWYIWL	L57;L62;L71
305	AYYNTTKGG	L72	VPFVVSTG	L47	KWYIRVGAR	L21;L15;L6
306	CAFAVDAA	L50	VPFWITIAYII	L47	KYAISAKNR	L15;L21;L17
307	CAFAVDAAK	L19	VPGLPGTI	L47	KYCALAPNM	L71;L72;L9
308	CAKEIKES	L43	VPGLPGTILR	L21	KYFKNHTSP	L8;L46;L71
309	CALAPNMMV	L47	VPHVGEIPVAY	L31	KYKGIKIQE	L13;L8;L15
310	CALDPLSET	L59	VPINTNSSP	L51	KYNYEPLTQ	L9;L8;L65
311	CAMRPNFTI	L47	VPLKSATCI	L47	KYTQLCQYL	L9;L8;L64
312	CANDPVGFTLK	L6	VPLNIIPLTT	L50	KYVQIPTTC	L8;L9;L66
313	CANFNVLF	L58	VPLNIIPLTTAA	L50	KYVRNLQHR	L15;L17;L8
314	CAQVLSEM	L59	VPQEHYVRIT	L39	KYWDQTYHP	L8;L9;L66
315	CATTRQVV	L70	VPVAIHAD	L51	LAAVYRINW	L49;L52;L69
316	CAYCCNIVN	L69	VPVSIINNTVY	L31	LAFVVFLLVT	L31;L47;L50
317	CAYCCNIVNV	L69	VPYNMRVIH	L47	LAGTITSGW	L49;L52;L54
318	CAYWVPRASA	L50	VQAGNVQLRV	L24	LAVFDKNL	L60;L61;L74
319	CCSLSHRF	L33	VQELYSPIF	L27	LAYILFTR	L47;L17;L59
320	CDAMRNAGI	L33	VQELYSPIFL	L68	LDDDSQQTV	L5;L68;L63
321	CDGTTFTY	L65	VQHMVVKAA	L51	LDDFSKQL	L33;L68;L62
322	CDIRQLLF	L33	VQIGEYTFEK	L7	LDGEVITF	L33;L65;L29
323	CDIRQLLFV	L73	VQIPCTCGK	L13	LDNVLSTF	L33;L59;L43
324	CDLKGKYV	L33	VQIPTTCA	L48	LEAPFLYLYA	L46;L42;L38
325	CDQLREPML	L33	VQLHNDILLAK	L6	LEAPFLYLYAL	L41;L40;L36
326	CDTLKEIL	L33	VQLRVIGHSM	L14	LECIKDLLA	L38;L46;L42
327	CDTLKEILV	L33	VQLSEISM	L44	LEMKSEKQV	L45;L38;L37
328	CEEMLDNRATL	L36	VQLSLPVLQ	L44	LENVAFNV	L33;L29;L45
329	CEFQFCNDPF	L29	VQLSLPVLQVR	L15	LEYHDVRV	L45;L48;L37
330	CEFQFCNDPFL	L36	VQMAPISAMVR	L21	LEYHDVRVVL	L36;L37;L41
331	CEIVGGQIVTC	L36	VQMLSDTLK	L7	LFFSYFAVH	L71;L72;L12
332	CEKALKYL	L37	VQPTESIV	L48	LFLPFFSNVTW	L52;L9;L8
333	CFDKFKVNS	L62	VQQESPFV	L48	LFLTWICL	L71;L72;L62
334	CFKMFYKGV	L13	VQSKMSDV	L48	LFLTWICLLQF	L8;L9;L12
335	CFLGYFCTC	L8	VQSTQWSLFF	L9	LFLVLIML	L71;L72;L62
336	CFLGYFCTCYF	L8	VQTFFKLV	L48	LFLVLIMLI	L47;L9;L8
337	CFVDDIVKT	L8	VQTFFKLVNK	L7	LFVAAIFY	L72;L71;L12
338	CGFIQQKLAL	L65	VQVTCGTTTL	L44	LGDIAARDL	L68;L63;L62
339	CGPKKSTNL	L57	VRDLPQGFSAL	L68	LGDVRETM	L63;L62;L68
340	CGYLPQNAV	L48	VRFPNITNLC	L30	LGLPTQTV	L47;L48;L25
341	CHATREAV	L28	VRKIFVDGV	L64	LHCANFNVL	L35;L28;L34
342	CHDGKAHFP	L34	VRLQAGNAT	L30	LHSTQDLFL	L28;L34;L35
343	CHIDHPNPK	L28	VRMYIFFASF	L30	LIAAVITR	L19;L21;L17
344	CHIDHPNPKGF	L8	VRTNVYLAVF	L66	LIDSYFVV	L68;L63;L5
345	CHNKCAYWV	L35	VRVLQKAA	L25	LIRKSNHNF	L58;L26;L52
346	CIKDLLARA	L3	VSAKPPPGD	L43	LITPVHVM	L59;L61;L60

347	CINANQVIV	L73	VSALVYDNK	L7	LIVAAIVFI	L20;L47;L5
348	CIRCLWSTK	L13	VSELLTPLG	L1	LIVGVALL	L74;L60;L61
349	CISTKHFY	L14	VSGNCDVVI	L53	LIVNSVLL	L60;L74;L61
350	CISTKHFYW	L54	VSGTNGTKRF	L52	LKEILVTY	L27;L18;L1
351	CKDGHVETFY	L27	VSIINNTVYTK	L7	LKRGDKSVY	L27;L26;L43
352	CLAVHECFV	L2	VSKVVKVT	L43	LKVGGSCVL	L44;L27;L61
353	CLAVHECFVKR	L19	VSKVVKVTIDY	L43	LKVPATVSV	L50;L51;L64
354	CLAYYFMR	L21	VSLAIDAYPL	L55	LLALHRSYL	L74;L3;L4
355	CLFLLPSLA	L3	VSLLSVLLS	L52	LLDQALVSD	L5;L68;L1
356	CLFWNCNVDR	L21	VSLLSVLLSM	L52	LLEIKDTEKY	L1;L18;L12
357	CLGDIAAR	L21	VSMTKTSV	L48	LLFVVEVV	L3;L23;L47
358	CLLNRYFR	L21	VSTIQRKYK	L13	LLKSIAATR	L21;L15;L17
359	CLNRVCTNY	L26	VSTQEFRY	L54	LLLDQALV	L2;L4;L5
360	CLSGLDSLDTY	L14	VTCLAYYF	L62	LLLSVCLGSL	L4;L2;L5
361	CLVGLMWL	L74	VTFFPDLNG	L7	LLPPKNSI	L57;L5;L23
362	CNVKTTEV	L48	VTFGDDTVIEV	L20	LLPSLATV	L5;L57;L3
363	CPACHNSEV	L22	VTFQSAVK	L7	LLPSLATVAY	L12;L57;L5
364	CPDGVKHV	L47	VTFQSAVKRTI	L52	LLSAGIFGA	L3;L2;L4
365	CPIFFITG	L50	VTHSKGLYRK	L7	LLSVCLGSL	L57;L4;L3
366	CPNFVFPL	L22	VTIDYTEISFM	L11	LLSVLQQL	L4;L59;L23
367	CPNFVFPLN	L50	VTKGKAKK	L13	LLTKSSEY	L26;L43;L1
368	CQAVTANV	L48	VTKNSKVQIGEY	L14	LLVTLAIL	L74;L23;L59
369	CQEPKLGSL	L44	VTLACFVL	L55	LMNVLTLV	L48;L62;L47
370	CQPILLLD	L48	VTLADAGF	L54	LMWLIINL	L47;L62;L74
371	CQVHGNAHV	L24	VTLADAGFI	L55	LNDILSRL	L63;L68;L62
372	CQYLNTLTLAV	L48	VTLADAGFIKQY	L14	LNLEEAARY	L12;L14;L31
373	CRFDTRVLSN	L65	VTLIGEAV	L48	LNRYFRLTL	L65;L73;L22
374	CRFDTRVLSNL	L30	VTLIGEAVK	L7	LNVGDYFVL	L65;L67;L32
375	CRFQEKDED	L65	VTLKQGEI	L55	LPDDFTGCV	L32;L49;L47
376	CRFVTDTPK	L30	VTLKQGEIK	L7	LPFKLTCAT	L50;L32;L51
377	CRHHANEY	L66	VTQNVLYENQK	L7	LPGVYSVIY	L31;L65;L49
378	CRKVQHMVV	L25	VTQQLIRAA	L51	LPGVYSVIYL	L56;L39;L22
379	CRMNSRNY	L65	VTRCLNRV	L48	LPIDKCSRI	L47;L49;L32
380	CRMNSRNYI	L34	VTRCLNRVC	L52	LPLTQYNRY	L31;L49;L12
381	CSFYPPDED	L65	VTRDIAST	L43	LPLVSSQCV	L47;L50;L51
382	CSLSHRFY	L55	VTSAMQTM	L70	LPNNTASW	L49;L50;L56
383	CSQHTMLV	L48	VTSNYSGVV	L70	LPQLEQPYV	L47;L50;L51
384	CSQHTMLVK	L7	VTTTLEETK	L7	LPQLEQPYVF	L31;L32;L39
385	CSRIIPAR	L48	VTYKLDGVV	L73	LPTGTLLV	L47;L50;L51
386	CTDDNALA	L1	VTYNCCDDDY	L14	LPVLQVRDVL	L31;L22;L32
387	CTFEYVSQPFL	L20	VVDGCNSSTCM	L63	LPWNVVRI	L47;L50;L49
388	CTLKSFTVEK	L7	VVDMSMTYG	L68	LPWNVVRIK	L31;L47;L32
389	CTQHQPYVV	L73	VVFVLWAH	L59	LPWNVVRIKI	L47;L50;L39
390	CTTIVNGVRR	L19	VVGPNVNK	L7	LPWNVVRIKIV	L50;L39;L47
391	CVCSVIDL	L74	VVIGIVNN	L74	LPYPDPSR	L47;L50;L51
392	CVDEAGSKS	L63	VVIGIVNNT	L20	LQAIASEF	L26;L59;L27

393	CVDTVRTNVYL	L68	VVIGIVNNTV	L20	LQSINFVRI	L24;L48;L34
394	CVEYCPIFF	L62	VVIPTKKAG	L43	LRIAGHHL	L66;L35;L25
395	CVIAWNSNNL	L10	VVKAALLA	L51	LSDRELHLS	L1;L53;L18
396	CVLGQSKR	L17	VVKAALLAD	L51	LSFKELLV	L73;L48;L47
397	CVLSGHNL	L60	VVLHSYFTSDY	L14	LSKGRLIIR	L15;L17;L21
398	CVRGTTVL	L59	VVLKKLKKSL	L23	LSPRWYFYY	L1;L12;L18
399	CVVADAVIKTL	L10	VVLKTGDL	L74	LSTDTGVEH	L43;L61;L59
400	CVVLHSYF	L74	VVNARLRAKHY	L14	LSYFIASFR	L19;L15;L17
401	CWHHSIGFDY	L14	VVQQLPETYF	L12	LTAFGLVAEW	L52;L10;L54
402	CYDHVIST	L62	VVREFLTRN	L43	LTALRLCAY	L1;L59;L18
403	CYDHVISTS	L62	VVRIKIVQ	L23	LTENKYSQL	L1;L63;L60
404	CYDTNVLE	L62	VVSDIDYV	L20	LTENLLLY	L1;L18;L12
405	CYDTNVLEG	L62	VVSTGYHF	L54	LTENLLLYI	L1;L18;L73
406	CYDYCIPY	L62	VVTCLAYY	L14	LTESNKKFL	L1;L63;L60
407	CYDYCIPYN	L62	VVTTVMFL	L74	LTGHMLDMY	L1;L18;L12
408	CYTPSKLI	L9	VVVNAANVYL	L20	LTILTSLLV	L73;L1;L18
409	DAALALLLLDR	L19	VVVNAANVYLK	L7	LTKEGATTC	L55;L53;L52
410	DADSTLIGD	L49	VWTLMNVLTL	L9	LTLQQIELK	L6;L7;L52
411	DAFKLNIK	L47	VYAADPAMH	L9	LTLQQIELKF	L52;L12;L53
412	DAGFIKQY	L70	VYANLGER	L17	LTNDNTSR	L21;L15;L17
413	DALCEKALK	L19	VYCCREHEH	L72	LTNMFTPL	L59;L61;L60
414	DAMRNAGI	L47	VYCFLGYFC	L9	LTPVVQTI	L47;L55;L57
415	DAMRNAGIV	L47	VYDDGARR	L62	LTRNPAWRK	L13;L6;L7
416	DAQGMDNL	L74	VYDNKLKA	L62	LVAEWFLAYI	L20;L3;L4
417	DATPSDFV	L47	VYDPLQPE	L62	LVASIKNF	L74;L52;L58
418	DATPSDFVRA	L50	VYDPLQPELDSF	L9	LVASIKNFK	L6;L7;L19
419	DAVIKTLQP	L49	VYDYLVST	L62	LVAVPTGY	L26;L43;L1
420	DAVNLLTN	L47	VYFASTEKS	L9	LVDFQVTI	L68;L63;L62
421	DAVNLLTNMF	L10	VYFASTEKSNI	L9	LVDLPIGI	L68;L62;L63
422	DAVVCFNSTY	L10	VYFLQSINFVR	L15	LVEVEKGVL	L68;L63;L1
423	DAYKTFPPT	L47	VYIGDPAQ	L71	LVFLFVAAIF	L31;L12;L52
424	DAYNMMIS	L47	VYKQFDTYNLW	L9	LVKQGDDYVY	L14;L26;L52
425	DAYNMMISAGF	L11	VYLAVFDKNLY	L12	LVKQLSSNF	L26;L58;L52
426	DAYVNTFSS	L47	VYNPFMID	L66	LVPFWITIAY	L12;L26;L6
427	DAYYRARAG	L25	VYNPFMIDVQ	L9	LWLDDVVYC	L31;L4;L8
428	DCATVHTANK	L19	VYNPFMIDVQQW	L9	LYDANYFL	L62;L68;L63
429	DCSARHINA	L25	VYQCAMRPN	L72	LYFDKAGQKTY	L71;L14;L12
430	DCVVLHSY	L29	VYRAFDIY	L66	LYLDAYNM	L71;L72;L66
431	DCVVLHSYF	L29	VYSVIYLYLT	L9	LYPTLNISD	L71;L72;L9
432	DDFTGCVI	L25	VYYSQLMCQ	L72	MADSNGTI	L68;L63;L47
433	DDFVEIIKS	L29	VYYTSNPTTFHL	L9	MADSNGTIT	L63;L68;L32
434	DDKKIKAC	L23	WCKDGHVET	L43	MAFPSGKV	L47;L70;L69
435	DDNALAYY	L29	WDLIISDM	L33	MCDIRQLL	L62;L63;L68
436	DDNLIDSY	L29	WDLLKYDF	L33	MDEFIERY	L18;L1;L29
437	DDNLIDSYF	L29	WDLTAFGL	L33	MEVTPSGTWL	L36;L37;L41

438	DDQIGYYR	L17	WEIVKFISTC	L45	MFVFLVLL	L62;L71;L72
439	DDQIGYYRR	L17	WEPEFYEA	L42	MFYKGVITH	L71;L72;L17
440	DDTLRVEA	L25	WESGVKDCVV	L38	MHAASGNLL	L34;L28;L35
441	DDTVIEVQGY	L29	WESGVKDCVVL	L36	MHAASGNLLL	L28;L34;L35
442	DDVVYCPRH	L29	WEVGKPRP	L46	MISAGFSL	L60;L61;L28
443	DDYQGKPL	L25	WEVGKPRPPL	L36	MLDMYSVM	L63;L68;L62
444	DDYVYLPY	L29	WFHAIHVSG	L71	MLTNDNTSRY	L14;L12;L18
445	DEAGSKSPIQY	L29	WFLAYILFT	L12	MLVKQGDDY	L26;L14;L12
446	DEDDNLID	L29	WFLNRFTTT	L8	MPVCVETKA	L50;L51;L32
447	DEDDNLIDS	L29	WHNMLKTV	L48	MPYFFTLLLQL	L31;L50;L47
448	DEDDNLIDSYF	L41	WHNMLKTVY	L27	MSAFAMMFV	L73;L20;L70
449	DEDDSEPV	L29	WHTNCYDYCI	L34	MSKFPLKLR	L15;L17;L21
450	DEDEEEGD	L29	WICLLQFAY	L12	MSYEDQDALF	L54;L53;L52
451	DEEQPMEID	L29	WKSYVHVVD	L44	MTQMYKQAR	L17;L15;L21
452	DEFIERYK	L29	WLCWKCRSK	L13	MVTNNTFTLK	L6;L7;L19
453	DEFIERYKLEGY	L29	WLDDVVYCPR	L21	MVYMPASWVMR	L21;L19;L15
454	DEGNCDTL	L29	WLDDVVYCPRH	L5	MYKGLPWNV	L13;L64;L3
455	DEISMATN	L29	WLDDVVYCPRHV	L5	NADIVEEA	L68;L67;L63
456	DELGTDPY	L29	WLDMVDTSLS	L1	NADLYKLM	L63;L68;L62
457	DELTGHMLDM	L29	WLGFIAGLI	L24	NAGDYILAN	L67;L69;L43
458	DELTGHMLDMY	L29	WLKQLIKVT	L3	NAGIVGVL	L67;L70;L74
459	DEMIAQYT	L29	WLKQLIKVTLV	L3	NALDQAISMW	L10;L49;L52
460	DEMIAQYTS	L29	WLLWPVTLA	L2	NAVASKILGL	L31;L49;L10
461	DEPEEHVQ	L29	WLSYFIASFR	L21	NCTEVPVAI	L35;L20;L34
462	DEPEEHVQIH	L29	WMVMFTPLV	L48	NDFNLVAM	L29;L33;L25
463	DEPTTTTS	L29	WNLVIGFLFL	L73	NDNLLEIL	L33;L25;L29
464	DERIDKVLN	L29	WNVKDFMSL	L32	NEFYAYLRK	L41;L40;L29
465	DETQALPQR	L29	WNVVRIKIV	L69	NEKTHVQLSL	L37;L41;L36
466	DEVRQIAPG	L29	WPLIVTALRA	L50	NENGTITDA	L42;L38;L46
467	DEWSMATY	L29	WPQIAQFAP	L50	NETLVTMPL	L37;L29;L41
468	DFAVSKGFF	L9	WPQIAQFAPSA	L50	NEYRLYLDAY	L29;L41;L40
469	DFCGKGYHL	L8	WPVTLACFV	L47	NFKSVLYY	L72;L71;L12
470	DFGDFIQTT	L17	WPVTLACFVLA	L50	NFNVLFSTV	L62;L71;L72
471	DFIDTKRGV	L11	WPWYIWLGFI	L47	NFSKLINII	L8;L34;L9
472	DFIPMDSTV	L71	WPWYIWLGFIA	L50	NFYGPFVDR	L17;L19;L15
473	DFLEYHDVR	L17	WQTGDFVKA	L24	NGDFLHFL	L68;L63;L62
474	DFLHFLPR	L17	WRVYSTGSNV	L30	NGLMLLEI	L25;L47;L48
475	DFLHFLPRVF	L9	WSFNPETNIL	L60	NGYPNMFITR	L19;L17;L15
476	DFQENWNTK	L17	WSLFFFLYE	L73	NHDLYCQVH	L35;L34;L28
477	DFVEIIKS	L29	WSYSGQSTQ	L55	NHTSPDVDL	L28;L35;L34
478	DGADVTKIK	L19	WTAFVTNV	L20	NIALIWNVK	L19;L7;L6
479	DGCVPLNI	L47	WTAFVTNVNA	L20	NIIPLTTA	L3;L25;L23
480	DGCVPLNII	L47	WTAGAAAYYV	L20	NINLHTQV	L25;L23;L48
481	DGDMVPHI	L47	WTIEYPIIG	L69	NIVNVSLVK	L19;L7;L6

482	DGGSLYVNK	L19	WTLMNVLTLVY	L52	NKGAGGHSY	L27;L66;L14
483	DGHVETFY	L29	WVATEGAL	L74	NLAKHCLHVV	L3;L2;L4
484	DGIIWVAT	L25	WVLNNDYY	L14	NLIDSYFVVKR	L19;L17;L21
485	DGKMKDLSP	L23	WYDFGDFI	L62	NLIIKNLSK	L6;L23;L7
486	DGKSKCEE	L23	WYDFVENP	L62	NLLEILQK	L6;L7;L4
487	DGTLMIERF	L29	WYIRVGAR	L17	NLLKDCPAV	L4;L2;L5
488	DGVDVELF	L29	WYIRVGARK	L8	NLLLQYGSF	L10;L27;L12
489	DGVKHVYQLR	L19	WYIWLGFIA	L50	NLSDRVVFVL	L4;L3;L2
490	DGVPFVVSTGY	L11	WYTERSEKSY	L14	NLWNTFTR	L21;L17;L19
491	DGVVCTEI	L25	YAADPAMHAAS	L67	NLYKMQRML	L64;L23;L74
492	DGWEIVKFI	L47	YAAFATAQ	L59	NNDYYRSL	L68;L62;L63
493	DGYVMHANYI	L47	YAAFATAQEAY	L31	NNLDKSAGF	L8;L12;L11
494	DHCGETSW	L28	YAAVINGDR	L19	NNLNRGMVL	L25;L23;L71
495	DHIGTRNPA	L28	YADSFVIRGD	L49	NPDILRVY	L31;L49;L1
496	DHSSSSDNIALL	L34	YAFASEAA	L50	NPFMIDVQQW	L49;L31;L41
497	DHVISTSH	L28	YAFEHIVYGD	L49	NQKLIANQF	L26;L27;L58
498	DIAANTVIWDY	L11	YAFEHIVYGDF	L31	NQMCLSTL	L25;L48;L35
499	DIAKKPTET	L23	YALVYFLQSI	L47	NRATLQAI	L25;L35;L64
500	DIDYVPLKS	L1	YANGGKGFC	L58	NRNYVFTGY	L30;L66;L65
501	DIGNPKAIK	L19	YANGGKGFCKL	L60	NRPQIGVV	L66;L64;L25
502	DILGPLSA	L25	YASAVVLLILM	L31	NRQFHQKL	L25;L35;L66
503	DINGNLHPD	L11	YASQGLVASI	L20	NRVCGVSAA	L25;L35;L30
504	DINKLCEEM	L29	YATHSDKFTD	L49	NSFSGYLK	L19;L55;L7
505	DIPGIPKD	L11	YAWNRKRIS	L69	NSFTRGVY	L14;L1;L70
506	DIPGIPKDMTY	L11	YAYLRKHFS	L23	NSPNLAWPL	L57;L67;L66
507	DIPIGAGIC	L11	YCALAPNMM	L28	NSRNYIAQV	L13;L70;L48
508	DIQLLKSA	L23	YCPACHNSE	L57	NSSPDDQIGYY	L1;L14;L18
509	DIRQLLFV	L23	YCPACHNSEV	L57	NSTNVTIATY	L14;L43;L10
510	DISGINASVV	L20	YCPIFFITG	L57	NSVPWDTIANY	L52;L14;L11
511	DISTEIYQA	L11	YCPIFFITGNTL	L57	NTFSSTFNV	L20;L70;L19
512	DITPCSFGGV	L11	YCRHGTCER	L43	NTVIWDYKR	L17;L19;L15
513	DIVEEAKK	L19	YDANYFLCW	L49	NVAKYTQL	L74;L25;L56
514	DIVEEAKKVK	L19	YDDGARRVW	L49	NVGDYFVL	L67;L66;L65
515	DIVKTDGTLM	L11	YDHVISTSH	L43	NVLSTFISA	L50;L51;L17
516	DIVVFDEI	L47	YDKLVSSFL	L33	NVLTLVYK	L7;L17;L6
517	DKAGQKTY	L27	YDNKLKAH	L33	NVPMEKLKTL	L57;L10;L5
518	DKAGQKTYER	L19	YDPKTKNV	L33	NVSLVKPSF	L31;L39;L12
519	DKKIKACV	L23	YDSMSYED	L33	NVYADSFVI	L49;L10;L20
520	DKNTQEVF	L29	YDYVIFTQ	L33	NVYLAVFDK	L7;L19;L6
521	DKVEAEVQI	L44	YDYYRYNL	L33	NWLKQLIKV	L4;L8;L25
522	DKYVRNLQH	L25	YDYYRYNLP	L33	NWYDFGDF	L9;L71;L62
523	DLATNNLVVM	L11	YEAMYTPHTVL	L36	NWYDFGDFI	L34;L8;L9
524	DLICAQKF	L11	YECDIPIGAGI	L45	NYIAQVDVVNF	L8;L9;L71
525	DLKGKYVQ	L23	YECLYRNRD	L45	NYIFWRNTN	L72;L8;L71
526	DLKPVSEE	L23	YEDFQENWN	L45	NYKLPDDF	L62;L9;L71
527	DLLIRKSN	L23	YEDLLIRK	L45	NYQKVGMQKY	L8;L14;L12

528	DLLIRKSNH	L23	YEDLLIRKSN	L41	PASWVMRIM	L70;L32;L69
529	DLNDFVSD	L23	YEGNSPFHP	L38	PAYTNSFTR	L19;L17;L15
530	DLNGNWYDF	L11	YEGNSPFHPL	L36	PEAGLPYGA	L46;L42;L38
531	DLPIGINITR	L19	YELKHGTFT	L45	PETTADIVV	L38;L37;L36
532	DLPIGINITRF	L11	YELKHGTFTC	L38	PETTADIVVF	L29;L41;L40
533	DLPKEITV	L23	YELKHGTFTCA	L46	PGIPKDMTY	L43;L26;L14
534	DLPKEITVA	L11	YENFNQHEVLL	L36	PGLPGTILR	L15;L21;L17
535	DLSVVNAR	L17	YEPLTQDH	L33	PHGHVMVEL	L35;L34;L28
536	DLSVVSKVVK	L19	YEPQIITT	L29	PLADNKFAL	L4;L2;L16
537	DLTAFGLVAEW	L10	YEQAVANGD	L38	PLHGTILTR	L21;L19;L17
538	DLYCQVHGN	L11	YEQFKKGVQ	L46	PLQPELDSF	L9;L26;L16
539	DMCASLKEL	L25	YEQFKKGVQIP	L38	PPIKDFGGF	L49;L11;L10
540	DMFLGTCR	L17	YEQYIKWP	L38	PPTSFGPLV	L50;L51;L47
541	DMYSVMLTN	L47	YERHSLSH	L29	PQNAVVKIY	L26;L14;L27
542	DNGPQNQR	L17	YERHSLSHFV	L45	PRPPLNRNY	L64;L65;L66
543	DNIALLVQ	L25	YFDCYDGG	L62	PTITQMNLKY	L11;L12;L18
544	DNLACEDL	L25	YFDCYDGGC	L62	PTLVPQEHY	L52;L12;L16
545	DNLKTLLSLR	L17	YFDCYDGGCI	L62	PTMCDIRQL	L55;L53;L10
546	DNQDLNGNW	L49	YFDKAGQK	L62	PTSFGPLVR	L19;L7;L21
547	DNSSLTIKK	L19	YFDKAGQKT	L62	PVAYRKVLL	L23;L20;L74
548	DNVTDFNAI	L10	YFFTLLLQ	L48	PVLDWLEEK	L7;L6;L13
549	DNYYKKDNSY	L11	YFFTLLLQLC	L12	PVSELLTPL	L20;L67;L56
550	DPAQLPAP	L50	YFGLFCLLNR	L17	PVYSFLPGVY	L14;L11;L12
551	DPAQLPAPRTL	L22	YFIASFRLFAR	L17	PWDTIANY	L1;L18;L62
552	DPIHSLRV	L47	YFIKGLNNLNR	L17	PYFFTLLL	L9;L71;L72
553	DPKTKNVT	L23	YFKNHTSP	L71	PYIKWDLLKY	L12;L8;L14
554	DPKTKNVTK	L23	YFLQSINFVR	L17	PYPDPSRI	L9;L8;L62
555	DPLSETKC	L47	YFLQSINFVRI	L8	QAAGTDTTI	L32;L49;L67
556	DPNFKDQVILL	L31	YFRLTLGV	L48	QADVEWKF	L63;L68;L62
557	DPQTLEILD	L32	YFRLTLGVYDY	L12	QADVEWKFY	L1;L18;L70
558	DPQTLEILDI	L47	YFTQSRNLQEF	L9	QAPTHLSV	L57;L47;L70
559	DPSRILGA	L50	YFYTSKTTVAS	L71	QECVRGTTVL	L36;L40;L37
560	DPVGFTLK	L47	YFYTSKTTVASL	L71	QEEVQELYSP	L42;L38;L46
561	DPYEDFQE	L47	YGADLKSFDL	L44	QEFRYMNSQ	L46;L29;L45
562	DPYEDFQENW	L49	YGDFSHSQ	L68	QEFRYMNSQGL	L40;L36;L41
563	DQALVSDV	L25	YGDSATLP	L63	QEILGTVSWNL	L40;L41;L36
564	DQDALFAY	L1	YGFQPTNGV	L47	QEKNFTTAP	L46;L42;L38
565	DQFKHLIP	L25	YGFQPTNGVGY	L27	QELIRQGTD	L40;L33;L46
566	DQLREPML	L25	YHDVRVVLDF	L34	QESPFVMMSA	L42;L46;L38
567	DQLTPTWR	L17	YHDVRVVLDFI	L34	QEVFAQVKQI	L41;L45;L40
568	DQVILLNK	L25	YHTTDPSF	L28	QFAYANRNR	L17;L15;L21
569	DQVILLNKH	L29	YHYQECVR	L28	QHEETIYNL	L34;L35;L28
570	DRCILHCA	L25	YICGDSTEC	L43	QHEETIYNLL	L34;L28;L35
571	DRCILHCAN	L25	YIDIGNYTVS	L68	QHMVVKAAL	L28;L35;L34
572	DRDAAMQRKL	L35	YIDIGNYTVSC	L68	QIAPGQTGK	L6;L7;L19
573	DRLITGRL	L25	YIFFASFYYV	L20	QKKQQTVTL	L44;L27;L39

574	DRLITGRLQ	L25	YILANTCTER	L17	QLDEEQPMEI	L5;L2;L68
575	DRLITGRLQSL	L25	YIRVGARK	L43	QLHNDILLA	L3;L2;L24
576	DRLNEVAK	L25	YITTYPGQGL	L60	QLPAPRTLL	L57;L5;L22
577	DRLNQLES	L25	YIWLGFIA	L50	QLPPAYTNSF	L9;L57;L5
578	DRLNQLESKM	L30	YKAFKQIVE	L44	QLPQGTTL	L57;L23;L5
579	DRQTAQAA	L25	YKAIDGGVTR	L19	QMAPISAMV	L20;L3;L28
580	DRVVFVLW	L25	YKENSYTTT	L27	QPGVAMPNL	L22;L56;L39
581	DRYFKYWD	L25	YKENSYTTTI	L34	QPITNCVKML	L32;L39;L22
582	DRYFKYWDQ	L25	YKHITSKETL	L44	QPPQTSITSA	L50;L51;L22
583	DRYFKYWDQTY	L30	YKHWPQIAQF	L27	QPQLEMEL	L39;L22;L56
584	DSAEVAVK	L19	YKKVDGVVQ	L27	QPRTFLLKY	L31;L11;L22
585	DSATLPKGI	L10	YKLEGYAFE	L44	QPSVGPKQA	L51;L22;L39
586	DSATLVSDI	L10	YKLMGHFAW	L27	QPTSEAVEA	L50;L51;L32
587	DSCKRVLNV	L73	YKLNVGDY	L27	QQLIRAAEI	L48;L25;L24
588	DSCNNYMLTY	L18	YKLNVGDYFVL	L44	QQQQGQTV	L48;L24;L28
589	DSDLNDFV	L1	YKLPDDFTGC	L27	QSASKIITLK	L7;L6;L19
590	DSDLNDFVS	L1	YKNTCDGTTF	L27	QSIIAYTM	L55;L48;L54
591	DSEPVLKGV	L20	YKNTCDGTTFTY	L27	QSINFVRI	L48;L73;L55
592	DSFKEELDK	L19	YKSVNITFEL	L44	QSINFVRIIMR	L19;L21;L7
593	DSFVIRGD	L65	YKYFSGAM	L27	QSSYIVDSV	L20;L73;L70
594	DSFVIRGDEV	L20	YKYFSGAMD	L27	QTFFKLVNKF	L11;L10;L52
595	DSKEGFFTYI	L10	YLALYNKYK	L6	QTLLALHRSY	L52;L14;L40
596	DSVEEVLSEAR	L19	YLASGGQPIT	L2	QTNSPRRAR	L15;L21;L17
597	DSVTVKNGSI	L10	YLDGADVT	L1	QVDLFRNAR	L21;L17;L15
598	DSYFVVKRH	L19	YLGKPREQI	L2	QVRDVLVR	L21;L15;L17
599	DTANPKTPKYK	L19	YLGTGPEAGL	L2	QVTCGTTTL	L32;L56;L10
600	DTDLTKPYI	L1	YLITPVHVMSK	L6	QVVSDIDYV	L20;L11;L5
601	DTFNGECPNFV	L20	YLKHGGGVAGA	L3	QWLPTGTL	L33;L71;L9
602	DTKRGVYCC	L10	YLKLRSDV	L23	QWNLVIGF	L33;L62;L29
603	DTLRVEAF	L29	YLKLRSDVL	L23	QYIDIGNYT	L9;L8;L72
604	DTPNNTDF	L11	YLKLRSDVLL	L23	QYIDIGNYTV	L8;L20;L9
605	DTSLSGFKLK	L19	YLNSTNVTIA	L3	QYNRYLAL	L71;L72;L66
606	DTTEAFEK	L19	YLNTLTLA	L3	RAAEIRASA	L51;L50;L46
607	DTTITVNVLAW	L10	YLPIDKCSR	L57	RAFDIYND	L65;L54;L55
608	DTVRTNVYLAVF	L10	YLPYPDPSRIL	L57	RAFGEYSHVV	L24;L70;L69
609	DTYPSLET	L25	YLRKHFSM	L23	RAKVTSAM	L43;L70;L59
610	DVDLGDISGI	L10	YLRKHFSMM	L3	RALTGIAVE	L52;L44;L53
611	DVENPHLMGWDY	L1	YLVQQESPF	L26	RDAAMQRKL	L33;L55;L37
612	DVETKDVV	L23	YLVQQESPFV	L2	REAACCHL	L33;L37;L36
613	DVGDSAEV	L20	YLYALVYFLQ	L12	REAACCHLA	L38;L42;L46
614	DVGDSAEVAV	L20	YLYRLFRKS	L24	REAACCHLAKA	L46;L38;L42
615	DVGDSAEVAVK	L19	YMGTLSYEQF	L9	REAVGTNLPL	L36;L41;L40
616	DVKCTSVV	L23	YMPASWVMRI	L5	REEAIRHVRAW	L40;L38;L41
617	DVKCTSVVLL	L11	YMRSLKVPA	L50	REGYLNSTNV	L45;L38;L36

618	DVLECNVKT	L11	YMRSLKVPATV	L3	RELGVVHN	L33;L37;L29
619	DVLECNVKTT	L10	YNLWNTFTR	L17	RELNGGAY	L29;L14;L27
620	DVLLPLTQ	L25	YNYEPLTQ	L48	RELNGGAYT	L36;L45;L40
621	DVLLPLTQYNR	L17	YNYKLPDDF	L12	RFASVYAWNR	L15;L21;L17
622	DVLVRGFGD	L17	YNYLYRLFR	L17	RFLYIIKLIF	L8;L9;L12
623	DVQQWGFTGN	L10	YPANSIVC	L47	RFYRLANEC	L72;L71;L8
624	DVRVVLDF	L23	YPGQGLNGYTV	L50	RGFGDSVEE	L65;L44;L27
625	DVSFLAHI	L20	YPLECIKDLL	L31	RGIVFMCVEY	L26;L43;L27
626	DVTQLYLGG	L11	YPLECIKDLLA	L50	RHFDEGNCDTL	L34;L28;L16
627	DVVECLKLSH	L11	YPLTKHPNQEY	L31	RHHANEYRLY	L14;L27;L18
628	DVVIGIVNNTV	L20	YPNMFITREEA	L50	RHVRAWIGF	L27;L34;L53
629	DVVYCPRHV	L20	YPSLETIQIT	L31	RIMTWLDMV	L73;L4;L24
630	DWTIEYPII	L47	YPSLETIQITI	L47	RKGGRTIAF	L27;L44;L33
631	DWYDFVENP	L11	YPTLNISD	L50	RLANECAQVL	L16;L24;L44
632	DYDCVSFC	L62	YQCAMRPNF	L58	RLIDAMMF	L26;L16;L54
633	DYDCVSFCYM	L62	YQCGHYKHI	L24	RLISMMGF	L26;L27;L16
634	DYDYYRYNL	L62	YQLYSTQLS	L24	RLKLFDRY	L14;L18;L26
635	DYFNKKDWYDF	L8	YQPYRVVV	L48	RLNQLESKM	L14;L16;L24
636	DYGARFYF	L9	YRAFDIYNDK	L30	RLQSLENVAF	L16;L26;L56
637	DYGARFYFY	L12	YREAACCHL	L34	RLYECLYR	L21;L15;L6
638	DYIATNGPLKV	L8	YREGYLNST	L35	RLYECLYRNR	L21;L15;L6
639	DYIINLIIK	L17	YRINWITGG	L30	RMYIFFASFYY	L14;L18;L12
640	DYILANTC	L71	YRKVLLRKN	L64	RNLQHRLY	L55;L14;L65
641	DYILANTCTER	L17	YRLANECAQV	L30	RNSTPGSSR	L15;L21;L17
642	DYKAFKQIV	L23	YRLANECAQVL	L35	RNYVFTGY	L27;L26;L65
643	DYLVSTQEFR	L17	YRLFRKSNLK	L30	RPINPTDQSSY	L14;L27;L31
644	DYNYKLPDDF	L9	YRLYLDAY	L66	RPLLESEL	L56;L22;L39
645	DYVPLKSA	L25	YRNRDVDTD	L65	RPNFTIKGSF	L39;L22;L56
646	DYYQLYSTQ	L17	YRRLISMM	L66	RPNFTIKGSFL	L56;L39;L22
647	DYYRSLPGV	L47	YRVVVLSFELL	L30	RPPLNRNYV	L39;L22;L51
648	DYYRSLPGVF	L9	YSDSPCES	L1	RPPLNRNYVF	L22;L39;L56
649	EAACCHLAK	L19	YSDSPCESHG	L63	RPQIGVVR	L56;L15;L39
650	EAALCTFL	L74	YSDVENPHLMGW	L1	RQALLKTV	L48;L24;L33
651	EAANFCALI	L20	YSFLPGVYSVIY	L1	RQKKQQTV	L48;L24;L26
652	EAARVVRSIFSR	L19	YSFVSEET	L43	RQKKQQTVT	L26;L27;L44
653	EAELAKNVSL	L68	YSLLLCRM	L59	RQKRTATKAY	L26;L27;L14
654	EAEVQIDR	L17	YSLRLIDAM	L67	RQRLTKYTM	L27;L44;L26
655	EAFLIGCNYL	L20	YSPIFLIVAA	L50	RSDVLLPLTQY	L18;L1;L14
656	EAGLPYGANK	L19	YSVIYLYLTFY	L1	RSGETLGV	L73;L48;L24
657	EAIRHVRAWI	L20	YSVLYNSA	L50	RSVSPKLFIR	L15;L21;L7
658	EAKTVLKKC	L10	YTDFATSACV	L1	RTTNGDFL	L55;L54;L53
659	EASFNYLK	L19	YTDFATSACVL	L68	RTVAGVSI	L55;L54;L53
660	EAVGTNLPLQL	L20	YTEISFMLWC	L1	RVDFCGKGYHL	L18;L63;L68
661	EAVMYMGTLSY	L11	YTEKWESGV	L1	RVDGQVDLFR	L21;L7;L18
662	EAYEQAVA	L50	YTEKWESGVK	L1	RVEAFEYY	L18;L1;L14

663	ECAQVLSEMV	L20	YTELEPPCR	L1	RVESSSKL	L63;L18;L54
664	ECFDKFKVN	L10	YTELEPPCRF	L1	RVLNVVCK	L7;L13;L6
665	ECFVKRVD	L65	YTERSEKS	L1	RVLNVVCKT	L13;L24;L6
666	ECNQMCLSTL	L10	YTGNYQCGHY	L1	RVLSNLNLP	L6;L16;L15
667	ECNVKTTEV	L23	YTKRNVIPTI	L10	RVQPTESI	L54;L16;L24
668	ECTTIVNGV	L20	YTKVDGVDVELF	L52	RVQPTESIV	L24;L14;L28
669	ECTTIVNGVRR	L19	YTMADLVYA	L20	RVRQALLK	L13;L6;L7
670	ECVRGTTV	L48	YTPHTVLQA	L11	RVRQALLKT	L13;L6;L51
671	ECVRGTTVLL	L20	YTSALLAGT	L20	RVRQALLKTV	L13;L3;L51
672	EDDSEPVL	L28	YTSKTTVASL	L20	RVYSSANNCTF	L16;L54;L52
673	EDDSEPVLK	L19	YTSNPTTFH	L58	RWVLNNDYY	L14;L18;L12
674	EDIQLLKSA	L46	YTTTIKPV	L70	RYWEPEFYE	L65;L8;L9
675	EDIQLLKSAY	L40	YTVELGTEVNEF	L10	SAEVAVKM	L63;L62;L68
676	EDLLFNKVTL	L23	YTVSCLPFTI	L20	SAFFGMSR	L19;L17;L15
677	EDMLNPNY	L29	YVDNSSLTIK	L6	SAFYILPSII	L69;L20;L70
678	EDNQTTTI	L48	YVDNSSLTIKK	L7	SAGFPFNKW	L49;L52;L54
679	EEAALCTFLLN	L41	YVGCHNKCAY	L43	SAIGKIQDS	L43;L49;L58
680	EEAARYMRS	L42	YVMHANYIFW	L10	SARHINAQV	L20;L58;L70
681	EEAKKVKPT	L42	YVPLKSAT	L57	SAVGNICY	L70;L58;L69
682	EEEEFEPST	L42	YVPLKSATC	L57	SCKRVLNVV	L51;L3;L39
683	EEEGDCEEE	L42	YVSQPFLMDL	L20	SDDAVVCF	L33;L62;L63
684	EEHFIETIS	L42	YVTQQLIRAA	L50	SDRVVFVL	L33;L65;L29
685	EELFYSYATH	L40	YVYIGDPA	L50	SEAFLIGCNY	L40;L41;L29
686	EEMLDNRA	L42	YVYIGDPAQ	L67	SEAFLIGCNYL	L40;L36;L41
687	EEQEEDWL	L29	YVYNPFMI	L47	SEAKCWTET	L46;L42;L37
688	EEQPMEID	L29	YVYNPFMIDV	L20	SEETGTLI	L45;L36;L37
689	EERLKLFDR	L17	YWDQTYHP	L62	SEFRVYSS	L29;L33;L37
690	EERLKLFDRYF	L40	YWDQTYHPN	L62	SEGLNDNL	L33;L36;L37
691	EESSAKSASVYY	L41	YWEPEFYEAMY	L1	SEISMDNSPNL	L36;L41;L40
692	EETGLLMPLKA	L42	YWFFSNYLK	L7	SEKQVEQKIA	L42;L38;L46
693	EETGTLIVNSVL	L41	YWFFSNYLKR	L19	SEKSYELQTP	L42;L46;L38
694	EETIYNLLKD	L41	YYDSMSYE	L62	SELLTPLGIDL	L36;L41;L40
695	EETKFLTENLL	L41	YYDSMSYED	L62	SEQLDFIDT	L42;L40;L38
696	EETKFLTENLLL	L41	YYFMRFRR	L17	SFCYMHHM	L62;L72;L71
697	EEVGHTDLMA	L42	YYFMRFRRA	L46	SFCYMHHMEL	L71;L72;L62
698	EEVKPFIT	L29	YYGNALDQ	L71	SFGGASCCL	L72;L71;L62
699	EEVLSEAR	L29	YYGNALDQAI	L9	SFGGVSVI	L72;L71;L48
700	EEVQELYSPIFL	L41	YYHTTDPS	L71	SFIEDLLFN	L12;L8;L72
701	EEVTTTLEE	L41	YYLFDESG	L71	SFIEDLLFNK	L7;L13;L6
702	EEVVLKTG	L29	YYLGTGPE	L71	SFKKGAKL	L72;L62;L71
703	EFCSQHTML	L8	YYLGTGPEAGL	L9	SFLEMKSEK	L71;L72;L13
704	EFDRDAAM	L62	YYNTTKGGR	L17	SFNYLKSPNF	L9;L8;L12
705	EFDRDAAMQR	L17	YYRARAGEA	L72	SFTRGVYY	L72;L71;L12
706	EFEPSTQY	L1	YYRRATRR	L17	SFTVEKGIY	L14;L12;L72
707	EFIERYKL	L8	YYRSLPGV	L48	SFVSEETGTL	L8;L72;L71

708	EFKLASHMY	L14	YYSLLMPILTL	L9	SFYPPDED	L72;L71;L62
709	EFLRDGWEIVKF	L8	AAAYYVGY	L43;L58	SGVKDCVVL	L44;L32;L56
710	EFLTRNPAWR	L17	AADPAMHA	L63;L68	SHAAVDAL	L35;L28;L34
711	EFQFCNDPF	L72	AAFATAQEA	L69;L46	SHEGKTFYV	L34;L35;L28
712	EFYAYLRKH	L17	AAIMQLFFSY	L12;L14	SHEGKTFYVL	L34;L35;L28
713	EGDCEEEEF	L34	AAISDYDYYRY	L12;L14	SHFVNLDNL	L34;L28;L35
714	EGFFTYICGF	L11	AAKLMVVI	L70;L69	SHQSDIEVT	L28;L34;L35
715	EGKTFYVL	L23	AAKLMVVIP	L69;L42	SHSQLGGLHL	L34;L28;L35
716	EGKTFYVLP	L42	AALALLLLD	L12;L7	SHSQLGGLHLL	L34;L28;L35
717	EGNFYGPFVDR	L17	AALCTFLLNK	L7;L6	SHVVAFNTLL	L34;L28;L35
718	EGVLTAVV	L48	AALGVLMSNL	L74;L67	SIFSRTLET	L43;L6;L3
719	EGVVDYGAR	L17	AALLADKF	L33;L54	SIINNTVYTK	L7;L19;L6
720	EGYAFEHIVY	L27	AALLADKFPVL	L67;L31	SIIQFPNTYL	L11;L20;L6
721	EGYLNSTNV	L48	AANFCALILAY	L12;L31	SIKNFKSVLYY	L12;L14;L6
722	EHDYQIGGYTE	L34	AAYSRYRI	L70;L47	SKLINIIIW	L44;L27;L52
723	EHEIAWYTE	L34	AAYSRYRIG	L69;L70	SKPSKRSF	L27;L66;L57
724	EHFIETISLA	L28	ACFVLAAV	L48;L33	SKRSFIEDL	L44;L27;L66
725	EHIVYGDFS	L34	ADDLNQLTGY	L18;L1	SKVQIGEYTF	L27;L44;L34
726	EHIVYGDFSH	L34	ADLDDFSKQL	L40;L37	SLAEYHNESGL	L2;L3;L4
727	EHSWNADLY	L34	ADLVYALRHF	L40;L33	SLDNVLSTFI	L5;L68;L2
728	EHVNNSYECDI	L34	ADSFVIRGD	L65;L33	SLFDMSKFPLK	L6;L7;L13
729	EHVTFFIY	L29	ADVEWKFYD	L65;L33	SLFDMSKFPLKL	L2;L3;L4
730	EHYVRITGLY	L11	AEETRKLMPV	L42;L38	SLGAENSVAY	L12;L26;L14
731	EIDRLNEVA	L42	AEHVNNSYEC	L42;L38	SLIDLQELG	L2;L4;L12
732	EIIGYKAI	L10	AEILLIIMRTFK	L40;L41	SLKELLQNG	L3;L13;L4
733	EIIGYKAID	L11	AEIPKEEVKPF	L41;L40	SLKVPATV	L3;L23;L43
734	EIIGYKAIDGG	L11	AEIVDTVSALVY	L41;L40	SLPSYAAF	L57;L43;L72
735	EIIKSQDL	L23	AELAKNVSLD	L40;L41	SLPVLQVRDV	L57;L64;L5
736	EIIKSQDLSV	L11	AELEGIQYGRSG	L41;L40	SLREVRTIK	L13;L6;L21
737	EIKDATPSD	L11	AETLKATEE	L45;L46	SLRVCVDTV	L3;L4;L2
738	EIKDTEKYCAL	L10	AETLKATEETF	L41;L36	SLSEQLRKQ	L3;L4;L14
739	EIKLAKKF	L23	AEVAVKMFDAY	L40;L41	SLSHFVNL	L74;L56;L4
740	EILGTVSW	L10	AEVQIDRLIT	L41;L40	SLVVRCSFY	L14;L12;L26
741	EILQKEKV	L23	AEWFLAYILFT	L40;L41	SNHNFLVQA	L46;L51;L42
742	EIPKEEVKP	L11	AEYHNESGLKTI	L45;L41	SNYLKRRV	L48;L45;L33
743	EIPVAYRKVL	L57	AFATAQEA	L72;L71	SPCESHGKQV	L39;L51;L22
744	EISFMLWCK	L19	AFDKSAFV	L62;L63	SPFVMMSA	L50;L51;L25
745	EITVATSRTL	L10	AFDKSAFVNL	L62;L68	SPIFLIVA	L50;L51;L22
746	EIVGGQIV	L20	AFFGMSRIGM	L71;L72	SPISEHDYQI	L32;L49;L34
747	EKCSAYTVEL	L44	AFKLNIKL	L62;L71	SPNLAWPL	L22;L56;L39
748	EKDEDDNLI	L34	AFLIGCNY	L71;L72	SPSGVYQCAM	L22;L32;L39
749	EKGDYGDAVVY	L27	AFPFTIYS	L71;L72	SQCVNLTTR	L15;L21;L17
750	EKQEILGTV	L20	AFPSGKVE	L71;L72	SQDLSVVSKV	L63;L68;L24
751	ELAKNVSLD	L11	AFPSGKVEG	L72;L71	SQILPDPSK	L13;L7;L28
752	ELDSFKEELDKY	L1	AFQTVKPG	L72;L71	SQLGGLHLLI	L24;L34;L8
753	ELFYSYATH	L10	AFVETVKGLDY	L12;L71	SQNAVASKI	L24;L48;L34

754	ELGKYEQYI	L24	AFVNLKQL	L72;L71	SQWLTNIF	L27;L48;L26
755	ELGTDPYEDF	L11	AFVTNVNAS	L72;L71	SRELKVTFF	L34;L30;L62
756	ELHLSWEV	L23	AGFPFNKW	L54;L48	SRIGMEVTP	L35;L34;L30
757	ELIRQGTDYKHW	L10	AGFPFNKWGK	L7;L13	SRIIPARAR	L30;L17;L15
758	ELKHGTFTC	L10	AGGIVAIVV	L69;L73	SRNYIAQV	L64;L35;L48
759	ELKINAAC	L23	AGLIAIVMV	L4;L73	SRNYIAQVD	L65;L64;L35
760	ELKINAACR	L17	AGNVQLRV	L48;L73	SRVPDLLV	L64;L35;L25
761	ELKKLLEQ	L23	AGNVQLRVI	L55;L48	SRYRIGNYKL	L30;L35;L34
762	ELSLIDFY	L1	AGSDKGVAP	L46;L42	SRYWEPEF	L65;L66;L28
763	ELSLIDFYL	L20	AGTDLEGNFY	L14;L12	SSRGTSPAR	L21;L15;L13
764	ELSPVALRQM	L11	AHIQWMVM	L28;L35	SSRSRNSSR	L15;L21;L17
765	ELSRVLGL	L23	AHISTIGV	L28;L35	SSSDNIALLV	L73;L20;L18
766	ELTGHMLDM	L11	AHKDKSAQCF	L43;L34	SSVELKHFFF	L52;L53;L54
767	ELTPVVQTIEV	L20	AHVASCDAI	L34;L28	STASALGK	L7;L19;L6
768	ELTSMKYFV	L20	AIAMACLVGL	L3;L4	STASDTYACW	L10;L52;L54
769	ELVAELEGIQY	L11	AIGKIQDSL	L67;L44	STDGNKIADKY	L18;L1;L14
770	ELVIGAVI	L23	AINRPQIGVVR	L21;L15	STFNVPMEKLK	L7;L6;L13
771	EMELTPVV	L48	AIPTNFTISV	L57;L5	STKPVETSNSF	L52;L53;L10
772	EMIAQYTSA	L42	AITILDGISQY	L14;L18	STMTNRQF	L52;L55;L53
773	EMIAQYTSAL	L10	AKDTTEAF	L27;L68	STQLGIEFLKR	L15;L7;L19
774	EMKSEKQV	L48	AKHDFFKF	L27;L66	STYASQGLV	L20;L73;L14
775	EMLAKALR	L17	AKHDFFKFR	L15;L21	SVEEVLSEA	L3;L5;L51
776	EMLAKALRK	L6	AKKVKPTVV	L23;L3	SVITPGTNT	L13;L11;L7
777	EMVMCGGSL	L10	AKNLNESL	L44;L27	SVMLTNDNTSR	L7;L19;L15
778	EMYLKLRSD	L23	AKNRARTVA	L42;L46	SVQTFFKLVNK	L7;L6;L15
779	ENFNQHEVLL	L20	AKSHNIALI	L44;L34	SVVNARLRAK	L7;L10;L6
780	ENSYTTTI	L48	ALALLLLDRL	L4;L3	SVVNIQKEI	L20;L10;L24
781	ENVAFNVVNK	L19	ALAPNMMVT	L3;L2	SVVSKVVK	L7;L19;L13
782	EPEFYEAMY	L31	ALDPLSETKC	L5;L18	SYCTGYREGY	L14;L72;L71
783	EPIYDEPTT	L32	ALDQAISMWAL	L5;L68	SYELQTPF	L71;L72;L62
784	EPKKDKKKK	L23	ALEPLVDLP	L1;L18	SYFVVKRH	L71;L48;L72
785	EPKKDKKKKAD	L23	ALFAYTKR	L21;L15	SYGIATVREV	L72;L64;L71
786	EPLTQDHV	L47	ALFAYTKRN	L24;L3	SYKDWSYSG	L8;L66;L15
787	EPLTQDHVD	L32	ALFAYTKRNV	L3;L2	TAALGVLM	L70;L31;L74
788	EPLVDLPI	L47	ALGGSVAIK	L6;L7	TADIVVFD	L68;L63;L62
789	EPLVDLPIG	L31	ALGKLQDVV	L24;L2	TADIVVFDEI	L67;L68;L49
790	EPMLQSADA	L50	ALIISVTSN	L3;L26	TANVNALL	L62;L68;L63
791	EPQIITTD	L23	ALITLATCEL	L2;L4	TAYNGYLTS	L49;L43;L69
792	EPTTTTSVPL	L22	ALKGGKIV	L23;L39	TCCSLSHRF	L49;L8;L34
793	EQDKNTQEVF	L34	ALKGGKIVN	L43;L26	TDDNALAYY	L1;L18;L14
794	EQIDGYVM	L35	ALKGGKIVNN	L3;L21	TDNYITTY	L29;L65;L33
795	EQIDGYVMHA	L11	ALLADKFPV	L2;L4	TEAFEKMV	L45;L37;L38
796	EQKSILSPL	L10	ALLAGTITS	L2;L4	TEAFEKMVSLL	L36;L40;L41
797	EQKSILSPLY	L14	ALLLLDRL	L4;L74	TECSNLLL	L45;L36;L37
798	EQLDFIDTKR	L17	ALLSDLQDLK	L6;L7	TEGSVKGL	L37;L33;L45
799	EQPTSEAV	L48	ALLSTDGNK	L6;L7	TEGSVKGLQP	L38;L42;L46

800	EQYIKWPW	L48	ALLSTDGNKI	L24;L2	TEIYQAGSTP	L38;L46;L42
801	EQYIKWPWYI	L48	ALLTKSSEYK	L6;L7	TEKYCALAP	L46;L42;L38
802	EQYVFCTVN	L48	ALLTLQQI	L4;L24	TELEPPCRFV	L45;L38;L36
803	ERLKLFAA	L25	ALNDFSNSG	L43;L16	TENLLLYIDI	L41;L40;L36
804	ERLKLFDR	L17	ALPETTAD	L57;L43	TESNKKFLP	L38;L42;L46
805	ERLKLFDRYF	L30	ALPETTADIV	L5;L2	TETICAPLTV	L45;L38;L46
806	ERSEAGVC	L35	ALPETTADIVV	L5;L2	TETICAPLTVF	L40;L41;L29
807	ERVRQALL	L35	ALQDAYYR	L21;L15	TFEEAALCTF	L62;L8;L9
808	ERVRQALLK	L30	ALQDAYYRAR	L21;L15	TFGAGAAL	L72;L71;L62
809	ERYKLEGY	L25	ALRANSAVK	L13;L6	TFISDEVAR	L17;L19;L15
810	ESCGNFKVTK	L19	ALRKVPTDNY	L26;L14	TFLLNKEMY	L12;L72;L71
811	ESDDYIAT	L1	ALSKGVHF	L26;L74	TFTYASAL	L72;L71;L62
812	ESDDYIATN	L1	ALTCFSTQF	L26;L27	TFVTHSKGL	L71;L8;L72
813	ESFGGASCC	L19	ALTNNVAF	L26;L43	TGSNVFQTR	L19;L17;L15
814	ESGLKTIL	L23	ALYYPSAR	L21;L6	TGYKKPASR	L17;L19;L15
815	ESGLKTILRK	L19	AMACLVGL	L56;L3	THDVSSAIN	L28;L35;L34
816	ESLRPDTR	L17	AMMFTSDL	L71;L72	THHWLLLTIL	L28;L34;L35
817	ESLVPGFNE	L17	AMPNMLRIM	L64;L57	THSDKFTDGVCL	L34;L35;L28
818	ESPFELEDF	L11	ANGDSEVVLK	L7;L6	THTGTGQAI	L35;L34;L28
819	ESSAKSASV	L20	ANGQVFGL	L65;L33	THTGTGQAITV	L28;L34;L35
820	ESSAKSASVY	L14	ANGQVFGLYK	L7;L6	THVQLSLPVL	L28;L34;L35
821	ESVQTFFKLV	L20	ANKDGIIWVA	L51;L42	TIDGSSGVV	L68;L63;L28
822	ETAHSCNV	L20	ANSTVLSF	L33;L65	TIFKDASGK	L19;L6;L7
823	ETAQNSVRVLQK	L19	ANYAKPFLNK	L6;L7	TISLAGSY	L14;L18;L1
824	ETDLTKGPH	L1	ANYQKVGMQK	L6;L7	TISLAGSYK	L6;L19;L7
825	ETDLTKGPHEF	L1	APFLYLYA	L50;L51	TITQMNLKY	L12;L18;L14
826	ETFKLSYGIA	L11	APGQTGKIA	L51;L39	TITVNVLAW	L10;L16;L49
827	ETFKLSYGIATV	L20	APGTAVLRQWL	L56;L22	TKDVVECL	L62;L68;L63
828	ETFVTHSKGLY	L11	APHGHVMVE	L51;L39	TKHPNQEY	L27;L66;L43
829	ETFYPKLQS	L20	APKEIIFLE	L39;L56	TKPYIKWDL	L44;L66;L57
830	ETGLLMPLK	L19	APLLSAGIF	L22;L31	TKVDGVDVEL	L44;L32;L66
831	ETGTLIVNSV	L20	APNMMVTNNTF	L39;L22	TLADAGFIK	L6;L7;L19
832	ETICAPLTVFF	L11	APRTLLTK	L22;L51	TLADAGFIKQY	L11;L10;L14
833	ETIQITISSFK	L19	APRTLLTKG	L51;L22	TLEPEYFNSV	L5;L2;L4
834	ETISLAGS	L11	APSASAFF	L22;L56	TLIVNSVL	L23;L68;L28
835	ETIYNLLK	L19	APSASAFFGM	L22;L56	TLKATEETF	L26;L9;L16
836	ETKDVVEC	L17	APYIVGDV	L47;L51	TLKKRWQLAL	L23;L3;L39
837	ETKDVVECLK	L19	APYIVGDVVQ	L56;L51	TLLSLREVR	L15;L21;L17
838	ETKFLTENLL	L20	AQAAGTDTTI	L34;L24	TLNGLWLDDV	L2;L4;L3
839	ETKFLTENLLLY	L1	AQALNTLV	L24;L48	TLQAENVTGL	L4;L3;L2
840	ETLGVLVPHV	L20	AQCFKMFYK	L7;L6	TLSYEQFKK	L6;L7;L19
841	ETLPTEVLT	L17	AQDGNAAISDY	L14;L18	TLVFLFVAA	L50;L46;L51
842	ETLYCIDGALL	L20	AQEAYEQAV	L24;L28	TMCDIRQLLF	L12;L8;L9
843	ETNILLNVPL	L20	AQNSVRVLQ	L44;L15	TNNLVVMAY	L14;L31;L65
844	ETQALPQRQ	L20	AQSFLNRV	L48;L24	TPLVPFWIT	L31;L47;L50

845	ETQALPQRQK	L19	AQTGIAVLD	L44;L24	TPLVPFWITI	L47;L50;L22
846	ETRKLMPVCV	L20	AQVAKSHNI	L24;L48	TPTWRVYST	L23;L32;L39
847	ETSNSFDV	L20	AQVDVVNFN	L24;L44	TQLGIEFL	L25;L35;L34
848	ETSNSFDVLK	L19	AQVKQIYKT	L24;L44	TQLGIEFLK	L7;L30;L6
849	ETSWQTGDFV	L20	AQYTSALLA	L24;L28	TQVVDMSMTY	L26;L27;L14
850	ETTADIVV	L20	ARAGKASCTL	L30;L35	TQWSLFFFLY	L14;L12;L27
851	ETTADIVVFD	L20	ARDGCVPLNI	L30;L34	TRAKVGILC	L30;L34;L35
852	ETYFTQSRN	L11	ARHINAQV	L35;L25	TREEAIRHV	L64;L35;L34
853	EVARDLSL	L20	ARLRAKHYVY	L66;L30	TRLQSLENV	L30;L34;L35
854	EVAVKMFDAYV	L20	ARNGVLIT	L65;L35	TRQVVNVV	L35;L25;L64
855	EVFAQVKQ	L20	ARNGVLITEG	L65;L30	TRVECTTI	L25;L35;L34
856	EVFNATRFAS	L20	ASAVVLLILM	L52;L7	TRVECTTIV	L64;L35;L25
857	EVFNATRFASV	L20	ASDTYACWH	L18;L1	TSAFVETV	L48;L20;L70
858	EVGKPRPPL	L20	ASEAARVVR	L15;L21	TSAMQTMLF	L53;L52;L54
859	EVGKPRPPLNR	L17	ASEFSSLP	L1;L18	TSDLATNNLV	L1;L68;L18
860	EVGPEHSLA	L20	ASEYTGNY	L1;L18	TSFGPLVRKI	L55;L20;L10
861	EVITFDNLKT	L11	ASEYTGNYQ	L1;L18	TSLEIPRR	L48;L17;L15
862	EVKILNNL	L23	ASFYYVWK	L7;L13	TSNSFDVL	L73;L55;L67
863	EVKILNNLGV	L11	ASGKPVPY	L43;L65	TSPISEHDY	L14;L1;L26
864	EVKPFITE	L23	ASGNLLLDK	L7;L6	TSSGDATTAY	L18;L14;L1
865	EVLLAPLL	L74	ASKKPRQK	L13;L55	TSTDVVYR	L19;L17;L15
866	EVLLAPLLSA	L50	ASLPFGWLIV	L73;L69	TSVDCTMYI	L70;L69;L73
867	EVLSDRELH	L17	ASLVLARKH	L55;L52	TSVVLLSV	L48;L73;L59
868	EVLSDRELHL	L10	ASSSEAFL	L74;L73	TTCCSLSHR	L17;L15;L19
869	EVNEFACV	L20	ASTDTCFANK	L7;L13	TTCFSVAAL	L20;L68;L57
870	EVPANSTV	L20	ATALLTLQQ	L7;L18	TTFTYASALW	L52;L10;L54
871	EVPVSIINNTV	L20	ATCDWTNAGDY	L14;L18	TTIAKNTVK	L7;L19;L6
872	EVQELYSPIF	L11	ATCFSTASDTY	L18;L14	TTIKPVTYKL	L20;L53;L11
873	EVQELYSPIFL	L20	ATEETFKLS	L1;L18	TTLDSKTQSL	L10;L16;L8
874	EVQGYKSVNI	L20	ATEGALNTP	L42;L18	TTLEETKF	L53;L54;L52
875	EVQPQLEMEL	L20	ATLVSDIDITF	L52;L53	TTLNGLWL	L55;L61;L60
876	EVRQIAPGQ	L11	ATNNAMQV	L73;L70	TTTLEETKF	L53;L52;L54
877	EVRTIKVFT	L20	ATNNLVVMA	L42;L69	TTVDNINL	L20;L70;L60
878	EVRTIKVFTTV	L20	ATNVVIKVCEF	L52;L16	TTYKLNVGDY	L14;L11;L10
879	EVTGDSCNNYM	L11	ATTAYANSV	L73;L70	TVCTVCGMWK	L7;L6;L19
880	EVTTTLEET	L10	ATVAYFNMV	L73;L20	TVEEAKTVLK	L19;L7;L6
881	EVVDKYFD	L20	ATVAYFNMVY	L14;L18	TVELGTEV	L63;L68;L23
882	EVVENPTI	L20	ATVREVLSD	L65;L10	TVFFDGRVD	L65;L55;L32
883	EWKFYDAQP	L42	AVAKHDFF	L74;L54	TVMPLSAPTL	L20;L28;L32
884	EYCRHGTCER	L17	AVAKHDFFK	L7;L6	TVNVLAWL	L62;L59;L23
885	EYDYVIFT	L62	AVANGDSEVVL	L44;L56	TVQFCDAMR	L19;L21;L17
886	EYDYVIFTQ	L17	AVANGDSEVVLK	L7;L6	TVYDDGARRVW	L16;L52;L10
887	EYFNSVCR	L17	AVCRHHANEY	L18;L14	TVYDPLQPE	L6;L43;L20
888	EYRLYLDAY	L14	AVDAAKAYK	L7;L6	TVYSHLLLVA	L51;L3;L46

889	EYTDFATSA	L17	AVINGDRWFLNR	L7;L15	TVYTKVDGV	L3;L20;L11
890	EYTFEKGDY	L14	AVKMFDAY	L14;L26	TWFSQRGGSY	L14;L10;L12
891	EYVSQPFL	L9	AVKTQFNYYK	L13;L7	TWICLLQF	L8;L9;L59
892	FAAYSRYR	L17	AVKTQFNYYKK	L7;L13	TYASALWEI	L9;L8;L64
893	FAFACPDGVKH	L31	AVLQSGFRK	L7;L6	TYEGNSPF	L72;L71;L62
894	FAKFLKTN	L70	AVRDPQTLE	L13;L6	TYICGFIQQ	L8;L17;L9
895	FAKFLKTNC	L58	AVSKGFFKE	L7;L24	TYKLNVGDY	L14;L72;L71
896	FAMMFVKH	L59	AVVIPTKK	L7;L6	TYLDGADVTK	L8;L9;L17
897	FANKHADFD	L58	AVVIPTKKA	L51;L46	TYLEGSVRVV	L8;L72;L71
898	FANKHADFDTW	L49	AVVYRGTTTYK	L7;L6	TYNKVENM	L71;L72;L62
899	FASEAARVVR	L19	AVYRINWI	L48;L24	TYNLWNTFTR	L17;L15;L21
900	FASFYYVWKSY	L31	AWQPGVAMP	L42;L38	TYRRLISM	L72;L71;L66
901	FATSACVLAA	L50	AYANRNRFLY	L12;L14	VAALTNNVAF	L31;L52;L58
902	FAVDAAKA	L50	AYANRNRFLYI	L9;L8	VAFNVVNKG	L69;L70;L47
903	FAYANRNR	L17	AYCNKTVGEL	L72;L71	VAITRAKV	L70;L47;L48
904	FAYANRNRFLY	L12	AYIICIST	L71;L72	VAKYTQLCQY	L43;L14;L58
905	FAYANRNRFLYI	L47	AYIICISTKHFY	L14;L40	VANGDSEV	L70;L58;L63
906	FAYTKRNVIPTI	L47	AYITGGVV	L72;L71	VAYESLRPD	L43;L49;L59
907	FCAFAVDAA	L50	AYKIEELFYSY	L14;L12	VAYSNNSI	L47;L70;L68
908	FCGKGYHL	L74	AYNGYLTS	L65;L71	VCTEIDPKL	L8;L9;L5
909	FCLLNRYFR	L17	AYNMMISA	L71;L72	VDDPCPIHFY	L18;L1;L14
910	FCSQHTML	L74	AYNMMISAG	L72;L71	VDILGPLSA	L46;L50;L51
911	FDEDDSEPVL	L67	AYNVTQAFGR	L15;L21	VDYGARFY	L65;L14;L55
912	FDEGNCDTL	L67	AYPLTKHP	L72;L71	VEGCMVQV	L45;L37;L33
913	FDEISMATNY	L1	AYPLTKHPN	L72;L71	VEHVTFFI	L45;L33;L48
914	FDKSAFVNL	L58	AYRFNGIGV	L13;L72	VEHVTFFIY	L29;L40;L41
915	FDRDAAMQR	L17	AYRKVLLR	L15;L17	VEKKKLDGF	L33;L37;L29
916	FDTRVLSNL	L74	AYTRYVDNNF	L9;L8	VELKHFFFA	L46;L42;L38
917	FDVEGCHATR	L19	AYVDNSSLT	L8;L9	VEQDKNTQEV	L38;L45;L37
918	FEEAALCTFL	L36	AYWVPRAS	L71;L72	VEQKIAEIP	L38;L42;L29
919	FEHIVYGD	L33	AYYFMRFRRA	L46;L42	VESSSKLWA	L46;L38;L42
920	FEKGDYGDA	L46	AYYFMRFRRAF	L71;L72	VETSNSFDV	L45;L38;L46
921	FEKGDYGDAV	L45	AYYNTTKGGRF	L8;L9	VEWKFYDAQP	L46;L42;L38
922	FELEDFIP	L38	AYYRARAG	L71;L72	VFAQVKQIY	L12;L14;L72
923	FELLHAPA	L50	AYYVGYLQPR	L15;L21	VFCGVDAV	L71;L62;L72
924	FELLHAPAT	L38	CANGQVFGLY	L14;L12	VFCTVNAL	L72;L71;L62
925	FELTSMKY	L29	CASLKELL	L23;L74	VFDEISMATNY	L12;L18;L62
926	FELTSMKYFV	L45	CATVHTANKW	L54;L49	VFHLYLQY	L71;L72;L12
927	FELWAKRN	L29	CAYWVPRA	L50;L47	VFKNIDGY	L14;L71;L72
928	FENKTTLP	L38	CAYWVPRAS	L59;L69	VFLFVAAI	L71;L72;L48
929	FFASFYYV	L62	CCDDDYFNK	L13;L7	VFLLVTLAIL	L9;L62;L8
930	FFDGRVDG	L62	CCYDHVIST	L69;L43	VFPLNSII	L62;L71;L72
931	FFDGRVDGQ	L62	CDNIKFAD	L65;L33	VFPPTSFG	L62;L72;L71
932	FFDGRVDGQV	L62	CDVTDVTQL	L37;L33	VFQSASKIITL	L72;L71;L8
933	FFIYNKIV	L71	CEEEEFEP	L38;L42	VFQTRAGCL	L72;L71;L62

934	FFSNYLKRR	L17	CEEMLDNRA	L38;L42	VFTTVDNINL	L9;L8;L72
935	FFTLLLQLC	L12	CEFQFCNDP	L46;L42	VGSDNVTDF	L26;L9;L8
936	FFYVLGLA	L62	CEIVGGQI	L45;L48	VHFVCNLL	L28;L34;L35
937	FFYVLGLAAIM	L71	CFSTQFAF	L72;L71	VHFVCNLLL	L34;L28;L35
938	FGADPIHSLR	L19	CFTNVYADSF	L9;L72	VHNQDVNL	L28;L34;L35
939	FGDDTVIEVQ	L68	CFVLAAVY	L72;L71	VIAWNSNNL	L60;L74;L58
940	FGDFIQTT	L68	CFVLAAVYR	L17;L15	VILRGHLRI	L24;L8;L48
941	FGDFIQTTP	L68	CGFIQQKL	L48;L25	VINGDRWFLNR	L15;L21;L17
942	FGGCVFSY	L66	CGPDGYPL	L57;L66	VIVFDGKSK	L7;L13;L43
943	FGLFCLLNR	L17	CHDGKAHF	L62;L63	VKDCVVLHSY	L14;L18;L27
944	FGLFCLLNRY	L12	CIDCSARHI	L68;L63	VKQGDDYVY	L27;L66;L14
945	FGLVAEWF	L59	CIKDLLAR	L17;L15	VKRVDWTIEY	L43;L27;L26
946	FGPLVRKIF	L57	CLAYYFMRF	L12;L10	VLAAECTIF	L26;L9;L74
947	FGWLIVGVA	L50	CLDDRCILH	L5;L18	VLHSTQDLF	L9;L12;L26
948	FHAIHVSGT	L28	CLDDRCILHC	L18;L5	VLHSYFTSDY	L43;L26;L14
949	FHLVDFQVT	L35	CLEASFNY	L1;L18	VLITEGSVK	L6;L13;L7
950	FHLVDFQVTI	L34	CLEASFNYL	L5;L1	VLKKCKSAF	L23;L43;L26
951	FHQKLLKSI	L34	CLLQFAYANR	L21;L15	VLLFLAFVV	L4;L2;L24
952	FHTPAFDKSAF	L28	CLTPVYSF	L23;L26	VLLILMTAR	L21;L15;L6
953	FIASFRLFA	L69	CMMCYKRNR	L15;L17	VLLSVLQQLR	L21;L15;L6
954	FIDTKRGVYC	L63	CNIVNVSLV	L73;L48	VLNNDYYRSL	L43;L57;L4
955	FIEDLLFN	L1	CNLLLLFV	L73;L48	VLPNDDTL	L57;L5;L62
956	FIETISLAGSY	L1	CPAEIVDTVSA	L50;L51	VLPNDDTLR	L21;L15;L5
957	FISDEVARD	L3	CPDGVKHVYQL	L32;L39	VLPNDDTLRV	L5;L2;L57
958	FISDEVARDL	L60	CPFGEVFNA	L50;L51	VLPPLLTD	L57;L5;L43
959	FISNSWLM	L58	CPIFFITGNTL	L56;L22	VLPQLEQPY	L12;L26;L57
960	FISPYNSQN	L58	CPIHFYSKW	L49;L10	VLQAVGACV	L2;L5;L4
961	FIYNKIVDE	L69	CPLIAAVI	L47;L48	VLQKAAITI	L4;L24;L2
962	FKDQVILLN	L1	CRFDTRVLS	L65;L30	VLQVRDVLV	L2;L4;L5
963	FKEELDKY	L1	CRSKNPLL	L35;L66	VLSFELLHA	L3;L2;L4
964	FKEELDKYF	L27	CSDKAYKI	L55;L63	VLSTFISAA	L3;L2;L51
965	FKELLVYAA	L50	CSVIDLLL	L73;L74	VLYQPPQTS	L43;L3;L24
966	FKFVCDNIKF	L27	CTCGKQATK	L7;L19	VMCGGSLY	L18;L1;L14
967	FKHLIPLM	L66	CTEIDPKLDNY	L1;L18	VMFLARGI	L48;L55;L47
968	FKLASHMY	L27	CTEIDPKLDNYY	L1;L18	VPFWITIA	L50;L51;L47
969	FKLNEEIAI	L44	CTFEYVSQP	L11;L10	VPNQPYPNA	L51;L50;L22
970	FKLSYGIAT	L44	CTFLLNKEM	L70;L69	VPQADVEW	L56;L49;L39
971	FKVNSTLEQY	L27	CTVCGMWKGY	L10;L11	VPVSIINNTV	L51;L50;L47
972	FKVSIWNLDY	L12	CVFSYVGCHNK	L7;L6	VQIDRLITG	L26;L69;L27
973	FKWDLTAFGL	L44	CVLAAECTIFK	L7;L6	VQLHNDILL	L44;L8;L34
974	FKYWDQTYH	L27	CVLSGHNLAK	L6;L7	VQQESPFVM	L66;L35;L28
975	FLAHIQWM	L74	CVVADAVIK	L7;L19	VQQLPETY	L26;L27;L48
976	FLALITLA	L3	CYFGLFCLLNR	L15;L17	VQQLPETYF	L26;L27;L9
977	FLALITLATC	L3	CYKRNRATR	L17;L15	VRAWIGFDV	L64;L30;L35
978	FLAYILFTRFFY	L12	CYNGSPSGV	L62;L72	VRCSFYEDF	L66;L30;L34
979	FLEGETLPTEV	L2	CYNGSPSGVY	L14;L72	VRETMSYLF	L9;L66;L34

980	FLGIITTVAA	L2	DAAMQRKL	L47;L70	VRIKIVQM	L66;L35;L25
981	FLGYFCTCY	L12	DALFAYTKR	L17;L19	VRTNVYLAV	L35;L64;L30
982	FLIGCNYLG	L2	DALNNIINN	L47;L17	VSCLPFTI	L55;L48;L68
983	FLIGCNYLGK	L6	DALNNIINNAR	L17;L19	VSDIDITFLK	L1;L18;L7
984	FLKKDAPY	L43	DAMMFTSDL	L25;L61	VSDIDITFLKK	L18;L1;L7
985	FLKTNCCRF	L43	DANYFLCW	L49;L47	VSDVGDSAE	L68;L1;L63
986	FLLKYNENG	L2	DAPYIVGDV	L47;L20	VSGTNGTKR	L15;L19;L21
987	FLLNKEMY	L12	DAQSFLNR	L17;L19	VSNGTHWFV	L73;L58;L70
988	FLLNKEMYLK	L6	DATPSDFVR	L19;L17	VSTSGRWV	L48;L70;L55
989	FLLPSLATVA	L2	DAYPLTKHP	L47;L49	VSWNLREML	L53;L16;L67
990	FLLVTLAI	L59	DDFTGCVIAW	L10;L29	VTDFNAIAT	L68;L1;L18
991	FLLVTLAILTA	L2	DDPCPIHFY	L11;L29	VTDTPKGPKV	L63;L1;L18
992	FLMDLEGKQ	L2	DDYQGKPLEF	L10;L49	VTHSKGLY	L1;L14;L18
993	FLMDLEGKQG	L2	DEFTPFDV	L29;L25	VTLLPAADL	L60;L61;L53
994	FLNKVVST	L23	DEFTPFDVVR	L29;L19	VTMPLGYVT	L52;L55;L53
995	FLNRVCGV	L3	DEFTPFDVVRQ	L41;L29	VTMPLGYVTH	L52;L53;L7
996	FLPFAMGI	L57	DELTGHMLD	L29;L25	VTQLYLGGMSY	L1;L14;L18
997	FLPFFSNVT	L57	DEMIAQYTSA	L38;L42	VTRDIASTD	L43;L55;L13
998	FLPFFSNVTWF	L57	DESGEFKL	L29;L37	VTTEILPV	L73;L48;L70
999	FLPGVYSVIYLY	L12	DEVRQIAP	L29;L46	VTVYSHLL	L60;L55;L70
1000	FLRDGWEIVK	L13	DEWSMATYYLF	L41;L40	VVDADSKIV	L63;L5;L68
1001	FLRDGWEIVKF	L43	DFATSACVL	L72;L71	VVDADSKIVQL	L68;L5;L63
1002	FLVFLGIITT	L2	DFLELAMDEF	L9;L8	VVDDPCPI	L68;L63;L62
1003	FLVLIMLI	L74	DFLHFLPRV	L47;L4	VVDDPCPIH	L63;L68;L5
1004	FLWLLWPV	L2	DFMSLSEQLR	L17;L19	VVDYGARFYF	L1;L63;L12
1005	FLWLLWPVT	L2	DFTGCVIAW	L49;L10	VVFDEISM	L69;L59;L58
1006	FLYIIKLIFLW	L12	DFVENPDIL	L62;L67	VVFLLVTLA	L50;L51;L3
1007	FMRFRRAF	L59	DFVENPDILR	L17;L19	VVFNGVSFSTF	L16;L26;L52
1008	FMRIFTIGTV	L3	DFVRATATI	L10;L8	VVIPDYNTYK	L7;L6;L13
1009	FNDGVYFAS	L68	DGADVTKI	L47;L25	VVKRHTFSNY	L14;L10;L26
1010	FNICQAVTA	L50	DGISQYSL	L23;L25	VVLLILMTAR	L15;L21;L17
1011	FNKWGKARLY	L14	DGNAAISDY	L14;L29	VVLSFELLH	L12;L7;L6
1012	FNLVAMKYNY	L12	DGYFKIYSK	L23;L19	VVNAANVY	L26;L18;L14
1013	FNPETNILLNV	L5	DIAKKPTETI	L10;L11	VVNARLRAK	L6;L7;L13
1014	FNPPALQDAY	L12	DIASTDTCF	L11;L10	VVNPVMEPIY	L12;L14;L31
1015	FNVAITRAKV	L20	DILGPLSAQ	L10;L11	VVNVVTTKI	L24;L49;L48
1016	FNYLKSPNF	L59	DILRVYANL	L10;L11	VVPGLPGTI	L5;L57;L9
1017	FPDLNGDV	L68	DIPGIPKDM	L11;L57	VVREFLTR	L15;L21;L17
1018	FPFNKWGKAR	L50	DIQLLKSAY	L14;L29	VVRQCSGVTF	L26;L52;L53
1019	FPFNKWGKARLY	L31	DIVKTDGTL	L10;L11	VVRSIFSR	L15;L21;L17
1020	FPKSDGTGTI	L49	DIYNDKVAGF	L11;L10	VVRSIFSRTL	L13;L39;L55
1021	FPLQSYGF	L31	DKFPVLHDI	L47;L20	VVYCPRHV	L48;L47;L64
1022	FPLQSYGFQP	L50	DKLQFTSL	L25;L23	VVYCPRHVI	L16;L47;L39
1023	FPNITNLC	L47	DKVFRSSVL	L25;L44	VYAADPAM	L71;L72;L66
1024	FPNITNLCP	L50	DLEGKQGNF	L11;L10	VYANLGERV	L9;L8;L72
1025	FPNTYLEG	L50	DLGDELGTD	L10;L11	VYCPRHVIC	L8;L66;L9

1026	FPPTEPKKD	L49	DLNDFVSDA	L3;L11	VYDDGARRVW	L9;L62;L52
1027	FPQSAPHGVVFL	L31	DLNQLTGY	L11;L26	VYDNKLKAH	L62;L71;L72
1028	FPSGKVEG	L50	DLQDLKWARF	L11;L10	VYDYLVSTQEF	L8;L9;L62
1029	FQEKDEDDNL	L34	DLQELGKYEQY	L11;L10	VYLAVFDKN	L9;L8;L12
1030	FQQFGRDI	L48	DLSVVNARL	L20;L4	VYLKHGGGV	L72;L71;L8
1031	FQSASKII	L48	DLSVVNARLR	L19;L17	VYLPYPDPS	L9;L72;L71
1032	FQTRAGCLI	L24	DLTKPYIKW	L10;L49	VYMPASWV	L72;L71;L62
1033	FQTVKPGNF	L58	DLVYALRHF	L10;L11	VYMPASWVMR	L15;L9;L21
1034	FQVTIAEI	L48	DLYDKLQFTSL	L10;L11	VYPVASPNE	L9;L71;L72
1035	FQVTIAEILL	L44	DLYKLMGHF	L11;L10	VYPVASPNEC	L72;L9;L71
1036	FRIDGDMV	L35	DMSKFPLKLR	L17;L19	VYQLRARSV	L72;L71;L64
1037	FRIDGDMVPH	L30	DMVDTSLSGF	L10;L11	VYSDVENPH	L72;L9;L71
1038	FRIDGDMVPHI	L34	DMVPHISRQ	L11;L10	VYSVIYLYLTF	L9;L8;L12
1039	FRKMAFPSG	L66	DMVPHISRQR	L19;L17	VYYGNALDQ	L71;L72;L8
1040	FRLTLGVY	L66	DNINLHTQV	L25;L20	VYYHKNNKSW	L9;L8;L71
1041	FRLTLGVYD	L30	DNLLEILQK	L17;L7	WAHGFELTSM	L58;L43;L59
1042	FRRAFGEY	L66	DPAQLPAPR	L19;L17	WAKRNIKPV	L70;L58;L69
1043	FRVQPTES	L66	DPLQPELDSF	L31;L47	WEVGKPRPP	L38;L46;L42
1044	FRYMNSQGLL	L30	DPLSETKCTL	L32;L23	WFFSNYLKR	L17;L15;L19
1045	FSALEPLVD	L69	DPNFKDQV	L23;L47	WFLAYILFTRF	L8;L12;L9
1046	FSGYLKLTD	L65	DQIGYYRRA	L11;L24	WFLLLSVCL	L71;L72;L62
1047	FSHSQLGGLHL	L60	DQLTPTWRV	L24;L48	WFLNRFTTTL	L71;L8;L72
1048	FSLELQDH	L59	DQLTPTWRVY	L27;L14	WHHSIGFDY	L14;L12;L43
1049	FSNVTWFHA	L50	DRAMPNML	L25;L35	WLDDDSQQT	L5;L2;L1
1050	FSNVTWFHAI	L61	DRDLYDKL	L25;L35	WLDDDSQQTV	L5;L2;L24
1051	FSNYLKRRVV	L73	DRDLYDKLQF	L34;L35	WLKQLIKVTL	L23;L3;L56
1052	FSSLPSYAA	L50	DRELHLSW	L25;L35	WLPTGTLL	L57;L74;L62
1053	FSSNVANYQK	L19	DRLNQLESK	L30;L25	WSYSGQSTQL	L60;L55;L53
1054	FSYVGCHNK	L7	DRVVFVLWA	L25;L35	WVMRIMTW	L10;L54;L52
1055	FTDGVCLFWN	L1	DRYPANSIVC	L25;L35	WWTAFVTNV	L20;L3;L64
1056	FTEERLKLFD	L1	DSAEVAVKMF	L10;L11	YAADPAMHAA	L50;L67;L61
1057	FTGNLQSNHDLY	L1	DSGFAAYSR	L19;L17	YAAVINGDRW	L52;L49;L54
1058	FTIGTVTLKQ	L11	DSIIIGGAK	L19;L11	YACWHHSIG	L59;L69;L70
1059	FTPLIQPI	L57	DSIIIGGAKL	L20;L11	YAFASEAAR	L19;L17;L31
1060	FTPLIQPIGAL	L57	DSSQGSEY	L1;L18	YAFASEAARV	L20;L47;L58
1061	FTRGVYYPDK	L13	DSVEEVLSE	L10;L11	YAKPFLNK	L13;L59;L70
1062	FTRSTNSRIK	L13	DSYFVVKR	L19;L17	YAKPFLNKVV	L70;L69;L58
1063	FTSDLATN	L59	DTANPKTPKY	L11;L10	YALRHFDEG	L67;L59;L61
1064	FTVEKGIY	L1	DTDFVNEFYAY	L1;L18	YALVYFLQS	L59;L61;L47
1065	FTYASALW	L54	DTDLTKPY	L1;L18	YANLGERVR	L17;L19;L32
1066	FVCNLLLLFV	L20	DTFNGECPNF	L10;L11	YANRNRFLYI	L47;L49;L73
1067	FVDDIVKTDGTL	L68	DTGVEHVTFF	L10;L11	YANSVFNI	L47;L70;L49
1068	FVDGVPFVVST	L68	DTIANYAKP	L11;L10	YATHSDKF	L58;L49;L54
1069	FVDRQTAQ	L68	DTIANYAKPF	L10;L11	YCIPYNSV	L28;L47;L45
1070	FVEIIKSQDL	L68	DTLKEILVT	L10;L11	YCQVHGNAH	L71;L72;L59
1071	FVETVKGLD	L1	DTLRVEAFEY	L12;L10	YDDGARRV	L63;L33;L62

1072	FVFLVLLP	L50	DTPKGPKV	L11;L47	YDFTEERL	L33;L65;L29
1073	FVIRGDEV	L67	DTPKGPKVK	L19;L11	YDKLQFTSL	L23;L37;L33
1074	FVLTSHTV	L47	DTPKGPKVKY	L11;L10	YDKLVSSF	L33;L43;L23
1075	FVMMSAPPA	L50	DTPNNTDFSR	L19;L17	YDYLVSTQEF	L33;L43;L27
1076	FVNLDNLRA	L50	DTSLSGFKL	L20;L19	YEDQDALF	L62;L33;L63
1077	FVNLKQLPFFY	L12	DTTDAVRDP	L11;L10	YEKLKPVLD	L45;L46;L23
1078	FVNLKQLPFFYY	L12	DTWFSQRGGSY	L11;L14	YELKHGTF	L33;L29;L37
1079	FVRATATI	L48	DVDTDFVNEFY	L1;L18	YENAFLPF	L29;L33;L59
1080	FVSDADSTLI	L20	DVEGCHATR	L19;L17	YENAFLPFAM	L29;L36;L40
1081	FVSEETGTLI	L20	DVENPHLMGW	L10;L11	YENQKLIA	L46;L38;L42
1082	FVSGNCDVVI	L32	DVFHLYLQYI	L20;L10	YENQKLIANQF	L29;L40;L41
1083	FVSLAIDA	L50	DVNLHSSR	L17;L19	YEQYIKWPWY	L41;L29;L40
1084	FVSNGTHWFV	L20	DVNLHSSRL	L11;L10	YESLRPDTRY	L29;L40;L41
1085	FVTDTPKGPKV	L20	DVRETMSYL	L11;L10	YEYGTEDDY	L29;L14;L27
1086	FVTNVNASS	L20	DVRETMSYLF	L11;L10	YFAVHFISN	L71;L72;L46
1087	FVVEVVDK	L19	DVSFLAHIQW	L19;L10	YFKNHTSPD	L71;L43;L72
1088	FVVFLLVT	L59	DVTQLYLGGM	L11;L10	YFLCWHTNC	L71;L72;L8
1089	FVVFLLVTLA	L50	DVVECLKLS	L11;L10	YFLCWHTNCY	L72;L71;L12
1090	FVVKRHTFS	L74	DVVECLKLSHQ	L10;L11	YFNKKDWYDF	L8;L9;L12
1091	FVVKRHTFSNY	L10	DVVNQNAQA	L11;L20	YFNSVCRL	L62;L71;L72
1092	FVVPGLPG	L61	DVVQEGVLTA	L11;L10	YFNSVCRLM	L62;L71;L72
1093	FVVPGLPGTILR	L19	DVVQEGVLTAV	L11;L20	YFSGAMDTTSY	L71;L72;L12
1094	FVVSTGYHFREL	L60	DVVRQCSGVTF	L11;L10	YFTQSRNL	L71;L72;L62
1095	FYDAQPCSD	L62	DVVYRAFDIY	L10;L11	YFVKIGPER	L17;L19;L8
1096	FYDFAVSKGFF	L62	DWYDFVEN	L25;L29	YFYTSKTTVA	L71;L72;L46
1097	FYFYTSKT	L71	DYDCVSFCY	L12;L1	YFYYLGTGP	L72;L71;L46
1098	FYGPFVDRQ	L66	DYIATNGPL	L72;L71	YHFRELGV	L28;L35;L48
1099	FYILPSIISN	L72	DYIINLII	L47;L25	YHNESGLKT	L28;L35;L34
1100	FYKENSYTTTI	L9	DYPKCDRAM	L72;L71	YHNESGLKTI	L34;L28;L35
1101	FYKGVITHD	L66	DYTEISFM	L72;L62	YIATNGPLK	L6;L7;L19
1102	FYLTNDVS	L71	DYTEISFMLW	L9;L8	YIDINGNLHP	L1;L68;L18
1103	FYPPDEDEEE	L66	DYVYNPFMI	L8;L9	YILFTRFFY	L12;L14;L1
1104	FYSKWYIR	L17	EAALCTFLL	L20;L74	YKHYTPSF	L66;L27;L59
1105	FYSYATHSDKF	L9	EAANFCALIL	L69;L20	YKIEELFY	L27;L66;L12
1106	FYVYSRVK	L71	EAEVQIDRL	L32;L63	YKKDNSYF	L58;L27;L66
1107	GAAAYYVGYL	L74	EAGVCVSTSGR	L19;L17	YKLNVGDYF	L27;L9;L12
1108	GAALQIPFA	L50	EAMYTPHTVL	L67;L32	YKQFDTYNL	L44;L66;L34
1109	GADLKSFD	L63	EAPFLYLYAL	L57;L20	YLALYNKYKY	L12;L1;L14
1110	GADVTKIKP	L63	EAPLVGTPV	L57;L20	YLCFLAFLLF	L12;L9;L1
1111	GAISSVLND	L49	EASKKPRQK	L19;L17	YLFDESGEFK	L6;L2;L13
1112	GAISSVLNDIL	L67	EASKKPRQKR	L17;L19	YLFDESGEFKL	L2;L4;L5
1113	GALDISASI	L44	EAVKTQFNYY	L11;L10	YLKRRVVF	L23;L26;L27
1114	GATTCGYL	L74	EAVMYMGTL	L10;L61	YLKSPNFSK	L13;L6;L43
1115	GAVILRGHLR	L19	ECFDKFKV	L20;L24	YLKSPNFSKL	L3;L10;L5
1116	GAWNIGEQKS	L24	ECPNFVFPL	L57;L20	YLPQNAVVKI	L5;L3;L2
1117	GCDVTDVTQL	L34	ECVLGQSKR	L19;L17	YLTNDVSF	L43;L26;L74

1118	GCDVTDVTQLY	L18	EDLLFNKV	L33;L48	YLVSTQEFRY	L12;L14;L1
1119	GCINANQV	L48	EEAIRHVR	L29;L42	YMPASWVM	L57;L66;L71
1120	GCVPLNII	L48	EEAKTVLKKC	L41;L40	YNDKVAGF	L62;L33;L63
1121	GCVPLNIIPL	L44	EEEEFEPSTQY	L41;L40	YNGSPSGVY	L65;L14;L12
1122	GDAALALL	L33	EEEFEPSTQY	L41;L40	YPDKVFRSS	L32;L49;L39
1123	GDAALALLL	L40	EEFEPSTQYE	L41;L40	YPDKVFRSSV	L32;L22;L39
1124	GDCEEEEF	L33	EEGDCEEEEF	L40;L41	YPKLQSSQA	L51;L50;L22
1125	GDELGTDPY	L18	EEIAIILASFS	L40;L41	YPNMFITR	L50;L17;L47
1126	GDELKINAA	L46	EELDKYFKNH	L41;L40	YPNMFITRE	L49;L32;L50
1127	GDFIQTTP	L65	EELFYSYAT	L42;L40	YQIGGYTEKW	L49;L10;L24
1128	GDFLHFLP	L33	EELKKLLEQW	L40;L41	YQPPQTSI	L48;L24;L57
1129	GDFLHFLPR	L7	EESSAKSA	L42;L38	YQVNGYPNM	L58;L28;L61
1130	GDFLHFLPRV	L33	EESSAKSASV	L42;L38	YQVNGYPNMF	L34;L27;L58
1131	GDFVKATC	L33	EESSAKSASVY	L41;L40	YRFNGIGV	L25;L35;L64
1132	GDIAARDL	L37	EETFKLSYGI	L40;L41	YRFNGIGVTQ	L30;L35;L34
1133	GDMVPHISR	L15	EETGLLMP	L42;L46	YRVVVLSFEL	L66;L30;L35
1134	GDQFKHLI	L33	EETKFLTENL	L41;L40	YSGVVTTV	L48;L73;L70
1135	GDSAEVAV	L33	EETRKLMP	L42;L46	YSVIYLYLTF	L52;L54;L10
1136	GDSCNNYM	L33	EETRKLMPV	L42;L45	YTDFATSA	L1;L68;L63
1137	GDSEVVLK	L33	EEVLSEARQ	L41;L40	YTEISFML	L1;L68;L60
1138	GDSEVVLKKL	L37	EEVLSEARQHL	L40;L41	YTERSEKSY	L1;L18;L14
1139	GDSVEEVL	L33	EEVQELYSPI	L41;L40	YTRYVDNNF	L53;L52;L58
1140	GDVRETMSY	L27	EEVQELYSPIF	L40;L41	YTSNPTTFHL	L20;L60;L61
1141	GDVVQEGV	L33	EEVTTTLEETKF	L40;L41	YVMHANYIF	L58;L12;L31
1142	GDYFVLTSH	L43	EEVVLKTGDL	L41;L40	YVPAQEKNF	L5;L10;L12
1143	GEGSEGLNDNL	L36	EFEPSTQYEY	L12;L1	YVRITGLY	L1;L14;L26
1144	GEGSEGLNDNLL	L36	EFGATSAAL	L72;L71	YVRNLQHRLY	L12;L14;L13
1145	GEIPVAYR	L45	EFIERYKLEGY	L11;L10	YVVDDPCPI	L20;L67;L49
1146	GEQKSILSPL	L36	EFLRDGWEI	L8;L9	YVVDDPCPIHFY	L11;L14;L12
1147	GETFVTHSKGL	L36	EFTPFDVVR	L17;L19	YVWKSYVHVV	L2;L5;L3
1148	GETLPTEVLT	L36	EFVFKNIDGY	L11;L10	YVYNPFMID	L61;L60;L59
1149	GEVFNATR	L45	EFYEAMYTP	L42;L8	YWVPRASA	L50;L46;L51
1150	GEVPVSIINNTV	L36	EGYAFEHI	L48;L47	YYFMRFRRAF	L71;L72;L9
1151	GEYSHVVAFNTL	L36	EGYAFEHIV	L48;L47	YYKKDNSY	L66;L72;L71
1152	GEYTFEKGDY	L41	EHEHEIAW	L35;L28	YYRRATRRI	L8;L48;L9
1153	GFDVEGCH	L62	EHSWNADL	L35;L28	YYSDSPCES	L66;L72;L9
1154	GFDYVYNP	L62	EHSWNADLYKL	L34;L35	AACRKVQHM	L70;L69;L58;L63
1155	GFDYVYNPF	L62	EIAWYTER	L17;L19	AADLDDFSK	L68;L7;L63;L18
1156	GFDYVYNPFM	L62	EIKDATPSDF	L10;L11	AAFATAQEAY	L31;L27;L14;L12
1157	GFFKEGSSVEL	L44	EIKESVQTFF	L10;L11	AAIFYLITP	L69;L42;L38;L46
1158	GFLFLTWI	L48	EILGTVSWNLR	L19;L17	AAKAYKDY	L43;L70;L58;L14
1159	GFQPTNGV	L48	EILLIIMR	L17;L19	AAKKNNLPF	L58;L43;L70;L52

1160	GFSALEPL	L72	EIPKEEVKPF	L10;L11	AARVVRSI	L48;L55;L70;L47
1161	GFSTGVNLV	L64	EIPVAYRKV	L11;L10	AATRGATVV	L69;L70;L58;L24
1162	GFTLKNTV	L48	EITVATSR	L17;L19	AAVDALCEK	L7;L19;L67;L69
1163	GGAYTRYV	L48	EIVDTVSALV	L20;L11	ADAVIKTL	L33;L37;L25;L23
1164	GGDGKMKDL	L63	EIVDTVSALVY	L11;L10	ADFDTWFSQR	L15;L21;L7;L19
1165	GGFNFSQI	L48	EIYQAGSTP	L10;L11	ADSKIVQL	L33;L37;L56;L65
1166	GGIVAIVV	L48	EKFKEGVEFL	L44;L20	AEAELAKNVSL	L36;L41;L40;L37
1167	GGIVAIVVT	L44	ELAMDEFIERY	L11;L10	AECTIFKDA	L42;L46;L38;L40
1168	GGKIVNNWL	L44	ELGDVRETMSY	L10;L11	AEILLIIMRTF	L41;L40;L37;L29
1169	GGKPCIKV	L48	ELKFNPPAL	L23;L3	AEIRASANLA	L38;L42;L46;L40
1170	GGNYNYLYR	L15	ELKKLLEQW	L10;L11	AESHVDTDL	L36;L37;L41;L40
1171	GGQPITNCV	L48	ELLQNGMNGR	L17;L19	AEWFLAYI	L45;L33;L48;L37
1172	GGRFVLALL	L44	ELSPVALRQ	L24;L20	AFATAQEAY	L72;L71;L12;L14
1173	GGSVAIKI	L48	ELSRVLGLK	L19;L6	AFAVDAAKAY	L14;L72;L71;L12
1174	GGTTEMLAK	L7	ELTGHMLDMY	L11;L10	AFEKMVSL	L62;L72;L71;L63
1175	GGVAGALNK	L7	ELYHYQECV	L24;L20	AFLPFAMGI	L71;L72;L8;L9
1176	GHFAWWTA	L28	ENFNQHEV	L48;L20	AFNTLLFL	L62;L71;L72;L73
1177	GHFAWWTAFV	L28	EPEEHVQI	L49;L25	AFYILPSI	L48;L71;L72;L47
1178	GHHLGRCDI	L34	EPKLGSLV	L23;L51	AGNGGDAAL	L44;L57;L56;L61
1179	GHMLDMYSVM	L28	EPKLGSLVVR	L17;L19	AGSKSPIQY	L26;L27;L14;L18
1180	GHMLDMYSVML	L28	EPTTTTSV	L23;L50	AGTDTTITV	L24;L69;L48;L2
1181	GHSMQNCV	L28	EQLDFIDTK	L24;L7	AHISTIGVC	L35;L28;L34;L27
1182	GHSMQNCVLKL	L28	ERFVSLAI	L25;L35	AHSCNVNRF	L34;L35;L28;L27
1183	GHTDLMAA	L28	ERHSLSHFV	L35;L64	AIDAYPLTK	L6;L7;L18;L68
1184	GHTDLMAAYV	L28	ERIDKVLNE	L30;L35	AIMTRCLAV	L23;L73;L3;L4
1185	GHVETFYPK	L7	ERIDKVLNEK	L30;L11	AISDYDYY	L14;L18;L1;L58
1186	GHVMVELV	L28	ESELVIGAV	L20;L1	AISDYDYYRY	L12;L14;L18;L16
1187	GIDLDEWSMATY	L18	ESIVRFPNI	L48;L20	ALALLLLDR	L21;L6;L7;L15
1188	GIKIQEGVVDY	L26	ESLRPDTRY	L11;L14	ALCEKALKYL	L3;L2;L4;L5

1189	GIPKDMTY	L26	ETAHSCNVNRF	L11;L10	ALDQAISM	L63;L68;L62;L18
1190	GIVAIVVTC	L19	ETAQNSVR	L17;L19	ALLKTVQF	L26;L27;L33;L74
1191	GIVNNTVY	L26	ETFVTHSK	L19;L17	ALNHTKKWKY	L14;L12;L18;L16
1192	GIYQTSNF	L26	ETFVTHSKGL	L10;L20	ALNLGETFV	L2;L4;L24;L3
1193	GKASCTLSE	L44	ETFYPKLQSS	L20;L10	ALYYPSARI	L24;L45;L2;L3
1194	GKASCTLSEQL	L44	ETICAPLTVF	L10;L11	AMDEFIER	L15;L21;L62;L68
1195	GKFCLEASFNY	L27	ETKDVVECLKL	L11;L10	ANGQVFGLY	L14;L12;L18;L40
1196	GKGYHLMSF	L27	ETLVTMPLGY	L11;L12	APAHISTIGV	L56;L22;L51;L39
1197	GKIADYNY	L27	ETMSYLFQHA	L20;L10	APHGHVMVEL	L56;L39;L22;L32
1198	GKIADYNYKL	L44	ETNILLNV	L48;L73	APPAQYEL	L56;L39;L22;L66
1199	GKIQDSLSS	L27	ETQALPQR	L17;L19	AQNSVRVLQK	L7;L6;L13;L24
1200	GKIQDSLSST	L27	ETSWQTGDF	L11;L10	AQYTSALL	L28;L48;L44;L27
1201	GKIVNNWL	L44	ETVKGLDY	L11;L1	ARDGCVPL	L35;L66;L63;L68
1202	GKIVNNWLKQL	L44	ETVKGLDYKAF	L10;L11	ARDLSLQF	L35;L33;L65;L62
1203	GKMKDLSPRWY	L27	ETYFTQSR	L17;L19	ARHINAQVA	L35;L25;L46;L28
1204	GKPCIKVAT	L44	EVAVKMFDAY	L10;L11	ARNGVLITE	L30;L65;L66;L35
1205	GKPREQIDGY	L27	EVEKGVLPQL	L11;L20	ARTRSMWSF	L66;L30;L35;L34
1206	GKPVPYCY	L66	EVFNATRFA	L20;L11	ASAVVLLI	L73;L48;L55;L24
1207	GKSHFAIGL	L44	EVGFVVPGL	L20;L11	ASFRLFARTR	L15;L19;L21;L55
1208	GKVEGCMVQ	L27	EVGHTDLMAAY	L11;L10	ASFYYVWKSY	L43;L16;L14;L52
1209	GKVEGCMVQV	L27	EVITFDNL	L20;L74	ASKKPRQKR	L15;L13;L21;L17
1210	GKYEQYIKWP	L27	EVITFDNLKTL	L10;L11	ASMPTTIAK	L7;L6;L13;L43
1211	GKYEQYIKWPWY	L27	EVKPFITESK	L11;L10	ASSSEAFLI	L55;L24;L53;L54
1212	GKYVQIPTTC	L27	EVLSDREL	L23;L55	ATAEAELAK	L7;L6;L19;L13
1213	GLAAIMQLFF	L12	EVLSEARQHL	L10;L20	ATCELYHY	L18;L1;L14;L54
1214	GLCVDIPGIPK	L6	EVNEFACVV	L20;L11	ATEETFKL	L63;L1;L18;L68
1215	GLFCLLNRYF	L12	EVNSFSGYLKL	L11;L10	ATLQAIASEF	L52;L53;L16;L10
1216	GLHLLIGL	L23	EVPANSTVLSF	L11;L10	ATNGPLKV	L73;L70;L48;L24

1217	GLHLLIGLA	L24	EVPVAIHAD	L10;L11	ATNNLVVM	L70;L73;L59;L58
1218	GLHLLIGLAK	L6	EVPVSIINN	L17;L11	ATNYDLSVV	L73;L70;L58;L18
1219	GLHPTQAP	L43	EVQIDRLITGR	L17;L19	ATRFASVY	L18;L14;L26;L1
1220	GLKTILRKG	L3	EVTPSGTW	L10;L54	ATRGATVVI	L53;L70;L52;L10
1221	GLKTLATHGL	L3	EVTPSGTWLTY	L11;L10	ATSRTLSY	L18;L1;L54;L14
1222	GLLMPLKAPK	L6	EVVDKYFDCY	L10;L11	AVDALCEKAL	L68;L5;L67;L63
1223	GLMWLSYF	L26	EVVENPTIQ	L11;L20	AYANRNRF	L9;L71;L72;L8
1224	GLNGYTVEE	L2	EWFLAYILFTR	L17;L19	AYANSVFNI	L9;L8;L72;L34
1225	GLPGTILR	L21	EWSMATYYLF	L9;L8	AYFNMVYM	L71;L72;L62;L66
1226	GLTGTGVL	L74	EYCPIFFI	L9;L8	AYFNMVYMP	L42;L71;L66;L72
1227	GLTGTGVLT	L2	EYHDVRVVLDF	L8;L9	AYIICISTK	L13;L72;L7;L71
1228	GLVAEWFL	L74	EYHNESGL	L71;L72	AYIICISTKHF	L8;L9;L72;L40
1229	GLVAEWFLA	L2	EYKGPITDV	L17;L11	AYITGGVVQ	L71;L72;L8;L9
1230	GLWLDDVVYC	L2	EYSHVVAFNTL	L8;L9	AYNGYLTSS	L72;L71;L15;L8
1231	GLYRKCVKS	L24	EYYHTTDPSF	L9;L8	AYSNNSIAI	L72;L9;L71;L8
1232	GLYRKCVKSR	L21	FADDLNQLTG	L67;L68	AYVDNSSLTI	L8;L9;L71;L72
1233	GMSRIGMEV	L24	FALTCFSTQ	L59;L61	AYVNTFSSTF	L8;L9;L71;L72
1234	GMVLGSLAA	L46	FAMGIIAMSA	L50;L61	AYYFMRFRR	L15;L17;L21;L12
1235	GNAAISDYDY	L12	FASTEKSNI	L49;L70	CCNIVNVSL	L56;L44;L32;L35
1236	GNCDVVIGI	L24	FATSACVLA	L50;L69	CEFCGTENL	L37;L36;L29;L45
1237	GNFGDQEL	L65	FCDLKGKY	L1;L18	CFSTASDTY	L14;L72;L71;L12
1238	GNFKVTKGK	L13	FCLEASFNY	L12;L31	CLHVVGPNV	L2;L24;L4;L5
1239	GNFYGPFV	L48	FCNDPFLGVYY	L31;L12	CLVGLMWLSY	L12;L16;L10;L11
1240	GNFYGPFVD	L65	FDAYVNTF	L33;L29	CSNLLLQY	L18;L59;L1;L48
1241	GNVQLRVI	L48	FDESGEFKL	L32;L63	CTSVVLLSV	L73;L20;L69;L70
1242	GPDGYPLEC	L49	FEKMVSLL	L33;L23	CVDIPGIPK	L7;L6;L13;L68
1243	GPEAGLPY	L18	FEKMVSLLSV	L45;L46	CVPLNIIPL	L57;L5;L74;L64
1244	GPEQTQGNF	L49	FELDERIDKVL	L40;L41	CVRGTTVLL	L74;L58;L13;L56
1245	GPITDVFYK	L7	FERDISTEIY	L43;L29	CYLATALL	L71;L72;L9;L62
1246	GPKQASLNGV	L51	FEYYHTTD	L25;L45	CYLATALLTL	L8;L9;L71;L72
1247	GPKQASLNGVTL	L56	FFGMSRIGM	L72;L71	CYTPSKLIEY	L12;L72;L66;L71
1248	GPKVKYLY	L23	FFITGNTLQ	L71;L72	DAAKAYKDY	L10;L11;L58;L49
1249	GPLKVGGSCV	L51	FFITGNTLQC	L71;L72	DAYNMMISA	L47;L50;L25;L69

1250	GPLKVGGSCVL	L56	FFIYNKIVD	L72;L71	DDTLRVEAF	L33;L29;L23;L25
1251	GPLVRKIF	L23	FFKEGSSVE	L71;L72	DEDDNLIDSY	L29;L41;L40;L1
1252	GPNVNKGED	L49	FFLYENAFLPF	L12;L8	DEFSSNVAN	L29;L46;L25;L41
1253	GQAITVTP	L48	FFYYSDSP	L71;L72	DEISMATNY	L29;L41;L11;L40
1254	GQINDMILS	L24	FFYYSDSPC	L71;L72	DELTGHML	L25;L29;L23;L37
1255	GQIVTCAKE	L24	FGAGAALQI	L64;L47	DEPTTTTSV	L45;L29;L57;L37
1256	GQKTYERHSL	L44	FGATSAAL	L61;L59	DFMSLSEQL	L8;L71;L9;L72
1257	GQQDGSEDN	L24	FGLVAEWFL	L61;L44	DISGINASV	L20;L11;L28;L19
1258	GQQGEVPV	L24	FHPLADNKF	L34;L62	DIVEEAKKV	L11;L10;L20;L24
1259	GQQGEVPVS	L24	FIAGLIAIVMV	L20;L2	DKFKVNSTL	L44;L25;L27;L35
1260	GQQGEVPVSI	L24	FIDTKRGV	L63;L68	DKVAGFAKF	L10;L11;L27;L29
1261	GQQQQGQTVTK	L7	FIEDLLFNKV	L5;L20	DLKGKYVQI	L23;L10;L11;L3
1262	GQQQTTLKG	L24	FIERYKLEGY	L1;L18	DLPQGFSAL	L57;L10;L11;L5
1263	GQSTQLGIEFL	L44	FIKGLNNLNR	L17;L21	DLQDLKWAR	L17;L19;L21;L15
1264	GQTFSVLAC	L24	FIPMDSTV	L57;L5	DLQELGKY	L14;L11;L1;L10
1265	GQTFSVLACY	L14	FISDEVAR	L19;L17	DLSPRWYFYY	L11;L12;L1;L18
1266	GQTGKIADYNY	L14	FISNSWLMW	L49;L69	DLYDKLQF	L23;L11;L43;L25
1267	GQTVTKKS	L48	FITGNTLQC	L60;L58	DLYDKLQFT	L11;L2;L3;L10
1268	GQVDLFRN	L24	FITLCFTLK	L6;L7	DMILSLLSK	L6;L19;L17;L7
1269	GQVDLFRNAR	L15	FIYNKIVD	L43;L23	DNLKTLLSL	L25;L23;L8;L73
1270	GQVFGLYKN	L24	FKESPFEL	L66;L68	DPCPIHFY	L49;L29;L31;L47
1271	GRCDIKDLPK	L30	FKKGAKLL	L66;L64	DPFLGVYY	L31;L29;L47;L49
1272	GRDIADTTD	L34	FKLKDCVMY	L27;L31	DPIHSLRVC	L47;L32;L49;L31
1273	GRFVLALLS	L30	FKLVNKFLAL	L61;L44	DPNFKDQVIL	L39;L32;L56;L23
1274	GRFVLALLSD	L30	FKNLREFVF	L66;L27	DPSFLGRYM	L31;L32;L49;L22
1275	GRLIIREN	L65	FKYWDQTY	L27;L66	DPVGFTLKN	L49;L11;L47;L32
1276	GRLIIRENN	L30	FLALITLAT	L2;L3	DQAISMWAL	L25;L44;L35;L28
1277	GRLIIRENNR	L30	FLAYILFTRF	L12;L10	DSNGTITV	L48;L47;L70;L73
1278	GRLQSLQTYV	L30	FLEYHDVRVV	L3;L2	DTDFVNEF	L62;L1;L68;L63
1279	GRSGETLGVLV	L30	FLGIITTVA	L2;L3	DTTEAFEKM	L11;L10;L29;L20

1280	GRTIAFGGC	L30	FLKKDAPYI	L2;L3	DTTITVNVL	L10;L25;L35;L11
1281	GRTILGSALL	L30	FLKKDAPYIV	L3;L2	DTVSALVYD	L11;L20;L19;L17
1282	GRVDGQVD	L65	FLKRGDKSV	L3;L2	DTYNLWNTFTR	L19;L17;L21;L7
1283	GRVDGQVDLFR	L30	FLLNKEMYLKL	L4;L2	DVDTDFVNEF	L10;L11;L68;L49
1284	GRWVLNNDY	L30	FLLPSLATVAY	L12;L31	DVKCTSVVL	L23;L10;L11;L39
1285	GRWVLNNDYY	L30	FLNRVCGVSA	L2;L50	DYFNKKDWY	L72;L12;L14;L71
1286	GRWVLNNDYYR	L30	FLPFAMGII	L57;L5	DYFVLTSH	L71;L25;L72;L17
1287	GRYMSALNH	L30	FLPFFSNV	L57;L5	DYGDAVVYR	L17;L19;L15;L21
1288	GRYMSALNHT	L30	FLPFFSNVTW	L57;L5	EAANFCAL	L67;L59;L61;L20
1289	GRYMSALNHTK	L30	FLTWICLLQF	L12;L5	EDQDALFAY	L40;L10;L14;L29
1290	GSCGSVGF	L54	FLVFLGIITTV	L2;L3	EEAALCTFL	L41;L40;L36;L20
1291	GSEGLNDNL	L1	FLVLIMLII	L69;L67	EEAALCTFLL	L41;L40;L42;L20
1292	GSEYDYVIF	L53	FLVLIMLIIF	L74;L69	EEAKTVLKK	L42;L19;L41;L40
1293	GSGVPVVD	L65	FLYENAFLPFA	L2;L3	EEEQEEDWL	L36;L41;L40;L34
1294	GSIHLYFDK	L7	FMGRIRSV	L48;L64	EEHFIETI	L45;L29;L48;L37
1295	GSLIYSTAA	L46	FNGECPNFV	L73;L64	EEKFKEGVEF	L40;L41;L42;L37
1296	GSLVVRCSFY	L14	FNGVSFSTF	L59;L9	EELDKYFKN	L41;L40;L29;L42
1297	GSLYVNKHAF	L52	FNQHEVLL	L62;L74	EELKKLLEQ	L42;L41;L40;L46
1298	GSNVFQTR	L15	FNVLFSTV	L47;L48	EEMLDNRATL	L40;L41;L36;L42
1299	GSRGGSQAS	L43	FNVPMEKL	L67;L74	EETKFLTEN	L42;L46;L29;L45
1300	GSSVELKHFF	L52	FPDLNGDVVA	L50;L32	EEVVLKTGD	L41;L42;L46;L40
1301	GSTPCNGV	L48	FPFNKWGKARL	L56;L31	EHDYQIGGY	L1;L11;L10;L18
1302	GTCGLVEVEK	L7	FPKSDGTGTIY	L31;L49	EHEHEIAWY	L11;L34;L1;L10
1303	GTDLEGNFYG	L1	FPLCANGQV	L50;L47	EHVQIHTI	L34;L48;L35;L28
1304	GTDTTITVNV	L18	FPLKLRGTA	L50;L51	EIIFLEGETL	L20;L10;L34;L11
1305	GTGVLTESNK	L7	FPNITNLCPF	L31;L49	EIKDTEKY	L11;L10;L26;L43
1306	GTHHWLLL	L73	FPPTSFGPLV	L47;L50	EILLIIMRTF	L10;L11;L40;L41

1307	GTHWFVTQRNF	L52	FPQSAPHGVV	L50;L22	EIVGGQIVTC	L11;L10;L19;L20
1308	GTILTRPLL	L13	FPREGVFVS	L50;L31	EKSNIIRGW	L10;L40;L41;L49
1309	GTKRFDNPVL	L53	FPSGKVEGC	L49;L31	ELAKNVSL	L23;L20;L35;L56
1310	GTLIVNSV	L48	FPVLHDIGN	L50;L31	ELGTEVNEF	L10;L9;L11;L26
1311	GTLIVNSVLLF	L52	FSALEPLVDL	L74;L60	ELIRQGTDY	L11;L10;L26;L12
1312	GTNGTKRF	L54	FSGAMDTTSY	L43;L1	ELLHAPATV	L2;L4;L20;L3
1313	GTNGTKRFD	L65	FSNSGSDV	L58;L70	ELNGGAYTRY	L11;L10;L14;L26
1314	GTNTSNQVAVLY	L18	FSSEIIGYK	L19;L7	ELVAELEGI	L10;L20;L24;L11
1315	GTRNPANNA	L13	FSTASDTY	L1;L54	ENFNQHEVL	L25;L20;L35;L34
1316	GTSTDVVY	L18	FTALTQHGK	L19;L7	EQYIKWPWY	L26;L27;L11;L48
1317	GTSTDVVYRAF	L52	FTEERLKLFDRY	L1;L18	ERDISTEIY	L1;L34;L35;L18
1318	GTTEMLAK	L7	FTIYSLLLCR	L19;L17	ERSEAGVCV	L35;L34;L28;L20
1319	GTTLPKGF	L55	FTLLLQLCTF	L52;L53	ESKPSVEQR	L17;L19;L11;L15
1320	GTTSPISEHDY	L14	FTPLVPFWI	L64;L20	ETAHSCNVNR	L19;L17;L20;L21
1321	GTTTYKLNV	L73	FTRSTNSR	L17;L21	ETICAPLTV	L20;L73;L11;L10
1322	GTVSWNLREM	L10	FTSDLATNNL	L20;L60	ETISLAGSYK	L19;L11;L17;L7
1323	GVAMPNLY	L18	FTTTLNDF	L59;L58	ETLGVLVPH	L17;L20;L7;L11
1324	GVAPGTAVLRQW	L52	FTVLCLTPV	L20;L59	ETVKGLDYK	L19;L11;L20;L17
1325	GVCSMTDIAK	L7	FVCDNIKFA	L3;L69	EVFAQVKQIYK	L19;L7;L6;L20
1326	GVCSMTDIAKK	L7	FVDRQTAQA	L5;L63	EVFNATRF	L11;L10;L29;L20
1327	GVDIAANTVI	L68	FVFKNIDGYFK	L6;L7	EVNSFSGY	L11;L10;L26;L14
1328	GVDVELFENK	L7	FVIRGDEVR	L19;L17	EVPANSTVL	L10;L11;L57;L20
1329	GVEGFNCYF	L12	FVLWAHGF	L59;L60	EVVDKYFDC	L11;L10;L20;L19
1330	GVEHVTFF	L63	FVNLKQLPFF	L58;L59	EVVGDIILKP	L11;L10;L20;L19
1331	GVEHVTFFI	L24	FVTHSKGL	L60;L61	EYHDVRVV	L64;L72;L48;L71
1332	GVGYQPYRV	L24	FVTHSKGLYR	L19;L17	EYVSQPFLM	L9;L8;L17;L66
1333	GVITHDVSSA	L3	FVVPGLPGT	L11;L20	FAAETLKA	L50;L69;L59;L61
1334	GVKHVYQL	L23	FVVSTGYHFR	L19;L17	FACPDGVKHV	L70;L69;L58;L47
1335	GVKHVYQLRAR	L15	FWITIAYI	L62;L47	FASFYYVWK	L7;L67;L19;L69

1336	GVLTAVVI	L55	FWRNTNPIQL	L62;L74	FATAQEAY	L59;L31;L58;L70
1337	GVLTESNKKF	L52	FYDFAVSKG	L62;L68	FAVHFISNS	L69;L70;L58;L49
1338	GVPVVDSY	L26	FYDFAVSKGF	L62;L9	FAWWTAFVTN	L67;L50;L49;L31
1339	GVQIPCTCGK	L7	FYEAMYTPH	L71;L72	FCGPDGYPL	L67;L61;L66;L60
1340	GVSAARLT	L55	FYFYTSKTT	L71;L72	FCTQLNRAL	L61;L60;L64;L32
1341	GVSICSTMTNR	L19	FYFYTSKTTV	L71;L72	FDKAGQKTY	L58;L43;L14;L70
1342	GVSPTKLND	L65	FYGPFVDR	L17;L66	FDYVYNPF	L33;L59;L71;L43
1343	GVTFQSAVK	L7	FYKENSYTT	L66;L9	FEEAALCTF	L38;L41;L36;L40
1344	GVTRELMREL	L10	FYLCFLAFLL	L9;L8	FELDERIDKV	L45;L36;L38;L37
1345	GVVCTEIDPK	L7	FYLITPVH	L71;L72	FELLHAPATV	L45;L46;L38;L36
1346	GVVDYGARFYF	L12	FYPPDEDE	L66;L71	FELTSMKYF	L41;L40;L29;L33
1347	GVVFLHVTYV	L20	FYRLANEC	L72;L71	FENKTTLPV	L45;L38;L37;L42
1348	GVVGEGSEGL	L10	FYSKWYIRV	L64;L62	FEPSTQYEY	L66;L12;L40;L41
1349	GVVTTVMF	L74	FYSYATHSD	L72;L71	FERDISTEI	L45;L43;L36;L37
1350	GVVTTVMFL	L74	FYTSKTTV	L71;L72	FFPDLNGDV	L62;L72;L71;L5
1351	GVYDYLVSTQ	L10	FYTSKTTVASL	L71;L72	FFSNVTWF	L72;L62;L71;L9
1352	GVYYHKNNKSW	L16	FYVLGLAAIM	L71;L72	FGAISSVL	L61;L59;L28;L25
1353	GWEIVKFI	L48	FYVYANGGKGF	L8;L9	FGDSVEEV	L63;L68;L62;L67
1354	GWLIVGVALL	L8	FYVYSRVKNL	L71;L72	FHLDGEVIT	L35;L34;L28;L44
1355	GYKAIDGGVTR	L15	FYYLGTGP	L71;L72	FIASFRLF	L58;L59;L74;L60
1356	GYKKPASREL	L13	FYYLGTGPE	L72;L71	FISAARQGF	L58;L12;L60;L16
1357	GYLNSTNV	L71	FYYSDSPC	L71;L72	FKWDLTAF	L59;L27;L66;L71
1358	GYLQPRTFLLK	L6	FYYVWKSYVH	L71;L72	FLARGIVF	L74;L59;L26;L23
1359	GYLQPRTFLLKY	L12	GAALQIPF	L74;L59	FLCWHTNCY	L43;L59;L26;L1
1360	GYLTSSSK	L71	GAENSVAY	L18;L27	FLEYHDVRV	L2;L63;L5;L4
1361	GYREGYLNS	L13	GALLTKSSEY	L27;L14	FLIVAAIVFI	L2;L3;L4;L5
1362	GYRVTKNSK	L13	GCFVDDIVK	L7;L13	FLMSFTVLC	L2;L4;L12;L5
1363	GYVMHANYI	L9	GDDTVIEV	L33;L37	FLNKVVSTT	L3;L2;L4;L43

1364	HAASGNLLLD	L49	GDYGDAVVYR	L15;L19	FLPGVYSVIY	L12;L66;L26;L43
1365	HAAVDALCE	L49	GEAANFCA	L38;L46	FLPGVYSVIYL	L2;L5;L57;L74
1366	HADQLTPTWR	L63	GEAANFCALIL	L36;L41	FLQSINFVR	L21;L17;L15;L19
1367	HADQLTPTWRVY	L18	GEAVKTQFNY	L40;L41	FLTENLLLYI	L3;L2;L4;L5
1368	HAFHTPAFD	L49	GECPNFVFPL	L37;L36	FLVQAGNVQL	L2;L4;L5;L74
1369	HAFLCLFLLP	L50	GEDIQLLKSAY	L41;L40	FLYLYALV	L62;L2;L3;L47
1370	HANEYRLYLD	L49	GEQKSILSPLY	L40;L41	FMIDVQQW	L49;L69;L54;L3
1371	HANLDSCKR	L17	GERSGARSK	L13;L45	FPLKLRGTAV	L50;L51;L22;L32
1372	HDELTGHM	L33	GETFVTHSK	L37;L38	FPREGVFVSN	L50;L51;L31;L22
1373	HDELTGHMLDMY	L18	GETSWQTGD	L46;L37	FRNARNGVL	L25;L66;L64;L35
1374	HDFFKFRI	L33	GEVFNATRFA	L46;L38	FSASTSAFV	L58;L70;L20;L73
1375	HDFFKFRID	L65	GEYTFEKG	L45;L29	FSHSQLGGL	L58;L60;L57;L61
1376	HDIGNPKAI	L37	GFAAYSRY	L12;L14	FSKLINII	L70;L48;L55;L47
1377	HDLYCQVH	L33	GFAAYSRYR	L15;L17	FSKLINIII	L70;L69;L55;L68
1378	HEFCSQHT	L29	GFCDLKGKY	L12;L14	FSNYLKRRV	L73;L64;L70;L69
1379	HEIAWYTE	L29	GFNEKTHV	L62;L48	FSQRGGSY	L1;L14;L59;L18
1380	HEVLLAPLLS	L41	GGAKLKAL	L23;L44	FSSNVANY	L58;L1;L70;L59
1381	HFDEGNCD	L62	GGDAALAL	L68;L63	FSTGVNLVA	L50;L61;L69;L73
1382	HFDEGNCDT	L62	GGHSYGADL	L57;L44	FSTGVNLVAV	L20;L73;L58;L50
1383	HFISNSWLMW	L8	GGLHLLIGL	L44;L4	FTEQPIDLV	L1;L20;L18;L63
1384	HFYSKWYI	L48	GGRFVLAL	L48;L23	FTISVTTEIL	L60;L67;L61;L20
1385	HGFELTSMK	L13	GHFDGQQG	L28;L35	FTIYSLLLC	L73;L1;L12;L58
1386	HGGGVAGAL	L44	GHFDGQQGEV	L28;L35	FTQSRNLQEF	L58;L10;L59;L60
1387	HGHVMVELV	L48	GHLRIAGHHL	L34;L44	FVCDNIKF	L58;L74;L68;L63
1388	HGKQVVSD	L23	GHSYGADL	L28;L35	FVENPDILR	L19;L17;L21;L15
1389	HGLNLEEAA	L50	GHVMVELVA	L28;L35	FVFPLNSIIK	L6;L7;L13;L19
1390	HGLNLEEAARY	L14	GIGVTQNVLY	L12;L18	FVKHKHAF	L23;L59;L58;L43
1391	HGVVFLHV	L48	GINASVVNIQK	L7;L6	FVLAAVYRI	L4;L47;L5;L20
1392	HHMELPTG	L28	GISQYSLRL	L24;L73	FVLWAHGFEL	L60;L61;L67;L59
1393	HHSIGFDYVY	L34	GKFCLEASF	L27;L44	FVNEFYAYLR	L15;L21;L17;L19

1394	HIDAYKTFP	L63	GKQGNFKNL	L44;L27	FVNLKQLPF	L59;L12;L58;L60
1395	HIDHPNPKG	L63	GKYVQIPTT	L27;L44	FVRIQPGQTF	L26;L43;L10;L58
1396	HIDHPNPKGF	L63	GLALYYPSA	L2;L3	FVSGNCDVV	L58;L67;L20;L69
1397	HISRQRLTK	L6	GLDSLDTYPSL	L2;L5	FVVPGLPGTI	L20;L10;L67;L3
1398	HITSKETL	L23	GLFCLLNR	L15;L21	FWNCNVDRY	L58;L12;L49;L14
1399	HKHAFLCLFL	L44	GLIAIVMVT	L3;L2	FYDFAVSK	L62;L71;L68;L72
1400	HKLVLSVNP	L44	GLKTILRK	L13;L6	FYEDFLEYH	L62;L72;L71;L12
1401	HKPIVWHV	L48	GLMWLSYFI	L24;L2	FYGGWHNM	L72;L66;L71;L62
1402	HKPIVWHVN	L44	GLNGYTVEEA	L3;L2	FYILPSII	L62;L71;L72;L47
1403	HLIPLMYK	L6	GLNLEEAAR	L21;L15	FYWFFSNY	L72;L71;L66;L12
1404	HLIPLMYKG	L24	GLQPSVGPK	L6;L7	GANKDGIIW	L54;L49;L52;L53
1405	HLKDGTCGLV	L3	GLVEVEKGVL	L44;L2	GEAVKTQF	L33;L29;L37;L45
1406	HLKDGTCGLVEV	L3	GLYKNTCV	L24;L2	GECPNFVF	L29;L37;L33;L36
1407	HLLIGLAKRF	L12	GLYPTLNIS	L24;L3	GEDIQLLKS	L45;L46;L37;L41
1408	HLMGWDYPK	L6	GNKGAGGHSY	L14;L26	GEDIQLLKSA	L46;L38;L42;L37
1409	HLRIAGHHL	L26	GNLQSNHDLY	L12;L14	GEFKLASHMY	L40;L29;L41;L27
1410	HLSVDTKFK	L6	GNYNYLYRL	L4;L24	GEIPVAYRKVL	L36;L41;L40;L37
1411	HLSWEVGKP	L24	GNYQCGHYK	L7;L6	GGDAALALL	L63;L62;L68;L34
1412	HLVDFQVTIA	L3	GPKKSTNLV	L51;L39	GGFNFSQIL	L44;L64;L28;L69
1413	HLYFDKAGQK	L6	GPLVRKIFV	L23;L47	GHFDGQQGE	L28;L34;L35;L24
1414	HLYLQYIR	L21	GPPGTGKSH	L39;L22	GHSMQNCVL	L35;L28;L34;L44
1415	HMELPTGV	L48	GQGLNGYTV	L24;L48	GIATVREVL	L44;L16;L28;L67
1416	HMLDMYSV	L48	GQGVPINTN	L24;L26	GIDLDEWSM	L68;L63;L28;L18
1417	HMLDMYSVM	L72	GQINDMIL	L28;L44	GIVFMCVEY	L26;L43;L12;L27
1418	HMLDMYSVML	L44	GQIVTCAKEI	L24;L48	GIYQTSNFR	L21;L7;L6;L19
1419	HNLAKHCL	L23	GQPITNCV	L48;L24	GKYEQYIKW	L27;L44;L49;L10
1420	HNSHEGKTFY	L12	GQSKRVDF	L27;L26	GLAAIMQL	L3;L74;L2;L4

1421	HPTQAPTH	L50	GQSTQLGI	L48;L24	GLAAVNSV	L3;L2;L4;L24
1422	HQECSLQSC	L24	GQSTQLGIEF	L26;L27	GLCVDIPGI	L4;L2;L24;L3
1423	HQSDIEVTGD	L44	GRIRSVYPV	L30;L35	GLEAPFLYLY	L18;L12;L1;L14
1424	HRFYRLAN	L25	GRRGPEQTQ	L65;L30	GLFKDCSKV	L24;L3;L2;L4
1425	HRFYRLANE	L25	GRSGETLGVL	L30;L35	GLIAIVMV	L24;L2;L3;L4
1426	HRLYECLY	L65	GSALLEDEF	L53;L52	GLPNNTASW	L57;L10;L16;L5
1427	HRLYECLYR	L30	GSDNVTDFN	L1;L18	GLYPTLNI	L24;L48;L3;L2
1428	HRLYECLYRNR	L30	GSGVPVVDSY	L14;L18	GPEHSLAEY	L49;L31;L18;L12
1429	HSCNVNRFN	L55	GSSGVVNPV	L20;L24	GPKKSTNL	L56;L39;L23;L22
1430	HSMQNCVL	L55	GSTPCNGVEGF	L52;L54	GQQFGPTY	L26;L27;L48;L14
1431	HSSSSDNIAL	L44	GSVAYESL	L67;L55	GQQFGPTYL	L44;L28;L24;L34
1432	HSTQDLFLP	L53	GSVAYESLR	L19;L7	GQTGKIADY	L26;L14;L27;L12
1433	HSTQDLFLPF	L52	GTAVLRQWL	L53;L16	GRSGETLGV	L30;L24;L35;L34
1434	HSTQDLFLPFF	L52	GTDPYEDFQ	L1;L18	GSFCTQLNR	L7;L15;L19;L21
1435	HSWNADLYKL	L53	GTDPYEDFQENW	L52;L54	GSLPINVI	L48;L55;L47;L53
1436	HTGTGQAITV	L20	GTDTTITVN	L18;L1	GTDLEGNFY	L1;L18;L14;L12
1437	HTKKWKYPQV	L13	GTEDDYQGK	L13;L7	GTGTIYTEL	L53;L10;L67;L65
1438	HTPINLVRD	L11	GTGTSTDVVY	L18;L52	GTITVEELKK	L7;L13;L6;L19
1439	HTPINLVRDL	L11	GTILTRPL	L55;L60	GTLEPEYF	L52;L55;L54;L53
1440	HTTCCSLSHRF	L54	GTLIVNSVLL	L53;L13	GTLIVNSVL	L53;L44;L55;L52
1441	HTTDPSFLG	L20	GTLSYEQFKK	L7;L6	GTTLPKGFY	L14;L1;L12;L18
1442	HTVLQAVGA	L50	GTNLPLQLGF	L12;L52	GVAMPNLYK	L6;L7;L13;L19
1443	HTVMPLSA	L50	GTPVCINGL	L57;L10	GVCVSTSGR	L19;L15;L21;L7
1444	HTVMPLSAP	L10	GTSSGDATTAY	L18;L14	GVKHVYQLR	L15;L21;L19;L17
1445	HVDILGPLS	L1	GTTSPISEH	L7;L10	GVPFVVSTGY	L11;L12;L26;L14
1446	HVDTDLTK	L18	GTTTLNGLW	L52;L54	GVVDYGARFY	L12;L14;L10;L11
1447	HVICTSEDM	L11	GTVSWNLR	L19;L15	GVYFASTEK	L7;L6;L13;L19
1448	HVISTSHKLV	L20	GVAGALNKA	L51;L3	GWHNMLKTV	L24;L3;L48;L45
1449	HVMSKHTD	L23	GVALLAVF	L26;L59	GYLPQNAVV	L72;L8;L71;L9
1450	HVNNATNKA	L51	GVDAVNLLT	L18;L1	HADFDTWFS	L68;L49;L18;L63
1451	HVNNATNKATY	L14	GVEGFNCY	L18;L1	HCANFNVL	L35;L28;L25;L44
1452	HVRAWIGF	L26	GVFVSNGTHW	L10;L52	HDVRVVLDF	L33;L49;L65;L29

1453	HVSGTNGTKRF	L11	GVFVSNGTHWF	L16;L26	HDYQIGGY	L29;L33;L14;L11
1454	HVTFFIYNKI	L20	GVGGKPCIK	L6;L7	HEETIYNL	L37;L33;L29;L36
1455	HVTYVPAQE	L20	GVKDCVVLH	L13;L7	HEFCSQHTML	L37;L36;L45;L25
1456	HVTYVPAQEK	L19	GVLITEGSVK	L6;L7	HEGKTFYV	L33;L45;L37;L29
1457	HVYQLRARSV	L24	GVLPQLEQPY	L12;L14	HEHEIAWY	L29;L37;L33;L45
1458	HWFVTQRN	L48	GVLTAVVIPTK	L7;L6	HFISNSWLM	L8;L72;L12;L71
1459	HWFVTQRNFY	L12	GVLTAVVIPTKK	L7;L6	HFRELGVVH	L72;L71;L13;L43
1460	HYQECVRGT	L72	GVTFQSAVKR	L19;L7	HGFELTSMKY	L14;L12;L11;L29
1461	HYVYIGDPA	L50	GVTLIGEAV	L20;L24	HHANEYRL	L34;L35;L28;L44
1462	IAARDLICA	L50	GVTQNVLY	L12;L18	HISRQRLTKY	L11;L14;L18;L10
1463	IAARDLICAQKF	L52	GVVTTVMFLAR	L7;L19	HKDKSAQCF	L34;L49;L27;L63
1464	IADKYVRN	L63	GVYYPDKV	L48;L24	HKPPISFPL	L66;L44;L57;L64
1465	IADYNYKLP	L63	GWTAGAAAYY	L12;L14	HLIPLMYKGL	L3;L11;L10;L5
1466	IAFGGCVFS	L69	GYINVFAFP	L9;L12	HNIALIWNV	L20;L24;L73;L4
1467	IAGLIAIVMV	L50	GYKKPASR	L15;L17	HNSHEGKTF	L49;L34;L32;L53
1468	IAIILASFSA	L50	GYLKLTDNVY	L12;L14	HPNCVNCL	L32;L56;L39;L23
1469	IAKKPTET	L43	GYLNSTNVTI	L8;L9	HPNQEYADVF	L32;L31;L49;L39
1470	IALIWNVKDF	L52	GYLPQNAVVK	L13;L7	HSIGFDYV	L73;L20;L48;L67
1471	IALKGGKI	L47	GYLPQNAVVKI	L9;L8	HSWNADLY	L18;L1;L14;L54
1472	IALKGGKIVNNW	L52	GYLQPRTFLL	L9;L8	HTSPDVDLG	L52;L53;L18;L20
1473	IAMACLVGLMW	L52	GYVDTPNNTDF	L8;L9	HTTDPSFLGRY	L14;L11;L18;L10
1474	IANQFNSA	L50	GYVMHANY	L71;L72	HVDTDLTKP	L63;L18;L49;L11
1475	IANYAKPF	L59	GYVMHANYIF	L8;L9	IAANTVIWD	L69;L70;L74;L49
1476	IAQFAPSA	L50	GYYRRATR	L15;L17	IAANTVIWDY	L31;L12;L58;L14
1477	IASEFSSLPSY	L31	GYYRRATRR	L15;L17	IAPGQTGKI	L47;L49;L63;L57
1478	IASTDTCF	L54	HAIHVSGTN	L32;L49	ICHDGKAHF	L43;L49;L8;L9
1479	IAYIICIS	L47	HANYIFWR	L17;L15	ICYTPSKL	L74;L48;L47;L25
1480	IAYTMSLG	L47	HANYIFWRN	L49;L32	IDHPNPKGF	L33;L43;L29;L52

1481	IAYTMSLGA	L50	HDELTGHML	L37;L34	IDYDCVSF	L33;L43;L71;L29
1482	ICHDGKAH	L43	HDVRVVLD	L65;L33	IEFLKRGD	L33;L45;L46;L65
1483	ICISTKHFYWF	L8	HECFVKRVDW	L41;L40	IFFASFYYV	L47;L62;L72;L71
1484	ICLLQFAYA	L50	HEGKTFYVLP	L38;L42	IFGADPIHSL	L72;L9;L8;L71
1485	IDAFKLNI	L33	HFAWWTAFV	L62;L20	IFLIVAAI	L71;L48;L72;L47
1486	IDCSARHI	L55	HFIETISLAGSY	L14;L12	IFLIVAAIV	L71;L72;L47;L62
1487	IDFYLCFL	L33	HFLPRVFSAV	L71;L72	IGFLFLTW	L48;L47;L54;L52
1488	IDFYLCFLAF	L33	HFRELGVV	L48;L62	IGINITRF	L29;L54;L27;L26
1489	IDGGVTRD	L65	HFYWFFSNYL	L71;L72	IIIGGAKLK	L7;L6;L19;L13
1490	IDLDEWSM	L33	HGLAAVNSV	L48;L47	IINNTVYTK	L7;L6;L19;L21
1491	IDLLLDDF	L33	HGLNLEEA	L25;L50	IKLIFLWLL	L44;L4;L64;L8
1492	IDLVPNQPY	L12	HGVVFLHVTY	L29;L26	ILANTCTER	L21;L19;L15;L6
1493	IDVQQWGF	L33	HKHAFLCLF	L27;L34	ILLNKHIDAY	L12;L14;L6;L16
1494	IDYKHYTP	L33	HLDGEVIT	L62;L63	ILLNVPLHG	L4;L12;L6;L2
1495	IDYKHYTPSF	L33	HLLIGLAK	L6;L23	ILSDDAVVCF	L26;L9;L16;L49
1496	IEELFYSYAT	L38	HMVVKAAL	L23;L25	INDMILSL	L68;L63;L62;L67
1497	IEFLKRGDK	L46	HMVVKAALL	L23;L62	INDMILSLL	L68;L62;L63;L5
1498	IEFLKRGDKSV	L45	HNESGLKTI	L49;L34	INFVRIIMR	L17;L21;L15;L19
1499	IELKFNPP	L46	HNMLKTVY	L29;L65	IPIQASLPF	L22;L31;L49;L50
1500	IELSLIDFYLC	L40	HPDSATLVS	L32;L49	IPKEEVKPF	L39;L49;L31;L22
1501	IELSLIDFYLCF	L41	HPDSATLVSD	L49;L32	IQPGQTFSV	L5;L24;L48;L57
1502	IERFVSLA	L46	HPLADNKFA	L51;L50	IRKSNHNFL	L25;L66;L64;L30
1503	IETISLAGS	L46	HPNCVNCLD	L32;L49	ISAGFSLW	L54;L52;L53;L18
1504	IEVNSFSGYL	L36	HPTQAPTHLSV	L50;L51	ISDEFSSN	L68;L1;L63;L18
1505	IEVNSFSGYLKL	L36	HSCNVNRF	L53;L54	ISDEVARD	L63;L1;L68;L54
1506	IEVQGYKS	L29	HSDKFTDGVCL	L63;L68	ISDEVARDLSL	L68;L63;L67;L1
1507	IEVQGYKSVN	L46	HSMQNCVLKL	L73;L53	ISMWALII	L55;L48;L47;L73
1508	IEVTGDSC	L29	HSQLGGLHLL	L53;L18	ISVTTEIL	L67;L74;L60;L54
1509	IEYPIIGDE	L46	HSSRLSFKEL	L53;L73	ITEEVGHTDL	L63;L68;L1;L60
1510	IEYPIIGDELKI	L45	HSTQDLFL	L73;L74	ITHDVSSAI	L53;L61;L70;L68
1511	IFFASFYYVW	L9	HSWNADLYK	L13;L7	ITHDVSSAINR	L19;L21;L15;L17
1512	IFLEGETLP	L8	HSYFTSDYYQLY	L1;L18	ITSKETLY	L1;L18;L54;L53

1513	IFLWLLWPV	L71	HTANKWDLI	L20;L53	ITTYPGQGL	L60;L61;L53;L20
1514	IFWRNTNPI	L8	HTDFSSEIIGY	L18;L1	IVDEPEEH	L63;L68;L62;L67
1515	IFYLITPVHV	L62	HTFSNYQHE	L10;L11	IVFDGKSK	L13;L19;L7;L6
1516	IGAEHVNNSY	L14	HTQVVDMSM	L32;L53	IVFITLCF	L26;L59;L54;L52
1517	IGEAVKTQF	L63	HVASCDAIM	L32;L11	IVGVALLAV	L73;L4;L51;L5
1518	IGEAVKTQFNYY	L18	HVDILGPLSA	L18;L50	IVKTDGTLM	L58;L53;L11;L52
1519	IGEQKSIL	L63	HVGEIPVA	L50;L51	IYQTSNFRV	L8;L9;L71;L72
1520	IGGAKLKAL	L23	HVMVELVAEL	L20;L10	KADETQALP	L63;L54;L18;L68
1521	IGGYTEKW	L54	HVVDGCNSS	L10;L11	KAPKEIIF	L63;L74;L54;L53
1522	IGKIQDSL	L23	HVVDGCNSST	L11;L10	KATNNAMQV	L70;L73;L69;L58
1523	IGPERTCC	L57	HYTPSFKKG	L9;L8	KAVFISPY	L70;L43;L59;L54
1524	IGPERTCCL	L57	HYVYIGDPAQL	L8;L9	KCTSVVLL	L56;L73;L55;L74
1525	IGVTQNVL	L25	IADTTDAVR	L68;L63	KCYGVSPTKL	L6;L8;L73;L30
1526	IGYYRRATR	L15	IADTTDAVRD	L63;L49	KESPFELEDF	L36;L41;L33;L40
1527	IHFGAGSDK	L28	IAEILLII	L47;L68	KGEDIQLLK	L18;L13;L7;L6
1528	IHFYSKWY	L27	IAGLIAIV	L47;L70	KGGKIVNNW	L54;L16;L52;L53
1529	IHFYSKWYI	L34	IALKGGKIV	L47;L70	KGGRFVLAL	L73;L65;L44;L67
1530	IHSLRVCV	L28	ICISTKHFYW	L52;L54	KHTDFSSEI	L35;L34;L28;L8
1531	IHTIDGSSG	L28	ICYTPSKLI	L47;L45	KIAEIPKEEV	L2;L3;L20;L5
1532	IHTIDGSSGV	L28	IDFLELAM	L33;L29	KIITLKKRW	L54;L52;L16;L14
1533	IHTIDGSSGVV	L28	IDLQELGKY	L14;L12	KILGLPTQTV	L16;L24;L2;L4
1534	IHVSGTNGT	L28	IDSYFVVKR	L19;L21	KKLDGFMGR	L21;L15;L27;L17
1535	IICISTKHF	L26	IDYTEISF	L33;L29	KKPASREL	L66;L57;L27;L64
1536	IICISTKHFY	L18	IEDLLFNKVTL	L36;L41	KLDGVVCTEI	L5;L68;L63;L2
1537	IIGDELKI	L24	IELSLIDF	L33;L29	KLFAAETLK	L6;L21;L7;L13
1538	IIKLIFLW	L52	IERYKLEGY	L29;L26	KLIEYTDF	L26;L43;L27;L54
1539	IIKSQDLSV	L3	IETISLAGSY	L40;L41	KLIFLWLL	L74;L4;L55;L2
1540	IIKSQDLSVV	L3	IEYTDFATS	L46;L45	KLKTLVATA	L3;L51;L13;L2
1541	IIKTIQPR	L21	IFLWLLWPVTL	L9;L8	KLLEQWNLVI	L16;L2;L4;L8
1542	IILKPANNSL	L16	IFYLITPVHVM	L71;L72	KLNDLCFTNVY	L14;L16;L18;L26
1543	IIMRLWLCWK	L6	IGFLFLTWI	L47;L48	KLTDNVYIK	L6;L13;L16;L7
1544	IIMRTFKV	L48	IGIVNNTV	L48;L47	KNVSLDNVL	L44;L73;L67;L36

1545	IIPARARV	L5	IGNYTVSCL	L57;L65	KPANNSLKI	L24;L47;L49;L51
1546	IIPARARVE	L57	IHADQLTP	L35;L28	KPPPGDQF	L39;L56;L22;L66
1547	IIRENNRV	L48	IIIWFLLLS	L73;L6	KPRPPLNRNY	L52;L13;L14;L22
1548	IISDMYDPK	L6	IILFLALI	L48;L47	KRFDNPVLP	L64;L30;L65;L66
1549	IISDMYDPKTK	L6	IILFLALITL	L4;L67	KRSFIEDLL	L64;L34;L66;L30
1550	IISNEKQEI	L24	IIMRLWLCW	L54;L52	KSAFVNLKQ	L54;L73;L18;L53
1551	IITTDNTF	L54	IIPLTTAAK	L57;L6	KSATCITRC	L54;L53;L18;L52
1552	IITTVAAF	L59	IIPLTTAAKL	L57;L5	KSEDAQGM	L55;L18;L54;L63
1553	IKESVQTF	L27	IIQFPNTY	L26;L18	KSFTVEKGIY	L54;L14;L18;L52
1554	IKESVQTFF	L27	IISVTSNY	L18;L26	KSHFAIGLAL	L57;L61;L73;L60
1555	IKIQEGVVD	L27	IKFADDLNQL	L27;L44	KSNIIRGWIF	L53;L54;L55;L52
1556	IKIQEGVVDY	L27	IKGTHHWLL	L66;L44	KSQDLSVVSK	L13;L7;L6;L15
1557	IKLDDKDPNF	L9	IKNFKSVLYY	L27;L12	KSREETGL	L53;L55;L65;L54
1558	IKLIFLWLLW	L52	IKWPWYIWLGF	L27;L8	KTCGQQQTT	L54;L53;L55;L16
1559	IKNADIVEE	L27	ILANTCTERL	L4;L2	KTCGQQQTTL	L53;L16;L55;L54
1560	IKNLSKSL	L27	ILDGISQYS	L5;L1	KTFPPTEPKK	L13;L7;L6;L52
1561	IKPVTYKL	L66	ILFTRFFY	L12;L18	KTFYVLPND	L13;L53;L54;L52
1562	IKRSDARTA	L27	ILLNVPLHGT	L2;L4	KTGDLQPL	L55;L73;L54;L53
1563	IKTIQPRV	L48	ILNNLGVDI	L24;L4	KTIGPDMF	L54;L52;L55;L53
1564	IKWADNNCY	L27	ILPDPSKPSK	L6;L5	KTLLSLREV	L73;L13;L52;L55
1565	ILASFSAST	L43	ILPSIISNE	L5;L57	KTLQPVSELL	L53;L16;L54;L52
1566	ILCIMSDRDLY	L18	ILPSIISNEK	L6;L57	KTTLPVNVAF	L53;L52;L16;L54
1567	ILFLALITLA	L3	ILPVSMTKT	L57;L5	KVFRSSVLH	L6;L7;L21;L54
1568	ILFTRFFYVL	L4	ILRGHLRIA	L3;L51	KVPTDNYITTY	L18;L11;L16;L14
1569	ILGTVSWNLR	L21	IMLVYCFLGY	L12;L6	KVTIDYTEI	L53;L55;L54;L24
1570	ILHCANFNVL	L57	IMQLFFSY	L18;L26	KVTLVFLF	L54;L55;L52;L33
1571	ILKPANNSLK	L6	IMQLFFSYF	L9;L26	KWDLIISDM	L62;L63;L68;L18

1572	ILLAKDTTEA	L2	INASVVNIQK	L19;L7	KWDLTAFGL	L62;L68;L63;L36
1573	ILLIIMRTFK	L6	INLIIKNL	L48;L25	KWGKARLYY	L12;L18;L14;L16
1574	ILLLDQAL	L23	INRPQIGVV	L3;L73	KYLVQQESPF	L8;L9;L72;L71
1575	ILLNKHIDA	L2	IPARARVECF	L49;L31	KYNENGTI	L9;L71;L8;L72
1576	ILMTARTV	L48	IPDYNTYKN	L49;L32	KYNENGTIT	L8;L72;L9;L71
1577	ILPSIISN	L57	IPFAMQMA	L50;L51	LAAVNSVPW	L49;L52;L61;L31
1578	ILPVSMTK	L57	IPFAMQMAYRF	L31;L49	LAFVVFLLVTL	L31;L69;L59;L47
1579	ILRGHLRI	L48	IPMDSTVKNY	L31;L49	LALYNKYKY	L12;L31;L52;L14
1580	ILSDDAVV	L2	IPVAYRKV	L47;L51	LATNNLVV	L47;L70;L50;L69
1581	ILSLLSKGR	L21	IPYNSVTSSI	L47;L22	LAVPYNMRVI	L47;L69;L70;L55
1582	ILTALRLCAY	L12	IQEGVVDY	L26;L27	LAWLYAAV	L47;L50;L59;L67
1583	IMASLVLARK	L6	IQKDVLEC	L48;L26	LAYCNKTV	L47;L70;L69;L48
1584	IMLIIFWF	L33	IQLLKSAY	L27;L26	LAYYFMRFR	L17;L69;L59;L47
1585	IMLIIFWFSL	L4	IQPGQTFSVL	L57;L26	LDYIINLI	L47;L48;L33;L25
1586	IMMNVAKY	L14	IQPIGALDI	L24;L48	LEFGATSAA	L46;L38;L42;L37
1587	IMRLWLCW	L48	IRASANLAA	L35;L46	LEFGATSAAL	L36;L41;L37;L40
1588	IMRLWLCWK	L13	IRENNRVVI	L34;L35	LEGSVRVV	L45;L37;L38;L48
1589	IMRTFKVSI	L48	IRQEEVQELY	L30;L14	LETAQNSV	L45;L46;L37;L38
1590	IMRTFKVSIW	L52	IRQLLFVV	L25;L35	LETIQITI	L45;L48;L37;L29
1591	IMTRCLAV	L48	IRQLLFVVEV	L64;L30	LFDRYFKY	L1;L62;L12;L18
1592	INFVRIIMRLW	L52	ISAMVRMYI	L55;L73	LFENKTTL	L62;L71;L72;L23
1593	INGDRWFLNR	L17	ISDEFSSNVA	L46;L68	LFFFLYENAF	L72;L71;L12;L9
1594	INGLMLLEI	L73	ISDEFSSNVANY	L1;L18	LFLPFFSNV	L47;L8;L71;L72
1595	INIIIWFL	L73	ISEHDYQIGGY	L1;L18	LGFSTGVNL	L44;L56;L61;L49
1596	INLHTQVV	L48	ISGINASVV	L73;L48	LIDLQELGKY	L1;L18;L14;L12
1597	INNTVYTKV	L73	ISLAGSYKD	L54;L55	LIIFWFSLEL	L60;L61;L73;L59
1598	INRPQIGV	L48	ISMDNSPNLAW	L52;L54	LITLATCEL	L60;L59;L61;L67
1599	IPGIPKDMTY	L31	ISMMGFKMNY	L1;L18	LKAPKEIIF	L27;L44;L66;L69

1600	IPIGAGICASY	L31	ISNCVADY	L54;L18	LKSPNFSKL	L44;L66;L64;L27
1601	IPKDMTYRRL	L39	ISNSWLMW	L54;L73	LLALHRSY	L26;L59;L1;L18
1602	IPKDMTYRRLI	L39	ISQYSLRL	L73;L60	LLFLAFVVFL	L4;L2;L3;L5
1603	IPKEEVKP	L51	ISSVLNDIL	L67;L53	LLFLMSFTV	L5;L2;L4;L3
1604	IPKEEVKPFI	L47	ISTKHFYW	L54;L52	LLHKPIVWHV	L3;L5;L4;L2
1605	IPMDSTVKNYF	L31	ITDAQTGSS	L1;L18	LLLDKRTTC	L4;L23;L16;L2
1606	IPRRNVATLQA	L51	ITDAQTGSSK	L18;L1	LLSDLQDL	L4;L3;L57;L59
1607	IPTITQMNLKY	L31	ITDAQTGSSKC	L18;L1	LLTILTSL	L23;L59;L74;L25
1608	IPYNSVTS	L47	ITDVFYKEN	L1;L68	LLTLQQIEL	L74;L68;L2;L56
1609	IPYNSVTSSIV	L47	ITDVFYKENSY	L1;L18	LMCQPILLL	L5;L4;L61;L34
1610	IPYNSVTSSIVI	L47	ITEHSWNADLY	L1;L18	LNDFNLVAM	L68;L62;L63;L32
1611	IQDSLSSTA	L28	ITFDNLKTLL	L20;L53	LNDLNETL	L68;L63;L62;L67
1612	IQFPNTYLE	L24	ITGGIAIAM	L70;L58	LNDLNETLV	L63;L62;L1;L68
1613	IQITISSFK	L13	ITGRLQSL	L53;L54	LPDPSKPSK	L32;L22;L31;L49
1614	IQITISSFKW	L54	ITILDGISQ	L53;L52	LPETTADIVVF	L31;L39;L32;L49
1615	IQKEIDRL	L48	ITLCFTLK	L6;L7	LPFGWLIV	L47;L50;L51;L39
1616	IQRKYKGI	L48	ITLCFTLKRK	L7;L6	LPFGWLIVGVAL	L56;L31;L22;L39
1617	IQRKYKGIKI	L48	ITQMNLKY	L18;L1	LPGTILRTT	L51;L50;L32;L56
1618	IQTIVEVQ	L48	ITREEAIRH	L53;L52	LPIDKCSRII	L47;L32;L49;L39
1619	IQTTPGSGV	L28	ITREEAIRHV	L13;L52	LPKGIMMNV	L51;L47;L39;L50
1620	IQWMVMFTP	L24	ITVNVLAW	L54;L52	LPPLLTDEM	L31;L22;L47;L32
1621	IRAAEIRAS	L64	IVAGGIVA	L51;L50	LPVLQVRDV	L47;L50;L51;L39
1622	IRENNRVV	L64	IVAGGIVAIV	L20;L3	LQFTSLEI	L48;L24;L47;L25
1623	IRGGDGKMK	L30	IVAIVVTCLAY	L12;L18	LQKAAITIL	L44;L58;L26;L69
1624	IRHVRAWIGF	L30	IVDEPEEHVQ	L63;L68	LQSLENVAF	L26;L27;L31;L34
1625	IRQGTDYKH	L30	IVDSVTVK	L63;L68	LRGTAVMSL	L65;L66;L35;L64
1626	IRVGARKSA	L30	IVEVQPQL	L63;L68	LSDRELHLSW	L52;L1;L54;L18
1627	ISAARQGFV	L73	IVFITLCFTLK	L6;L7	LSDRVVFV	L63;L68;L62;L1
1628	ISAGFSLWVYK	L7	IVFMCVEY	L26;L59	LSGLDSLDTY	L18;L1;L52;L14
1629	ISAMVRMYIF	L53	IVNNATNVVIK	L7;L6	LTILTSLL	L60;L1;L59;L61
1630	ISDEFSSNVAN	L68	IVVTCLAYYF	L12;L52	LTILTSLLVL	L67;L60;L59;L73

1631	ISDEVARDLS	L1	IWNVKDFMSL	L8;L9	LTKPYIKW	L52;L54;L53;L55
1632	ISDYDYYR	L1	IWVATEGAL	L28;L67	LVFLGIITT	L50;L51;L69;L13
1633	ISFPLCAN	L59	IYDEPTTTTS	L62;L9	LVKNKCVNF	L58;L26;L43;L52
1634	ISFPLCANGQVF	L52	IYDEPTTTTSV	L62;L5	LVSTQEFRY	L12;L14;L18;L1
1635	ISLAGSYKDW	L52	IYKTPPIKD	L9;L13	LWAHGFEL	L61;L59;L60;L56
1636	ISMATNYDL	L53	IYKTPPIKDF	L9;L8	LYDANYFLC	L62;L1;L9;L12
1637	ISPYNSQNAV	L57	IYLYLTFYLT	L9;L8	LYDKLQFTSL	L62;L9;L68;L8
1638	ISRQRLTK	L13	IYNDKVAG	L71;L72	LYFIKGLNNL	L9;L8;L71;L72
1639	ISSDVLVN	L73	IYNDKVAGFAKF	L9;L8	LYIIKLIFLW	L9;L8;L52;L12
1640	ISTCACEI	L55	IYQAGSTP	L71;L72	LYLDAYNMM	L71;L72;L8;L9
1641	ISTEIYQAG	L43	IYQAGSTPC	L71;L72	LYLTFYLTN	L8;L9;L71;L72
1642	ITDAQTGS	L1	IYQTSNFR	L71;L72	LYNKYKYF	L9;L62;L72;L71
1643	ITDVFYKE	L1	IYSLLLCRM	L62;L9	LYNSASFSTF	L8;L9;L72;L71
1644	ITEEVGHTDLM	L18	IYSTAALGV	L72;L71	LYYQNNVFM	L72;L71;L62;L9
1645	ITFELDERIDK	L7	IYSTAALGVL	L9;L8	MADQAMTQMY	L1;L18;L31;L49
1646	ITGLYPTL	L67	IYTELEPPCRF	L9;L8	MAFPSGKVE	L69;L70;L61;L32
1647	ITGNTLQCI	L53	KACPLIAA	L50;L51	MEKLKTLV	L45;L33;L23;L48
1648	ITLATCEL	L60	KAFKQIVESC	L54;L52	MEKLKTLVA	L42;L46;L38;L37
1649	ITLATCELYHY	L12	KAIVSTIQRKY	L14;L52	MELTPVVQTI	L45;L40;L41;L36
1650	ITNCVKML	L73	KALRKVPTD	L54;L52	MGYINVFAF	L27;L26;L47;L59
1651	ITNLCPFGEVF	L52	KATEETFKLSY	L14;L18	MIDVQQWGF	L63;L1;L68;L54
1652	ITPCSFGGV	L57	KCDRAMPNML	L63;L68	MIERFVSL	L60;L63;L68;L23
1653	ITPGTNTSN	L57	KCKSAFYIL	L39;L13	MLDNRATL	L62;L63;L68;L5
1654	ITREVGFVVP	L52	KDAPYIVGD	L65;L33	MPLGYVTHGL	L31;L32;L56;L22
1655	ITSGDGTTS	L53	KDKSAQCF	L33;L55	MRIFTIGTV	L35;L64;L30;L28
1656	ITSKETLYC	L18	KDLSPRWY	L55;L14	MRNAGIVGV	L30;L64;L35;L25
1657	ITSKETLYCI	L53	KDMTYRRL	L33;L55	MRNAGIVGVL	L65;L35;L66;L30
1658	ITTDNTFV	L73	KDVVECLKL	L33;L37	MSDVKCTSV	L63;L68;L18;L1
1659	ITTYPGQGLNGY	L1	KEDLKFPRG	L45;L36	MVSLLSVL	L59;L67;L25;L74
1660	ITVATSRTLSY	L18	KEELDKYFK	L36;L38	MWLIINLV	L48;L47;L25;L33
1661	ITVEELKK	L7	KEGFFTYI	L45;L33	MWLSYFIASF	L9;L8;L12;L10
1662	ITVEELKKLL	L53	KEGQINDM	L33;L37	MYMGTLSY	L71;L72;L66;L12

1663	IVAAIVFIT	L20	KEGQINDMI	L45;L36	NANQVIVNN	L49;L17;L31;L19
1664	IVAGGIVAIVV	L20	KEGSSVELKHF	L41;L40	NAVASKIL	L70;L60;L61;L69
1665	IVAIVVTCLAYY	L18	KEGVEFLRD	L45;L65	NDPVGFTL	L33;L57;L66;L71
1666	IVEEAKKV	L63	KENDSKEGFFTY	L40;L14	NEFACVVAD	L29;L46;L37;L42
1667	IVGDVVQEGV	L20	KESVQTFF	L33;L29	NEYRLYLDA	L42;L46;L38;L25
1668	IVGGQIVTC	L26	KETLYCIDGA	L38;L42	NFCALILAY	L12;L72;L71;L31
1669	IVGVALLAVF	L52	KFKEGVEFLR	L15;L21	NFKNLREF	L71;L72;L62;L23
1670	IVKFISTCA	L51	KFLKTNCCRF	L8;L9	NFVFPLNSI	L8;L71;L9;L72
1671	IVNNWLKQLIK	L6	KFLPFQQFGR	L15;L21	NFVRIIMRL	L20;L8;L29;L9
1672	IVNSVLLFLAF	L12	KFNGLTVLP	L8;L62	NGVEGFNCY	L29;L49;L27;L10
1673	IVNVSLVKPSF	L52	KFNPPALQDAY	L14;L12	NIKPVPEV	L3;L48;L23;L58
1674	IVQLSEISM	L28	KFTDGVCLFW	L8;L9	NKWGKARLY	L27;L64;L14;L66
1675	IVQMLSDTL	L67	KFVRIQPGQTF	L8;L9	NLAKHCLHV	L3;L24;L2;L4
1676	IVRFPNITNL	L13	KFYDAQPC	L72;L71	NLDSKVGGNY	L1;L18;L14;L12
1677	IVSTIQRKYK	L13	KGRLIIREN	L55;L13	NLEEAARY	L1;L18;L12;L14
1678	IVVTCLAY	L59	KGSLPINVI	L16;L44	NLIDSYFVVK	L6;L19;L7;L13
1679	IVWHVNNATNK	L6	KGVEAVMY	L54;L27	NLKTLLSL	L23;L3;L25;L57
1680	IVYTACSHAA	L51	KGYHLMSF	L54;L59	NLKTLLSLR	L15;L17;L21;L19
1681	IWLGFIAGLI	L8	KHFSMMIL	L28;L35	NLLEILQKE	L4;L24;L2;L5
1682	IWNLDYIINL	L62	KHITSKETLY	L14;L18	NLPGCDGGSLY	L14;L12;L11;L18
1683	IWNVKDFM	L62	KHLIPLMY	L27;L18	NLQSNHDLY	L1;L18;L12;L14
1684	IYSKHTPIN	L9	KHSSGVTR	L21;L15	NPETNILL	L39;L56;L23;L32
1685	IYTELEPPC	L9	KHSSGVTREL	L34;L28	NPFMIDVQQ	L49;L32;L31;L50
1686	KAHFPREGV	L13	KHTPINLVR	L35;L21	NPKAIKCV	L39;L23;L51;L47
1687	KAHKDKSAQ	L43	KHVYQLRAR	L15;L21	NPNYEDLLI	L49;L32;L34;L47
1688	KAHKDKSAQCF	L54	KIADKYVR	L21;L15	NQFNSAIGK	L7;L19;L13;L6
1689	KAIDGGVT	L55	KIADKYVRN	L43;L16	NQPYPNASF	L27;L26;L57;L9
1690	KAIDGGVTRD	L54	KIITLKKR	L21;L15	NQVIVNNL	L48;L25;L35;L28
1691	KALRKVPTDNY	L14	KILGLPTQT	L6;L16	NRGMVLGSL	L66;L25;L35;L30
1692	KARLYYDSM	L43	KIQDSLSST	L14;L16	NRNRFLYII	L35;L34;L64;L30
1693	KASCTLSEQL	L54	KITEHSWNADLY	L14;L18	NRPQIGVVR	L66;L19;L30;L35

1694	KASMPTTIAK	L6	KIVNNWLKQL	L16;L60	NSTLEQYVF	L53;L54;L55;L52
1695	KAYKDYLAS	L43	KIYSKHTPINL	L16;L6	NTCDGTTF	L53;L54;L70;L58
1696	KAYNVTQA	L69	KKFDTFNGE	L27;L44	NTKHSSGVTR	L17;L19;L15;L21
1697	KAYNVTQAFGR	L15	KKIKACVEE	L44;L27	NTSNQVAVLY	L12;L18;L1;L14
1698	KCAYWVPR	L21	KKKADETQAL	L44;L27	NTWCIRCLW	L52;L16;L54;L53
1699	KCDHCGETSW	L54	KKLLEQWNL	L44;L27	NTYLEGSVR	L17;L19;L21;L15
1700	KCDRAMPNM	L63	KKPNELSRV	L5;L24	NVAFELWAK	L7;L19;L6;L17
1701	KCEESSAKSA	L38	KKPNELSRVL	L44;L66	NVLTLVYKV	L4;L20;L24;L5
1702	KCKSAFYI	L55	KKQQTVTLL	L44;L27	NVLTLVYKVY	L10;L14;L12;L11
1703	KCRSKNPLL	L13	KKVDGVVQ	L27;L44	NYITTYPGQGL	L8;L72;L71;L9
1704	KCSRIIPAR	L21	KKVDGVVQQ	L27;L44	NYLGKPREQ	L71;L72;L8;L17
1705	KDASGKPVP	L46	KKVDGVVQQL	L44;L27	NYLKRRVV	L71;L25;L23;L72
1706	KDASGKPVPY	L43	KKVKPTVVV	L44;L27	NYLKSPNF	L9;L8;L71;L72
1707	KDATPSDF	L33	KKWKYPQVN	L44;L27	NYNYLYRL	L66;L62;L8;L71
1708	KDATPSDFVR	L21	KLALGGSVAI	L16;L2	NYQKVGMQK	L17;L13;L71;L8
1709	KDCPAVAK	L33	KLCEEMLDNR	L21;L15	NYQVNGYPNMF	L9;L8;L72;L71
1710	KDCPAVAKH	L33	KLDGFMGR	L21;L15	NYSGVVTTVM	L66;L71;L72;L8
1711	KDEDDNLIDSY	L18	KLDGFMGRIR	L21;L15	NYTVSCLPF	L72;L9;L71;L8
1712	KDFMSLSE	L33	KLDGVVCTE	L5;L2	NYYKKDNSYF	L8;L71;L9;L72
1713	KDFYDFAV	L33	KLDNDALNN	L18;L5	PAFDKSAF	L43;L59;L58;L70
1714	KDFYDFAVSK	L13	KLDNYYKKDNSY	L18;L1	PAFDKSAFV	L20;L58;L69;L70
1715	KDGHVETFY	L14	KLFAAETLKA	L3;L2	PEEHFIETI	L45;L37;L36;L42
1716	KDGIIWVA	L65	KLGSLVVR	L21;L15	PFFSNVTWF	L9;L72;L8;L71
1717	KDGTCGLV	L33	KLHDELTGHML	L2;L16	PINPTDQSSY	L43;L14;L26;L18
1718	KDHIGTRN	L33	KLINIIIWFLL	L4;L16	PLIAAVITR	L21;L19;L17;L15
1719	KDKKKKAD	L23	KLKKSLNVA	L3;L51	PLIQPIGAL	L4;L10;L3;L11
1720	KDKSAQCFK	L13	KLKKSLNVAK	L13;L6	PLNSIIKTI	L24;L3;L4;L16
1721	KDLLARAG	L33	KLKPVLDW	L16;L54	PLVDLPIGI	L3;L2;L4;L5
1722	KDLPKEIT	L33	KLKVDTANPK	L13;L6	PTLNISDEF	L53;L52;L9;L12
1723	KDMTYRRLI	L55	KLLHKPIVWHV	L4;L2	PYCYDTNVL	L9;L8;L72;L71
1724	KDMTYRRLISM	L33	KLLKSIAATR	L21;L15	PYNSVTSSI	L9;L8;L72;L71
1725	KDPNFKDQV	L33	KLMGHFAW	L16;L54	QAGNVQLRV	L73;L69;L24;L70
1726	KDQVILLN	L33	KLQFTSLEI	L24;L16	QEAYEQAVA	L42;L38;L46;L40
1727	KDTEKYCAL	L33	KLQNNELSPV	L2;L3	QEGVLTAV	L45;L33;L48;L37

1728	KDVLECNV	L33	KLQSSQAW	L54;L16	QEGVLTAVVI	L40;L41;L36;L45
1729	KDYLASGG	L33	KLRSDVLLPL	L6;L3	QEHYVRITG	L42;L41;L38;L29
1730	KEELDKYF	L33	KLSYGIATVR	L21;L15	QEHYVRITGL	L37;L41;L36;L40
1731	KEELDKYFKN	L38	KLWAQCVQLH	L6;L16	QELGKYEQYI	L40;L45;L41;L36
1732	KEEVKPFI	L45	KMFDAYVNT	L13;L16	QELYSPIFLI	L41;L40;L36;L45
1733	KEEVKPFIT	L38	KMFYKGVITH	L16;L6	QGDDYVYL	L63;L62;L68;L67
1734	KEGATTCGY	L14	KMKDLSPR	L15;L21	QIDRLITGR	L21;L17;L19;L15
1735	KEGATTCGYL	L36	KMQRMLLEK	L13;L6	QLCQYLNTL	L4;L3;L5;L57
1736	KEGQINDMIL	L36	KMSDVKCTSV	L3;L2	QLIKVTLV	L48;L3;L24;L23
1737	KEGQINDMILSL	L36	KMVSLLSV	L48;L73	QLLFVVEV	L4;L2;L23;L48
1738	KEGSSVELK	L36	KNADIVEEA	L3;L46	QPILLLDQAL	L22;L32;L31;L56
1739	KEIKESVQTFF	L36	KNIDGYFKIY	L14;L27	QPRVEKKKL	L39;L22;L23;L56
1740	KEILVTYNCC	L38	KNKCVNFNF	L53;L52	QPVSELLTP	L32;L51;L50;L31
1741	KEITVATS	L37	KNLREFVF	L54;L53	QRNAPRITF	L30;L65;L34;L66
1742	KELLVYAADP	L38	KPFLNKVVS	L56;L50	QSTQWSLFF	L73;L53;L55;L54
1743	KENDSKEGFF	L40	KPFLNKVVST	L56;L50	QTIEVNSFSGY	L11;L14;L1;L10
1744	KENSYTTTIKP	L38	KPGNFNKDF	L39;L56	QTYVTQQL	L55;L70;L48;L25
1745	KEPCSSGTY	L14	KPHNSHEGKTF	L39;L56	QTYVTQQLI	L55;L48;L24;L53
1746	KESPFELE	L33	KPIVWHVNNA	L51;L50	QVRDVLVRGF	L10;L11;L52;L26
1747	KESPFELEDFI	L36	KPLEFGATSA	L51;L50	QWNLVIGFLF	L9;L40;L41;L8
1748	KESVQTFFKLV	L45	KPPISFPL	L22;L56	QYELKHGTF	L9;L62;L8;L72
1749	KFADDLNQLTGY	L14	KPSFYVYSR	L21;L15	QYGSFCTQL	L9;L66;L72;L8
1750	KFCLEASFNY	L12	KPSKRSFIED	L56;L39	QYIDIGNY	L72;L71;L14;L66
1751	KFDEDDSE	L62	KPTETICA	L51;L50	QYIKWPWYI	L9;L8;L64;L55
1752	KFDEDDSEP	L62	KPTETICAPL	L56;L22	QYNRYLALY	L14;L12;L72;L9
1753	KFDTFNGE	L62	KPTVVVNA	L51;L50	RAFDIYNDK	L13;L7;L6;L19
1754	KFDTFNGEC	L62	KQDDKKIKA	L24;L63	RAMPNMLRIM	L69;L70;L52;L55
1755	KFISTCAC	L71	KQEILGTV	L48;L24	RDLSLQFKR	L15;L21;L30;L7
1756	KFISTCACEI	L8	KQFDTYNLWNTF	L16;L27	RDVLVRGF	L33;L65;L37;L29
1757	KFKTEGLCV	L13	KQGNFKNLR	L21;L15	REEAIRHVRA	L38;L42;L46;L37

1758	KFLKTNCCR	L15	KQIYKTPPI	L48;L24	REFLTRNPA	L46;L38;L42;L37
1759	KFLPFQQFG	L8	KQYGDCLGD	L27;L24	REGVFVSN	L33;L45;L37;L29
1760	KFLTENLLLYI	L8	KRAKVTSAM	L66;L30	RELKVTFFP	L38;L42;L46;L33
1761	KFLVFLGI	L8	KRHTFSNY	L66;L65	RELNGGAYTR	L21;L36;L15;L38
1762	KFLVFLGII	L8	KRISNCVADY	L30;L14	REPMLQSA	L33;L37;L38;L46
1763	KFNPPALQ	L62	KRNVIPTI	L48;L66	RFPNITNLC	L8;L9;L72;L71
1764	KFNPPALQDAYY	L14	KRRVVFNGV	L13;L30	RGDKSVYY	L18;L1;L54;L27
1765	KFPRGQGV	L71	KRSFIEDL	L65;L66	RHINAQVAK	L7;L28;L13;L6
1766	KFYDAQPCSDK	L6	KRSFIEDLLF	L30;L34	RHSLSHFVNL	L34;L56;L28;L35
1767	KFYGGWHNMLK	L6	KSAQCFKM	L54;L55	RIFTIGTV	L48;L24;L3;L33
1768	KGAKLLHKP	L46	KSAQCFKMFY	L18;L14	RIFTIGTVTLK	L6;L7;L13;L21
1769	KGDYGDAVV	L63	KSATCITR	L21;L15	RIMASLVL	L73;L61;L60;L56
1770	KGFCDLKGK	L13	KSAYENFNQ	L54;L53	RIMASLVLAR	L21;L6;L7;L15
1771	KGFCDLKGKY	L14	KSDGTGTIYT	L18;L1	RKYKGIKI	L24;L27;L48;L44
1772	KGGAPTKVTF	L65	KSDGTGTIYTEL	L18;L68	RLANECAQV	L3;L24;L2;L4
1773	KGGRTIAF	L54	KSIAATRGA	L46;L55	RLFRKSNLK	L6;L21;L13;L7
1774	KGIKIQEGV	L24	KSLNVAKSE	L55;L53	RLQSLENV	L4;L24;L2;L3
1775	KGIMMNVAKY	L14	KSNHNFLV	L73;L18	RNFYEPQII	L24;L55;L65;L73
1776	KGLDYKAF	L27	KSNHNFLVQ	L73;L18	RNRDVDTDF	L27;L26;L65;L53
1777	KGLDYKAFK	L13	KSNIIRGWI	L55;L73	RQALLKTVQF	L27;L44;L26;L16
1778	KGLNNLNR	L15	KSTNLVKNK	L13;L7	RQCSGVTF	L27;L26;L44;L54
1779	KGLPWNVV	L48	KSVLYYQNNVF	L54;L52	RQFHQKLL	L48;L44;L24;L27
1780	KGLYRKCVKSR	L15	KSWMESEFR	L21;L15	RQGTDYKHW	L54;L16;L52;L14
1781	KGPITDVFY	L14	KSYVHVVDG	L73;L53	RQIAPGQTG	L24;L26;L27;L44
1782	KGPKVKYLYF	L8	KTHVQLSLP	L18;L53	RQKKQQTVTL	L44;L26;L27;L56
1783	KGVAPGTAV	L51	KTILRKGGR	L21;L15	RQVVNVVTT	L44;L26;L27;L24
1784	KGVAPGTAVL	L44	KTPEEHFI	L55;L53	RQWLPTGTLL	L44;L27;L30;L24
1785	KGVEAVMYM	L69	KTPKYKFVR	L21;L15	RRVVFNGVSF	L30;L65;L54;L53
1786	KGVHFVCNL	L69	KTQFNYYKK	L13;L7	RSEDKRAKV	L63;L73;L18;L13

1787	KHADFDTW	L54	KTTEVVGD	L54;L55	RSQMEIDFL	L55;L73;L53;L65
1788	KHAFLCLFLL	L34	KTTEVVGDIILK	L6;L7	RSVASQSI	L55;L54;L53;L48
1789	KHDFFKFRI	L34	KTTVASLI	L55;L54	RTIAFGGCVFSY	L18;L14;L16;L52
1790	KHFYWFFSN	L16	KTVQFCDAM	L54;L53	RTLLTKGTL	L55;L53;L16;L44
1791	KHKHAFLCL	L13	KTYERHSLS	L18;L73	RTTNGDFLH	L54;L53;L52;L7
1792	KIADYNYK	L6	KVATVQSK	L13;L6	RVDFCGKGY	L18;L14;L1;L26
1793	KIALKGGKI	L24	KVGGNYNYLYR	L21;L15	RVESSSKLW	L54;L18;L52;L16
1794	KIFVDGVPFVV	L16	KVPATVSV	L5;L57	RVQPTESIVR	L21;L15;L7;L13
1795	KILNNLGV	L73	KVTIDYTEISF	L16;L52	RVVTTFDSEY	L14;L18;L26;L54
1796	KINAACRKV	L73	KVTKGKAKK	L13;L6	RYFRLTLGV	L24;L13;L8;L71
1797	KIVDEPEEHV	L2	KVYYGNALD	L14;L21	RYMNSQGL	L71;L72;L8;L9
1798	KKAGGTTE	L27	KWADNNCY	L54;L18	RYRIGNYKL	L8;L9;L13;L66
1799	KKAGGTTEML	L44	KWDLIISD	L62;L68	RYWEPEFYEA	L8;L13;L9;L65
1800	KKCKSAFY	L27	KWDLTAFGLV	L62;L18	SAAKKNNL	L74;L23;L56;L58
1801	KKCKSAFYIL	L44	KWPWYIWLGF	L8;L9	SAFAMMFVK	L7;L6;L19;L69
1802	KKGAKLLHK	L6	KYFSGAMDTTSY	L14;L71	SAMQTMLF	L58;L59;L74;L70
1803	KKKLDGFMGR	L15	KYFVKIGPER	L15;L21	SAMVRMYIF	L59;L58;L69;L70
1804	KKLKKSLNV	L73	KYLPIDKCSRI	L8;L9	SCVLSGHNL	L60;L36;L56;L34
1805	KKRWQLAL	L27	KYLVQQESP	L71;L8	SDIDITFLK	L7;L19;L6;L13
1806	KKSTNLVKN	L44	KYNENGTITD	L8;L9	SDIDITFLKK	L7;L13;L19;L6
1807	KLALGGSVAIK	L6	KYPQVNGLTS	L8;L9	SDIDYVPLK	L7;L13;L6;L19
1808	KLASHMYCSFY	L18	KYPQVNGLTSI	L9;L8	SDNGPQNQR	L15;L21;L17;L19
1809	KLDDKDPNFK	L6	KYVRNLQHRL	L8;L9	SDYDYYRY	L29;L65;L43;L14
1810	KLDGVVCT	L63	LAAECTIFK	L7;L19	SEAFLIGC	L33;L45;L37;L29
1811	KLDNDALN	L18	LAAIMQLFFSY	L31;L12	SEDNQTTTIQTI	L40;L45;L36;L41
1812	KLDNYYKK	L18	LAATKMSEC	L70;L58	SEPVLKGV	L33;L48;L45;L37
1813	KLDNYYKKD	L5	LAATVRLQA	L50;L51	SEPVLKGVKL	L36;L41;L37;L40
1814	KLEGYAFEH	L18	LACEDLKPV	L47;L70	SETKCTLKSF	L40;L41;L29;L37
1815	KLEGYAFEHI	L18	LACFVLAAVY	L31;L12	SEVGPEHSLA	L38;L42;L46;L41
1816	KLEGYAFEHIVY	L18	LADNKFALT	L63;L1	SFLAHIQWM	L71;L72;L12;L8
1817	KLGASQRV	L24	LAHIQWMVMF	L31;L49	SFNPETNI	L62;L48;L71;L72

1818	KLGSLVVRCSF	L16	LAIDAYPLT	L61;L31	SFPLCANGQVF	L72;L71;L9;L8
1819	KLHDELTGHM	L14	LAIDAYPLTK	L7;L61	SFRLFARTR	L17;L15;L21;L48
1820	KLHNWNCVN	L16	LAKALNDF	L58;L59	SFSGYLKL	L62;L8;L72;L71
1821	KLIANQFNSA	L46	LAKDTTEA	L43;L50	SFYVYSRV	L48;L62;L71;L72
1822	KLINIIIWFLLL	L6	LAKHCLHV	L70;L47	SFYVYSRVK	L13;L71;L72;L7
1823	KLKALNLGETF	L16	LALITLAT	L59;L47	SGAMDTTSY	L43;L26;L27;L14
1824	KLKKSLNV	L13	LALLSDLQDL	L31;L60	SIIIGGAKLK	L7;L19;L13;L6
1825	KLLEQWNLVIGF	L16	LANECAQV	L47;L70	SIVCRFDTR	L19;L17;L21;L15
1826	KLLGVGGK	L6	LAPLLSAG	L57;L59	SLDTYPSLE	L1;L62;L63;L18
1827	KLLGVGGKP	L14	LAPLLSAGI	L47;L57	SLENVAFNV	L4;L5;L2;L24
1828	KLLHKPIVWH	L6	LATHGLAA	L50;L61	SLETIQITI	L24;L5;L2;L68
1829	KLMGHFAWWTA	L16	LCDRRATCF	L63;L62	SLIDLQELGK	L6;L7;L13;L19
1830	KLMGHFAWWTAF	L16	LCEKALKY	L1;L18	SLIDLQELGKY	L14;L11;L12;L10
1831	KLMVVIPDYNTY	L18	LCPFGEVF	L72;L71	SLKVPATVSV	L43;L3;L2;L13
1832	KLNEEIAIILA	L2	LDEWSMATY	L18;L1	SLNGVTLI	L24;L3;L74;L48
1833	KLNTDHSSS	L16	LDEWSMATYY	L1;L18	SLRPDTRY	L26;L43;L27;L14
1834	KLNVGDYF	L62	LDISASIVA	L46;L38	SLVKPSFYV	L5;L2;L4;L20
1835	KLNVGDYFVL	L16	LDSCKRVL	L65;L33	SMDNSPNL	L62;L68;L63;L28
1836	KLQDVVNQNA	L2	LDSFKEEL	L33;L65	SMMGFKMNY	L26;L14;L12;L16
1837	KLQNNELSP	L16	LDWLEEKF	L33;L29	SMQNCVLKL	L4;L3;L73;L8
1838	KLRGTAVMSLK	L6	LEASFNYL	L45;L29	SNSGSDVLY	L14;L12;L27;L18
1839	KLRSDVLL	L74	LEDEFTPF	L29;L62	SPDAVTAY	L31;L49;L1;L22
1840	KLSHQSDIEV	L2	LEGETLPTEV	L45;L38	SPFELEDF	L31;L49;L56;L39
1841	KLTCATTR	L21	LEGYAFEHI	L45;L41	SPFHPLAD	L50;L51;L65;L49
1842	KLTDNVYI	L2	LEILDITP	L38;L46	SPFHPLADN	L51;L49;L56;L22
1843	KLVLSVNPYV	L2	LEILDITPC	L38;L29	SPIQYIDIGNY	L31;L11;L14;L49
1844	KLVSSFLEMK	L6	LEILDITPCSF	L40;L41	SPNECNQMC	L49;L32;L56;L39
1845	KMADQAMTQ	L16	LEIPRRNVAT	L38;L46	SPNECNQMCL	L56;L39;L32;L22
1846	KMKDLSPRWYF	L16	LEKCDLQNY	L29;L26	SPNLAWPLI	L47;L22;L50;L39
1847	KMSECVLGQ	L16	LELAMDEF	L29;L33	SPTKLNDL	L56;L39;L22;L23
1848	KMVSLLSVLL	L44	LEPPCRFV	L45;L64	SRELKVTF	L65;L35;L66;L34

1849	KNLSDRVV	L73	LEQWNLVIGF	L40;L41	SRLDKVEA	L65;L25;L35;L66
1850	KNSKVQIGEY	L14	LEQYVFCTVNA	L38;L42	SSAKSASVYY	L18;L1;L58;L14
1851	KNTVKSVGK	L13	LETAQNSVRV	L45;L38	SSQGSEYDY	L14;L1;L18;L26
1852	KPASRELKVTF	L39	LETIQITISSF	L40;L41	SSVLNDILSR	L19;L7;L15;L17
1853	KPGGTSSGD	L65	LFARTRSM	L72;L71	STECSNLLL	L1;L18;L68;L63
1854	KPIVWHVNN	L56	LFDESGEFK	L62;L1	STFEEAALCTF	L16;L52;L10;L53
1855	KPLEFGATSAA	L51	LFDMSKFPL	L62;L68	STFISAAR	L21;L15;L19;L17
1856	KPNELSRVLGL	L56	LFFSYFAV	L71;L72	STLEQYVF	L53;L54;L52;L55
1857	KPNTWCIRC	L56	LFIRQEEV	L48;L71	STVLSFCAF	L10;L52;L60;L59
1858	KPPPGDQFKHL	L39	LFLAFVVFLL	L8;L9	SVAYESLR	L19;L21;L17;L15
1859	KPREQIDGYVM	L39	LFLALITLA	L50;L12	SVIDLLLDD	L11;L7;L12;L49
1860	KPRSQMEI	L39	LFSTVFPPTSF	L9;L8	SVPWDTIANY	L11;L10;L12;L14
1861	KPRSQMEIDF	L39	LFTRFFYVL	L8;L9	SVQTFFKLV	L13;L20;L73;L64
1862	KPSKRSFIEDL	L56	LFVTVYSH	L71;L72	SVSSPDAVTAY	L14;L6;L11;L12
1863	KPTETICAP	L51	LFVTVYSHLL	L8;L9	SVTSNYSGV	L11;L3;L10;L20
1864	KPVPEVKI	L47	LFYSYATH	L71;L72	SVVNARLR	L19;L15;L17;L21
1865	KPVSEEVV	L51	LFYSYATHS	L72;L71	SYEDQDAL	L72;L71;L62;L66
1866	KPYIKWDLLK	L6	LGDELGTDPY	L1;L18	SYFIASFR	L17;L71;L15;L72
1867	KQARSEDKR	L21	LGDVRETMSY	L18;L1	SYLTPGDSS	L71;L72;L9;L8
1868	KQASLNGV	L24	LGFIAGLI	L47;L48	SYYKLGASQR	L17;L15;L19;L21
1869	KQASLNGVT	L44	LGLAAIMQL	L4;L61	SYYSLLMPI	L71;L8;L72;L9
1870	KQATKYLV	L24	LGSLAATV	L47;L48	TACTDDNAL	L32;L67;L57;L68
1871	KQATKYLVQ	L44	LGVLVPHV	L47;L48	TAFGLVAEWF	L31;L49;L52;L58
1872	KQIRSAAKK	L24	LGYVTHGL	L25;L47	TAHSCNVNR	L17;L19;L15;L21
1873	KQIVESCGNF	L26	LHAPATVC	L28;L35	TANKWDLII	L32;L47;L73;L49
1874	KQIYKTPPIK	L13	LHNDILLAK	L6;L7	TASDTYACW	L49;L54;L52;L10
1875	KQLPFFYYS	L15	LIAIVMVTI	L47;L24	TCGQQQTTL	L34;L35;L28;L65
1876	KQQTVTLLP	L24	LIANQFNSA	L46;L50	TCLAYYFMR	L17;L15;L21;L7
1877	KQRRPQGL	L44	LIIMRTFKV	L4;L5	TDPSFLGRY	L14;L11;L12;L10
1878	KQVEQKIAE	L44	LIKVTLVFLF	L52;L12	TEDDYQGKP	L38;L42;L46;L45

1879	KQYGDCLGDI	L24	LIPLMYKGL	L57;L5	TEEVGHTDL	L36;L25;L37;L45
1880	KRDAPAHI	L63	LIVAAIVF	L59;L60	TEHSWNADLY	L41;L29;L14;L40
1881	KRFKESPF	L66	LKAPKEIIFL	L44;L64	TEISFMLW	L41;L40;L29;L45
1882	KRHTFSNYQH	L30	LKFNPPAL	L66;L59	TENKYSQL	L33;L37;L29;L45
1883	KRISNCVAD	L30	LKFPRGQGV	L25;L64	TENLLLYI	L45;L48;L33;L41
1884	KRNIKPVP	L65	LKPANNSL	L57;L66	TENLLLYID	L42;L29;L40;L41
1885	KRNIKPVPE	L30	LKQLIKVTL	L44;L56	TENLTKEGA	L42;L38;L46;L37
1886	KRNIKPVPEV	L30	LKQLPFFYY	L27;L12	TERLKLFAA	L42;L46;L38;L37
1887	KRNIKPVPEVK	L30	LLADKFPVLH	L6;L3	TESNKKFL	L33;L37;L45;L36
1888	KRNRATRVE	L65	LLAKDTTEA	L3;L2	TEVNEFACVV	L38;L37;L45;L36
1889	KRNVIPTIT	L30	LLAKDTTEAF	L26;L43	TFCAGSTF	L72;L71;L62;L9
1890	KRNVIPTITQ	L30	LLAPLLSAG	L3;L4	TFISAARQGF	L8;L9;L12;L72
1891	KRNVIPTITQM	L30	LLEKCDLQNY	L1;L18	TFLKKDAPY	L12;L71;L72;L14
1892	KRPINPTD	L66	LLFLAFVV	L47;L23	TFYLTNDV	L48;L71;L62;L72
1893	KRRVVFNGVSF	L30	LLKDCPAVA	L3;L51	TFYPKLQSS	L8;L43;L72;L71
1894	KRTATKAY	L66	LLKSAYENF	L43;L26	THDVSSAI	L28;L35;L68;L34
1895	KRTIKGTHH	L30	LLLCRMNSR	L21;L15	TIAEILLIIMR	L19;L21;L17;L15
1896	KRVDWTIEYP	L65	LLLDDFVEII	L4;L2	TIKKPNEL	L23;L39;L58;L74
1897	KRVLNVVCK	L30	LLLDQALVSD	L4;L2	TKHSSGVTR	L17;L19;L21;L15
1898	KRWQLALSKG	L30	LLMPILTLTR	L21;L6	TLACFVLAA	L3;L46;L2;L4
1899	KRWQLALSKGV	L30	LLPLTQYNRY	L12;L1	TLACFVLAAV	L3;L2;L4;L20
1900	KSAFVNLK	L55	LLPLVSSQC	L57;L5	TLATCELYHY	L12;L10;L18;L14
1901	KSAFYILPSI	L52	LLPSLATVA	L5;L57	TLATHGLAA	L3;L51;L46;L2
1902	KSAPLIELCV	L73	LLQFAYANR	L21;L15	TLATHGLAAV	L3;L4;L2;L20
1903	KSAQCFKMFYK	L7	LLQLCTFTR	L21;L15	TLAVPYNMR	L21;L19;L17;L15
1904	KSDGTGTIYTE	L18	LLQNGMNGR	L21;L15	TLEETKFL	L62;L63;L23;L68
1905	KSEDAQGMD	L18	LLSKGRLII	L24;L16	TLGVLVPHV	L4;L2;L5;L3
1906	KSEDAQGMDNLA	L18	LLSVCLGSLIY	L18;L12	TLKGVEAVMY	L26;L12;L14;L43
1907	KSEFDRDAA	L18	LLSVLQQLR	L21;L15	TLNDFNLVA	L2;L3;L46;L4
1908	KSEFDRDAAM	L18	LLTNMFTPL	L5;L74	TLNDFNLVAM	L4;L2;L3;L43

1909	KSEKQVEQK	L18	LLWPVTLA	L2;L3	TLPKGIMMNV	L5;L57;L2;L3
1910	KSEKQVEQKI	L53	LLWPVTLACF	L5;L12	TLSEQLDFI	L3;L4;L2;L5
1911	KSFDLGDELG	L52	LMCQPILL	L74;L62	TMADLVYALR	L19;L21;L15;L17
1912	KSFTVEKG	L54	LMRELNGGAY	L14;L43	TNPIQLSSY	L26;L72;L14;L71
1913	KSHFAIGLALYY	L18	LNDLCFTNVY	L1;L18	TPCGTGTST	L51;L39;L22;L32
1914	KSIAATRG	L54	LNDNLLEI	L68;L62	TPCNGVEGF	L49;L31;L34;L39
1915	KSILSPLYA	L73	LNHTKKWKY	L12;L14	TPEEHFIET	L31;L32;L39;L49
1916	KSKCEESSAK	L13	LNIIPLTTA	L50;L46	TPEEHFIETI	L49;L34;L39;L32
1917	KSLTENKYS	L52	LNRVCGVSA	L51;L50	TPFDVVRQ	L49;L47;L50;L56
1918	KSPIQYIDI	L53	LNSIIKTI	L48;L47	TPFEIKLA	L50;L51;L47;L23
1919	KSPIQYIDIGNY	L18	LPAPRTLLTK	L22;L6	TPGSGVPV	L51;L50;L39;L22
1920	KSQDLSVVS	L53	LPDDFTGCVI	L49;L32	TPKGPKVKYL	L39;L56;L22;L32
1921	KSTNLVKN	L54	LPETTADIV	L32;L47	TPLIQPIGAL	L22;L56;L31;L32
1922	KSYELQTPFEI	L55	LPFFSNVT	L47;L50	TPNNTDFSR	L32;L19;L17;L15
1923	KTCGQQQTTLK	L6	LPFGWLIVGVA	L50;L51	TPRDLGACI	L39;L51;L49;L22
1924	KTDGTLMIE	L18	LPFKLTCA	L50;L51	TPSFKKGAKL	L56;L39;L32;L22
1925	KTGDLQPLEQ	L73	LPFNDGVYFA	L50;L51	TPSKLIEY	L31;L49;L56;L39
1926	KTILRKGGRTI	L55	LPFQQFGRD	L49;L50	TQHQPYVV	L48;L35;L24;L28
1927	KTIQPRVE	L55	LPFQQFGRDI	L39;L47	TQLYLGGMSY	L27;L14;L26;L12
1928	KTKNVTKEN	L13	LPGCDGGSLY	L31;L18	TQYNRYLALY	L14;L27;L26;L12
1929	KTLLSLREVRTI	L55	LPGVFCGVDA	L50;L51	TRAKVGIL	L35;L66;L65;L64
1930	KTNCCRFQ	L55	LPKGIMMNVA	L51;L50	TRELMREL	L25;L35;L64;L66
1931	KTNCCRFQE	L16	LPLQLGFST	L50;L31	TRNPAWRKA	L64;L30;L51;L65
1932	KTNCCRFQEK	L13	LPNDDTLRVEA	L50;L51	TSAVLQSGF	L53;L52;L54;L26
1933	KTPEEHFIETI	L16	LPPKNSIDA	L51;L50	TSDYYQLY	L1;L18;L54;L55
1934	KTPKYKFVRI	L53	LPPKNSIDAF	L39;L56	TSFGPLVR	L19;L17;L7;L15
1935	KTSVDCTM	L54	LPRVFSAVG	L51;L22	TSRTLSYY	L1;L18;L14;L58
1936	KTSVDCTMYI	L53	LPSLATVA	L50;L51	TSTDVVYRAF	L10;L52;L55;L43

1937	KTTLPVNV	L73	LPSYAAFA	L50;L51	TTEILPVSM	L63;L18;L1;L62
1938	KTTLPVNVA	L51	LPSYAAFATA	L50;L51	TTITVNVLAW	L10;L52;L54;L19
1939	KTTVASLINTL	L16	LPTEVLTE	L47;L50	TTRQVVNVV	L20;L13;L70;L73
1940	KTVGELGD	L65	LPTEVLTEEV	L50;L51	TTSPISEHDY	L14;L18;L12;L1
1941	KTVGELGDVR	L21	LPTGVHAGTDL	L56;L22	TTTNIVTR	L19;L17;L21;L15
1942	KTVQFCDAMR	L21	LPTMCDIRQL	L39;L32	TVATSRTLSYY	L11;L14;L10;L18
1943	KVDGVVQQ	L63	LPVNVAFELW	L49;L31	TVCGMWKGY	L26;L14;L10;L11
1944	KVDTANPKT	L63	LPYPDPSRILGA	L50;L51	TVDSSQGSEY	L1;L18;L14;L10
1945	KVDTANPKTPK	L6	LQDLKWARF	L63;L62	TVEEAKTV	L23;L39;L48;L63
1946	KVDTANPKTPKY	L18	LQELGKYEQY	L18;L1	TVEELKKL	L39;L63;L23;L68
1947	KVEAEVQI	L63	LQIPFAMQMAY	L27;L26	TVGELGDVR	L19;L17;L21;L15
1948	KVFTTVDNINL	L16	LQTYVTQQL	L44;L24	TVYDDGARRV	L20;L11;L14;L24
1949	KVGGSCVL	L65	LRAKHYVY	L66;L65	TYACWHHSI	L8;L9;L71;L72
1950	KVKPTVVVNAA	L51	LRAKHYVYI	L64;L34	TYHPNCVNCL	L72;L8;L71;L9
1951	KVKYLYFI	L55	LRDGWEIVK	L30;L35	TYLDGADVT	L8;L72;L71;L9
1952	KVKYLYFIKG	L13	LREVRTIKV	L25;L64	TYLEGSVR	L17;L15;L71;L72
1953	KVLLRKNGNK	L6	LRKGGRTI	L55;L65	TYPGQGLNG	L8;L72;L9;L71
1954	KVNINIVGDF	L26	LRPDTRYV	L64;L66	VAEWFLAY	L59;L18;L1;L31
1955	KVQHMVVK	L13	LRSDVLLP	L65;L64	VAEWFLAYI	L47;L68;L63;L69
1956	KVQIGEYTFEK	L7	LRVEAFEY	L66;L65	VAFNVVNK	L7;L13;L19;L70
1957	KVTSAMQTMLF	L16	LRVIGHSM	L25;L66	VAGFAKFL	L70;L74;L60;L61
1958	KVVSTTTN	L54	LSAPTLVPQEHY	L1;L52	VAGGIVAIVV	L69;L70;L58;L67
1959	KVVSTTTNIVTR	L19	LSAQTGIAV	L61;L50	VAIKITEH	L43;L59;L74;L58
1960	KWDLLKYD	L62	LSDTLKNLS	L1;L18	VAIKITEHSW	L52;L54;L49;L53
1961	KWDLTAFG	L62	LSDTLKNLSD	L1;L18	VAIVVTCLAY	L43;L12;L59;L31
1962	KWKYPQVNG	L13	LSEARQHL	L63;L1	VATSRTLSYY	L58;L14;L69;L12
1963	KWYIRVGARK	L6	LSEARQHLK	L1;L18	VAVPTGYV	L70;L58;L47;L69
1964	KYDFTEER	L62	LSEMVMCGGSLY	L1;L18	VCLSGLDSL	L67;L4;L8;L44
1965	KYFDCYDGGCI	L8	LSETKCTL	L63;L68	VCRHHANEY	L43;L59;L26;L58
1966	KYFSGAMDT	L71	LSFELLHAP	L46;L50	VDADSKIVQL	L56;L37;L4;L3

1967	KYKFVRIQP	L13	LSKGRLII	L55;L70	VDGVDVELF	L9;L33;L52;L34
1968	KYLPIDKC	L8	LSKGVHFV	L70;L58	VDSSQGSEY	L14;L26;L43;L18
1969	KYLPIDKCS	L8	LSKGVHFVC	L70;L52	VEAPLVGTP	L46;L38;L42;L29
1970	KYLPIDKCSR	L15	LSKSLTENKY	L14;L1	VEFLRDGWEI	L45;L36;L40;L41
1971	KYLYFIKGLNNL	L8	LSLLSKGRLI	L55;L52	VELFENKTT	L38;L45;L41;L40
1972	KYPQVNGLT	L9	LSMQGAVDI	L55;L53	VENMTPRDL	L37;L36;L40;L45
1973	KYTQLCQY	L14	LSPVALRQM	L57;L59	VEQKIAEI	L45;L48;L33;L37
1974	KYVRNLQHRLY	L14	LSRLDKVEA	L50;L43	VETFYPKL	L37;L45;L29;L36
1975	KYWDQTYH	L71	LSTDGNKI	L55;L48	VETKAIVST	L37;L45;L38;L29
1976	KYWDQTYHPNC	L8	LSVCLGSL	L59;L60	VETVKGLDY	L29;L41;L40;L12
1977	LAAVYRINWI	L47	LSVCLGSLIY	L18;L1	VFCGVDAVNL	L62;L8;L72;L71
1978	LACFVLAA	L50	LSVLQQLRV	L73;L48	VFFDGRVD	L72;L71;L65;L55
1979	LADKFPVLHDI	L68	LSVVSKVV	L48;L70	VFISPYNSQ	L8;L72;L71;L9
1980	LAFLLFLVLIM	L31	LSWEVGKPR	L15;L19	VFLFVAAIFY	L12;L72;L71;L14
1981	LAHAEETRKL	L32	LTAVVIPTKK	L6;L7	VFLHVTYV	L72;L71;L62;L48
1982	LAHIQWMV	L47	LTDEMIAQ	L1;L68	VFLVLLPL	L71;L72;L59;L62
1983	LAKNVSLDN	L43	LTDNVYIKN	L1;L18	VFMSEAKCW	L71;L72;L9;L8
1984	LALCADSI	L47	LTEEVVLKT	L1;L18	VFNICQAV	L71;L48;L72;L62
1985	LALCADSII	L47	LTKGTLEPEY	L52;L14	VFQSASKI	L48;L71;L72;L62
1986	LALCADSIII	L47	LTLVYKVY	L52;L55	VGPEHSLAEY	L43;L57;L14;L12
1987	LALGGSVA	L50	LTNNVAFQTV	L73;L20	VGVALLAVF	L9;L31;L52;L27
1988	LALLSDLQDLKW	L52	LTPLGIDL	L57;L62	VHFISNSWL	L28;L35;L34;L25
1989	LALSKGVHFV	L47	LTPTWRVY	L55;L1	VIDLLLDDF	L62;L1;L68;L63
1990	LALYNKYKYF	L52	LTPVYSFL	L57;L62	VIPDYNTYK	L6;L7;L57;L5
1991	LALYYPSA	L50	LTQYNRYL	L55;L60	VKCTSVVLL	L44;L66;L62;L64
1992	LALYYPSAR	L17	LTQYNRYLALY	L1;L18	VLAWLYAAV	L3;L2;L4;L5
1993	LARAGKASC	L43	LTSHTVMPL	L61;L60	VLDMCASL	L68;L62;L63;L5
1994	LATNNLVVMA	L50	LTSLLVLV	L73;L1	VLHDIGNPK	L6;L13;L43;L7
1995	LATNNLVVMAY	L31	LTVLPPLL	L60;L55	VLIMLIIF	L74;L26;L23;L59
1996	LAVHECFV	L47	LTWICLLQFAY	L1;L12	VLLPLTQYN	L4;L12;L2;L5
1997	LAVHECFVKR	L19	LTYNKVENM	L70;L58	VLLPLVSSQ	L4;L16;L3;L2

1998	LAVPYNMRVIHF	L31	LVAAGLEA	L51;L50	VLPFNDGVYF	L9;L12;L57;L5
1999	LAYILFTRFFY	L12	LVDFQVTIA	L68;L63	VLTESNKKF	L9;L26;L16;L12
2000	LCADSIII	L47	LVDFQVTIAEI	L5;L68	VPATVSVSS	L51;L56;L39;L22
2001	LCANGQVF	L59	LVDLPIGIN	L68;L1	VPFWITIAYI	L20;L47;L49;L50
2002	LCFLAFLL	L47	LVDLPIGINI	L68;L63	VPHVGEIPV	L51;L50;L47;L22
2003	LCNSQTSL	L57	LVDSDLNDFV	L5;L1	VPLNIIPLT	L47;L50;L31;L51
2004	LCNSQTSLR	L21	LVFLFVAA	L50;L51	VPTDNYITT	L49;L56;L50;L51
2005	LCVDIPGI	L47	LVFLFVAAIFY	L12;L31	VPTDNYITTY	L49;L31;L43;L12
2006	LDDFVEII	L68	LVIGFLFLT	L12;L20	VPVAIHADQL	L31;L32;L56;L39
2007	LDERIDKVL	L32	LVKPSFYVYSR	L15;L21	VPYNMRVI	L47;L48;L39;L25
2008	LDGEVITFD	L65	LVLIMLIIFWF	L52;L12	VQEGVLTAV	L24;L48;L68;L63
2009	LDGISQYSL	L65	LVLVQSTQW	L52;L54	VQLSLPVL	L48;L25;L44;L59
2010	LDMYSVML	L33	LVQAGNVQLR	L21;L19	VQPQLEMEL	L57;L44;L64;L5
2011	LDSKTQSL	L33	LVQMAPISA	L50;L51	VQPTESIVRF	L26;L9;L8;L27
2012	LDSKVGGNY	L14	LVRGFGDSV	L51;L58	VRDPQTLEIL	L35;L34;L66;L68
2013	LDYIINLII	L47	LVSDIDITFLK	L6;L7	VRFPNITN	L25;L66;L65;L35
2014	LDYKAFKQI	L47	LVSDVGDSA	L50;L51	VRGTTVLL	L66;L65;L64;L35
2015	LEASFNYLK	L38	LVSSFLEM	L59;L67	VRGTTVLLK	L30;L65;L7;L6
2016	LEASFNYLKSP	L46	LVSSFLEMK	L6;L7	VRIIMRLWL	L25;L64;L66;L30
2017	LEDEFTPFDV	L38	LVSSQCVNL	L74;L56	VSDVGDSAEV	L63;L68;L1;L18
2018	LEETKFLTE	L46	LVTLAILTA	L50;L51	VSELLTPL	L68;L59;L63;L1
2019	LEGETLPTEVL	L36	LWAKRNIKP	L38;L46	VSFCYMHHM	L70;L73;L58;L69
2020	LEGSVAYESL	L36	LWLDDVVY	L71;L31	VSIWNLDY	L1;L43;L18;L54
2021	LEGSVRVVT	L38	LWPVTLAC	L71;L57	VSLDNVLST	L43;L55;L52;L73
2022	LEGYAFEHIVY	L41	LYAFASEA	L72;L71	VSTTTNIVTR	L19;L15;L7;L21
2023	LEIPRRNVATL	L36	LYCIDGAL	L72;L71	VTGDSCNNY	L18;L1;L14;L58
2024	LELAMDEFI	L36	LYDKLVSSFL	L62;L63	VTTTLEETKF	L52;L53;L54;L12
2025	LELQDHNETC	L36	LYECLYRNR	L17;L15	VTTVMFLAR	L7;L15;L17;L19
2026	LEMELTPV	L45	LYFDKAGQK	L13;L72	VVADAVIKT	L20;L19;L7;L6
2027	LEQPTSEA	L38	LYFIKGLNN	L71;L72	VVAFNTLLFL	L74;L20;L6;L60
2028	LEQPTSEAVEA	L38	LYIDINGNLH	L8;L9	VVDKYFDCY	L18;L1;L12;L14
2029	LEQPYVFI	L45	LYKMQRMLL	L9;L71	VVDMSMTY	L18;L1;L68;L63

2030	LEQPYVFIK	L38	LYLDAYNMMI	L8;L9	VVENPTIQK	L7;L6;L13;L19
2031	LEQWNLVI	L45	LYLYALVYFL	L9;L8	VVEVVDKYF	L63;L52;L62;L12
2032	LEQWNLVIGFLF	L40	LYQDVNCT	L72;L71	VVGDIILK	L7;L6;L13;L19
2033	LESELVIGAVI	L41	LYQDVNCTEV	L72;L71	VVHNQDVNL	L74;L56;L67;L63
2034	LETAQNSVRVL	L41	LYQPPQTS	L71;L72	VVIGIVNNTVY	L14;L11;L12;L26
2035	LETIQITIS	L46	LYRKCVKSR	L17;L15	VVISSDVL	L67;L74;L60;L61
2036	LFDMSKFP	L62	LYSPIFLIVA	L50;L51	VVLSFELL	L74;L67;L60;L23
2037	LFDMSKFPLKL	L62	LYVNKHAFH	L71;L72	VVPGLPGTIL	L57;L67;L56;L5
2038	LFDRYFKYW	L62	LYYDSMSYE	L72;L71	VVPGLPGTILR	L19;L21;L7;L15
2039	LFFFLYENA	L50	MAPISAMV	L47;L57	VVTTKIAL	L23;L74;L56;L60
2040	LFKDCSKVI	L8	MATNYDLSVV	L69;L70	VVTTKIALK	L7;L6;L13;L19
2041	LFLLPSLAT	L71	MAYITGGV	L47;L48	VVTTVMFLAR	L7;L19;L6;L15
2042	LFLMSFTV	L71	MAYRFNGI	L47;L48	VYCFLGYF	L9;L62;L72;L71
2043	LFLPFFSNVTWF	L8	MAYRFNGIGV	L50;L47	VYCPRHVI	L9;L71;L8;L72
2044	LFMRIFTI	L47	MCASLKEL	L25;L59	VYKQFDTY	L66;L14;L71;L72
2045	LFTMLRKL	L62	MCASLKELL	L34;L20	VYKVYYGNAL	L71;L72;L9;L66
2046	LFVAAIFYLI	L8	MDNSPNLAW	L49;L16	VYQCAMRPNF	L9;L8;L71;L72
2047	LFVVEVVDKY	L12	MDSTVKNY	L29;L33	VYSDVENPHL	L9;L8;L66;L72
2048	LFWNCNVDR	L17	MELPTGVH	L29;L33	VYSHLLLVA	L9;L8;L50;L51
2049	LFWNCNVDRY	L12	MESEFRVYS	L42;L46	VYYTSNPTT	L9;L71;L72;L8
2050	LGERVRQAL	L32	MESLVPGF	L33;L29	WEIQQVVDA	L46;L38;L42;L37
2051	LGFIAGLIA	L50	MEVTPSGTWLTY	L41;L40	WFSQRGGSY	L14;L71;L72;L12
2052	LGFSTGVNLV	L47	MFITREEA	L71;L72	WFVTQRNFY	L71;L12;L72;L14
2053	LGGLHLLI	L47	MFITREEAI	L71;L72	WLLWPVTL	L23;L74;L4;L2
2054	LGGSVAIKI	L47	MGHFAWWTA	L50;L51	WLMWLIINLV	L3;L2;L4;L5
2055	LGIITTVAA	L50	MHHMELPTG	L28;L34	WLTNIFGTVY	L12;L14;L26;L43
2056	LGLPTQTVD	L65	MIELSLIDFY	L1;L18	WSMATYYLF	L54;L53;L55;L52
2057	LGQSKRVD	L65	MILSLLSK	L6;L7	WVMRIMTWL	L20;L74;L60;L10
2058	LGRYMSAL	L59	MILSLLSKGR	L17;L21	YADVFHLYLQY	L1;L18;L49;L12
2059	LGTDPYEDF	L49	MISAGFSLW	L16;L10	YAWNRKRI	L47;L70;L69;L48
2060	LGTEVNEF	L59	MKDLSPRWY	L27;L1	YEDQDALFA	L38;L46;L42;L45
2061	LHAPATVCG	L28	MKFLVFLGI	L47;L27	YEDQDALFAY	L1;L40;L41;L29
2062	LHCANFNVLF	L34	MLTNDNTSR	L21;L17	YENAFLPFA	L46;L38;L42;L50

2063	LHDIGNPKA	L28	MPASWVMRIM	L32;L22	YENFNQHEVL	L37;L36;L41;L29
2064	LHDIGNPKAI	L28	MPILTLTR	L50;L47	YEPQIITTD	L45;L37;L36;L29
2065	LHFLPRVFSA	L50	MPILTLTRA	L50;L51	YEQFKKGV	L45;L33;L38;L37
2066	LHLLIGLAK	L6	MPLGYVTH	L50;L47	YEQFKKGVQI	L45;L37;L38;L36
2067	LHNDILLA	L50	MPLGYVTHG	L50;L31	YEQYIKWPW	L40;L41;L38;L42
2068	LHPTQAPTHL	L57	MPLSAPTLVP	L50;L51	YFCTCYFGL	L72;L62;L8;L71
2069	LHSSRLSF	L28	MPNLYKMQRM	L32;L31	YFIASFRL	L71;L72;L62;L8
2070	LHTQVVDM	L28	MPNMLRIM	L47;L32	YFVLTSHTV	L71;L48;L72;L62
2071	LHVTYVPAQ	L28	MPNMLRIMA	L50;L51	YGVSPTKL	L74;L67;L25;L61
2072	LHVVGPNV	L28	MPTTIAKNTV	L50;L32	YHDVRVVLD	L34;L62;L28;L35
2073	LHVVGPNVN	L28	MPYFFTLLLQ	L50;L47	YICGFIQQK	L7;L13;L6;L19
2074	LIAAVITREV	L3	MQNCVLKL	L48;L73	YIDINGNLH	L1;L68;L18;L63
2075	LIDAMMFTSDL	L68	MRIFTIGTVTL	L34;L35	YIVDSVTVK	L19;L7;L6;L60
2076	LIDFYLCFLAF	L68	MRPNFTIKG	L64;L66	YLALYNKY	L1;L26;L18;L27
2077	LIDLQELG	L1	MSALNHTKK	L7;L19	YLAVFDKNLY	L1;L12;L18;L26
2078	LIDLQELGK	L1	MSDVKCTSVV	L63;L68	YLDAYNMM	L62;L1;L63;L68
2079	LIGCNYLGK	L6	MSLSEQLRK	L7;L6	YLEGSVRV	L2;L63;L1;L62
2080	LIIKNLSKSL	L60	MTNRQFHQK	L7;L13	YLKLTDNVY	L26;L27;L1;L14
2081	LIINLVQM	L59	MTPRDLGAC	L10;L11	YLQPRTFLLKY	L12;L1;L14;L18
2082	LIINLVQMA	L3	MTYGQQFGPTY	L14;L11	YLQYIRKL	L64;L23;L4;L74
2083	LIISVTSN	L43	MVLGSLAA	L50;L51	YNYLYRLF	L33;L27;L59;L55
2084	LINTLNDL	L59	MVPHISRQRL	L20;L5	YPANSIVCR	L19;L17;L49;L31
2085	LIRQGTDY	L26	MVYMPASWV	L20;L47	YPDPSRILGA	L50;L51;L49;L32
2086	LITPVHVMSK	L6	MYASAVVLLI	L9;L8	YPIIGDELKI	L47;L49;L32;L34
2087	LIVGVALLAV	L5	MYDPKTKNV	L62;L5	YPSARIVYT	L49;L32;L31;L22
2088	LIVNSVLLFL	L60	MYIFFASFYY	L12;L14	YQHEETIY	L26;L27;L43;L58
2089	LKALNLGETF	L27	MYKGLPWNVVR	L15;L17	YRLFRKSNL	L25;L23;L30;L66
2090	LKATEETF	L27	MYMGTLSYEQF	L8;L9	YRVTKNSKV	L64;L30;L25;L35
2091	LKATEETFKL	L44	NAAISDYDY	L49;L31	YRYNLPTMC	L64;L66;L25;L30
2092	LKEPCSSGTY	L27	NAANVYLKH	L69;L19	YSDSPCESH	L68;L43;L1;L63
2093	LKGVEAVMY	L27	NADIVEEAK	L67;L68	YSDVENPHLM	L63;L1;L68;L62
2094	LKKLKKSL	L23	NALPETTAD	L31;L32	YSGQSTQL	L74;L61;L60;L65

2095	LKLFAAETL	L44	NARLRAKHY	L58;L70	YSHLLLVAA	L50;L46;L67;L51
2096	LKLRSDVLL	L44	NASSSEAF	L49;L54	YSKWYIRV	L70;L43;L58;L69
2097	LKLTDNVY	L27	NASVVNIQK	L19;L7	YSNNSIAI	L48;L59;L43;L61
2098	LKNLSDRVVF	L27	NCDVVIGI	L62;L68	YTEISFMLW	L1;L52;L18;L49
2099	LKRGDKSVYY	L27	NCYLATALL	L28;L62	YTMADLVY	L1;L18;L59;L70
2100	LKYDFTEER	L27	NDFNLVAMKY	L12;L29	YTVEEAKTVL	L60;L53;L10;L20
2101	LKYDFTEERL	L44	NDMILSLL	L33;L25	YVDTPNNTD	L68;L63;L1;L32
2102	LLADKFPV	L2	NEEIAIILASF	L41;L40	YVDTPNNTDF	L68;L63;L1;L60
2103	LLAGTITSG	L3	NEFYAYLRKH	L29;L41	YVFTGYRVTK	L7;L13;L19;L6
2104	LLAPLLSAGI	L3	NEFYAYLRKHF	L41;L40	YVLGLAAIM	L31;L12;L67;L32
2105	LLAVFQSASK	L6	NEKQEILGTVSW	L40;L41	YVLPNDDTLR	L17;L15;L21;L19
2106	LLDDFVEIIKS	L5	NELSPVALRQ	L41;L40	YVMHANYIFWR	L7;L21;L19;L15
2107	LLDKRTTC	L63	NELSPVALRQM	L40;L41	YVTHGLNL	L60;L61;L74;L59
2108	LLDQALVS	L1	NELSRVLGLKTL	L41;L40	YYHKNNKSW	L71;L9;L72;L8
2109	LLDQALVSDV	L5	NESGLKTILR	L19;L41	YYKLGASQR	L17;L15;L21;L71
2110	LLDRLNQLE	L1	NETLVTMPLGY	L41;L40	YYQNNVFM	L71;L72;L62;L66
2111	LLDRLNQLES	L1	NEVAKNLNESL	L36;L41	YYQNNVFMS	L72;L66;L71;L9
2112	LLEQWNLV	L1	NFGAISSV	L72;L71	YYVGYLQPR	L17;L15;L71;L72
2113	LLEQWNLVI	L68	NFKNLREFVF	L8;L9	YYVGYLQPRTF	L9;L8;L72;L71
2114	LLFLVLIM	L59	NFLVQAGNV	L72;L71	AAIVFITLC	L69;L74;L58;L70;L7
2115	LLFLVLIMLI	L3	NFNFNGLTG	L72;L71	AAIVFITLCF	L59;L52;L43;L69;L12
2116	LLFVTVYSH	L4	NFTIKGSF	L72;L71	AAKAYKDYL	L58;L67;L70;L69;L74
2117	LLFVVEVVDK	L6	NFTTAPAI	L71;L72	AAVITREV	L48;L70;L59;L69;L64
2118	LLFVVEVVDKY	L12	NGDSEVVLK	L19;L7	ACTDDNALAY	L12;L14;L40;L18;L41
2119	LLHAPATV	L3	NGDVVAIDY	L1;L18	ADAQSFLNR	L7;L15;L21;L19;L17
2120	LLHKPIVW	L23	NGIGVTQNV	L24;L20	AEAELAKN	L46;L45;L37;L33;L42
2121	LLHKPIVWH	L43	NGLTGTGVL	L25;L44	AEAELAKNVS	L46;L42;L40;L36;L41
2122	LLIGLAKR	L21	NGMNGRTI	L55;L48	AEHVNNSY	L29;L45;L33;L26;L41
2123	LLIIMRTFK	L6	NGTITVEEL	L67;L25	AEIVDTVSAL	L36;L40;L41;L37;L45

2124	LLKDCPAV	L3	NGVSFSTF	L29;L27	AENSVAYSN	L42;L38;L40;L41;L37
2125	LLKDCPAVAK	L6	NGYPNMFI	L47;L25	AENVTGLFK	L40;L7;L41;L6;L42
2126	LLKEPCSS	L43	NHDLYCQV	L35;L28	AEVAVKMF	L33;L29;L41;L37;L40
2127	LLKEPCSSG	L43	NHNFLVQA	L35;L28	AEWFLAYILF	L40;L41;L36;L37;L42
2128	LLKEPCSSGT	L43	NIDGYFKI	L68;L63	AFEKMVSLL	L62;L72;L63;L71;L8
2129	LLKEPCSSGTY	L14	NIFGTVYEKL	L11;L10	AFGLVAEWF	L72;L9;L62;L71;L12
2130	LLKSIAAT	L43	NIIPLTTAAK	L19;L6	AFLIGCNYL	L71;L72;L8;L9;L62
2131	LLLDKRTT	L23	NILLNVPL	L23;L25	AFYILPSII	L62;L72;L71;L48;L69
2132	LLLFVTVY	L26	NIQKEIDRL	L4;L34	AGFSLWVY	L27;L69;L14;L26;L59
2133	LLLLDRLNQL	L4	NITFELDER	L19;L17	AIDGGVTR	L21;L63;L68;L15;L19
2134	LLLQLCTF	L23	NITRFQTL	L60;L23	AISDYDYYR	L21;L15;L7;L19;L17
2135	LLLQLCTFTR	L21	NIVTRCLNR	L19;L17	AIVSTIQR	L21;L19;L7;L15;L17
2136	LLLTILTSLL	L4	NKSWMESEF	L27;L66	AIVSTIQRK	L7;L6;L19;L24;L13
2137	LLLVAAGL	L23	NKWDLIISD	L44;L27	ALDPLSET	L1;L68;L5;L62;L63
2138	LLMPLKAPK	L6	NLAWPLIVTA	L3;L2	ALIISVTSNY	L26;L14;L6;L18;L12
2139	LLNKEMYL	L74	NLDKSAGF	L63;L62	ALIWNVKDF	L26;L10;L27;L16;L11
2140	LLNKEMYLKL	L4	NLDSKVGGNYNY	L18;L1	ALLEDEFTPF	L6;L12;L9;L2;L16
2141	LLNRYFRLTL	L4	NLEEAARYM	L62;L63	ALNNIINNA	L3;L4;L2;L5;L24
2142	LLPLTQYNR	L21	NLGERVRQA	L3;L2	ALPETTADI	L57;L5;L3;L24;L2
2143	LLPLTQYNRYL	L57	NLGETFVTH	L5;L2	ALYNKYKY	L14;L12;L26;L18;L16
2144	LLPLVSSQ	L57	NLKPFERDI	L64;L3	ALYYPSARIVY	L27;L6;L16;L14;L12
2145	LLPLVSSQCV	L5	NLKQLPFFY	L12;L14	AMYTPHTV	L48;L3;L69;L70;L47
2146	LLPPKNSID	L5	NLKQLPFFYY	L12;L14	APHGHVMV	L51;L39;L56;L22;L50
2147	LLSDLQDLK	L6	NLLEILQKEKV	L2;L4	APHGVVFL	L56;L22;L39;L65;L23
2148	LLSDLQDLKW	L12	NLLLLFVTVY	L12;L27	APISAMVRM	L56;L22;L32;L31;L39
2149	LLSKGRLI	L55	NLNRGMVL	L23;L57	APKEIIFL	L56;L39;L23;L22;L51

2150	LLSKGRLIIR	L21	NLPFKLTCA	L3;L5	AQEKNFTTA	L42;L46;L27;L24;L26
2151	LLSLREVRTI	L3	NLQHRLYEC	L23;L4	AQFAPSASAF	L26;L27;L16;L71;L28
2152	LLSTDGNKI	L24	NLREFVFKN	L4;L3	AQVDVVNF	L26;L27;L58;L33;L69
2153	LLSVLLSM	L59	NLREMLAHA	L3;L2	AQYELKHGT	L24;L27;L14;L44;L26
2154	LLTILTSLL	L74	NLSDRVVF	L23;L26	AQYELKHGTF	L27;L26;L14;L44;L10
2155	LLVAAGLEA	L51	NLTTRTQL	L23;L25	ARAGEAANF	L30;L34;L66;L65;L35
2156	LLVDSDLNDF	L26	NNLVVMAY	L71;L29	ARFYFYTSK	L30;L7;L13;L66;L6
2157	LLVTLAILTA	L3	NPETNILLN	L49;L32	ARSVASQSI	L35;L34;L28;L64;L30
2158	LLYDANYFLCW	L6	NPHLMGWDY	L31;L49	ASAFFGMSR	L7;L19;L15;L21;L17
2159	LMIERFVSLA	L3	NPKAIKCVP	L39;L51	ASCDAIMTR	L7;L21;L19;L15;L17
2160	LMNVLTLVYK	L6	NPKGFCDL	L39;L23	ASVYYSQL	L74;L60;L61;L70;L67
2161	LMSFPQSA	L50	NPPALQDAY	L31;L12	ASWVMRIMTW	L52;L53;L54;L16;L10
2162	LMSNLGMPSY	L12	NPTDQSSYI	L49;L47	ATEETFKLSY	L1;L18;L12;L14;L16
2163	LMWLSYFI	L47	NQEYADVFHLY	L14;L1	ATVHTANKW	L54;L52;L53;L10;L16
2164	LMWLSYFIA	L50	NQHEVLLA	L24;L25	ATVVIGTSK	L7;L19;L6;L13;L15
2165	LMYKGLPWNV	L3	NQHEVLLAP	L24;L25	ATYKPNTW	L54;L52;L16;L55;L53
2166	LNDILSRLD	L65	NQRNAPRITF	L27;L26	AVANGDSEV	L3;L20;L2;L58;L28
2167	LNGDVVAID	L65	NRARTVAGV	L35;L30	AVDCALDPL	L68;L5;L67;L63;L62
2168	LNGDVVAIDY	L12	NRDVDTDF	L62;L35	AVFQSASKI	L24;L16;L10;L45;L3
2169	LNGGAYTRY	L12	NRDVDTDFV	L34;L35	AVHFISNSW	L16;L10;L54;L52;L26
2170	LNGYTVEEA	L65	NRFLYIIKLI	L30;L64	AVKLQNNEL	L26;L68;L39;L56;L67
2171	LNIKLLGV	L73	NRFNVAIT	L25;L35	AVNLLTNMF	L26;L16;L12;L52;L58
2172	LNKEMYLKL	L73	NRFTTTLNDF	L30;L34	AYWVPRASA	L72;L42;L71;L46;L51
2173	LNTLTLAV	L48	NRVCGVSA	L25;L35	AYYVGYLQP	L46;L72;L42;L71;L38
2174	LPDDFTGCVIA	L50	NRVVISSDV	L25;L35	CAKEIKESV	L43;L70;L58;L23;L69

2175	LPDPSKPSKRSF	L39	NRYFRLTLG	L25;L30	CASEYTGNY	L58;L49;L14;L18;L70
2176	LPETTADIVV	L32	NRYFRLTLGV	L25;L30	CIMSDRDLY	L14;L18;L12;L1;L16
2177	LPFAMGII	L47	NRYLALYNK	L30;L25	CRFDTRVL	L65;L25;L64;L66;L35
2178	LPFAMGIIAMSA	L50	NSASFSTFK	L7;L19	CSFYEDFLEY	L18;L12;L1;L65;L59
2179	LPFFSNVTWFHA	L50	NSFDVLKSE	L69;L70	CTLSEQLDF	L53;L12;L52;L54;L16
2180	LPFFYYSD	L50	NSGSDVLY	L1;L18	CYMHHMEL	L71;L72;L25;L66;L62
2181	LPFNDGVY	L31	NSLKITEEV	L73;L48	DAIMTRCL	L23;L61;L70;L47;L60
2182	LPFQQFGRDIA	L50	NSPRRARSV	L57;L64	DAVNLLTNM	L11;L31;L19;L58;L17
2183	LPFTINCQ	L47	NSQNAVASK	L19;L7	DAVTAYNGY	L10;L11;L49;L31;L19
2184	LPFTINCQEP	L32	NSTPGSSR	L19;L17	DCSKVITGL	L20;L11;L34;L25;L35
2185	LPGVFCGV	L47	NSVPWDTI	L67;L55	DESGEFKLA	L42;L38;L46;L41;L29
2186	LPGVYSVI	L47	NSWLMWLI	L48;L55	DFVKATCEF	L8;L9;L72;L10;L71
2187	LPGVYSVIYLY	L31	NTDFSRVSA	L68;L1	DGARRVWTL	L25;L23;L10;L29;L47
2188	LPIDKCSRIIPA	L50	NTDHSSSSD	L1;L18	DIDITFLKK	L1;L6;L7;L18;L19
2189	LPIGINIT	L47	NTLQCIMLV	L73;L20	DILSRLDKV	L23;L11;L4;L47;L25
2190	LPKGFYAEG	L51	NTLTLAVPY	L12;L14	DKAYKIEEL	L44;L25;L23;L20;L10
2191	LPLQLGFSTG	L50	NTPKDHIGTR	L11;L19	DLDEWSMATY	L1;L18;L10;L11;L14
2192	LPLTQYNRYL	L32	NTQEVFAQVK	L19;L13	DLLFNKVTL	L23;L4;L44;L2;L25
2193	LPNDDTLRVEAF	L31	NTWCIRCL	L55;L70	DPNFKDQVI	L32;L47;L49;L23;L39
2194	LPNNTASWFTA	L50	NVAKSEFDR	L19;L17	DPSKPSKRSF	L39;L49;L32;L23;L22
2195	LPNNTASWFTAL	L56	NVANYQKV	L24;L20	DRYPANSIV	L25;L35;L28;L64;L47
2196	LPQGTTLPKGF	L39	NVATLQAEN	L19;L20	DTGVEHVTF	L53;L54;L10;L52;L11
2197	LPQLEQPY	L31	NVLYENQKL	L25;L24	DTVSALVY	L11;L1;L29;L10;L18
2198	LPQNAVVKIY	L31	NVNKGEDIQL	L32;L56	DVRETMSY	L11;L10;L29;L43;L26
2199	LPSLATVAYF	L31	NVNRFNVAI	L20;L32	DVVECLKL	L25;L11;L23;L10;L74

2200	LPSYAAFAT	L50	NVNRFNVAITR	L19;L17	DYGDAVVY	L66;L72;L65;L71;L29
2201	LPTEVLTEEVV	L50	NVSLDNVL	L67;L25	DYKHWPQIAQF	L9;L11;L8;L17;L10
2202	LPTEVLTEEVVL	L31	NVSLVKPSFY	L12;L14	DYKHYTPSF	L9;L66;L8;L72;L71
2203	LPTGVHAGT	L56	NVTQAFGR	L17;L19	DYLVSTQEF	L9;L8;L72;L71;L12
2204	LPTGVHAGTD	L49	NVTQAFGRR	L19;L17	EAKKVKPTV	L23;L20;L70;L58;L47
2205	LPTQTVDSS	L50	NVVTTKIALK	L19;L7	ECSNLLLQY	L11;L41;L12;L40;L10
2206	LPVLQVRD	L50	NVYIKNAD	L23;L25	EEIAIILA	L42;L46;L38;L29;L37
2207	LPVLQVRDVLV	L50	NYEDLLIRK	L17;L8	EETGTLIV	L45;L48;L42;L37;L29
2208	LPVNVAFELWA	L50	NYFITDAQ	L71;L72	EETGTLIVN	L42;L41;L40;L29;L46
2209	LPVSMTKTSV	L50	NYFLCWHTNCY	L72;L71	EEVGHTDLM	L29;L41;L36;L45;L42
2210	LPYGANKD	L47	NYGDSATLP	L9;L8	EEVQELYSP	L42;L46;L38;L41;L40
2211	LPYGANKDGI	L47	NYIAQVDV	L71;L72	EFSSNVANY	L12;L17;L11;L14;L72
2212	LQCIMLVY	L26	NYIAQVDVV	L72;L71	EILPVSMTK	L19;L7;L6;L17;L13
2213	LQFAYANR	L21	NYLGKPREQI	L8;L9	ELNGGAYTR	L17;L21;L19;L15;L11
2214	LQFAYANRNR	L21	NYLKSPNFS	L9;L8	ELVIGAVIL	L20;L28;L23;L74;L11
2215	LQGPPGTGK	L6	NYLKSPNFSKL	L8;L9	EQDKNTQEV	L24;L35;L48;L34;L63
2216	LQHRLYECLY	L14	NYLYRLFRK	L17;L8	ETIQITISS	L20;L11;L19;L10;L17
2217	LQKAAITI	L48	NYMPYFFTLLL	L9;L8	ETKDVVECL	L20;L10;L11;L13;L70
2218	LQLGFSTGV	L24	NYNYLYRLFR	L17;L15	EVITFDNLK	L19;L11;L7;L20;L17
2219	LQNNELSPV	L24	NYQHEETI	L71;L72	EVKPFITES	L11;L10;L20;L17;L43
2220	LQPEEEQEE	L24	NYQHEETIYNL	L8;L9	EVLTEEVVLK	L19;L7;L17;L6;L13
2221	LQPELDSF	L26	NYQVNGYPN	L71;L72	EVRTIKVF	L10;L23;L11;L29;L26
2222	LQPRTFLLK	L6	NYSGVVTTVMF	L9;L8	EYSHVVAF	L9;L71;L72;L62;L66
2223	LQQIELKF	L26	PALQDAYYR	L17;L15	FAAYSRYRI	L70;L67;L69;L47;L49
2224	LQSLQTYV	L48	PDDQIGYY	L1;L18	FASFYYVW	L67;L70;L69;L59;L54

2225	LQTYVTQQLI	L24	PELDSFKEEL	L36;L41	FAVSKGFFK	L60;L19;L61;L7;L58
2226	LQVRDVLV	L48	PETNILLNV	L45;L37	FELWAKRNI	L45;L41;L37;L40;L36
2227	LQYGSFCTQ	L26	PFAMGIIAM	L72;L71	FEYVSQPF	L29;L33;L43;L59;L71
2228	LQYIRKLH	L48	PFHPLADNKF	L9;L8	FFKEGSSV	L71;L72;L62;L43;L23
2229	LRARSVSPK	L30	PFLYLYAL	L71;L72	FFLYENAFL	L72;L71;L62;L9;L8
2230	LRARSVSPKLF	L30	PFMIDVQQW	L9;L8	FFYVLGLAA	L50;L71;L72;L46;L51
2231	LRCGACIRR	L30	PFNKWGKAR	L17;L15	FGWLIVGVAL	L67;L68;L44;L61;L31
2232	LRDGWEIV	L35	PFTIYSLLL	L9;L8	FIAGLIAI	L59;L67;L74;L3;L61
2233	LREPMLQSA	L25	PFVVSTGYHF	L8;L9	FISNSWLMWL	L60;L59;L58;L61;L74
2234	LRIAGHHLGR	L30	PFWITIAY	L72;L71	FITLCFTL	L60;L59;L23;L61;L67
2235	LRLIDAMMF	L30	PGCDGGSLY	L14;L18	FKHLIPLMY	L66;L12;L27;L31;L59
2236	LRPDTRYVLM	L66	PGLPGTIL	L23;L25	FLCLFLLPSL	L2;L4;L3;L5;L59
2237	LRQWLPTGT	L30	PIFLIVAAI	L20;L3	FLFVAAIFYL	L2;L4;L5;L3;L74
2238	LRTTNGDFLH	L30	PIYDEPTTT	L43;L3	FLIGCNYL	L74;L67;L2;L61;L59
2239	LRVCVDTVR	L30	PLCANGQVF	L26;L9	FLLFLVLI	L4;L74;L2;L47;L23
2240	LRVIGHSMQ	L25	PLLESELVI	L2;L4	FLMSFTVLCL	L3;L2;L4;L5;L74
2241	LSAPTLVPQEH	L52	PMDSTVKNY	L1;L18	FLNGSCGSV	L3;L2;L4;L57;L5
2242	LSAQTGIAVL	L53	PPISFPLCA	L50;L51	FLPRVFSAV	L5;L57;L2;L3;L4
2243	LSDDAVVCFN	L1	PPKNSIDAF	L39;L56	FLRDGWEIV	L3;L43;L2;L4;L5
2244	LSDLQDLK	L1	PPQTSITSA	L51;L50	FLYLYALVYF	L74;L12;L59;L2;L62
2245	LSEISMDNS	L1	PPTSFGPL	L56;L22	FMIDVQQWGF	L43;L8;L12;L11;L9
2246	LSEQLDFI	L1	PQNAVVKI	L48;L24	FNVLFSTVF	L59;L31;L27;L26;L60
2247	LSETKCTLK	L1	PQSAPHGVVF	L26;L27	FQFCNDPFL	L44;L58;L61;L69;L28
2248	LSFELLHA	L50	PRRNVATL	L66;L65	FQSAVKRTI	L24;L48;L34;L64;L44
2249	LSFELLHAPA	L50	PRWYFYYL	L65;L66	FRVQPTESI	L34;L35;L30;L66;L28
2250	LSGFKLKD	L65	PSGTWLTY	L65;L18	FSNSGSDVLY	L1;L14;L18;L58;L52
2251	LSHQSDIEV	L73	PTSFGPLVRK	L7;L6	FSSTFNVPM	L70;L61;L58;L69;L59
2252	LSHRFYRL	L60	PVAYRKVLLR	L19;L21	FTVEKGIYQ	L60;L58;L20;L61;L69

2253	LSKSLTEN	L43	PVLKGVKL	L23;L74	FVTHSKGLY	L12;L14;L1;L49;L58
2254	LSKSLTENK	L13	PVNVAFELW	L54;L52	FVTVYSHL	L74;L60;L59;L61;L68
2255	LSLIDFYL	L55	PVPEVKIL	L57;L64	FVVPGLPGTIL	L60;L67;L74;L31;L61
2256	LSLIDFYLC	L52	PYEDFQENW	L9;L8	FWITIAYII	L69;L34;L8;L9;L55
2257	LSLIDFYLCF	L52	PYFFTLLLQL	L9;L8	FYAYLRKHF	L9;L72;L71;L66;L12
2258	LSLPVLQVRD	L52	PYIKWDLLK	L8;L9	FYEPQIITT	L62;L72;L66;L71;L9
2259	LSLQFKRPI	L55	PYIVGDVV	L71;L72	FYLITPVHVM	L71;L72;L66;L9;L8
2260	LSLREVRTIKVF	L52	PYPNASFDNF	L9;L8	FYLTNDVSFL	L72;L71;L9;L62;L8
2261	LSPRWYFY	L1	QAENVTGLF	L49;L63	FYPPDEDEE	L66;L72;L62;L9;L71
2262	LSPRWYFYYL	L57	QAITVTPEA	L50;L32	FYYVWKSY	L71;L72;L43;L66;L59
2263	LSRVLGLKTL	L52	QASSRSSSR	L17;L19	GADPIHSLR	L63;L19;L15;L18;L68
2264	LSSYSLFD	L65	QAVTANVNAL	L67;L61	GAMDTTSYR	L15;L19;L17;L7;L21
2265	LSTDGNKIADKY	L1	QEAYEQAV	L33;L45	GCINANQVI	L24;L34;L36;L28;L45
2266	LSTDTGVEHVTF	L52	QEAYEQAVAN	L38;L40	GDSEVVLKK	L7;L6;L19;L13;L24
2267	LSVCLGSLI	L55	QEEVQELY	L29;L1	GEFKLASH	L45;L37;L29;L46;L33
2268	LSVVNARL	L60	QEFKPRSQ	L29;L48	GEQKSILSP	L38;L42;L46;L37;L45
2269	LSYEQFKK	L55	QEGVVDYGA	L42;L38	GERVRQAL	L37;L25;L33;L45;L36
2270	LSYFIASFRLF	L52	QEGVVDYGARF	L40;L41	GERVRQALL	L36;L45;L37;L40;L33
2271	LTAESHVD	L55	QEHYVRITGLY	L40;L41	GETLPTEV	L45;L48;L37;L46;L36
2272	LTAFGLVA	L50	QEILGTVSWN	L41;L40	GEVITFDNL	L36;L37;L45;L41;L40
2273	LTAFGLVAEWF	L52	QEKNFTTA	L46;L42	GEVPVSII	L45;L48;L37;L36;L29
2274	LTCATTRQV	L70	QELGKYEQYIKW	L40;L41	GEYSHVVA	L46;L38;L25;L37;L42
2275	LTDEMIAQYT	L1	QELIRQGTDY	L40;L41	GFFTYICGF	L72;L12;L9;L71;L8
2276	LTDNVYIK	L1	QELYSPIF	L29;L33	GFIAGLIAI	L71;L72;L24;L8;L34
2277	LTEEVVLK	L1	QEPKLGSL	L33;L57	GFIQQKLAL	L72;L71;L8;L23;L37

2278	LTESNKKF	L1	QEPKLGSLV	L45;L36	GFQPTNGVGY	L14;L12;L72;L26;L71
2279	LTFYLTNDV	L20	QEPKLGSLVV	L42;L36	GHFAWWTAF	L27;L28;L35;L34;L26
2280	LTFYLTNDVSF	L52	QESPFVMM	L29;L33	GHYKHITSK	L27;L28;L6;L7;L35
2281	LTKEGATT	L55	QEVFAQVKQIY	L41;L40	GLAAIMQLF	L12;L9;L26;L16;L24
2282	LTKGTLEPEYF	L52	QEYADVFHLYL	L41;L40	GLTVLPPLL	L4;L2;L74;L3;L5
2283	LTKPYIKWD	L70	QFAPSASAFF	L9;L12	GLVEVEKGV	L2;L5;L3;L24;L4
2284	LTLDNQDL	L60	QFDTYNLWNTF	L9;L8	GLWLDDVVY	L27;L26;L18;L14;L12
2285	LTLDNQDLN	L52	QFKHLIPL	L71;L72	GPKVKYLYF	L39;L23;L49;L22;L43
2286	LTLDNQDLNGNW	L52	QFPNTYLEG	L72;L71	GQQQQGQTV	L24;L48;L28;L26;L35
2287	LTLGVYDY	L1	QGAVDINKL	L64;L34	GRFVLALL	L25;L64;L35;L66;L30
2288	LTNDNTSRYW	L52	QGDDYVYLPY	L18;L1	GSDNVTDF	L63;L62;L68;L74;L54
2289	LTNDVSFLA	L1	QHEVLLAPL	L34;L28	GSIIQFPNTY	L26;L14;L55;L52;L27
2290	LTNDVSFLAH	L6	QHEVLLAPLL	L28;L34	GSKSPIQYI	L55;L13;L24;L70;L53
2291	LTPGDSSSG	L57	QHMVVKAALL	L28;L34	GSLAATVRL	L44;L53;L73;L74;L60
2292	LTPLGIDLDEW	L52	QIDGYVMHANY	L18;L1	GSLVVRCSF	L52;L53;L54;L55;L16
2293	LTPVVQTIEV	L5	QIGEYTFEK	L7;L6	GTDPYEDF	L1;L54;L62;L18;L63
2294	LTRPLLES	L59	QIGGYTEKW	L54;L16	GTHWFVTQR	L21;L7;L15;L19;L17
2295	LTRPLLESE	L52	QIVESCGNF	L10;L11	GVAPGTAV	L28;L20;L51;L23;L24
2296	LTSMKYFVK	L7	QLDEEQPM	L63;L62	GVDAVNLL	L63;L74;L68;L62;L1
2297	LTSQWLTNI	L53	QLDFIDTKRGVY	L1;L18	GVFCGVDAV	L20;L3;L24;L4;L2
2298	LTSQWLTNIF	L52	QLGIEFLKR	L21;L6	GVPVVDSYY	L12;L14;L26;L18;L11
2299	LTTAAKLM	L55	QLMCQPILLL	L4;L2	GVVQLTSQW	L10;L52;L54;L49;L16
2300	LTTAAKLMV	L73	QLNRALTGI	L3;L4	GVVQQLPETY	L12;L26;L10;L14;L52
2301	LTVFFDGRV	L20	QLPETYFTQ	L5;L57	GVYSVIYL	L74;L67;L64;L69;L58
2302	LTVFFDGRVD	L55	QLRKQIRSA	L3;L51	GVYYPDKVFR	L7;L15;L19;L21;L6
2303	LVAAGLEAPFLY	L12	QLRVIGHSM	L43;L26	GYINVFAF	L72;L71;L9;L8;L66

2304	LVAVPTGYV	L20	QLTPTWRV	L48;L4	GYINVFAFPF	L8;L9;L12;L72;L71
2305	LVKQGDDY	L26	QMAPISAMVR	L21;L19	GYLQPRTFL	L9;L8;L72;L71;L36
2306	LVLARKHTT	L23	QNAQALNTL	L34;L28	HECFVKRV	L48;L45;L37;L33;L29
2307	LVLIMLII	L47	QNYGDSATL	L28;L65	HFAIGLALYY	L12;L18;L14;L72;L71
2308	LVLIMLIIFW	L52	QPEEEQEED	L32;L49	HFDEGNCDTL	L62;L34;L68;L67;L63
2309	LVLLPLVSS	L50	QPIGALDISA	L50;L51	HFIETISLA	L8;L46;L62;L11;L72
2310	LVPFWITI	L47	QPILLLDQA	L50;L51	HGFELTSM	L25;L48;L29;L59;L23
2311	LVPFWITIAYI	L5	QPITNCVKM	L32;L22	HHMELPTGV	L28;L35;L3;L34;L2
2312	LVPHVGEI	L47	QPLEQPTSEA	L50;L51	HITSKETLY	L12;L14;L11;L18;L58
2313	LVPHVGEIPV	L5	QPSVGPKQASL	L56;L22	HLLIGLAKR	L21;L15;L17;L6;L11
2314	LVPQEHYV	L5	QPVSELLTPL	L22;L31	HLLLVAAGL	L44;L4;L2;L5;L23
2315	LVPQEHYVRI	L5	QQQTTLKGV	L48;L24	HLMSFPQSA	L3;L2;L43;L46;L50
2316	LVRKIFVD	L65	QRNFYEPQI	L34;L30	HLYLQYIRKL	L3;L64;L24;L4;L44
2317	LVSDIDITFLKK	L6	QRVAGDSGF	L30;L34	HPDSATLV	L63;L62;L47;L50;L32
2318	LVTLAILTAL	L56	QSADAQSFLNR	L15;L7	HPLADNKFAL	L32;L56;L31;L23;L39
2319	LVYAADPAM	L32	QSAPHGVV	L70;L48	HPNPKGFCDL	L32;L39;L56;L22;L49
2320	LVYDNKLKAH	L43	QSAVKRTI	L55;L48	HPNQEYADV	L51;L50;L32;L49;L39
2321	LVYDNKLKAHK	L6	QSDIEVTGD	L65;L1	HSKGLYRKC	L55;L13;L14;L52;L10
2322	LVYFLQSINF	L12	QSFLNRVC	L55;L48	HSYFTSDY	L18;L43;L14;L26;L1
2323	LWCKDGHVETF	L8	QSYGFQPTN	L48;L55	HTDFSSEI	L68;L63;L62;L18;L1
2324	LWLLWPVTLA	L50	QTLEILDI	L55;L48	HTDFSSEII	L68;L34;L18;L63;L1
2325	LWNTFTRL	L62	QTMLFTMLRK	L7;L6	HTDLMAAYV	L62;L63;L18;L1;L68
2326	LYALVYFLQ	L9	QTSITSAVL	L28;L53	HVSGTNGTKR	L19;L21;L17;L11;L15
2327	LYDKLQFT	L62	QTTETAHSC	L55;L54	HVVAFNTLLF	L11;L12;L10;L49;L52
2328	LYDKLVSS	L62	QTTTIQTI	L55;L48	HWPQIAQF	L62;L33;L9;L11;L71

2329	LYIDINGN	L72	QTVDSSQGSEY	L14;L11	HYVRITGLY	L14;L12;L11;L49;L66
2330	LYIDINGNLHP	L8	QVAKSHNIAL	L56;L20	IAANTVIW	L54;L69;L52;L49;L70
2331	LYKLMGHF	L9	QVEQKIAEI	L20;L10	IAATRGATV	L58;L70;L47;L61;L69
2332	LYKMQRML	L71	QVIVNNLDK	L7;L6	IAEIPKEEV	L63;L68;L67;L49;L47
2333	LYPTLNISDEF	L9	QVNGLTSIK	L6;L7	IAIVMVTIML	L74;L60;L61;L67;L31
2334	LYSPIFLIVAA	L50	QVNGYPNMF	L16;L58	IANQFNSAI	L68;L47;L32;L70;L57
2335	MADLVYALRH	L68	QVNGYPNMFITR	L21;L17	IAQYTSALL	L60;L61;L63;L32;L74
2336	MADQAMTQ	L68	QVVDADSKI	L10;L20	IAYIICIST	L43;L69;L67;L47;L50
2337	MAFPSGKVEG	L31	QWMVMFTPL	L71;L72	IFGTVYEKL	L8;L9;L62;L72;L71
2338	MAGNGGDAA	L50	QWNLVIGFL	L62;L40	IFVDGVPF	L72;L71;L62;L9;L8
2339	MAGNGGDAAL	L32	QYIKWPWY	L71;L72	IFWFSLEL	L72;L62;L71;L68;L67
2340	MAPISAMVR	L57	QYIKWPWYIW	L9;L8	IFYLITPV	L48;L72;L71;L47;L62
2341	MASLVLAR	L17	QYIKWPWYIWL	L8;L9	IGAGICASY	L14;L26;L12;L43;L27
2342	MASLVLARK	L19	QYIRKLHDEL	L9;L8	IIIWFLLLSV	L3;L73;L4;L5;L20
2343	MAYITGGVVQ	L49	QYLNTLTLA	L8;L9	IIKTIQPRV	L58;L48;L5;L13;L3
2344	MAYITGGVVQL	L69	QYVFCTVNAL	L72;L71	IIRENNRVV	L3;L13;L58;L39;L48
2345	MDGSIIQF	L33	RAFDIYNDKV	L24;L20	IKDFGGFNF	L27;L34;L68;L63;L9
2346	MDLFMRIF	L33	RAGEAANF	L54;L53	ILDGISQYSL	L5;L68;L63;L2;L67
2347	MDNLACEDL	L33	RAMPNMLR	L15;L21	ILGLPTQTV	L2;L24;L5;L4;L3
2348	MDSTVKNYF	L33	RARSVASQSI	L55;L53	ILGTVSWNL	L2;L4;L5;L74;L9
2349	MEKLKTLVAT	L42	RARTVAGVSI	L53;L44	ILRKGGRTI	L55;L3;L24;L39;L48
2350	MELPTGVHAG	L40	RARVECFDKF	L52;L53	ILTSLLVL	L74;L23;L59;L4;L73
2351	MELTPVVQ	L29	RATRVECTTI	L54;L53	IMASLVLAR	L19;L17;L6;L21;L15
2352	MESEFRVYSS	L42	RCNLGGAVCR	L21;L15	INPTDQSSY	L14;L12;L43;L72;L71
2353	MFDAYVNT	L62	RDLPQGFSA	L51;L46	IPFAMQMAY	L31;L49;L12;L50;L71
2354	MFLGTCRR	L17	RDLPQGFSAL	L33;L37	IPTITQMNL	L56;L39;L32;L22;L49

2355	MFTPLIQPI	L9	RDPQTLEIL	L33;L57	IQYGRSGETL	L25;L27;L26;L28;L44
2356	MFTPLVPFWI	L9	REFVFKNIDGY	L29;L41	ITIAYIICI	L20;L69;L70;L73;L53
2357	MGIIAMSA	L50	REGYLNSTN	L45;L36	ITLKKRWQL	L53;L16;L73;L60;L4
2358	MGIIAMSAF	L59	RELNGGAYTRY	L40;L41	IVDSVTVKN	L63;L5;L68;L49;L18
2359	MHAASGNL	L28	REQIDGYVMHA	L42;L38	IWLGFIAGL	L4;L8;L9;L30;L62
2360	MHHMELPTGV	L28	RETMSYLF	L33;L29	IYDEPTTTT	L62;L68;L9;L8;L63
2361	MISAGFSLWVY	L14	REVLSDRELHL	L36;L40	KAFKQIVES	L69;L53;L70;L73;L58
2362	MLAHAEETR	L21	RFASVYAW	L54;L71	KAGGTTEM	L70;L58;L54;L59;L63
2363	MLDNRATLQ	L1	RFDTRVLSN	L18;L62	KAIVSTIQR	L21;L15;L19;L17;L7
2364	MLDNRATLQAI	L5	RFQTLLAL	L72;L71	KCRSKNPLLY	L13;L18;L6;L12;L14
2365	MLFTMLRK	L6	RFQTLLALH	L14;L15	KDCVVLHSY	L14;L16;L18;L26;L33
2366	MLKTVYSD	L23	RFVSLAIDAY	L14;L12	KDLPKEITV	L33;L73;L2;L37;L4
2367	MLKTVYSDV	L3	RFYFYTSK	L71;L72	KDLSPRWYF	L33;L16;L8;L52;L9
2368	MLLEIKDTEK	L6	RGGSQASSR	L15;L21	KEIDRLNEVA	L38;L46;L42;L36;L37
2369	MLLEIKDTEKY	L12	RHSLSHFV	L33;L28	KELLQNGM	L33;L37;L36;L45;L29
2370	MLLEKCDL	L23	RIDGDMVPHI	L5;L63	KELLVYAA	L33;L38;L46;L42;L37
2371	MLRIMASL	L23	RIIMRLWLCW	L54;L16	KELLVYAAD	L38;L33;L46;L40;L42
2372	MLWCKDGHV	L2	RIIPARAR	L21;L15	KESVQTFFKL	L36;L37;L41;L40;L45
2373	MMFVKHKH	L48	RIKIVQML	L23;L39	KFLTENLL	L71;L8;L62;L72;L9
2374	MMFVKHKHAF	L16	RILGAGCFV	L73;L13	KFNGLTVL	L62;L71;L72;L8;L56
2375	MMISAGFSLW	L10	RIMASLVLARK	L6;L7	KFTDGVCL	L72;L71;L62;L8;L56
2376	MNLKYAISA	L50	RIQPGQTFSV	L16;L4	KFYGGWHNML	L71;L8;L72;L9;L16
2377	MPASWVMRIMTW	L49	RIRSVYPVA	L51;L13	KGFCKLHNW	L16;L54;L52;L49;L53
2378	MPILTLTRALTA	L50	RKHFSMMIL	L44;L27	KGIYQTSNF	L54;L27;L8;L26;L16
2379	MPLKAPKE	L47	RKHTTCCSL	L44;L27	KGPKVKYLY	L14;L12;L66;L54;L18

2380	MPLKAPKEII	L47	RKIFVDGVPF	L27;L44	KHAFLCLFL	L28;L34;L73;L44;L35
2381	MPLKAPKEIIF	L31	RKLDNDAL	L44;L27	KHTPINLV	L28;L48;L73;L64;L35
2382	MPLSAPTLVPQ	L50	RKVQHMVVK	L44;L27	KIADKYVRNL	L3;L16;L4;L13;L64
2383	MPNLYKMQR	L17	RKYKGIKIQ	L27;L44	KIILFLALI	L73;L3;L48;L24;L16
2384	MPNLYKMQRML	L39	RLIIRENNR	L21;L15	KLDGFMGRI	L5;L18;L63;L2;L24
2385	MPNMLRIMAS	L50	RLIIRENNRV	L24;L2	KLGSLVVRC	L4;L2;L16;L21;L24
2386	MPNMLRIMASL	L22	RLISMMGFK	L6;L13	KLKDCVMY	L26;L13;L43;L14;L18
2387	MPVCVETKAI	L32	RLITGRLQS	L16;L13	KLLEQWNL	L2;L4;L55;L16;L5
2388	MQNCVLKLKV	L24	RLKLFAAETL	L16;L26	KLNEEIAIIL	L16;L2;L4;L5;L44
2389	MQRKLEKM	L48	RLKLFDRYFKY	L14;L18	KLVSSFLEM	L16;L5;L73;L6;L27
2390	MQTMLFTML	L44	RLQAGNATEV	L2;L24	KMKDLSPRWY	L14;L13;L55;L16;L26
2391	MQVESDDY	L26	RLWLCWKCR	L21;L15	KNFKSVLY	L27;L54;L65;L18;L26
2392	MQVESDDYI	L34	RLYLDAYNM	L21;L16	KNGSIHLY	L14;L65;L18;L55;L54
2393	MRELNGGAY	L1	RNAGIVGV	L24;L33	KPCIKVATV	L51;L39;L47;L23;L22
2394	MRLWLCWKC	L30	RNARNGVLI	L53;L24	KPFERDIST	L56;L51;L39;L32;L50
2395	MRLWLCWKCR	L30	RNLQEFKPR	L15;L21	KPFLNKVV	L47;L39;L51;L25;L50
2396	MRTFKVSI	L35	RNRFLYIIKL	L13;L44	KPNELSRV	L51;L39;L56;L47;L48
2397	MRTFKVSIWNL	L30	RNTNPIQL	L73;L56	KPYIKWDLL	L23;L39;L56;L22;L47
2398	MRVIHFGA	L25	RNYIAQVD	L65;L55	KQGDDYVY	L26;L14;L65;L27;L66
2399	MSALNHTKKW	L52	RNYIAQVDV	L73;L24	KQLIKVTLV	L48;L24;L73;L33;L4
2400	MSALNHTKKWKY	L1	RNYVFTGYR	L15;L21	KQLIKVTLVF	L16;L27;L26;L8;L52
2401	MSDNGPQNQ	L1	RPQGLPNNTA	L51;L22	KQLPFFYY	L27;L14;L26;L12;L16
2402	MSDRDLYD	L1	RPQIGVVRE	L56;L39	KRFDNPVLPF	L30;L66;L65;L16;L6
2403	MSDRDLYDK	L1	RQALLKTVQ	L44;L24	KRFKESPFEL	L65;L66;L30;L35;L16
2404	MSDRDLYDKL	L1	RQLLFVVE	L27;L44	KSAFVNLKQL	L55;L53;L73;L13;L44

2405	MSDVKCTSVVL	L68	RQLLFVVEVV	L24;L48	KSAGFPFNKW	L52;L54;L16;L53;L18
2406	MSLSEQLR	L17	RQVVNVVTTK	L30;L7	KSASVYYSQL	L55;L53;L44;L54;L73
2407	MSRIGMEV	L48	RRAFGEYSH	L30;L65	KSDGTGTI	L55;L68;L63;L54;L18
2408	MSYEDQDALFAY	L1	RRATCFSTA	L65;L30	KSFTVEKGI	L55;L53;L54;L52;L16
2409	MSYLFQHA	L50	RRCPAEIVD	L65;L30	KSHNIALI	L55;L48;L73;L53;L54
2410	MSYLFQHAN	L48	RRGPEQTQG	L65;L30	KSILSPLYAF	L52;L53;L54;L16;L26
2411	MTYRRLISMM	L11	RRLISMMGF	L30;L33	KSLNVAKSEF	L53;L52;L54;L16;L55
2412	MVDTSLSG	L68	RRSFYVYAN	L65;L30	KSPNFSKL	L57;L73;L63;L55;L54
2413	MVDTSLSGFKL	L68	RRVWTLMNV	L30;L64	KSPNFSKLI	L55;L64;L53;L57;L73
2414	MVLGSLAATV	L20	RRVWTLMNVL	L65;L30	KSQDLSVV	L73;L70;L48;L69;L18
2415	MVMCGGSLYVK	L7	RSDVLLPLT	L18;L1	KSREETGLLM	L52;L13;L53;L18;L55
2416	MVMFTPLV	L48	RSEKSYELQ	L18;L1	KSWMESEFRVY	L14;L18;L52;L55;L16
2417	MVMFTPLVP	L50	RSFIEDLLFNK	L7;L6	KTDGTLMIERF	L18;L54;L52;L53;L16
2418	MVRMYIFFA	L50	RSGARSKQR	L21;L15	KTHVQLSL	L73;L53;L55;L54;L60
2419	MVVKAALL	L74	RSKNPLLYD	L13;L15	KTLATHGL	L54;L55;L16;L33;L53
2420	MWKGYGCSC	L43	RSLPGVFC	L55;L54	KTPPIKDF	L53;L54;L52;L55;L66
2421	MWLSYFIA	L50	RSLPGVFCGV	L13;L73	KTYERHSLSHF	L16;L53;L54;L11;L52
2422	MYDPKTKN	L62	RSSVLHST	L55;L54	KVFRSSVL	L54;L53;L56;L44;L55
2423	MYLKLRSDVL	L9	RSVASQSII	L55;L54	KVGGNYNYLY	L14;L18;L16;L12;L54
2424	MYTPHTVLQ	L9	RSVASQSIIAY	L18;L14	KVKYLYFIK	L13;L7;L6;L21;L15
2425	NAAIVLQLP	L49	RSVYPVASP	L65;L54	KVTLVFLFV	L73;L13;L20;L24;L5
2426	NAANVYLK	L19	RTAPHGHV	L73;L18	KWADNNCYL	L44;L8;L9;L73;L36
2427	NADLYKLMG	L68	RTAPHGHVMVE	L16;L52	KWDLLKYDF	L62;L53;L9;L63;L33
2428	NALPETTA	L50	RTCCLCDRR	L21;L15	KYKYFSGAM	L66;L71;L72;L13;L14
2429	NANQVIVNNL	L31	RTFKVSIWNLDY	L18;L14	KYTMADLVY	L14;L66;L72;L71;L12

2430	NAPGCDVTD	L49	RTIAFGGCV	L73;L13	LADAGFIKQ	L63;L49;L68;L32;L18
2431	NAPGCDVTDV	L57	RTIKVFTT	L55;L54	LADAGFIKQY	L18;L1;L49;L70;L31
2432	NAQALNTLV	L70	RTLETAQNS	L53;L54	LAFLLFLVLI	L47;L50;L69;L31;L52
2433	NARNGVLI	L47	RTLETAQNSVR	L21;L15	LAKKFDTF	L58;L59;L23;L47;L52
2434	NARNGVLIT	L69	RTNVYLAV	L73;L18	LALHRSYL	L60;L61;L59;L47;L74
2435	NATNKATY	L70	RTQLPPAY	L18;L14	LALITLATC	L47;L50;L59;L52;L31
2436	NATNKATYK	L19	RTVAGVSIC	L54;L16	LATCELYHY	L31;L49;L12;L52;L58
2437	NATRFASV	L47	RTVYDDGAR	L21;L15	LAYILFTRFF	L52;L49;L47;L60;L31
2438	NCDTLKEI	L68	RTVYDDGARR	L15;L21	LCLFLLPSL	L4;L31;L50;L59;L47
2439	NCDVVIGIV	L62	RVAGDSGF	L54;L26	LEEKFKEGV	L45;L46;L42;L38;L37
2440	NCVADYSVLY	L31	RVCGVSAARL	L56;L14	LEFGATSA	L46;L25;L38;L29;L37
2441	NCVLKLKV	L25	RVCVDTVR	L21;L15	LEQPTSEAV	L38;L45;L42;L46;L36
2442	NDFNLVAMK	L19	RVIGHSMQN	L13;L11	LEQYVFCTV	L45;L38;L42;L37;L46
2443	NDLCFTNV	L33	RVIHFGAGSDK	L6;L7	LFCLLNRYF	L62;L72;L9;L71;L12
2444	NDLCFTNVY	L29	RVLQKAAITI	L16;L53	LFDESGEFKL	L62;L68;L63;L5;L8
2445	NDPFLGVYY	L12	RVVFVLWAH	L7;L6	LFFSYFAVHF	L71;L9;L72;L12;L8
2446	NDSKEGFF	L33	RVVFVLWAHGF	L16;L52	LFVAAIFYL	L72;L62;L71;L9;L8
2447	NDSKEGFFTY	L29	RVYANLGERVR	L21;L15	LFVTVYSHL	L72;L8;L71;L62;L9
2448	NEFACVVADA	L46	RYFRLTLGVY	L14;L12	LHDELTGHM	L62;L63;L28;L1;L5
2449	NEFYAYLR	L29	RYLALYNKYKY	L14;L12	LHPDSATLV	L5;L28;L64;L57;L34
2450	NEKQEILGT	L42	RYMSALNH	L71;L72	LIDFYLCF	L68;L1;L62;L63;L60
2451	NEKTHVQLS	L29	RYMSALNHT	L9;L8	LIDSYFVVK	L7;L6;L5;L68;L1
2452	NENGTITD	L29	RYPANSIV	L71;L72	LIIFWFSL	L23;L60;L61;L59;L67
2453	NESLIDLQ	L29	RYPANSIVCR	L15;L21	LIKVTLVF	L59;L43;L26;L23;L58
2454	NETLVTMP	L29	RYPANSIVCRF	L8;L9	LINIIIWF	L59;L26;L74;L23;L43
2455	NEVAKNLN	L29	RYVLMDGSIIQF	L9;L8	LIQPIGAL	L61;L59;L60;L23;L74

2456	NEYRLYLD	L29	SAAKKNNLPF	L58;L43	LLEDEFTPF	L5;L1;L26;L12;L9
2457	NFGDQELIR	L17	SADAQSFLN	L68;L63	LLFNKVTLA	L3;L2;L4;L6;L5
2458	NFVRIIMR	L17	SADAQSFLNR	L7;L19	LLIIMRTF	L26;L55;L59;L43;L23
2459	NFYEPQIITT	L71	SAINRPQI	L70;L47	LLLLFVTV	L47;L23;L50;L4;L2
2460	NGDRWFLNR	L17	SAINRPQIG	L69;L70	LLMPILTLT	L2;L5;L3;L4;L6
2461	NGGAYTRYV	L64	SAINRPQIGV	L20;L58	LLTDEMIAQY	L11;L14;L12;L26;L18
2462	NGLTGTGV	L25	SALNHTKKWKY	L12;L14	LLYDANYF	L59;L62;L26;L74;L72
2463	NGMNGRTIL	L25	SAMVRMYIFF	L58;L43	LNEEIAIIL	L32;L31;L63;L68;L62
2464	NGNKGAGGHSY	L14	SAQTGIAV	L70;L23	LPAPRTLLT	L22;L47;L31;L51;L49
2465	NGQVFGLY	L14	SASAFFGMSR	L19;L17	LPFFSNVTWF	L31;L49;L32;L39;L47
2466	NGSPSGVY	L14	SASKIITLKK	L7;L19	LPGCDGGSL	L39;L22;L32;L56;L31
2467	NGYLTSSS	L25	SAVGNICYT	L69;L58	LPKEITVA	L50;L51;L23;L39;L47
2468	NGYTVEEA	L25	SAVKLQNNEL	L67;L32	LPNNTASWF	L49;L31;L32;L39;L22
2469	NHNFLVQAG	L35	SAVLQSGFRK	L7;L19	LQAGNATEV	L24;L58;L28;L3;L64
2470	NHTKKWKY	L29	SDFVRATAT	L33;L25	LQAVGACVL	L44;L28;L61;L35;L25
2471	NICYTPSKL	L63	SDIDYVPL	L43;L71	LRVEAFEYY	L66;L30;L31;L12;L65
2472	NIFGTVYEKLK	L19	SDNIALLV	L33;L48	LSDDAVVC	L68;L63;L1;L62;L18
2473	NIGEQKSIL	L67	SDRELHLSW	L49;L52	LSLPVLQV	L73;L48;L47;L70;L59
2474	NIIIWFLL	L23	SDVENPHLM	L29;L33	LSSTASAL	L57;L61;L60;L59;L55
2475	NIIRGWIF	L29	SDYDYYRYN	L65;L43	LSVVNARLR	L55;L19;L15;L52;L17
2476	NIKFADDL	L23	SEAARVVR	L29;L42	LSYGIATVR	L19;L15;L17;L21;L69
2477	NIKPVPEVK	L13	SEAARVVRSIF	L41;L40	LTAVVIPTK	L7;L13;L6;L52;L19
2478	NINLHTQVV	L73	SEDAQGMDNL	L36;L37	LTLGVYDYL	L67;L60;L53;L61;L73
2479	NITRFQTLL	L74	SEDKRAKVTSA	L38;L42	LVFLGIITTV	L3;L20;L50;L51;L47
2480	NIVNVSLV	L48	SEDNQTTT	L45;L37	LVQSTQWSL	L32;L39;L60;L56;L4
2481	NKDGIIWVA	L35	SEETGTLIVN	L36;L42	LVYALRHF	L59;L55;L47;L52;L58

2482	NKFALTCF	L27	SEEVVENP	L42;L38	LVYDNKLKA	L50;L46;L51;L24;L3
2483	NKGEDIQL	L66	SEFSSLPSYAA	L46;L42	LYCIDGALL	L9;L62;L8;L72;L71
2484	NKHADFDTW	L49	SEFSSLPSYAAF	L41;L40	LYLGGMSY	L71;L72;L66;L12;L14
2485	NKHIDAYKTF	L27	SEGLNDNLLEI	L41;L45	LYLGGMSYY	L71;L72;L12;L14;L8
2486	NKKDWYDF	L66	SEMVMCGGSLY	L40;L41	LYLYALVY	L72;L71;L65;L12;L66
2487	NKKFLPFQQF	L27	SEQLRKQIRSA	L42;L38	LYQPPQTSI	L9;L8;L72;L71;L28
2488	NKWGKARLYY	L27	SEVGPEHSLAEY	L41;L40	LYVNKHAF	L72;L71;L9;L8;L66
2489	NKYKYFSGA	L46	SEVVLKKLK	L41;L40	MACLVGLMW	L49;L31;L54;L50;L52
2490	NLAWPLIV	L3	SEYKGPITDVF	L29;L41	MADLVYALR	L19;L68;L17;L63;L1
2491	NLAWPLIVTAL	L4	SFCTQLNR	L17;L15	MCQPILLL	L74;L28;L73;L25;L61
2492	NLDKSAGFP	L1	SFCTQLNRAL	L71;L72	MELPTGVHA	L46;L42;L38;L50;L40
2493	NLDSCKRV	L63	SFGGASCCLY	L14;L12	MELTPVVQT	L42;L29;L38;L46;L33
2494	NLDSCKRVLNV	L5	SFLAHIQW	L71;L72	MESEFRVY	L29;L40;L46;L45;L41
2495	NLDYIINLII	L68	SFLGRYMSAL	L71;L72	MFTPLVPF	L72;L62;L71;L9;L59
2496	NLHPDSATLV	L2	SFLNGFAV	L71;L72	MFTPLVPFW	L9;L49;L54;L52;L8
2497	NLIDSYFV	L2	SFLNGSCG	L72;L71	MLAKALRKV	L3;L2;L4;L24;L64
2498	NLKYAISA	L23	SFLNRVCGV	L71;L72	MLNPNYEDL	L5;L4;L3;L74;L2
2499	NLKYAISAK	L6	SFLPGVYS	L71;L72	MMSAPPAQY	L14;L12;L26;L31;L16
2500	NLLLDKRTT	L23	SFLPGVYSVI	L8;L9	MPASWVMRI	L47;L49;L32;L50;L20
2501	NLPFKLTC	L57	SFPQSAPH	L71;L72	MPILTLTRAL	L32;L22;L31;L50;L39
2502	NLPGCDGGSL	L57	SFSTFEEAAL	L72;L71	MPLKAPKEI	L47;L50;L39;L32;L49
2503	NLPLQLGF	L57	SFSTFKCY	L72;L71	MPLSAPTLV	L47;L50;L51;L22;L31
2504	NLPTMCDI	L57	SFVIRGDEV	L72;L71	MSKFPLKL	L70;L73;L55;L74;L69
2505	NLPTMCDIRQL	L57	SFYVYANGG	L72;L71	MVELVAEL	L68;L62;L63;L67;L59
2506	NLREFVFK	L13	SGDATTAY	L1;L18	MVPHISRQR	L19;L17;L15;L11;L21
2507	NLREFVFKNI	L3	SGDGTTSPI	L68;L63	MVVIPDYNTY	L10;L11;L26;L12;L14

2508	NLREMLAH	L43	SGLKTILR	L15;L17	MWALIISV	L50;L25;L47;L28;L33
2509	NLSKSLTEN	L3	SGLKTILRK	L7;L6	MYIFFASFY	L72;L12;L71;L14;L66
2510	NLVAMKYNY	L12	SGTNGTKRF	L49;L27	NCVADYSVL	L35;L25;L28;L10;L67
2511	NMFITREE	L48	SGVPVVDSYY	L14;L12	NCYDYCIPY	L43;L69;L6;L72;L71
2512	NMFTPLIQP	L46	SGYLKLTD	L48;L65	NEEIAIIL	L29;L25;L37;L36;L45
2513	NMLRIMASL	L8	SHAAVDALC	L34;L28	NEKCSAYTV	L37;L45;L42;L38;L29
2514	NNATNKATY	L12	SHFAIGLALYY	L12;L41	NELSPVALR	L17;L40;L41;L19;L15
2515	NNATNVVIK	L19	SHNIALIW	L35;L28	NESGLKTI	L45;L48;L29;L37;L25
2516	NNLDSKVGGNY	L14	SHQSDIEV	L28;L35	NESLIDLQEL	L40;L41;L36;L29;L37
2517	NPDILRVYA	L50	SHSQLGGL	L28;L35	NFNQHEVL	L71;L25;L72;L62;L23
2518	NPIQLSSY	L31	SHSQLGGLH	L28;L34	NFNVLFSTVF	L62;L9;L72;L71;L8
2519	NPKAIKCVPQA	L51	SHTVMPLSA	L28;L35	NFTIKGSFL	L72;L71;L8;L62;L9
2520	NPKTPKYKFV	L39	SIAIPTNF	L74;L26	NGGDAALAL	L67;L61;L35;L66;L57
2521	NPLLYDANY	L31	SIDAFKLNIK	L7;L6	NIDGYFKIY	L18;L1;L14;L58;L29
2522	NPLLYDANYF	L31	SIVAGGIVAI	L10;L20	NIFGTVYEK	L7;L19;L6;L17;L13
2523	NPTDQSSY	L31	SKEGFFTY	L27;L66	NIIPLTTAA	L28;L3;L11;L50;L46
2524	NPVLPFNDGVY	L31	SKHTPINLV	L28;L64	NPANNAAIV	L47;L22;L50;L39;L51
2525	NPVLPFNDGVYF	L31	SKIITLKKRW	L41;L40	NPANNAAIVL	L56;L39;L31;L22;L32
2526	NPVMEPIY	L31	SKSLTENKY	L27;L14	NPAWRKAV	L39;L25;L23;L22;L51
2527	NPVMEPIYD	L49	SKTPEEHFI	L44;L34	NPIQLSSYSL	L56;L22;L32;L39;L31
2528	NQFNSAIGKI	L24	SKTTVASL	L44;L66	NPKTPKYKF	L39;L49;L23;L31;L22
2529	NQNAQALNTL	L34	SKVGGNYNY	L27;L14	NQDLNGNWY	L1;L26;L27;L18;L68
2530	NQRNAPRI	L48	SKVQIGEY	L27;L66	NRALTGIAV	L35;L25;L30;L28;L64
2531	NRARTVAG	L35	SLAATVRLQ	L3;L64	NSSPDDQIGY	L1;L18;L52;L54;L14
2532	NRATLQAIA	L35	SLAEYHNES	L2;L3	NSSRVPDLL	L74;L67;L53;L73;L20

2533	NRATRVEC	L25	SLAGSYKDWSY	L14;L18	NTQEVFAQV	L20;L13;L73;L5;L11
2534	NRATRVECT	L25	SLAIDAYPL	L2;L4	NVVRIKIVQM	L19;L11;L20;L32;L10
2535	NRFLYIIK	L25	SLAIDAYPLTK	L6;L7	NYMPYFFTLL	L9;L8;L71;L66;L72
2536	NRFLYIIKLIF	L30	SLDTYPSLETI	L68;L5	NYQHEETIY	L72;L66;L71;L14;L12
2537	NRFNVAITRA	L30	SLFDMSKFPL	L2;L4	PEVKILNNL	L37;L36;L29;L41;L45
2538	NRFTTTLND	L65	SLIDFYLCFLAF	L12;L10	PFNDGVYF	L62;L72;L9;L71;L8
2539	NRNRFLYI	L35	SLKEGQIND	L13;L43	PLVPFWITI	L3;L2;L5;L4;L69
2540	NRNRFLYIIK	L30	SLKEGQINDM	L11;L3	PQLEQPYVF	L8;L9;L16;L27;L26
2541	NRNRFLYIIKL	L30	SLKELLQN	L3;L43	PVVDSYYSL	L10;L67;L20;L60;L61
2542	NRNYVFTG	L65	SLKITEEV	L23;L3	QAIASEFSSL	L61;L67;L60;L10;L32
2543	NRPQIGVVREF	L66	SLLSKGRLIIR	L21;L15	QAISMWAL	L67;L61;L59;L70;L60
2544	NRQFHQKLLK	L30	SLLVLVQST	L4;L2	QASLPFGWL	L67;L61;L60;L59;L74
2545	NRVCGVSAAR	L30	SLPINVIV	L57;L5	QELGKYEQY	L29;L41;L40;L42;L36
2546	NRVCTNYMPY	L66	SLPSYAAFA	L5;L57	QEYADVFHLY	L41;L40;L14;L29;L42
2547	NRVVISSD	L25	SLRCGACIR	L21;L15	QLFFSYFAV	L4;L24;L3;L2;L5
2548	NRVVISSDVL	L35	SLREVRTIKVF	L10;L43	QLLFVVEVV	L4;L2;L24;L3;L5
2549	NRYFRLTLGVY	L30	SLRPDTRYVL	L16;L13	QLMCQPILL	L74;L4;L2;L5;L3
2550	NRYLALYN	L25	SLSEQLRK	L6;L7	QLPAPRTL	L57;L64;L55;L5;L66
2551	NRYLALYNKY	L30	SLSHRFYR	L21;L15	QLYLGGMSYY	L18;L1;L6;L14;L26
2552	NSEVGPEHSL	L68	SLTIKKPNEL	L3;L4	QMEIDFLEL	L1;L67;L34;L68;L18
2553	NSHEGKTFYVL	L67	SLVKPSFY	L26;L14	QPYPNASF	L22;L39;L47;L31;L56
2554	NSIAIPTN	L48	SLWVYKQF	L43;L26	QQFGPTYL	L48;L28;L74;L69;L25
2555	NSIIKTIQPR	L19	SLYVKPGGT	L43;L3	QSLENVAF	L54;L52;L55;L53;L33
2556	NSIVCRFDTR	L19	SNYQHEETI	L34;L28	QTMLFTMLR	L21;L15;L17;L7;L19
2557	NSNNLDSKV	L73	SPDAVTAYN	L49;L22	QVDVVNFNL	L68;L5;L63;L1;L62
2558	NSPFHPLAD	L57	SPDVDLGDI	L49;L22	QVVNVVTTK	L19;L7;L6;L13;L20
2559	NSQGLLPPK	L7	SPFHPLADNKF	L31;L49	RANNTKGSL	L56;L44;L57;L58;L61

2560	NSVLLFLAFV	L20	SPFVMMSAP	L51;L22	RARSVSPKLF	L52;L53;L55;L58;L27
2561	NSVRVLQK	L19	SPIFLIVAAI	L22;L50	RCLAVHECF	L54;L8;L33;L53;L52
2562	NSVTSSIV	L70	SPIFLIVAAIVF	L31;L41	RDGWEIVKF	L33;L65;L53;L37;L54
2563	NSVTSSIVI	L70	SPKLFIRQ	L39;L51	REAVGTNL	L33;L37;L36;L45;L56
2564	NSWLMWLII	L67	SPKLFIRQE	L39;L51	REEAIRHVR	L38;L42;L36;L37;L40
2565	NTCTERLKLF	L10	SPLYAFASE	L51;L50	REETGLLM	L45;L33;L36;L37;L18
2566	NTDHSSSS	L1	SPLYAFASEA	L51;L50	REFLTRNPAW	L40;L41;L36;L38;L37
2567	NTKGSLPINV	L20	SPNFSKLI	L39;L47	REFVFKNI	L45;L48;L33;L37;L29
2568	NTLNDLNETL	L53	SPNFSKLINI	L56;L39	RELKVTFF	L33;L29;L37;L27;L36
2569	NTSNQVAV	L20	SPNLAWPLIVTA	L50;L51	RENNRVVIS	L33;L38;L42;L37;L46
2570	NTSRYWEPEF	L53	SPRRARSVA	L51;L22	REVGFVVPG	L38;L46;L37;L36;L42
2571	NTSRYWEPEFY	L1	SPYNSQNAVA	L51;L50	REVGFVVPGL	L36;L37;L41;L40;L45
2572	NTTKGGRF	L54	SQASSRSSSR	L21;L15	RFNGIGVTQ	L8;L15;L71;L56;L72
2573	NTTKGGRFV	L20	SQLDEEQPM	L24;L44	RFNVAITR	L15;L71;L21;L17;L72
2574	NTTKGGRFVL	L16	SQRGGSYTN	L26;L27	RFRRAFGEY	L14;L13;L27;L72;L12
2575	NTVCTVCGM	L11	SQRVAGDSGF	L26;L27	RFTTTLNDF	L8;L9;L72;L71;L62
2576	NTVKSVGK	L19	SREETGLL	L66;L35	RGDEVRQI	L55;L48;L63;L33;L45
2577	NTYLEGSVRV	L20	SRGTSPARM	L66;L30	RHHANEYRL	L44;L34;L35;L28;L56
2578	NVAFELWAKR	L19	SRILGAGCF	L30;L34	RIDKVLNEK	L6;L7;L18;L13;L5
2579	NVAFQTVK	L19	SRLDKVEAE	L30;L35	RIFTIGTVT	L44;L13;L6;L21;L16
2580	NVAFQTVKP	L19	SRYRIGNY	L65;L66	RKAVFISPY	L27;L26;L43;L18;L6
2581	NVAITRAKV	L20	SRYRIGNYK	L30;L6	RLKLFDRYF	L26;L55;L27;L14;L52
2582	NVAKYTQLCQY	L11	SSFLEMKSEK	L7;L13	RQFHQKLLK	L6;L24;L13;L7;L30
2583	NVATLQAENV	L20	SSKCVCSV	L70;L48	RQIAPGQTGK	L6;L7;L30;L13;L21
2584	NVDRYPANSI	L68	SSKLWAQCV	L13;L70	RSFIEDLL	L55;L53;L54;L65;L73

2585	NVGDYFVLT	L20	SSRVPDLLV	L73;L13	RSLPGVFCG	L54;L52;L55;L16;L53
2586	NVIPTITQMNL	L20	SSSSDNIALL	L53;L20	RSVSPKLF	L55;L54;L52;L53;L73
2587	NVIVFDGKSK	L19	SSTASALGK	L7;L19	RTAPHGHVMV	L73;L18;L20;L53;L13
2588	NVKTTEVV	L23	SSYIVDSV	L48;L47	RTFKVSIW	L54;L16;L52;L53;L55
2589	NVLAWLYAA	L50	SSYIVDSVTV	L48;L73	RTFKVSIWN	L53;L13;L54;L55;L7
2590	NVLEGSVA	L25	SSYIVDSVTVK	L7;L6	RTIKGTHHWL	L53;L16;L55;L54;L73
2591	NVLSTFISAAR	L17	STDGNKIAD	L68;L1	RTLSYYKL	L55;L54;L53;L73;L16
2592	NVLTLVYKVYY	L12	STDVVYRAFDIY	L1;L18	RTRSMWSF	L55;L53;L16;L54;L52
2593	NVPLHGTILTR	L19	STECSNLL	L1;L63	RVAGDSGFAAY	L14;L18;L16;L6;L26
2594	NVTDFNAI	L20	STECSNLLLQY	L1;L18	RVCGVSAAR	L21;L15;L7;L19;L6
2595	NVTDFNAIA	L20	STGVNLVAV	L73;L20	RVCTNYMPY	L18;L6;L14;L13;L16
2596	NVTWFHAIHV	L20	STIGVCSM	L70;L58	RVFSAVGNI	L16;L24;L3;L6;L10
2597	NVVNKGHFD	L11	STKPVETSN	L43;L53	RVYSSANNC	L16;L6;L21;L15;L14
2598	NVVRIKIVQ	L20	STLEQYVFC	L7;L13	RYPANSIVC	L72;L71;L8;L9;L66
2599	NVYIKNADI	L25	STLQGPPGTGK	L6;L7	SAFAMMFV	L47;L70;L69;L58;L73
2600	NVYLKHGGGV	L11	STMTNRQFHQK	L7;L6	SALVYDNKL	L32;L74;L61;L67;L60
2601	NWITGGIAIAM	L71	STNLVKNK	L13;L7	SAPLIELCV	L64;L57;L69;L47;L70
2602	NWNCVNCDTF	L8	STPCNGVEGF	L11;L10	SAQCFKMFY	L58;L14;L59;L69;L12
2603	NYDLSVVN	L62	STQDLFLPFF	L52;L12	SEAGVCVST	L42;L38;L36;L37;L41
2604	NYDLSVVNA	L62	STSHKLVL	L73;L70	SEDKRAKVT	L45;L38;L42;L37;L40
2605	NYDLSVVNAR	L17	STSHKLVLSV	L20;L73	SEDMLNPNY	L41;L29;L40;L36;L1
2606	NYDLSVVNARL	L62	STYASQGL	L60;L25	SEEVVENPTI	L36;L41;L38;L45;L42
2607	NYEDLLIR	L17	SVAYSNNSI	L20;L10	SEFDRDAA	L46;L42;L37;L29;L38
2608	NYITTYPG	L71	SVDCTMYI	L68;L63	SEGLNDNLL	L36;L40;L41;L37;L45
2609	NYLYRLFR	L17	SVELKHFF	L63;L68	SEHDYQIGGY	L40;L41;L14;L11;L29

2610	NYMLTYNKV	L62	SVELKHFFF	L12;L63	SEISMDNSP	L42;L38;L46;L37;L36
2611	NYQCGHYKH	L8	SVLHSTQDL	L60;L56	SEQLRKQI	L45;L48;L33;L29;L37
2612	NYQVNGYPNM	L71	SVLHSTQDLF	L12;L52	SEQLRKQIR	L42;L38;L40;L33;L29
2613	NYVFTGYR	L17	SVLQQLRV	L48;L24	SEYDYVIFTQ	L42;L37;L40;L41;L38
2614	NYVFTGYRV	L8	SVNITFELD	L65;L49	SFNPETNILL	L62;L8;L9;L71;L72
2615	NYYKKVDGV	L71	SVNPYVCNA	L65;L3	SGFAAYSRY	L14;L27;L12;L10;L26
2616	PANSIVCR	L17	SVRVLQKAA	L51;L13	SHKLVLSV	L48;L28;L23;L35;L51
2617	PAQLPAPRTL	L60	SVYAWNRK	L7;L6	SHLLLVAA	L50;L35;L25;L28;L51
2618	PARARVECF	L58	SVYPVASP	L51;L43	SHVDTDLTK	L34;L7;L28;L35;L19
2619	PAVAKHDFF	L58	SVYPVASPN	L6;L43	SICSTMTNR	L21;L15;L19;L17;L7
2620	PCIKVATV	L48	SVYYSQLMC	L6;L7	SIDAFKLNI	L5;L68;L63;L34;L24
2621	PCSDKAYKI	L8	SWEVGKPRP	L42;L38	SIKNFKSV	L23;L39;L13;L43;L48
2622	PDGVKHVY	L65	SWFTALTQH	L7;L6	SIVAGGIVA	L51;L46;L38;L28;L42
2623	PDILRVYAN	L33	SWFTALTQHGK	L7;L6	SLFFFLYEN	L4;L3;L2;L24;L12
2624	PEEEQEEDWL	L36	SWLMWLIINL	L4;L8	SLIDFYLCFL	L4;L2;L3;L5;L20
2625	PEEHVQIHTI	L45	SWMESEFRV	L4;L2	SLREVRTI	L48;L3;L55;L23;L24
2626	PEFYEAMY	L29	SWNLREML	L62;L71	SLTENKYSQL	L3;L10;L2;L4;L5
2627	PEHSLAEY	L29	SYAAFATAQ	L71;L72	SLVPGFNEK	L7;L6;L13;L19;L21
2628	PEYFNSVCRL	L37	SYEDQDALFAY	L12;L14	SPDDQIGY	L49;L1;L18;L31;L65
2629	PFAMQMAYR	L17	SYFTEQPI	L71;L72	SPFELEDFI	L47;L49;L34;L31;L32
2630	PFAMQMAYRF	L9	SYFTSDYYQLY	L14;L12	SPNLAWPLIV	L22;L50;L51;L47;L39
2631	PFDVVRQC	L62	SYGIATVR	L15;L17	SQLGGLHL	L48;L25;L35;L27;L24
2632	PFELEDFI	L62	SYIVDSVT	L71;L72	SQYSLRLI	L48;L24;L64;L25;L47
2633	PFFSNVTW	L71	SYIVDSVTVK	L13;L7	SREETGLLM	L34;L35;L30;L66;L65
2634	PFLGVYYHK	L8	SYLFQHAN	L71;L72	SRLSFKEL	L25;L66;L35;L30;L64
2635	PFLNKVVST	L71	SYQTQTNSP	L71;L72	SSANNCTF	L54;L53;L43;L58;L70

2636	PFLYLYALVY	L12	SYSLFDMSKF	L9;L8	SSANNCTFEY	L18;L1;L43;L58;L14
2637	PFMIDVQQWGF	L8	SYTNDKACPL	L72;L71	SSKTPEEHF	L43;L58;L52;L53;L26
2638	PFNKWGKARL	L8	SYTTTIKPV	L72;L71	SSQCVNLTTR	L19;L15;L21;L17;L7
2639	PFNKWGKARLY	L14	SYYKLGASQ	L72;L71	SSRSSSRSR	L15;L21;L17;L13;L19
2640	PFWITIAYI	L62	TAESHVDTD	L49;L32	STCMMCYKR	L17;L7;L15;L21;L19
2641	PGQTGKIADY	L14	TAESHVDTDL	L32;L63	STDTCFANK	L13;L7;L19;L1;L6
2642	PGSGVPVVD	L65	TAHSCNVNRF	L49;L58	STDTGVEH	L63;L68;L1;L62;L18
2643	PHNSHEGKTF	L34	TAPHGHVMVEL	L57;L67	STDTGVEHVTF	L53;L68;L63;L54;L52
2644	PHVGEIPVA	L28	TAVVIPTKK	L19;L7	STEKSNIIR	L17;L19;L21;L15;L7
2645	PIDKCSRI	L63	TCYFGLFCL	L34;L35	STFISDEVAR	L7;L19;L15;L17;L21
2646	PIDLVPNQPY	L1	TDDNALAY	L1;L18	STFNVPMEKL	L20;L53;L11;L10;L16
2647	PIFLIVAA	L50	TDFSRVSAK	L33;L6	STGSNVFQTR	L19;L21;L15;L7;L17
2648	PIHFYSKWY	L43	TDGTLMIER	L19;L17	STQLGIEFL	L20;L53;L60;L73;L68
2649	PIIGDELKI	L24	TDLTKGPHEF	L33;L8	STQWSLFFFLY	L14;L12;L1;L18;L7
2650	PILLLDQAL	L67	TDVTQLYL	L65;L33	SVAALTNNV	L20;L3;L64;L58;L4
2651	PILTLTRAL	L60	TDVVYRAF	L33;L29	SVAIKITEH	L11;L43;L6;L7;L10
2652	PIQYIDIGNY	L14	TDYKHWPQI	L33;L47	SVIDLLLDDF	L11;L10;L12;L52;L14
2653	PISAMVRMY	L14	TEAFEKMVS	L46;L38	SVLLFLAFV	L4;L20;L73;L2;L5
2654	PKGPKVKYL	L64	TECSNLLLQY	L41;L40	SVLNDILSRL	L4;L10;L11;L6;L14
2655	PKLGSLVVR	L17	TEERLKLFD	L45;L42	SVNITFEL	L23;L68;L59;L56;L65
2656	PKSDGTGTIY	L27	TEGALNTP	L38;L46	SYLFQHANL	L72;L9;L8;L71;L62
2657	PLIVTALR	L21	TEGLCVDIP	L38;L42	TAAKLMVV	L70;L47;L69;L23;L58
2658	PLKLRGTAV	L23	TEIDPKLD	L45;L29	TCANDPVGF	L34;L9;L31;L26;L28
2659	PLKSATCITR	L21	TEIDPKLDNYY	L41;L40	TCFSVAAL	L35;L28;L71;L72;L56
2660	PLLESELV	L2	TERSEKSYEL	L36;L37	TCTERLKLF	L40;L9;L8;L10;L41

2661	PLLYDANYF	L9	TESIVRFP	L33;L38	TEDDYQGKPL	L36;L41;L45;L40;L37
2662	PLSETKCTL	L2	TESIVRFPNI	L45;L41	TEERLKLF	L29;L33;L37;L41;L40
2663	PLYAFASEA	L3	TESNKKFLPF	L41;L40	TEHSWNADL	L37;L36;L41;L40;L45
2664	PMEKLKTL	L23	TETDLTKGPHEF	L41;L40	TEIDPKLDNY	L41;L40;L29;L14;L36
2665	PNFKDQVIL	L44	TEVNEFACVVA	L46;L38	TEILPVSMT	L36;L38;L41;L45;L46
2666	PNLAWPLIV	L73	TEVPANST	L29;L45	TEKSNIIRGW	L40;L41;L10;L45;L37
2667	PNYEDLLIR	L17	TEVPANSTVLSF	L41;L40	TENKYSQLD	L40;L65;L38;L45;L46
2668	PPGDQFKHL	L39	TEVPVAIHADQL	L36;L41	TEQPIDLV	L33;L45;L29;L48;L38
2669	PPKNSIDA	L51	TEVVGDII	L45;L36	TEQPIDLVP	L38;L42;L46;L40;L41
2670	PPLNRNYV	L47	TFCAGSTFI	L8;L62	TETAHSCNV	L45;L38;L46;L33;L37
2671	PPLNRNYVF	L8	TFLLNKEM	L72;L71	TEVNEFACV	L45;L37;L46;L38;L36
2672	PQADVEWKFY	L14	TFPPTEPK	L71;L72	TFDNLKTL	L62;L68;L71;L72;L63
2673	PQIITTDNTF	L26	TFPPTEPKK	L8;L9	TFHLDGEVI	L8;L72;L34;L9;L71
2674	PQLEQPYV	L48	TFQSAVKR	L17;L15	TFKVSIWNL	L72;L8;L62;L9;L71
2675	PQNQRNAPR	L21	TFSVLACY	L72;L71	TFNGECPNF	L9;L8;L62;L71;L72
2676	PQTLEILDI	L24	TFTCASEY	L72;L71	TFNVPMEKL	L62;L8;L72;L9;L71
2677	PQTSITSAV	L24	TFTRLQSL	L71;L72	TFYLTNDVSF	L62;L9;L72;L71;L8
2678	PQTSITSAVL	L44	TFTRSTNSR	L17;L19	TGPEAGLPY	L57;L72;L66;L12;L71
2679	PQVNGLTSI	L24	TFVTHSKGLY	L14;L12	THHWLLLTI	L34;L35;L28;L24;L47
2680	PREGVFVS	L65	TGTIYTEL	L23;L25	TIAEILLI	L24;L48;L47;L3;L73
2681	PRPPLNRNYV	L64	TGTLIVNSV	L48;L64	TICAPLTVF	L26;L10;L58;L59;L39
2682	PRVEKKKL	L25	TGTSTDVVY	L14;L27	TKFLTENLL	L44;L34;L64;L27;L28
2683	PSDSTGSNQ	L1	TGTSTDVVYR	L19;L17	TLAILTALR	L21;L19;L17;L15;L6
2684	PSFKKGAKL	L53	TGVNLVAV	L48;L23	TLDSKTQSLL	L63;L1;L5;L2;L68
2685	PSFLGRYM	L55	THGLAAVNSV	L28;L35	TLKNTVCTV	L3;L2;L4;L24;L23

2686	PSFYVYSRVK	L13	THSDKFTD	L35;L65	TLLLQLCTF	L26;L9;L16;L27;L12
2687	PSLATVAYF	L52	THSKGLYRK	L34;L35	TLLSLREV	L4;L23;L2;L3;L48
2688	PSLETIQI	L48	THVQLSLPV	L28;L35	TLMNVLTLVY	L12;L6;L14;L18;L26
2689	PSVEQRKQ	L55	THWFVTQR	L17;L19	TLNDLNETLV	L2;L4;L3;L5;L24
2690	PSYAAFATA	L46	TICAPLTV	L48;L73	TLQQIELKF	L12;L26;L16;L9;L8
2691	PTDQSSYI	L1	TIDGSSGV	L63;L68	TLRVEAFEY	L26;L43;L12;L14;L1
2692	PTITQMNLK	L7	TIDYTEISFM	L63;L62	TNYDLSVV	L48;L25;L47;L73;L69
2693	PTNGVGYQPY	L14	TIEVNSFSGY	L1;L18	TPSDFVRAT	L32;L51;L31;L39;L49
2694	PVLKGVKLHY	L12	TIKVFTTV	L23;L48	TPVCINGLML	L32;L56;L22;L31;L39
2695	PVLPFNDGVY	L14	TINCQEPKL	L4;L32	TQDLFLPFF	L62;L34;L68;L63;L58
2696	PVLPFNDGVYF	L52	TIPIQASL	L57;L23	TQFNYYKKV	L24;L48;L64;L3;L69
2697	PVPEVKILN	L5	TIQPRVEKK	L7;L6	TREAVGTNL	L35;L34;L30;L28;L66
2698	PVPEVKILNNL	L5	TIQTIVEV	L23;L48	TSITSAVL	L61;L55;L65;L54;L60
2699	PVSIINNTV	L20	TISVTTEIL	L34;L28	TSNQVAVL	L65;L73;L48;L55;L70
2700	PYFFTLLLQ	L9	TITSGWTF	L54;L55	TSRYWEPEF	L43;L65;L52;L53;L58
2701	PYGANKDGI	L9	TITVNVLAWLY	L12;L14	TTFDSEYCR	L19;L17;L15;L21;L7
2702	PYIKWDLL	L9	TIVNGVRR	L19;L17	TTNIVTRCL	L55;L65;L73;L64;L60
2703	PYNSVTSSIVI	L9	TIVNGVRRSF	L10;L16	TTTLNGLWL	L60;L61;L73;L55;L1
2704	PYPDPSRILG	L9	TKVDGVDVELF	L27;L34	TTVDNINLH	L19;L11;L20;L7;L10
2705	PYPNASFDN	L9	TLATCELY	L18;L1	TVATSRTL	L55;L65;L39;L28;L23
2706	PYVFIKRSD	L65	TLAVPYNMRV	L2;L4	TVKGLDYKAF	L10;L39;L26;L43;L11
2707	PYVVDDPCPIHF	L9	TLDNQDLNGNWY	L1;L18	TVLCLTPVY	L12;L14;L31;L52;L16
2708	QAENVTGL	L63	TLGVYDYLV	L2;L4	TVSWNLREM	L32;L64;L58;L39;L59
2709	QAGNATEV	L70	TLIGEAVKT	L24;L2	TVYSHLLL	L25;L74;L67;L73;L23
2710	QAGNVQLRVI	L55	TLKEILVT	L23;L43	TYPGQGLNGY	L14;L72;L12;L71;L8
2711	QAISMWALI	L47	TLKGGAPTK	L13;L6	TYPSLETI	L9;L8;L71;L72;L62

2712	QAISMWALII	L69	TLKGGAPTKV	L3;L2	VAIDYKHYT	L69;L67;L70;L58;L43
2713	QALPQRQK	L55	TLKGVEAV	L3;L23	VAPGTAVLR	L19;L7;L15;L17;L21
2714	QALPQRQKK	L13	TLKKRWQL	L23;L39	VAYFNMVY	L59;L70;L69;L43;L58
2715	QAPTHLSVD	L57	TLKKRWQLA	L23;L3	VCINGLML	L61;L71;L60;L72;L74
2716	QCIMLVYCF	L34	TLKNLSDRV	L3;L2	VECFDKFKV	L37;L45;L38;L42;L36
2717	QDDKKIKAC	L33	TLLFLMSFTV	L2;L4	VEEAKKVKP	L38;L42;L46;L45;L37
2718	QDKNTQEV	L33	TLLPAADL	L23;L74	VEEAKTVL	L37;L36;L45;L23;L25
2719	QDLFLPFF	L33	TLMIERFVSL	L2;L4	VEELKKLL	L45;L33;L23;L37;L36
2720	QDLKWARF	L33	TLMNVLTLVYK	L6;L7	VELFENKTTL	L36;L37;L45;L41;L40
2721	QDLSVVSKV	L33	TLNDFNLV	L4;L2	VESCGNFKV	L45;L37;L38;L42;L36
2722	QEGVVDYGARFY	L40	TLNISDEF	L26;L62	VETKDVVEC	L37;L45;L36;L29;L38
2723	QEHYVRIT	L29	TLPTEVLTE	L57;L5	VFHLYLQYI	L62;L8;L9;L71;L72
2724	QEILGTVS	L29	TLPVNVAFEL	L57;L5	VFKNIDGYF	L9;L8;L12;L62;L72
2725	QEKDEDDNL	L36	TLQGPPGTGK	L6;L7	VFVSNGTHW	L9;L8;L72;L71;L54
2726	QEKDEDDNLI	L41	TLVSDIDITF	L26;L10	VFVSNGTHWF	L8;L9;L72;L71;L12
2727	QEKNFTTAPA	L42	TLVSDIDITFL	L4;L2	VGDSAEVAV	L63;L68;L62;L5;L67
2728	QENWNTKH	L29	TLYCIDGAL	L2;L4	VGYQPYRVV	L47;L48;L64;L69;L51
2729	QENWNTKHS	L40	TMCDIRQL	L64;L48	VLEGSVAY	L1;L18;L26;L43;L27
2730	QESPFVMMS	L42	TMLFTMLRK	L6;L7	VLGSLAATV	L2;L3;L5;L4;L24
2731	QEVFAQVK	L29	TNDNTSRY	L1;L18	VLNDILSR	L21;L15;L17;L6;L43
2732	QFAYANRNRF	L9	TNVTIATY	L65;L29	VLTLVYKVY	L26;L14;L43;L27;L12
2733	QFCNDPFL	L62	TNYDLSVVNAR	L19;L17	VPQEHYVRI	L49;L47;L39;L56;L32
2734	QFDTYNLW	L62	TPFEIKLAKK	L19;L31	VPVVDSYYSL	L56;L39;L32;L22;L31
2735	QFKHLIPLMY	L12	TPFEIKLAKKF	L39;L31	VPYCYDTNVL	L39;L22;L32;L47;L56
2736	QFKKGVQI	L48	TPHTVLQA	L51;L50	VPYNMRVIHF	L31;L49;L47;L39;L22
2737	QFNYYKKV	L48	TPHTVLQAVGA	L50;L51	VQIGEYTF	L26;L27;L34;L58;L8

2738	QFTSLEIPR	L17	TPKGPKVK	L39;L51	VQMAPISAM	L26;L28;L27;L58;L61
2739	QGLNGYTV	L48	TPLGIDLDEW	L31;L49	VQSTQWSLF	L26;L9;L58;L27;L8
2740	QGLPNNTASW	L52	TPLIQPIGA	L50;L51	VRNLQHRLY	L66;L64;L30;L65;L14
2741	QGNFGDQEL	L32	TPSDFVRA	L50;L51	VSKVVKVTI	L53;L55;L43;L52;L70
2742	QGTTLPKGFY	L14	TPSDFVRATA	L51;L50	VSLVKPSF	L59;L52;L43;L54;L53
2743	QGYKSVNI	L48	TPVCINGL	L56;L39	VSSPDAVTA	L53;L52;L54;L55;L69
2744	QHGKEDLKF	L34	TPVCINGLM	L32;L31	VSTQEFRYM	L55;L52;L73;L60;L70
2745	QHLKDGTCGL	L34	TPVHVMSKH	L32;L49	VSWNLREM	L59;L70;L55;L48;L43
2746	QHMVVKAA	L28	TPVYSFLPGV	L51;L50	VTANVNAL	L70;L67;L60;L59;L61
2747	QHQPYVVD	L28	TQALPQRQK	L13;L7	VTCGTTTL	L60;L70;L68;L63;L57
2748	QHQPYVVDD	L28	TQDLFLPF	L68;L62	VTIDYTEI	L55;L67;L70;L59;L53
2749	QIAQFAPSA	L28	TQHQPYVVD	L26;L44	VTLAILTALR	L21;L15;L7;L19;L17
2750	QIGYYRRATR	L21	TQMNLKYAI	L24;L34	VTPSGTWL	L57;L63;L72;L71;L60
2751	QIPFAMQM	L57	TRAKVGILCI	L34;L35	VTSSIVITS	L20;L53;L70;L19;L69
2752	QITISSFKW	L54	TRALTAESH	L35;L30	VTVKNGSIHLY	L14;L18;L52;L11;L1
2753	QIYKTPPI	L48	TREVGFVVP	L35;L42	VTYVPAQEK	L13;L7;L43;L6;L19
2754	QIYKTPPIK	L6	TRFASVYA	L35;L65	VVDSYYSLLM	L1;L18;L63;L5;L68
2755	QKAAITIL	L44	TRFQTLLA	L35;L25	VVDYGARF	L63;L62;L68;L1;L54
2756	QKFNGLTV	L48	TRGATVVI	L35;L65	VVGDIILKP	L12;L24;L6;L11;L7
2757	QKLIANQF	L27	TRNPANNAAI	L35;L34	VVGEGSEGL	L16;L54;L2;L67;L56
2758	QKRTATKAY	L27	TRTQLPPAY	L66;L30	VVISSDVLV	L20;L5;L2;L73;L58
2759	QKTYERHSL	L44	TSAFVETVK	L19;L7	VVQEGVLTAV	L3;L2;L4;L5;L51
2760	QKVGMQKY	L27	TSDLATNN	L68;L1	VVQTIEVNSF	L16;L26;L52;L9;L10
2761	QLDEEQPME	L5	TSDYYQLYS	L1;L18	VVSKVVKV	L24;L48;L73;L20;L63
2762	QLDFIDTKR	L21	TSEAVEAPL	L63;L68	VVSTGYHFR	L21;L15;L19;L7;L17
2763	QLGGLHLL	L74	TSEDMLNPNY	L1;L18	VVSTTTNIVTR	L19;L7;L21;L15;L17

2764	QLGGLHLLI	L24	TSGDGTTSP	L43;L65	VVVLSFELL	L74;L67;L60;L20;L31
2765	QLHNDILL	L74	TSKETLYCI	L55;L53	VVYRAFDIY	L14;L12;L26;L18;L6
2766	QLHNDILLAK	L6	TSLEIPRRN	L55;L52	VYADSFVI	L9;L8;L66;L72;L71
2767	QLIRAAEIR	L21	TSLSGFKL	L55;L54	VYGDFSHSQ	L9;L66;L8;L72;L71
2768	QLPAPRTLLTK	L6	TSNSFDVLK	L7;L19	VYGDFSHSQL	L8;L9;L66;L71;L72
2769	QLPETYFTQS	L5	TSRTLSYYK	L13;L7	VYSHLLLV	L62;L64;L73;L48;L9
2770	QLPPAYTNS	L5	TSRYWEPEFY	L43;L1	VYSRVKNL	L72;L71;L9;L66;L62
2771	QLPQGTTLPK	L6	TTAAKLMVVI	L20;L10	WEPEFYEAM	L29;L36;L57;L37;L33
2772	QLRARSVSPK	L6	TTADIVVFDE	L20;L19	WFLAYILF	L71;L9;L62;L72;L8
2773	QLREPMLQSA	L3	TTDNTFVSG	L1;L18	WMESEFRVY	L27;L1;L18;L14;L26
2774	QLRVESSSK	L13	TTDPSFLG	L1;L18	WNLVIGFLF	L12;L9;L8;L52;L40
2775	QLSLPVLQVR	L21	TTEAFEKM	L18;L1	WTAGAAAY	L18;L14;L1;L59;L54
2776	QLTSQWLTNI	L3	TTIAKNTV	L20;L48	WVLNNDYYR	L17;L15;L21;L19;L7
2777	QMAPISAM	L28	TTITVNVLA	L20;L19	YAADPAMH	L59;L43;L69;L70;L74
2778	QMNLKYAI	L48	TTITVNVLAWLY	L1;L18	YACWHHSIGF	L58;L43;L49;L59;L60
2779	QMYKQARS	L48	TTIVNGVRRSF	L52;L10	YADSFVIR	L67;L63;L68;L17;L74
2780	QNCVLKLKV	L73	TTLKGVEAV	L20;L4	YANLGERV	L50;L47;L48;L58;L70
2781	QNGMNGRTI	L55	TTLNDFNLV	L20;L73	YASALWEI	L59;L47;L70;L69;L67
2782	QPIDLVPNQ	L31	TTLPKGFY	L14;L1	YASQGLVAS	L59;L50;L31;L67;L32
2783	QPIDLVPNQPY	L31	TTNGDFLHFL	L20;L53	YDPLQPEL	L33;L57;L66;L59;L67
2784	QPIGALDI	L47	TTPGSGVPV	L57;L20	YEAMYTPHTV	L45;L38;L46;L37;L36
2785	QPYPNASFD	L22	TTPGSGVPVV	L20;L57	YFLQSINFV	L72;L47;L71;L4;L62
2786	QPYRVVVLS	L47	TTRTQLPPAY	L52;L14	YGQQFGPTY	L59;L26;L14;L27;L12
2787	QPYVFIKR	L47	TTTIKPVTYK	L6;L7	YHFRELGVV	L28;L35;L46;L3;L34
2788	QPYVFIKRS	L48	TTTIQTIVEV	L20;L73	YIATNGPLKV	L3;L2;L73;L58;L4

2789	QQESPFVMM	L28	TTTNIVTRC	L20;L19	YILPSIISN	L4;L60;L43;L61;L6
2790	QQGQTVTK	L48	TTVASLINTL	L10;L20	YINVFAFPF	L59;L43;L12;L58;L60
2791	QQIELKFN	L48	TTVMFLAR	L17;L19	YKGPITDVF	L66;L27;L9;L44;L58
2792	QQLPETYF	L27	TVAGVSICS	L19;L20	YKIEELFYSY	L27;L12;L66;L31;L10
2793	QQQGQTVTK	L7	TVAGVSICST	L19;L20	YKLEGYAF	L27;L66;L71;L59;L72
2794	QQTTLKGV	L48	TVEEAKTVLKK	L6;L7	YLASGGQPI	L24;L2;L3;L43;L49
2795	QQTVTLLP	L48	TVFPPTSFG	L20;L6	YLAVFDKNL	L2;L4;L3;L74;L64
2796	QQWGFTGNL	L44	TVIWDYKR	L19;L17	YLCFLAFL	L62;L74;L59;L57;L68
2797	QRGGSYTN	L65	TVIWDYKRD	L10;L11	YLDGADVTK	L5;L2;L68;L63;L1
2798	QRKYKGIKI	L30	TVKSVGKF	L10;L11	YLITPVHV	L2;L3;L4;L5;L62
2799	QRLTKYTM	L66	TVKSVGKFC	L13;L39	YNSASFSTF	L9;L34;L49;L58;L27
2800	QRNFYEPQII	L30	TVREVLSD	L65;L43	YPDPSRILG	L32;L49;L22;L31;L1
2801	QRQKKQQTV	L35	TVSCLPFTI	L20;L24	YPQVNGLTSI	L22;L47;L32;L50;L39
2802	QSAPHGVVFLH	L52	TVTLLPAA	L51;L50	YQGKPLEF	L58;L27;L43;L26;L59
2803	QSCTQHQPY	L18	TVYDDGAR	L17;L19	YRFNGIGVT	L65;L35;L66;L64;L25
2804	QSFLNGFAV	L48	TWFHAIHV	L48;L47	YRGTTTYKL	L66;L65;L35;L64;L34
2805	QSRNLQEFK	L13	TYACWHHSIGF	L9;L8	YRIGNYKL	L35;L25;L66;L34;L64
2806	QTNSPRRA	L55	TYASQGLVASI	L9;L8	YSKWYIRVG	L70;L55;L65;L43;L69
2807	QTPFEIKLAK	L7	TYCTGSIPC	L71;L72	YSLFDMSKF	L53;L52;L54;L58;L60
2808	QTQTNSPRR	L21	TYERHSLSHF	L8;L9	YSLLMPILTL	L60;L67;L61;L73;L59
2809	QTRAGCLI	L55	TYFTQSRNLQEF	L8;L9	YSPIFLIVA	L50;L69;L46;L59;L64
2810	QTSITSAV	L48	TYGQQFGPTY	L12;L14	YSRYRIGNY	L43;L58;L1;L14;L10
2811	QTTPGSGVPV	L20	TYHPNCVNC	L8;L72	YTDFATSAC	L68;L1;L18;L63;L60
2812	QTTTIQTIV	L20	TYICGFIQQK	L17;L13	YWEPEFYEA	L38;L50;L46;L42;L8
2813	QTVKPGNFNK	L7	TYICGFIQQKL	L8;L9	YYLFDESGEF	L9;L71;L72;L8;L12
2814	QTYHPNCV	L48	TYKNTCDGTTF	L8;L9	YYLGTGPEA	L71;L72;L8;L9;L50

2815	QVAVLYQDV	L20	TYKPNTWCI	L8;L9	YYPDKVFR	L71;L66;L72;L62;L17
2816	QVHGNAHVA	L51	TYKPNTWCIR	L15;L17	YYPDKVFRSS	L72;L71;L66;L9;L8
2817	QVNGLTSI	L48	TYLDGADV	L71;L72	YYRYNLPTM	L66;L71;L9;L72;L59
2818	QVTIAEILL	L74	TYLDGADVTKI	L8;L9	YYVWKSYVH	L66;L71;L8;L72;L9
2819	QVVNVVTTKI	L20	TYNCCDDDYF	L8;L9	AADPAMHAA	L68;L67;L61;L63;L42;L38
2820	QWLPTGTLLV	L8	TYNLWNTFTRL	L8;L9	AARYMRSL	L59;L70;L55;L61;L43;L60
2821	QWNLVIGFLFL	L40	TYPSLETIQI	L9;L8	ACPDGVKHV	L57;L64;L5;L3;L24;L69
2822	QYLNTLTLAV	L71	TYVPAQEK	L72;L71	AEYHNESGL	L37;L36;L45;L41;L40;L33
2823	RAFGEYSH	L54	TYVPAQEKN	L8;L9	AFGGCVFSY	L12;L65;L14;L72;L71;L26
2824	RAGEAANFCAL	L67	TYVPAQEKNF	L8;L9	AFKLNIKLL	L13;L62;L64;L39;L9;L72
2825	RAKHYVYI	L70	TYVTQQLI	L9;L8	AFLLFLVLI	L9;L8;L48;L62;L40;L41
2826	RALTAESH	L54	TYVTQQLIR	L17;L15	AFPFTIYSLL	L72;L9;L71;L62;L57;L8
2827	RALTGIAV	L50	VAAFHQEC	L70;L59	AGDSGFAAY	L18;L14;L1;L27;L12;L43
2828	RARAGEAA	L51	VAAFHQECSL	L67;L61	AIKITEHSW	L16;L14;L26;L54;L10;L52
2829	RARAGEAANF	L52	VAAGLEAPFLY	L12;L31	AIVFITLCF	L26;L12;L58;L60;L43;L41
2830	RARSVSPK	L13	VAAIFYLIT	L69;L43	APYIVGDVV	L51;L50;L47;L39;L22;L24
2831	RCILHCANF	L33	VAALTNNV	L47;L70	AQFAPSASA	L46;L28;L51;L27;L44;L42
2832	RCLAVHEC	L33	VADAVIKT	L63;L68	ARSVSPKLF	L30;L66;L34;L64;L35;L9
2833	RCSFYEDF	L33	VAFELWAK	L59;L7	ARYMRSLKV	L25;L64;L30;L73;L24;L35
2834	RCSFYEDFLEY	L18	VAFNTLLFLM	L31;L69	ATNNLVVMAY	L14;L16;L18;L12;L10;L6
2835	RDAAMQRK	L33	VAITRAKVG	L69;L70	AVFDKNLYD	L6;L7;L12;L13;L11;L16
2836	RDAPAHIS	L33	VATVQSKM	L70;L63	AVILRGHLR	L15;L21;L19;L17;L7;L6
2837	RDAPAHIST	L33	VAYESLRP	L43;L47	AVVYRGTTTY	L26;L10;L18;L12;L14;L11
2838	RDAPAHISTI	L33	VAYRKVLLRK	L6;L7	AWQPGVAM	L71;L72;L28;L33;L62;L59
2839	RDIADTTDA	L46	VAYSNNSIA	L69;L70	AYILFTRFFY	L12;L14;L72;L71;L41;L40

2840	RDISTEIY	L29	VCNLLLLF	L62;L59	CANDPVGFTL	L61;L60;L68;L32;L67;L31
2841	RDLICAQK	L33	VCNLLLLFV	L73;L64	CFANKHADF	L8;L71;L72;L9;L62;L12
2842	RDPQTLEI	L33	VCSVIDLLL	L73;L34	CFLAFLLF	L9;L8;L12;L71;L72;L62
2843	RDVDTDFV	L33	VCVSTSGRW	L49;L54	CFLAFLLFL	L71;L8;L72;L73;L9;L62
2844	REAVGTNLPLQL	L36	VDIAANTV	L48;L33	CKDGHVETF	L27;L34;L62;L63;L49;L68
2845	REETGLLMPL	L36	VDLPIGINI	L8;L9	CRSKNPLLY	L66;L30;L64;L12;L65;L18
2846	REGYLNST	L45	VDMSMTYGQQF	L8;L9	CSAYTVEL	L59;L70;L67;L61;L74;L60
2847	RELHLSWEVG	L36	VDTPNNTDF	L9;L8	CTDDNALAYY	L18;L1;L11;L14;L12;L58
2848	RELKVTFFPDL	L36	VDTVSALVY	L12;L18	CTNYMPYFF	L53;L62;L55;L54;L16;L58
2849	RELMRELN	L33	VDYGARFYF	L9;L12	CVADYSVL	L67;L61;L74;L59;L10;L60
2850	RELMRELNG	L33	VDYGARFYFY	L14;L12	CYFGLFCLL	L9;L8;L64;L62;L66;L13
2851	REMLAHAE	L33	VEAEVQIDRLI	L41;L40	CYGVSPTKL	L62;L9;L66;L72;L8;L71
2852	REMLAHAEE	L33	VEGCHATREA	L38;L46	DAQSFLNGF	L11;L49;L10;L58;L31;L47
2853	RENNRVVISS	L38	VEGFNCYFP	L38;L42	DEPEEHVQI	L45;L36;L41;L25;L29;L37
2854	REQIDGYV	L33	VELKHFFF	L33;L29	DFVNEFYAY	L12;L10;L29;L11;L71;L72
2855	REQIDGYVMH	L38	VELVAELEGI	L41;L36	DGWEIVKF	L29;L47;L23;L49;L25;L11
2856	REVLSDRELH	L36	VENPHLMGWDY	L41;L29	DHVDILGPL	L35;L20;L34;L11;L28;L10
2857	REVRTIKVFT	L36	VESDDYIAT	L38;L36	DLSPRWYFY	L12;L1;L23;L11;L18;L14
2858	RFDNPVLP	L62	VETKAIVSTI	L45;L36	DPYEDFQEN	L49;L47;L31;L25;L32;L10
2859	RFDTRVLS	L62	VETKDVVECL	L36;L37	DRYPANSI	L25;L47;L35;L28;L64;L66
2860	RFDTRVLSNL	L62	VETSNSFDVL	L36;L45	DSLDTYPSL	L25;L61;L60;L67;L10;L74
2861	RFFYVLGLAA	L51	VEYCPIFF	L29;L33	DTLKEILVTY	L11;L10;L52;L53;L14;L16
2862	RFLYIIKLIFL	L8	VFDEISMAT	L62;L68	DVTDVTQL	L74;L11;L20;L25;L10;L23
2863	RFPKSDGTGTI	L8	VFDGKSKC	L62;L63	DVVIGIVNN	L11;L19;L17;L49;L10;L20
2864	RFPNITNLCPF	L8	VFFDGRVDG	L71;L72	EAFEYYHTT	L10;L49;L11;L20;L69;L32

2865	RFQTLLALHR	L15	VFLGIITT	L71;L72	EAMYTPHTV	L70;L20;L47;L32;L69;L50
2866	RFQTLLALHRSY	L14	VFMCVEYC	L71;L72	ECVRGTTVL	L35;L10;L32;L11;L34;L8
2867	RGATVVIGT	L44	VFPPTSFGP	L8;L9	EEAARYMRSL	L40;L41;L42;L10;L25;L37
2868	RGDEVRQIA	L46	VFQSASKII	L72;L9	EEHFIETISL	L40;L37;L41;L42;L36;L29
2869	RGGDGKMKD	L65	VFQTRAGC	L71;L72	EEVKPFITE	L29;L46;L42;L41;L37;L45
2870	RGIVFMCV	L48	VFYKENSY	L71;L72	EIDPKLDNY	L1;L18;L11;L10;L14;L12
2871	RGTAVMSLK	L13	VGDVVQEGV	L63;L5	EQIDGYVMH	L11;L24;L43;L34;L10;L35
2872	RGTTTYKL	L54	VGDVVQEGVL	L68;L63	ETKAIVSTI	L10;L20;L11;L70;L55;L17
2873	RGVYYPDKV	L73	VGFTLKNTV	L48;L47	ETMSYLFQH	L11;L17;L20;L7;L10;L19
2874	RHFDEGNCD	L34	VGFVVPGL	L48;L47	EVFAQVKQI	L20;L10;L48;L11;L19;L24
2875	RHINAQVA	L28	VGGNYNYLY	L14;L12	EVLTEEVVL	L20;L32;L44;L10;L31;L23
2876	RIAGHHLGRC	L14	VGLMWLSYF	L9;L8	EVVENPTIQK	L19;L11;L7;L20;L17;L6
2877	RIDGDMVPH	L6	VGVALLAV	L48;L47	FAVSKGFF	L58;L74;L59;L60;L70;L49
2878	RIDKVLNEKC	L18	VGYQPYRV	L48;L47	FAYTKRNV	L47;L70;L64;L69;L58;L59
2879	RIIMRLWL	L73	VHTANKWDL	L35;L34	FDNPVLPF	L33;L59;L43;L71;L72;L66
2880	RIIMRLWLC	L21	VIGIVNNTVY	L43;L26	FEYVSQPFL	L36;L45;L37;L61;L74;L60
2881	RIIMRLWLCWK	L6	VILRGHLR	L21;L15	FFKEGSSVEL	L62;L71;L72;L43;L67;L8
2882	RIKASMPTT	L13	VIPTITQM	L57;L63	FFTLLLQL	L62;L59;L72;L71;L74;L67
2883	RIKASMPTTI	L3	VIPTITQMNL	L57;L5	FIKGLNNL	L58;L74;L59;L60;L23;L67
2884	RIKASMPTTIAK	L6	VKCTSVVL	L44;L66	FKDQVILL	L74;L62;L68;L63;L66;L64
2885	RIMASLVLA	L6	VKPSFYVY	L66;L27	FLAFLLFLVL	L67;L74;L2;L3;L61;L20
2886	RINWITGGI	L24	VLAAECTIFK	L6;L7	FLAFVVFLLV	L2;L20;L3;L12;L4;L5
2887	RIRGGDGK	L13	VLALLSDL	L74;L23	FLFLTWICLL	L74;L2;L4;L3;L64;L5
2888	RIRGGDGKM	L14	VLDMCASLKEL	L68;L5	FLGIITTV	L3;L2;L23;L48;L24;L4
2889	RIRGGDGKMK	L13	VLDWLEEK	L68;L1	FLLFLVLIM	L2;L74;L4;L12;L69;L67

2890	RKIFVDGVP	L44	VLHSTQDL	L57;L43	FLLNKEMYL	L2;L74;L4;L5;L23;L61
2891	RKLDNDALN	L44	VLHSYFTSD	L43;L57	FLPGVYSVI	L57;L5;L3;L10;L64;L2
2892	RKLHDELTG	L44	VLHSYFTSDYY	L14;L12	FLYENAFLPF	L59;L12;L6;L2;L5;L10
2893	RKMAFPSGK	L6	VLIMLIIFWF	L12;L9	FLYIIKLI	L48;L47;L64;L23;L24;L3
2894	RKRISNCVADY	L27	VLKKCKSAFY	L43;L14	FNEKTHVQL	L63;L32;L68;L62;L74;L34
2895	RKSNHNFL	L44	VLKLKVDTA	L3;L23	FPFTIYSLLL	L31;L32;L47;L22;L50;L49
2896	RKSNLKPFER	L21	VLLFLAFV	L4;L2	FPPTSFGPL	L57;L22;L66;L47;L56;L72
2897	RKVPTDNY	L27	VLLFLAFVVF	L9;L12	FPREGVFV	L50;L47;L51;L23;L22;L39
2898	RKVPTDNYI	L44	VLLPLTQYNR	L15;L21	FPRGQGVPI	L50;L22;L49;L47;L39;L51
2899	RKVPTDNYITT	L44	VLLPLTQYNRY	L12;L14	FQSASKIITL	L44;L34;L28;L35;L69;L58
2900	RKVPTDNYITTY	L27	VLLSMQGAV	L2;L4	FSKQLQQSM	L58;L70;L43;L55;L69;L53
2901	RKYKGIKIQE	L27	VLLSVLQQLRV	L4;L2	FSTFEEAAL	L61;L60;L67;L68;L74;L59
2902	RLCAYCCNI	L24	VLNEKCSA	L23;L43	FSTGVNLV	L70;L73;L64;L48;L69;L58
2903	RLDKVEAEVQ	L18	VLNNDYYR	L21;L15	FTEQPIDL	L63;L60;L68;L62;L1;L61
2904	RLFARTRSMW	L16	VLPPLLTDE	L5;L57	FTRFFYVL	L59;L60;L67;L70;L61;L66
2905	RLIDAMMFT	L2	VLPPLLTDEM	L5;L57	FVDDIVKT	L63;L68;L62;L5;L1;L74
2906	RLISMMGFKMNY	L18	VLPQLEQPYV	L5;L2	FVENPDIL	L67;L62;L74;L63;L68;L60
2907	RLITGRLQ	L55	VLQLPQGTTL	L57;L26	FVVEVVDKYF	L11;L12;L60;L52;L10;L58
2908	RLKLFDRYFK	L13	VLQSGFRKM	L14;L13	FVVKRHTF	L58;L59;L54;L60;L23;L26
2909	RLMKTIGPDMF	L16	VLQVRDVLVR	L15;L21	FYVLGLAAI	L72;L71;L9;L59;L62;L50
2910	RLTKYTMADLVY	L18	VLRQWLPTG	L3;L4	FYYVWKSYV	L64;L71;L62;L72;L47;L69
2911	RLWLCWKCRSK	L6	VLSFCAFAV	L4;L2	GAEHVNNSY	L18;L31;L12;L1;L14;L49
2912	RMNSRNYIA	L38	VLSGHNLAK	L6;L7	GAKLKALNL	L23;L70;L74;L60;L58;L13
2913	RNFYEPQI	L48	VLTLVYKV	L48;L24	GECPNFVFP	L46;L42;L38;L37;L45;L36
2914	RNPANNAAI	L57	VLTLVYKVYY	L12;L14	GEFKLASHM	L36;L29;L37;L45;L41;L40

2915	RNPAWRKAV	L57	VLYQPPQTSI	L6;L3	GFGDSVEEV	L72;L2;L24;L3;L62;L71
2916	RNRATRVEC	L13	VMFLARGIVF	L26;L9	GFMGRIRSV	L3;L64;L72;L48;L45;L71
2917	RNRDVDTD	L65	VMMSAPPAQY	L14;L12	GIMMNVAKY	L26;L12;L14;L10;L11;L18
2918	RNRFLYIIK	L13	VMYASAVV	L48;L47	GLPWNVVRI	L24;L5;L3;L2;L4;L64
2919	RNTNPIQLSSY	L14	VNLKQLPFF	L9;L8	GLVAEWFLAY	L12;L6;L26;L10;L27;L18
2920	RNVIPTITQM	L65	VNQNAQAL	L71;L72	GRLQSLQTY	L30;L27;L14;L34;L12;L26
2921	RPLLESELV	L51	VPAQEKNFTTA	L51;L50	GRTILGSAL	L30;L35;L28;L25;L34;L66
2922	RPNFTIKGS	L39	VPEVKILNNL	L39;L56	GSVGFNIDY	L26;L18;L27;L14;L58;L7
2923	RPQGLPNNT	L56	VPHVGEIPVA	L51;L50	GSYKDWSY	L55;L18;L27;L14;L54;L26
2924	RPQIGVVREFL	L56	VPLHGTILT	L50;L31	GTSTDVVYR	L7;L21;L15;L19;L17;L6
2925	RQCSGVTFQ	L24	VPLNIIPLTTA	L50;L51	GVAPGTAVLR	L19;L7;L21;L15;L6;L17
2926	RQFHQKLLKS	L24	VPMEKLKTLVA	L50;L51	GVKDCVVLHSY	L14;L10;L11;L26;L12;L52
2927	RQGFVDSDV	L24	VPNQPYPNASF	L22;L31	GVRRSFYVY	L26;L14;L10;L12;L27;L52
2928	RQHLKDGTC	L14	VPQADVEWKF	L31;L49	GVVREFLTR	L7;L19;L15;L17;L10;L21
2929	RQKRTATKA	L24	VPRASANI	L47;L22	GVYYPDKVF	L26;L27;L52;L10;L39;L16
2930	RQRLTKYT	L48	VPVSIINNT	L49;L51	GYLQPRTF	L55;L9;L72;L71;L65;L8
2931	RQVVNVVT	L44	VPWDTIAN	L50;L51	GYPNMFITR	L17;L15;L7;L9;L72;L71
2932	RQVVNVVTTKI	L24	VPWDTIANYA	L51;L50	GYQPYRVVV	L72;L13;L71;L38;L64;L66
2933	RQWLPTGTLLV	L24	VPYCYDTNV	L47;L51	GYVTHGLNL	L71;L8;L72;L9;L66;L65
2934	RRAFGEYSHV	L30	VQIDRLITGR	L21;L15	HADFDTWF	L63;L68;L32;L74;L62;L49
2935	RRARSVASQ	L30	VQIPTTCAN	L43;L26	HECFVKRVD	L37;L38;L65;L42;L45;L46
2936	RRGPEQTQ	L65	VQLSLPVLQV	L4;L24	HEVLLAPL	L29;L37;L25;L33;L36;L45
2937	RRGPEQTQGNF	L30	VQLTSQWL	L25;L44	HFLPRVFSA	L50;L8;L72;L71;L38;L46
2938	RRIRGGDGK	L30	VQPTESIVR	L21;L15	HFVCNLLLL	L8;L62;L72;L73;L9;L71
2939	RRIRGGDGKM	L30	VQSTQWSL	L44;L35	HHWLLLTIL	L34;L35;L28;L44;L25;L31

2940	RRIRGGDGKMK	L30	VRDLPQGF	L62;L63	HQSDIEVTG	L44;L24;L26;L34;L35;L28
2941	RRLISMMGFK	L30	VRITGLYPTL	L66;L30	HVASCDAIMTR	L19;L21;L17;L11;L15;L7
2942	RRLISMMGFKM	L30	VRNLQHRL	L66;L65	HVETFYPKL	L32;L63;L11;L49;L13;L5
2943	RRNVATLQA	L30	VRQALLKTV	L64;L30	HVTFFIYNK	L7;L13;L19;L20;L6;L17
2944	RRPQGLPNNT	L30	VRRSFYVY	L66;L65	HVVGPNVNK	L19;L7;L13;L6;L20;L17
2945	RRSFYVYA	L65	VSDADSTLIG	L18;L1	HWLLLTIL	L25;L23;L62;L33;L59;L48
2946	RRVVFNGV	L30	VSDIDYVPLK	L1;L18	HYVRITGL	L72;L65;L66;L71;L25;L8
2947	RRVWTLMN	L65	VSDVGDSA	L1;L68	IAIAMACLV	L47;L69;L70;L58;L73;L64
2948	RSDARTAPH	L18	VSEETGTLIV	L18;L1	IAMSAFAMM	L61;L59;L60;L58;L70;L31
2949	RSDARTAPHGH	L18	VSEEVVEN	L63;L68	IELSLIDFY	L40;L41;L29;L12;L14;L36
2950	RSDVLLPLTQ	L18	VSFLAHIQ	L55;L48	IEVQGYKSV	L45;L46;L38;L37;L29;L36
2951	RSEAGVCV	L18	VSFSTFEEA	L43;L50	IEYPIIGD	L29;L33;L45;L46;L25;L48
2952	RSEKSYELQT	L18	VSICSTMTNR	L19;L15	IFLIVAAIVF	L8;L9;L71;L72;L12;L31
2953	RSFYVYAN	L65	VSIINNTV	L48;L70	IIKNLSKSL	L39;L43;L58;L60;L26;L13
2954	RSFYVYANG	L13	VSIWNLDYI	L73;L55	IIQFPNTYL	L68;L60;L61;L74;L63;L28
2955	RSGETLGVLV	L73	VSKGFFKEG	L43;L13	IKVTLVFLF	L66;L9;L27;L52;L8;L12
2956	RSKNPLLYDANY	L14	VSLAIDAY	L14;L1	ILSPLYAF	L59;L26;L23;L9;L54;L33
2957	RSKQRRPQ	L55	VSPTKLNDL	L57;L64	IPLTTAAKL	L47;L32;L31;L39;L22;L56
2958	RSKQRRPQG	L13	VSSQCVNL	L74;L70	IPVAYRKVLL	L31;L56;L22;L32;L49;L39
2959	RSKQRRPQGL	L55	VSSQCVNLTTR	L19;L15	IQLSSYSLF	L27;L9;L8;L26;L34;L16
2960	RSLKVPATVS	L53	VSTTTNIV	L48;L70	IQYIDIGNY	L26;L27;L14;L18;L43;L11
2961	RSQMEIDFLEL	L73	VSVSSPDAV	L67;L73	IRGDEVRQI	L64;L65;L34;L66;L30;L35
2962	RSRNSSRNS	L13	VTDFNAIATC	L18;L1	ISAGFSLWV	L73;L70;L69;L58;L64;L18
2963	RSSSRSRNS	L55	VTDTPKGPK	L1;L7	ISNEKQEI	L55;L48;L43;L73;L54;L53
2964	RSSVLHSTQ	L53	VTDTPKGPKVKY	L1;L18	ITEEVGHTD	L53;L55;L18;L49;L54;L1

2965	RSTNSRIK	L55	VTDVTQLYLG	L1;L18	ITFELDERI	L20;L53;L54;L52;L16;L34
2966	RSTNSRIKA	L13	VTFFIYNK	L7;L13	ITLCFTLKR	L7;L21;L6;L17;L15;L19
2967	RSYLTPGD	L48	VTFFIYNKIV	L70;L20	ITVNVLAWLY	L12;L14;L52;L18;L54;L1
2968	RTFLLKYNE	L53	VTKENDSKEGF	L52;L53	IYLYLTFYL	L8;L9;L71;L72;L66;L62
2969	RTIKGTHH	L54	VTKNSKVQI	L53;L70	KEILVTYNC	L38;L33;L36;L37;L42;L45
2970	RTLETAQN	L54	VTLADAGFIK	L7;L6	KEITVATSR	L15;L21;L38;L36;L37;L45
2971	RTLETAQNSV	L16	VTLVFLFV	L73;L47	KEKVNINIV	L45;L37;L42;L38;L46;L36
2972	RTNVYLAVFDK	L7	VTLVFLFVA	L52;L50	KFVCDNIKF	L8;L53;L54;L9;L52;L12
2973	RTRSMWSFN	L13	VTMPLGYV	L73;L70	KFYGGWHNM	L71;L72;L14;L8;L13;L16
2974	RTTNGDFLHFL	L53	VTQLYLGGMSYY	L1;L18	KGAGGHSY	L14;L55;L26;L27;L54;L18
2975	RTVYDDGARRVW	L52	VTSAMQTML	L73;L70	KGDYGDAVVY	L18;L14;L27;L65;L54;L1
2976	RVAGDSGFA	L14	VTTEILPVSM	L52;L20	KHAFHTPAF	L28;L27;L34;L33;L35;L9
2977	RVAGDSGFAA	L51	VTTFDSEY	L1;L18	KKADETQAL	L44;L27;L66;L16;L64;L24
2978	RVCGVSAA	L51	VTVKNGSIHL	L53;L60	KLNDLCFTNV	L5;L3;L2;L4;L13;L21
2979	RVCTNYMPYFF	L16	VTVYSHLLLV	L73;L20	KLNEEIAII	L3;L4;L16;L24;L2;L5
2980	RVCVDTVRTNVY	L18	VTYKLDGVVC	L53;L52	KLPDDFTGC	L5;L57;L6;L2;L16;L26
2981	RVDFCGKGYH	L18	VVADAVIK	L7;L19	KLVLSVNPY	L26;L16;L6;L27;L18;L14
2982	RVDFCGKGYHLM	L18	VVAFNTLL	L74;L68	KMKDLSPRW	L54;L52;L16;L14;L13;L53
2983	RVDWTIEYP	L18	VVCFNSTY	L26;L18	KMNYQVNGY	L26;L16;L14;L27;L18;L6
2984	RVEAFEYYH	L18	VVCTEIDPK	L7;L6	KNGSIHLYF	L73;L65;L12;L9;L54;L8
2985	RVECFDKF	L18	VVDADSKI	L63;L68	KNIDGYFKI	L8;L24;L73;L55;L16;L45
2986	RVECFDKFK	L13	VVDGCNSST	L68;L63	KPASRELKV	L73;L51;L24;L39;L22;L47
2987	RVECTTIVN	L18	VVDYGARFYFY	L1;L18	KPNTWCIRCL	L39;L56;L32;L55;L22;L65
2988	RVIHFGAGSD	L14	VVEVVDKY	L1;L18	KPYIKWDL	L23;L56;L25;L39;L65;L22
2989	RVKNLNSSRV	L13	VVEVVDKYFDCY	L18;L1	KRFDNPVL	L65;L66;L25;L35;L64;L28

2990	RVLGLKTLA	L24	VVFDEISMATNY	L14;L12	KSAAEASKK	L13;L7;L54;L55;L18;L6
2991	RVLGLKTLAT	L6	VVKVTIDY	L43;L26	KSAQCFKMF	L53;L52;L55;L54;L16;L73
2992	RVTKNSKV	L24	VVLLILMTA	L50;L51	KSILSPLY	L55;L54;L18;L52;L1;L14
2993	RVVVLSFELL	L20	VVLLSVLQQ	L6;L7	KSLTENKY	L55;L54;L14;L18;L52;L53
2994	RVWTLMNV	L13	VVNAANVYLK	L7;L6	KSNIIRGW	L55;L54;L52;L65;L53;L48
2995	RVWTLMNVLTL	L16	VVNIQKEI	L48;L55	KSNLKPFER	L21;L15;L73;L55;L17;L7
2996	RVYANLGERV	L24	VVQLTSQWL	L60;L74	KSYELQTP	L55;L54;L53;L43;L46;L48
2997	RWFLNRFT	L55	VVRSIFSRT	L13;L43	KTDGTLMI	L18;L68;L63;L1;L54;L73
2998	RWFLNRFTT	L16	VVSDIDYVPL	L20;L67	KVGGNYNYL	L65;L74;L16;L73;L67;L58
2999	RYFRLTLGVYDY	L14	VVSDIDYVPLK	L6;L7	LAAIMQLF	L59;L47;L52;L49;L74;L58
3000	RYLALYNK	L15	VVSKVVKVTI	L20;L53	LACFVLAAV	L50;L59;L47;L20;L67;L70
3001	RYLALYNKYK	L13	VVTCLAYYF	L12;L52	LAFLLFLV	L47;L50;L70;L69;L59;L64
3002	RYMNSQGLLP	L8	VVYRGTTTYK	L6;L7	LAKALRKV	L70;L47;L58;L64;L23;L69
3003	RYRIGNYK	L13	VWTLMNVL	L62;L25	LAKHCLHVV	L70;L47;L69;L58;L50;L32
3004	RYVDNNFCG	L8	VYANLGERVR	L15;L17	LALLLLDRL	L67;L47;L31;L74;L50;L60
3005	RYWEPEFYEAMY	L14	VYAWNRKRI	L9;L8	LAMDEFIERY	L31;L49;L12;L52;L18;L14
3006	SAAEASKK	L19	VYDPLQPELD	L62;L9	LARGIVFM	L58;L70;L59;L74;L47;L69
3007	SAAEASKKPR	L19	VYDYLVSTQ	L62;L9	LAWPLIVT	L47;L59;L69;L50;L31;L70
3008	SAEVAVKMFDAY	L18	VYFASTEK	L71;L72	LEIPRRNVA	L46;L38;L42;L25;L37;L29
3009	SAFAMMFVKHK	L7	VYIGDPAQLP	L9;L8	LENVAFNVV	L45;L29;L46;L38;L42;L37
3010	SAFVETVKG	L49	VYIKNADI	L71;L8	LFDESGEF	L62;L72;L68;L63;L71;L1
3011	SAGFPFNK	L7	VYIKNADIV	L71;L72	LFLMSFTVL	L72;L71;L8;L9;L61;L62
3012	SAGFSLWVYK	L7	VYKQFDTYNL	L8;L9	LFLTWICLL	L8;L9;L62;L72;L71;L4
3013	SAKPPPGD	L43	VYLAVFDKNL	L9;L8	LGAENSVAY	L26;L43;L27;L12;L31;L59
3014	SAKPPPGDQ	L43	VYLPYPDPSR	L9;L15	LHDELTGHML	L34;L35;L28;L68;L63;L5

3015	SALGKLQD	L65	VYLPYPDPSRI	L9;L8	LIMLIIFWF	L12;L26;L9;L52;L60;L58
3016	SALLAGTI	L47	VYMPASWVMRI	L9;L8	LIYSTAAL	L59;L61;L60;L67;L43;L57
3017	SALLEDEF	L59	VYPVASPN	L72;L71	LLAPLLSA	L3;L51;L50;L43;L2;L23
3018	SALVYDNKLK	L7	VYRGTTTYK	L13;L6	LLDRLNQL	L68;L1;L63;L5;L62;L74
3019	SAPTLVPQ	L57	VYRGTTTYKL	L8;L9	LLIGLAKRF	L12;L26;L11;L43;L49;L9
3020	SAPTLVPQEH	L57	VYSDVENPHLM	L9;L8	LLWPVTLAC	L6;L5;L4;L2;L12;L43
3021	SAQCFKMFYK	L7	VYSRVKNLN	L9;L8	LMWLIINLV	L47;L48;L5;L64;L50;L4
3022	SARIVYTA	L50	VYSSANNCTF	L9;L8	LNDNLLEIL	L68;L67;L62;L63;L5;L34
3023	SARIVYTAC	L43	VYSTGSNV	L71;L72	LPAADLDDF	L31;L49;L56;L32;L22;L39
3024	SASIVAGGI	L49	VYYHKNNKS	L8;L9	LPINVIVFD	L50;L31;L32;L49;L56;L47
3025	SASKIITLKKR	L19	VYYPDKVFRS	L8;L9	LPQGFSAL	L22;L56;L39;L47;L32;L31
3026	SASTSAFV	L58	VYYSQLMC	L71;L72	LPQNAVVKI	L47;L50;L49;L39;L32;L31
3027	SAVLQSGF	L58	VYYTSNPT	L71;L72	LPRVFSAV	L47;L51;L50;L22;L39;L23
3028	SAVLQSGFR	L19	WEIQQVVD	L37;L29	LPSLATVAY	L31;L50;L49;L22;L56;L51
3029	SAYENFNQHEV	L67	WESGVKDCV	L45;L42	LPTEVLTEE	L31;L56;L50;L32;L49;L51
3030	SAYENFNQHEVL	L67	WFFSNYLKRR	L17;L15	LQSADAQSF	L26;L31;L27;L34;L28;L58
3031	SCGNFKVTK	L7	WFLAYILFTR	L17;L15	LRDGWEIVKF	L30;L34;L65;L49;L63;L35
3032	SCKRVLNV	L48	WFVTQRNF	L71;L72	LRVESSSKL	L30;L25;L66;L35;L64;L28
3033	SCLPFTINC	L7	WIFGTTLDSK	L6;L7	LSDRVVFVLW	L52;L53;L1;L54;L18;L49
3034	SDADSTLI	L33	WLDDVVYCP	L5;L2	LSDTLKNL	L68;L63;L1;L60;L62;L74
3035	SDDYIATN	L33	WLKQLIKV	L3;L23	LSLREVRTI	L55;L48;L53;L47;L52;L65
3036	SDEFSSNV	L33	WLLLTILTSL	L4;L2	LTLQQIEL	L55;L60;L53;L59;L67;L61
3037	SDEFSSNVA	L38	WPLIVTALR	L21;L17	LTLVYKVYY	L52;L1;L12;L18;L14;L65
3038	SDEVARDL	L33	WPVTLACFVL	L32;L56	LTQDHVDIL	L67;L69;L73;L60;L61;L70
3039	SDFVRATATI	L33	WQLALSKGV	L24;L48	LTWICLLQF	L53;L52;L59;L16;L1;L18

3040	SDGTGTIY	L65	WRKAVFISPY	L66;L30	LVFLFVAAI	L47;L20;L3;L50;L59;L64
3041	SDIEVTGD	L33	WSFNPETNI	L24;L53	LVGLMWLSY	L12;L1;L18;L43;L6;L59
3042	SDKFTDGV	L33	WSLFFFLY	L1;L18	LVIGFLFLTW	L10;L52;L12;L16;L49;L6
3043	SDLATNNL	L33	WSMATYYL	L74;L55	LVLIMLIIF	L52;L31;L59;L12;L74;L53
3044	SDLATNNLV	L33	WSYSGQST	L43;L55	LVLSVNPYV	L4;L5;L2;L47;L13;L20
3045	SDRDLYDKLQF	L65	WTIEYPIIGD	L11;L10	LVYCFLGY	L18;L59;L12;L1;L26;L6
3046	SDRVVFVLW	L52	WTNAGDYIL	L32;L55	LVYCFLGYF	L11;L58;L59;L12;L10;L52
3047	SDSPCESH	L33	YAISAKNR	L17;L19	LVYFLQSI	L47;L59;L24;L48;L55;L25
3048	SDVENPHL	L33	YAISAKNRA	L50;L46	LWPVTLACF	L62;L9;L57;L71;L8;L72
3049	SDVETKDV	L33	YAISAKNRAR	L17;L19	LYALVYFL	L62;L66;L72;L71;L9;L64
3050	SDVETKDVV	L37	YASALWEIQ	L67;L49	LYENAFLPF	L9;L8;L72;L71;L62;L12
3051	SDVKCTSV	L33	YASQGLVA	L50;L61	LYIDINGNL	L8;L9;L72;L71;L62;L66
3052	SDVKCTSVV	L33	YCIDGALLTK	L7;L6	LYIIKLIF	L71;L72;L9;L8;L65;L23
3053	SDVLLPLTQY	L29	YDFAVSKGF	L33;L27	LYSPIFLI	L9;L47;L8;L64;L66;L62
3054	SEAFLIGCN	L40	YDLSVVNAR	L17;L19	LYYQNNVF	L9;L72;L71;L8;L62;L66
3055	SEAGVCVS	L29	YDYLVSTQ	L33;L48	MATNYDLSV	L70;L69;L50;L32;L73;L47
3056	SEAKCWTETDL	L36	YECLYRNRDV	L45;L38	MAYITGGVV	L47;L50;L70;L69;L61;L49
3057	SECVLGQSK	L40	YEDFLEYHDV	L38;L45	MCDIRQLLF	L1;L18;L33;L49;L62;L34
3058	SEDAQGMDNLA	L38	YEKLKPVLDW	L41;L40	MEIDFLELAM	L46;L40;L41;L36;L29;L42
3059	SEDKRAKVTS	L42	YELQTPFEIKL	L36;L41	MFLARGIVF	L71;L72;L9;L8;L12;L31
3060	SEFDRDAAMQ	L40	YEPLTQDHV	L45;L36	MKIILFLAL	L67;L27;L61;L44;L73;L59
3061	SEFSSLPSYA	L46	YERHSLSHF	L29;L58	MSAPPAQYEL	L20;L67;L60;L61;L53;L54
3062	SEHDYQIG	L29	YESLRPDTR	L33;L29	MSYEDQDAL	L67;L55;L61;L53;L60;L59
3063	SEIIGYKAID	L42	YFCTCYFGLF	L9;L62	MYIFFASF	L72;L9;L71;L62;L8;L59
3064	SEKQVEQK	L29	YFDKAGQKTY	L1;L12	NAFLPFAM	L70;L59;L67;L31;L50;L47

3065	SEKSYELQT	L42	YFGLFCLL	L62;L67	NCDTLKEIL	L68;L34;L63;L67;L62;L35
3066	SEMVMCGGSL	L36	YFIKGLNN	L71;L72	NEEIAIILA	L42;L38;L46;L37;L40;L29
3067	SEPVLKGVKLHY	L41	YFITDAQTG	L71;L72	NEFACVVA	L46;L29;L25;L37;L42;L38
3068	SEVGPEHS	L29	YFNKKDWY	L71;L72	NEKTHVQL	L23;L25;L37;L29;L33;L45
3069	SEVVLKKLKK	L41	YFPLQSYG	L62;L71	NFKDQVIL	L62;L71;L72;L67;L66;L23
3070	SEYDYVIFTQTT	L41	YFTSDYYQLY	L12;L14	NFNKDFYDF	L8;L9;L49;L12;L62;L72
3071	SEYKGPIT	L29	YFVLTSHTVM	L71;L72	NFYEPQII	L48;L62;L25;L71;L72;L47
3072	SEYTGNYQ	L45	YFYTSKTT	L71;L72	NGDSEVVL	L63;L68;L62;L67;L35;L28
3073	SFDLGDELG	L62	YGRSGETL	L23;L59	NIDYDCVSF	L68;L63;L62;L49;L34;L5
3074	SFDNFKFV	L62	YHKNNKSWM	L28;L58	NKGEDIQLL	L64;L34;L44;L66;L35;L27
3075	SFDNFKFVC	L62	YHNESGLKTIL	L28;L34	NLDSCKRVL	L23;L63;L68;L5;L62;L32
3076	SFDVLKSE	L62	YHYQECVRG	L34;L28	NLDYIINL	L74;L62;L68;L5;L63;L1
3077	SFDVLKSED	L62	YIDIGNYT	L1;L68	NLYDKLVSS	L23;L3;L43;L4;L2;L5
3078	SFGPLVRKIF	L9	YIICISTKH	L11;L43	NMMVTNNTF	L34;L9;L8;L71;L72;L26
3079	SFKEELDKYF	L9	YIKWPWYIW	L43;L16	NNELSPVAL	L68;L35;L67;L62;L28;L25
3080	SFLGRYMSA	L71	YILFTRFF	L60;L59	NPTIQKDVL	L23;L39;L32;L31;L56;L22
3081	SFLPGVYSVIY	L12	YIWLGFIAG	L67;L59	NRQFHQKLL	L64;L66;L35;L30;L34;L25
3082	SFVSEETGTLI	L8	YKGPITDVFY	L27;L12	NRYFRLTL	L25;L35;L66;L65;L64;L28
3083	SFYVYSRVKNL	L71	YKHWPQIAQ	L27;L43	NSASFSTF	L70;L54;L55;L59;L58;L53
3084	SGARSKQRR	L19	YKLDGVVC	L27;L44	NSHEGKTFY	L43;L1;L14;L18;L58;L26
3085	SGETLGVLV	L63	YKLDGVVCT	L44;L27	NVAFNVVNK	L19;L7;L6;L13;L17;L20
3086	SGFAAYSR	L15	YKSVNITF	L27;L66	NVYADSFVIR	L19;L17;L7;L21;L15;L6
3087	SGFAAYSRYR	L15	YLGGMSYY	L1;L43	NYYKKDNSY	L71;L72;L66;L14;L12;L8
3088	SGFRKMAF	L29	YLKHGGGVA	L51;L3	PANSIVCRF	L58;L49;L54;L43;L70;L69
3089	SGINASVV	L48	YLKRRVVFN	L3;L23	PVYSFLPGV	L3;L20;L4;L11;L5;L2

3090	SGNLLLDKR	L15	YLPQNAVV	L57;L5	PYNMRVIHF	L9;L8;L72;L71;L66;L62
3091	SGVTFQSAV	L48	YLPQNAVVK	L57;L6	QALLKTVQF	L33;L52;L31;L53;L27;L59
3092	SGVTFQSAVKR	L19	YLPYPDPSR	L5;L57	QEGVLTAVV	L42;L45;L38;L37;L36;L40
3093	SGVVTTVMF	L49	YLPYPDPSRI	L5;L57	QELYSPIFL	L36;L41;L40;L37;L29;L45
3094	SGWTAGAAA	L51	YLQPRTFLLK	L6;L7	QESFGGASC	L40;L42;L38;L36;L41;L45
3095	SGWTAGAAAY	L14	YLYFIKGLNNL	L2;L4	QEVFAQVKQ	L40;L41;L36;L38;L37;L46
3096	SGWTAGAAAYY	L14	YMLTYNKV	L48;L47	QLIKVTLVFL	L2;L4;L3;L5;L74;L20
3097	SHEGKTFY	L1	YMPYFFTLLL	L57;L5	QPGQTFSVL	L22;L39;L56;L32;L65;L31
3098	SHFAIGLA	L28	YNVTQAFGR	L19;L17	QPYRVVVLSF	L31;L22;L49;L47;L39;L32
3099	SHGKQVVSD	L35	YNYEPLTQD	L46;L43	QQGEVPVSI	L24;L44;L34;L48;L35;L28
3100	SHKPPISFP	L28	YPANSIVCRF	L49;L31	QSINFVRII	L55;L70;L69;L64;L48;L73
3101	SHKPPISFPL	L28	YPDKVFRSSVL	L32;L22	QSTQLGIEF	L53;L55;L52;L54;L58;L26
3102	SHLLLVAAGL	L40	YPGQGLNGY	L49;L31	QYGRSGETL	L9;L72;L8;L71;L66;L34
3103	SHNIALIWNV	L28	YPIIGDELK	L49;L32	QYLNTLTL	L72;L71;L9;L8;L66;L48
3104	SHQSDIEVTG	L34	YPKCDRAM	L39;L32	RAFGEYSHV	L58;L69;L24;L70;L13;L73
3105	SHSQLGGLHLLI	L34	YPLECIKD	L50;L47	RAGKASCTL	L53;L54;L44;L56;L58;L61
3106	SHTVMPLSAPTL	L28	YPNASFDNFKF	L31;L49	RDLICAQKF	L33;L55;L53;L8;L37;L54
3107	SHVVAFNTLLF	L34	YPPDEDEEE	L49;L32	RDLYDKLQF	L33;L65;L53;L16;L8;L52
3108	SIAATRGATV	L3	YPQVNGLTS	L50;L49	REAVGTNLP	L38;L42;L46;L45;L36;L37
3109	SIDAFKLNIKL	L68	YPSARIVY	L31;L22	REEAIRHV	L45;L37;L33;L38;L48;L42
3110	SIFSRTLETA	L3	YPSARIVYTA	L50;L51	REETGLLMP	L38;L42;L46;L36;L37;L45
3111	SIIKTIQPRV	L48	YPTLNISDEF	L31;L49	REFLTRNP	L33;L46;L38;L37;L45;L48
3112	SIISNEKQEI	L24	YQHEETIYN	L26;L24	REHEHEIA	L38;L46;L37;L42;L29;L33
3113	SIKWADNNCY	L14	YQLRARSV	L48;L25	RENNRVVI	L37;L45;L36;L33;L48;L29
3114	SINFVRII	L48	YQTSNFRV	L24;L48	RFFYVLGL	L71;L72;L65;L33;L48;L62

3115	SINFVRIIM	L39	YRAFDIYND	L65;L30	RFLYIIKL	L8;L33;L72;L71;L62;L48
3116	SIPCSVCL	L57	YRARAGEAA	L35;L46	RFPNITNL	L72;L62;L71;L57;L8;L9
3117	SIVRFPNI	L48	YRIGNYKLN	L30;L64	RIAGHHLGR	L21;L15;L6;L19;L7;L17
3118	SIWNLDYII	L24	YRLYLDAYNM	L30;L66	RISNCVADY	L14;L18;L26;L16;L6;L12
3119	SKFPLKLR	L15	YRRATRRI	L48;L64	RLQSLQTYV	L2;L4;L24;L5;L3;L13
3120	SKFPLKLRG	L44	YRSLPGVF	L66;L35	RLSFKELLV	L24;L73;L2;L18;L4;L3
3121	SKFYGGWHN	L27	YRSLPGVFC	L35;L30	RLSFKELLVY	L18;L6;L12;L14;L16;L26
3122	SKFYGGWHNM	L27	YSDVENPH	L1;L68	RLTLGVYDY	L14;L26;L18;L16;L12;L27
3123	SKFYGGWHNML	L44	YSDVENPHLMG	L1;L18	RMYIFFASFY	L14;L27;L18;L26;L6;L12
3124	SKGRLIIRE	L44	YSFLPGVYSV	L50;L20	RNAGIVGVL	L44;L65;L73;L56;L39;L69
3125	SKHTPINL	L66	YSGVVTTVMF	L53;L43	RPDTRYVL	L39;L22;L56;L32;L65;L63
3126	SKILGLPTQ	L27	YSHLLLVA	L50;L59	RPQIGVVREF	L39;L56;L22;L49;L31;L65
3127	SKLIEYTDF	L27	YSSANNCTFEY	L1;L18	RSAAKKNNL	L53;L73;L54;L44;L56;L16
3128	SKLINIIIWF	L27	YSTAALGV	L73;L48	RSEKSYEL	L55;L54;L63;L65;L18;L53
3129	SKLINIIIWFL	L44	YSTGSNVFQTR	L17;L19	RSVSPKLFI	L73;L55;L53;L54;L24;L65
3130	SKLWAQCVQL	L44	YSVLYNSASF	L43;L60	RTATKAYNV	L73;L13;L18;L20;L53;L21
3131	SKQRRPQGL	L44	YSYATHSD	L48;L43	RVKNLNSSR	L15;L21;L13;L17;L16;L14
3132	SKRSFIEDLL	L44	YSYATHSDKF	L54;L58	RVLSNLNL	L54;L74;L56;L16;L73;L55
3133	SKRVDFCGK	L13	YTACSHAAV	L20;L70	RVQPTESIVRF	L54;L16;L52;L53;L26;L14
3134	SKSPIQYI	L64	YTFEKGDY	L1;L14	RVVISSDVL	L53;L54;L65;L56;L26;L44
3135	SKSPIQYID	L44	YTKVDGVDV	L58;L70	RYMNSQGLL	L8;L9;L72;L71;L14;L62
3136	SKTPEEHF	L27	YTMADLVYAL	L20;L67	SAEVAVKMF	L63;L58;L49;L68;L70;L31
3137	SKVGGNYNYL	L44	YTNSFTRGVYY	L1;L12	SAIGKIQDSL	L67;L61;L32;L10;L58;L60
3138	SKVVKVTIDY	L27	YTPHTVLQAV	L57;L5	SAKPPPGDQF	L43;L58;L26;L52;L11;L53
3139	SLAATVRLQA	L3	YTQLCQYL	L60;L70	SALGKLQDV	L58;L24;L69;L70;L4;L64

3140	SLAGSYKDW	L10	YTVEEAKTVLK	L7;L19	SALNHTKKW	L52;L69;L49;L54;L10;L70
3141	SLATVAYF	L74	YTVSCLPF	L59;L60	SANLAATKM	L58;L63;L31;L68;L32;L70
3142	SLDNVLST	L68	YVDNNFCGPDGY	L1;L18	SDIDITFL	L74;L37;L33;L65;L29;L25
3143	SLEIPRRNV	L13	YVDNSSLT	L1;L63	SEETGTLIV	L45;L38;L42;L37;L36;L46
3144	SLENVAFNVV	L5	YVDTPNNT	L68;L1	SEIIGYKA	L38;L46;L42;L37;L29;L45
3145	SLKEGQIN	L43	YVFIKRSD	L65;L23	SEYCRHGTC	L25;L33;L46;L45;L37;L38
3146	SLKVPATVS	L43	YVFTGYRV	L20;L48	SEYKGPITDV	L45;L37;L36;L42;L46;L24
3147	SLLLCRMNSR	L21	YVFTGYRVT	L10;L69	SFDLGDEL	L62;L68;L67;L71;L63;L72
3148	SLLMPILTLT	L6	YVGYLQPRTF	L65;L55	SFIEDLLF	L8;L9;L62;L72;L71;L12
3149	SLLMPILTLTR	L21	YVKPGGTSSG	L43;L10	SFKEELDKY	L12;L14;L13;L11;L10;L26
3150	SLLSKGRL	L74	YVLGLAAI	L59;L67	SFKELLVYA	L13;L3;L51;L42;L17;L15
3151	SLLSKGRLII	L16	YVRNLQHR	L17;L15	SFSASTSAF	L72;L71;L9;L62;L12;L8
3152	SLNGVTLIG	L6	YVTQQLIRA	L50;L46	SGLDSLDTY	L14;L27;L12;L26;L16;L52
3153	SLPFGWLI	L57	YWVPRASAN	L71;L61	SIIKTIQPR	L19;L21;L15;L7;L17;L11
3154	SLPFGWLIVGV	L5	YWVPRASANI	L9;L8	SIINNTVY	L26;L43;L58;L29;L59;L14
3155	SLPSYAAFAT	L57	YYHKNNKSWM	L71;L72	SIKNFKSVLY	L12;L43;L14;L13;L58;L26
3156	SLPVLQVR	L57	YYKLGASQ	L71;L72	SINFVRIIMR	L21;L19;L15;L7;L17;L6
3157	SLPVLQVRD	L5	YYPDKVFRSSV	L71;L72	SLAATVRL	L74;L56;L4;L2;L44;L3
3158	SLQTYVTQQ	L4	YYPDKVFRSSVL	L71;L72	SLFDMSKF	L26;L11;L27;L16;L10;L43
3159	SLQTYVTQQL	L4	YYQLYSTQ	L71;L72	SLNVAKSEF	L43;L26;L62;L16;L57;L72
3160	SLRCGACIRR	L21	YYSDSPCESH	L72;L71	SLPFGWLIV	L57;L24;L5;L3;L2;L64
3161	SLRVCVDTVR	L21	YYTSNPTTFHL	L8;L9	SLREVRTIKV	L3;L2;L13;L5;L4;L24
3162	SLSEQLRKQI	L3	YYVWKSYV	L71;L72	SLSHRFYRL	L4;L23;L5;L2;L74;L3
3163	SLSGFKLK	L6	AAGLEAPFLY	L12;L18;L14	SLVKPSFYVY	L26;L12;L27;L14;L16;L10
3164	SLSGFKLKD	L24	AAVINGDRW	L54;L52;L49	SPRRARSV	L48;L51;L39;L22;L23;L47

3165	SLSSTASALGK	L6	AAVYRINWI	L69;L70;L64	SPRWYFYYL	L39;L22;L32;L56;L65;L13
3166	SLVVRCSF	L43	ACFVLAAVYR	L15;L21;L7	SPVALRQM	L56;L39;L22;L32;L51;L31
3167	SLWVYKQFDTY	L18	ACPLIAAV	L57;L33;L48	SQDLSVVSK	L7;L68;L35;L27;L28;L63
3168	SMATNYDLSV	L3	ACWHHSIGF	L33;L27;L26	SRTLSYYKL	L35;L30;L25;L66;L34;L64
3169	SMDNSPNLA	L62	ADKYVRNL	L33;L65;L37	SRYWEPEFY	L30;L66;L65;L64;L12;L14
3170	SMDNSPNLAW	L68	ADSNGTITV	L33;L37;L24	SSPDDQIGYY	L11;L14;L18;L43;L1;L10
3171	SMKYFVKI	L48	AEETRKLMP	L38;L42;L46	STASALGKL	L10;L20;L11;L58;L53;L73
3172	SMMGFKMNYQV	L2	AEGSRGGSQA	L46;L42;L38	STFEEAAL	L20;L67;L59;L28;L61;L60
3173	SMQGAVDINK	L7	AEILLIIMRT	L41;L40;L45	STQLGIEF	L59;L72;L60;L71;L53;L26
3174	SNGTHWFVTQR	L19	AEIRASANLAA	L38;L42;L46	STQWSLFFF	L53;L58;L7;L52;L12;L9
3175	SNGTITVEEL	L65	AEIVDTVSALV	L38;L40;L36	SVLLFLAF	L59;L33;L23;L29;L12;L60
3176	SNHDLYCQV	L13	AELEGIQYGR	L40;L15;L41	SVLYNSASF	L12;L16;L10;L26;L11;L52
3177	SNLKPFER	L17	AENVTGLF	L33;L29;L40	SYATHSDKF	L9;L8;L71;L72;L66;L12
3178	SNNLDSKV	L48	AENVTGLFKD	L42;L40;L41	SYFTEQPIDL	L72;L71;L9;L65;L66;L8
3179	SNPTTFHL	L57	AEVAVKMFDA	L42;L46;L38	SYFTSDYY	L71;L72;L14;L12;L65;L66
3180	SNSGSDVL	L65	AFGEYSHV	L62;L72;L71	SYFTSDYYQL	L8;L9;L71;L72;L66;L65
3181	SNVANYQKV	L73	AFGEYSHVV	L72;L71;L42	SYGADLKSF	L9;L72;L8;L71;L66;L10
3182	SNYLKRRVVF	L27	AFGEYSHVVAF	L71;L72;L9	TAPHGHVM	L57;L63;L70;L32;L59;L66
3183	SNYSGVVTTV	L3	AFGLVAEW	L71;L72;L62	TAVLRQWL	L70;L60;L67;L59;L74;L61
3184	SPCESHGKQVV	L39	AFHQECSL	L71;L72;L62	TEAFEKMVSL	L36;L37;L40;L41;L38;L45
3185	SPFELEDFIP	L32	AFLCLFLL	L8;L71;L72	TESKPSVEQ	L38;L36;L45;L46;L37;L42
3186	SPFELEDFIPM	L31	AFLCLFLLP	L12;L42;L8	TEVLTEEVVL	L36;L37;L40;L41;L44;L65
3187	SPFVMMSAPPA	L50	AFNVVNKGHF	L9;L62;L72	TEVPVAIHAD	L40;L37;L38;L41;L29;L36
3188	SPISEHDY	L49	AFQTVKPGNF	L72;L9;L71	TFDNLKTLL	L62;L68;L63;L8;L34;L9
3189	SPNECNQM	L39	AFVNLKQLPF	L12;L71;L72	TFEYVSQPF	L62;L72;L9;L8;L71;L12

3190	SPNFSKLINII	L39	AFVVFLLV	L48;L62;L73	TIAFGGCVF	L43;L26;L10;L58;L28;L11
3191	SPRRARSVAS	L22	AFVVFLLVTL	L71;L72;L8	TIYSLLLCR	L17;L6;L19;L15;L7;L21
3192	SPTKLNDLCF	L49	AGFSLWVYK	L7;L6;L13	TLAILTAL	L23;L3;L25;L59;L4;L74
3193	SPYNSQNA	L51	AGLPYGANK	L7;L13;L6	TLIGDCATV	L3;L2;L4;L24;L5;L20
3194	SQAWQPGV	L48	AHFPREGV	L28;L33;L25	TLIVNSVLLF	L12;L9;L6;L26;L8;L16
3195	SQAWQPGVAM	L28	AHFPREGVFV	L28;L34;L35	TLKSFTVEK	L13;L43;L6;L21;L17;L7
3196	SQDLSVVS	L68	AHGFELTSM	L28;L34;L35	TLQAIASEF	L26;L72;L12;L16;L9;L14
3197	SQGLVASI	L48	AIDGGVTRD	L63;L18;L68	TLQCIMLVY	L26;L14;L12;L18;L6;L16
3198	SQGSEYDYV	L24	AIGLALYY	L18;L1;L12	TLVPQEHYV	L2;L5;L4;L3;L20;L64
3199	SQHTMLVKQ	L24	AIHADQLTP	L46;L42;L38	TPCSFGGVSV	L51;L50;L39;L22;L32;L56
3200	SQLMCQPI	L48	AIILASFSA	L38;L42;L46	TPKDHIGTR	L17;L51;L39;L49;L15;L19
3201	SQLMCQPIL	L44	AILTALRL	L74;L73;L60	TPKYKFVRI	L39;L23;L47;L49;L51;L32
3202	SQLMCQPILL	L44	AISAKNRAR	L21;L15;L7	TQDHVDIL	L63;L35;L68;L62;L28;L34
3203	SQMEIDFL	L44	AISMWALII	L73;L24;L69	TQWSLFFFL	L44;L24;L34;L4;L35;L8
3204	SQNAVASKIL	L44	AIVVTCLAYY	L14;L12;L18	TQYEYGTED	L27;L43;L24;L26;L48;L65
3205	SQPFLMDL	L57	AKPPPGDQF	L27;L66;L9	TRVLSNLNL	L35;L25;L34;L30;L64;L66
3206	SQQTVGQQD	L24	AKSHNIAL	L44;L66;L35	TSHKLVLSV	L73;L70;L24;L69;L48;L64
3207	SQWLTNIFGTVY	L27	AKYTQLCQY	L27;L14;L26	TSMKYFVKI	L73;L55;L48;L24;L53;L20
3208	SQYSLRLID	L24	ALAPNMMV	L2;L3;L4	TTAYANSVF	L53;L52;L10;L54;L70;L58
3209	SRGGSQAS	L65	ALAYYNTTK	L6;L7;L21	TTDPSFLGRY	L1;L18;L14;L10;L11;L12
3210	SRGGSQASS	L65	ALCTFLLNK	L6;L7;L13	TTITVNVL	L70;L55;L67;L28;L69;L35
3211	SRGGSQASSR	L30	ALDISASI	L68;L63;L62	TTIVNGVRR	L19;L17;L15;L21;L7;L11
3212	SRIGMEVT	L35	ALGVLMSNL	L4;L3;L74	TTLEETKFL	L53;L55;L73;L4;L10;L60
3213	SRIIPARARV	L30	ALILAYCNK	L13;L7;L6	TVLPPLLTD	L6;L7;L51;L16;L4;L12
3214	SRIKASMPTTI	L34	ALKYLPIDK	L13;L6;L7	TVREVLSDR	L15;L17;L19;L21;L11;L6

3215	SRILGAGCFV	L30	ALLADKFPVL	L2;L4;L5	TYASQGLVA	L46;L8;L51;L9;L72;L38
3216	SRLDKVEAEV	L30	ALLEDEFTP	L2;L4;L16	TYNLWNTF	L62;L9;L72;L8;L71;L33
3217	SRLSFKELLV	L30	ALLKTVQFC	L4;L24;L2	VADYSVLYN	L68;L67;L63;L1;L74;L18
3218	SRLSFKELLVY	L30	ALLTLQQIEL	L4;L2;L44	VAFELWAKR	L19;L17;L15;L21;L7;L69
3219	SRNLQEFKP	L30	ALNLGETF	L26;L27;L23	VAGDSGFAAY	L59;L14;L12;L31;L43;L18
3220	SRNLQEFKPR	L30	ALNNIINNAR	L21;L15;L6	VAGGIVAI	L67;L70;L47;L68;L74;L69
3221	SRNSSRNST	L30	ALQDAYYRA	L2;L4;L5	VAIHADQL	L67;L74;L60;L61;L70;L59
3222	SRNSTPGSS	L30	ALVYDNKLK	L7;L6;L13	VDDPCPIHF	L62;L63;L74;L33;L68;L9
3223	SRNSTPGSSR	L30	AMQVESDDY	L14;L26;L18	VEAEVQIDRL	L36;L41;L40;L45;L37;L29
3224	SRNYIAQVDV	L30	AMRPNFTIK	L6;L13;L7	VEVEKGVL	L29;L37;L36;L45;L33;L25
3225	SRQRLTKY	L66	ANDPVGFTLK	L7;L6;L18	VEVEKGVLP	L38;L46;L42;L45;L36;L37
3226	SRQRLTKYTM	L30	ANNAAIVL	L73;L65;L71	VEYCPIFFI	L45;L37;L36;L47;L41;L40
3227	SRVKNLNSS	L30	APAHISTI	L47;L22;L39	VFAFPFTIY	L12;L72;L26;L71;L9;L31
3228	SRVKNLNSSR	L30	APHGVVFLHV	L51;L50;L22	VFITLCFTL	L8;L9;L72;L71;L62;L67
3229	SRVLGLKT	L25	APLVGTPV	L22;L51;L50	VFLLVTLAI	L71;L72;L8;L9;L48;L47
3230	SRVLGLKTLA	L30	APLVGTPVC	L22;L51;L31	VFLVLLPLV	L9;L47;L4;L48;L62;L8
3231	SRYWEPEFYE	L30	APTLVPQEH	L56;L22;L39	VFPPTSFGPL	L72;L9;L57;L71;L8;L62
3232	SRYWEPEFYEA	L30	AQALNTLVK	L7;L6;L27	VFVLWAHGF	L9;L8;L62;L72;L71;L12
3233	SRYWEPEFYEAM	L30	AQDGNAAI	L68;L63;L35	VGMQKYSTL	L23;L25;L57;L61;L8;L44
3234	SSAINRPQI	L48	AQKFNGLTVL	L44;L26;L27	VGTNLPLQL	L73;L69;L64;L44;L61;L67
3235	SSDNIALLVQ	L18	AQPCSDKAY	L26;L27;L14	VIGFLFLTW	L12;L16;L67;L9;L73;L52
3236	SSDVLVNN	L68	AQSFLNGF	L26;L33;L27	VLCNSQTSL	L57;L2;L5;L68;L3;L4
3237	SSEAFLIGC	L18	AQVLSEMVM	L28;L27;L44	VLPFNDGVY	L12;L26;L14;L57;L18;L1
3238	SSEAFLIGCNY	L1	ARDLICAQKF	L30;L34;L35	VLYYQNNVF	L26;L16;L27;L9;L8;L12
3239	SSEIIGYK	L1	ARKSAPLIEL	L66;L30;L56	VPANSTVLSF	L22;L31;L49;L39;L56;L9

3240	SSEIIGYKA	L42	ARLYYDSMSY	L30;L66;L65	VPGLPGTIL	L22;L39;L56;L31;L51;L47
3241	SSGDATTA	L65	ARSVSPKL	L66;L35;L28	VPLHGTIL	L56;L47;L22;L23;L39;L31
3242	SSGVVNPV	L48	ARTAPHGHVM	L30;L66;L35	VQAGNVQLR	L21;L15;L19;L24;L17;L7
3243	SSGVVNPVM	L70	ARTVAGVSI	L35;L30;L34	VQTIEVNSF	L26;L27;L9;L34;L8;L16
3244	SSGWTAGAAAY	L14	ARVECFDKF	L30;L66;L34	VRQCSGVTF	L66;L34;L30;L35;L9;L72
3245	SSIVITSG	L43	ASANLAATK	L7;L19;L13	VSEETGTL	L63;L68;L1;L60;L55;L62
3246	SSIVITSGD	L43	ASDTYACW	L54;L18;L1	VSEETGTLI	L63;L1;L18;L68;L55;L48
3247	SSKCVCSVI	L70	ASEFSSLPSY	L18;L1;L14	VSFLAHIQW	L52;L53;L54;L70;L69;L16
3248	SSKTPEEH	L43	ASFNYLKSP	L46;L69;L43	VSLLSVLL	L74;L55;L60;L53;L73;L48
3249	SSNFGAISS	L43	ASFRLFAR	L15;L21;L7	VSTGYHFREL	L60;L73;L55;L61;L59;L70
3250	SSNVANYQK	L7	ASFSASTSA	L46;L51;L43	VSTIQRKY	L55;L48;L52;L54;L14;L1
3251	SSPDDQIGYYR	L15	ASKIITLKK	L13;L7;L6	VTFFIYNKI	L20;L55;L53;L24;L70;L16
3252	SSQAWQPGV	L48	ASLKELLQN	L7;L73;L53	VTFGDDTVI	L53;L52;L70;L20;L55;L16
3253	SSQGSEYD	L65	ASRELKVTFF	L52;L53;L43	VTHSKGLYR	L15;L21;L17;L7;L6;L19
3254	SSRVPDLL	L74	ATNVVIKV	L73;L48;L70	VTNNTFTL	L70;L60;L55;L54;L53;L73
3255	SSSEAFLI	L55	ATNVVIKVC	L73;L52;L70	VTNNTFTLK	L7;L6;L13;L21;L19;L15
3256	SSSEAFLIG	L73	ATTRQVVNV	L73;L20;L13	VTWFHAIHV	L73;L20;L13;L69;L70;L63
3257	SSSGWTAGAAAY	L14	AVDAAKAY	L18;L1;L14	VVIKVCEF	L58;L74;L43;L26;L59;L54
3258	SSSKTPEEHF	L53	AVFDKNLYDK	L7;L6;L13	VVIKVCEFQF	L8;L53;L12;L52;L26;L54
3259	SSSRSRNSSR	L19	AVFQSASK	L7;L13;L6	VVTTFDSEY	L26;L14;L12;L18;L58;L52
3260	SSTCMMCYK	L7	AVIKTLQPV	L24;L3;L5	VVVLSFEL	L60;L59;L67;L68;L74;L61
3261	SSTFNVPMEK	L7	AVKMFDAYV	L13;L3;L58	VWKSYVHVV	L70;L3;L69;L39;L58;L51
3262	SSVLHSTQ	L48	AVLDMCASLK	L6;L7;L13	VYMPASWVM	L71;L66;L9;L72;L8;L62
3263	SSVLHSTQD	L65	AVPYNMRVI	L64;L57;L10	VYSFLPGVY	L66;L14;L12;L72;L9;L71
3264	SSVLHSTQDLF	L52	AVRDPQTLEI	L43;L10;L6	VYYPDKVF	L9;L72;L66;L71;L8;L62

3265	SSVLNDIL	L67	AWYTERSEK	L13;L7;L6	VYYPDKVFR	L15;L17;L9;L21;L8;L72
3266	SSYSLFDMSK	L7	AYCCNIVNV	L13;L62;L72	WCKDGHVETF	L10;L43;L26;L11;L52;L16
3267	STASDTYAC	L7	AYKDYLASG	L66;L72;L15	WEIVKFIST	L46;L45;L37;L42;L29;L38
3268	STDGNKIADK	L7	AYKIEELF	L9;L62;L71	WLIINLVQM	L4;L11;L26;L3;L2;L5
3269	STEKSNIIRGW	L52	AYKTFPPTE	L66;L9;L13	WLSYFIASF	L16;L26;L12;L43;L10;L27
3270	STFISAARQGF	L16	AYNMMISAGF	L9;L72;L71	WLTNIFGTV	L24;L3;L5;L2;L20;L4
3271	STGSNVFQT	L7	AYRKVLLRK	L13;L6;L7	WPWYIWLGF	L49;L31;L39;L50;L22;L32
3272	STIQRKYK	L13	AYVNTFSST	L72;L71;L8	YACWHHSI	L47;L70;L59;L67;L68;L61
3273	STIQRKYKGI	L10	CAPLTVFF	L62;L59;L74	YAYLRKHF	L59;L70;L47;L58;L60;L69
3274	STKHFYWF	L58	CAYCCNIV	L47;L70;L69	YAYLRKHFSM	L61;L60;L59;L69;L67;L70
3275	STKHFYWFFSNY	L14	CEESSAKSA	L38;L42;L46	YECDIPIGA	L46;L38;L42;L37;L50;L36
3276	STNSRIKAS	L10	CEIVGGQIVT	L36;L42;L38	YELQTPFEI	L45;L36;L37;L40;L41;L8
3277	STQLGIEFLK	L7	CEKALKYLP	L42;L38;L46	YFPLQSYGF	L62;L9;L72;L71;L12;L8
3278	STQWSLFFFL	L20	CELYHYQEC	L33;L45;L38	YIAQVDVVNF	L58;L74;L12;L26;L10;L11
3279	STQYEYGTEDDY	L14	CESHGKQV	L45;L48;L37	YIDINGNL	L68;L63;L1;L62;L74;L60
3280	STSAFVETVK	L7	CGVDAVNLL	L64;L69;L8	YIFFASFY	L58;L59;L12;L1;L43;L26
3281	STSGRWVL	L70	CIDGALLTK	L7;L6;L68	YIICISTKHF	L11;L10;L58;L43;L60;L26
3282	STSHKLVLS	L20	CINGLMLL	L74;L73;L59	YIRKLHDEL	L67;L58;L59;L74;L23;L60
3283	SVAIKITEHSW	L52	CLDDRCIL	L62;L63;L68	YKTPPIKDF	L27;L66;L60;L9;L58;L43
3284	SVASQSIIA	L51	CLFLLPSL	L59;L4;L23	YLCFLAFLL	L4;L5;L2;L74;L1;L64
3285	SVCRLMKTI	L10	CLLNRYFRL	L4;L23;L2	YLFQHANL	L74;L23;L3;L2;L59;L4
3286	SVFNICQAVT	L20	CNDPFLGVY	L18;L1;L14	YLVSTQEF	L43;L59;L26;L27;L49;L74
3287	SVIDLLLD	L11	CNDPFLGVYY	L1;L18;L12	YLYFIKGL	L23;L3;L74;L4;L43;L2
3288	SVIDLLLDDFV	L20	CNLGGAVCR	L17;L15;L21	YQHEETIYNL	L34;L44;L4;L24;L35;L3
3289	SVLLFLAFVVF	L52	CPAVAKHDF	L49;L31;L39	YQIGGYTEK	L43;L27;L26;L24;L7;L58

3290	SVLYYQNNV	L4	CSFGGVSV	L48;L70;L69	YQKVGMQKY	L26;L43;L58;L27;L14;L24
3291	SVLYYQNNVF	L16	CSHAAVDAL	L67;L61;L57	YQLYSTQL	L44;L27;L25;L35;L48;L28
3292	SVMLTNDNTSRY	L1	CSLSHRFYR	L15;L17;L21	YSHVVAFNTL	L60;L67;L61;L53;L59;L57
3293	SVNITFELDER	L15	CSMTDIAKK	L7;L13;L19	YSLLMPIL	L59;L74;L60;L61;L67;L47
3294	SVPWDTIAN	L57	CSTMTNRQF	L55;L54;L52	YSPIFLIV	L73;L47;L48;L59;L57;L67
3295	SVRVLQKA	L51	CTCGKQATKY	L11;L18;L14	YSTGSNVF	L59;L54;L58;L60;L70;L55
3296	SVSPKLFIRQ	L20	CTFEYVSQPF	L10;L16;L53	YTNSFTRGVY	L1;L14;L11;L10;L18;L12
3297	SVSSPDAVTA	L51	CTFTRSTNSR	L21;L19;L15	YVKPGGTSS	L43;L26;L58;L51;L11;L10
3298	SVTVKNGSI	L10	CTGSIPCSV	L20;L70;L73	YVVDDPCPIHF	L31;L60;L11;L12;L10;L58
3299	SVTVKNGSIHLY	L14	CVCSVIDLL	L20;L74;L5	YVWKSYVHV	L5;L24;L2;L20;L58;L63
3300	SVVLLSVLQ	L7	CVDTVRTNV	L63;L5;L68	YVYANGGKGF	L10;L11;L26;L58;L60;L12
3301	SVVNARLRA	L51	CVDTVRTNVY	L18;L1;L14	YYHTTDPSFL	L62;L72;L71;L9;L66;L8
3302	SVVNIQKEIDR	L19	CVRGTTVLLK	L6;L13;L7	YYNTTKGGRF	L8;L9;L71;L72;L62;L12
3303	SVVSKVVKVT	L10	CYFGLFCL	L72;L66;L71	YYPSARIV	L64;L71;L72;L66;L62;L47
3304	SVVSKVVKVTI	L20	CYFPLQSYGF	L8;L9;L12	AAGLEAPFL	L74;L61;L69;L70;L60;L63;L31
3305	SVYAWNRKRI	L10	DALCEKAL	L23;L25;L47	AAIMQLFF	L58;L74;L59;L69;L70;L54;L60
3306	SVYPVASPNEC	L7	DALCEKALKY	L31;L12;L11	ACPDGVKHVY	L14;L40;L71;L11;L41;L26;L66
3307	SWFTALTQ	L48	DAQSFLNRV	L47;L20;L70	AEASKKPRQ	L46;L36;L40;L42;L41;L45;L38
3308	SWNLREMLA	L42	DAYPLTKH	L47;L25;L11	AELEGIQYG	L40;L45;L41;L36;L42;L46;L37
3309	SWQTGDFVK	L7	DCLGDIAAR	L17;L19;L11	AEVQIDRL	L37;L36;L33;L29;L45;L41;L40
3310	SWQTGDFVKA	L42	DDLNQLTGY	L29;L11;L10	AFLLFLVL	L71;L72;L67;L59;L62;L23;L8
3311	SYELQTPFEI	L9	DEAGSKSP	L29;L46;L38	AFNTLLFLM	L62;L12;L9;L15;L71;L8;L72
3312	SYFAVHFIS	L66	DEFSSNVA	L25;L29;L46	AFVETVKGL	L72;L71;L8;L62;L41;L40;L9
3313	SYFTEQPID	L65	DEFSSNVANY	L29;L41;L40	AHIQWMVMF	L34;L28;L27;L35;L26;L8;L9
3314	SYFVVKRHT	L72	DELKINAA	L29;L25;L46	AIVMVTIML	L74;L44;L61;L60;L69;L5;L73

3315	SYREAACC	L72	DELKINAAC	L29;L40;L41	AIVSTIQRKY	L14;L10;L12;L40;L11;L41;L26
3316	SYREAACCH	L72	DERIDKVL	L29;L25;L23	ALDPLSETK	L5;L18;L1;L7;L2;L13;L6
3317	SYTTTIKPVTY	L12	DEVARDLSLQF	L41;L40;L29	ALDQAISMW	L18;L5;L1;L63;L68;L10;L16
3318	SYVGCHNKC	L8	DEWSMATYY	L29;L41;L40	ALLAVFQSA	L2;L46;L5;L4;L3;L24;L51
3319	SYVGCHNKCAY	L71	DFDTWFSQR	L17;L15;L19	ALSKGVHFV	L2;L3;L24;L4;L5;L64;L73
3320	SYYCKSHKP	L8	DFIDTKRGVY	L11;L10;L14	ALWEIQQV	L2;L24;L4;L3;L5;L48;L64
3321	SYYSLLMPIL	L9	DFNLVAMKY	L29;L12;L14	ASFSASTSAF	L26;L43;L16;L52;L10;L27;L54
3322	TACSHAAV	L70	DFQVTIAEI	L72;L62;L71	ASHMYCSFY	L18;L43;L14;L26;L1;L58;L70
3323	TACTDDNALAY	L31	DFTEERLKL	L8;L25;L9	ASLPFGWL	L74;L61;L73;L55;L59;L60;L67
3324	TADIVVFDE	L68	DFTEERLKLF	L9;L8;L10	ATATIPIQA	L7;L20;L69;L13;L3;L46;L42
3325	TAFVTNVNA	L50	DFVEIIKSQ	L10;L17;L11	ATVVIGTSKF	L52;L53;L10;L54;L11;L16;L26
3326	TAGAAAYYV	L70	DGISQYSLR	L19;L17;L11	AVAKHDFFKF	L12;L10;L11;L16;L53;L52;L54
3327	TALLTLQQI	L47	DGNKIADKY	L29;L14;L11	AYANRNRFL	L64;L72;L71;L9;L8;L66;L40
3328	TALLTLQQIEL	L67	DGVKHVYQL	L25;L29;L23	AYILFTRF	L9;L72;L8;L71;L62;L27;L12
3329	TALRLCAY	L59	DGYPLECI	L47;L25;L48	AYLRKHFSM	L71;L8;L72;L9;L66;L12;L33
3330	TANKWDLI	L47	DHSSSSDNI	L34;L28;L35	AYNVTQAF	L72;L71;L9;L62;L43;L33;L66
3331	TAQNSVRV	L70	DHSSSSDNIAL	L34;L28;L35	AYVDNSSL	L72;L71;L66;L8;L62;L9;L61
3332	TASALGKL	L74	DHVISTSHKL	L34;L35;L28	CANGQVFGL	L58;L70;L60;L32;L65;L69;L61
3333	TASALGKLQ	L49	DIAANTVIW	L10;L49;L19	CLTPVYSFL	L74;L5;L4;L2;L3;L61;L44
3334	TATIPIQA	L50	DIADTTDAV	L11;L20;L10	DAALALLL	L47;L74;L23;L25;L31;L67;L61
3335	TATIPIQASL	L61	DIADTTDAVR	L19;L11;L17	DAFKLNIKLL	L47;L32;L69;L10;L20;L74;L49
3336	TAYANSVFNI	L47	DIKDLPKEI	L10;L3;L23	DAPAHISTI	L47;L57;L10;L49;L70;L69;L11
3337	TAYNGYLTSS	L43	DKFTDGVCL	L44;L35;L25	DASGKPVPY	L49;L70;L58;L31;L69;L59;L43
3338	TCASEYTGNY	L14	DLATNNLVV	L2;L3;L11	DEVARDLSL	L25;L29;L41;L37;L36;L40;L23
3339	TCATTRQV	L48	DLDEWSMATYY	L1;L18;L11	DFSSEIIGY	L11;L12;L17;L10;L14;L29;L49

3340	TCATTRQVV	L28	DMFLGTCRR	L17;L19;L21	DFYDFAVSK	L17;L19;L13;L72;L71;L7;L6
3341	TCDWTNAGDY	L1	DMSKFPLKL	L73;L35;L74	DLKPVSEEV	L3;L23;L2;L20;L5;L43;L11
3342	TCFSTASDTY	L14	DMVPHISR	L25;L17;L19	DSAEVAVKM	L19;L20;L11;L53;L54;L29;L70
3343	TCGKQATKY	L14	DPFLGVYYH	L47;L29;L31	DTFCAGSTF	L10;L53;L11;L52;L16;L58;L54
3344	TCTERLKL	L25	DPQTLEIL	L23;L25;L47	EANMDQESF	L49;L43;L54;L31;L10;L52;L32
3345	TDAQTGSSK	L19	DQFKHLIPL	L25;L44;L35	EAVGTNLPL	L67;L61;L20;L32;L60;L74;L31
3346	TDAVRDPQTL	L33	DRAMPNMLR	L19;L17;L30	EEAIRHVRA	L42;L46;L38;L25;L40;L29;L37
3347	TDFATSAC	L33	DRYPANSIVCR	L19;L30;L17	EEAIRHVRAW	L40;L41;L10;L42;L38;L29;L46
3348	TDFSRVSA	L46	DSFKEELDKY	L10;L11;L14	EEIAIILAS	L41;L40;L42;L46;L29;L20;L37
3349	TDFSSEIIGY	L27	DTANPKTPK	L19;L7;L6	EEIAIILASF	L40;L41;L10;L11;L29;L37;L20
3350	TDFVNEFY	L29	DTDFVNEFY	L1;L18;L12	EEVVENPTI	L41;L45;L40;L36;L29;L37;L42
3351	TDFVNEFYAY	L29	DTKFKTEGL	L23;L10;L11	EHYVRITGL	L25;L23;L28;L35;L34;L10;L11
3352	TDGNKIADKY	L14	DTLKNLSDR	L17;L19;L11	EPKLGSLVV	L51;L39;L47;L50;L22;L23;L42
3353	TDLEGNFY	L29	DTVRTNVY	L29;L11;L10	EQWNLVIGF	L27;L26;L34;L11;L10;L30;L24
3354	TDLMAAYV	L33	DTVRTNVYL	L20;L11;L53	EVTPSGTWL	L11;L10;L20;L74;L61;L60;L28
3355	TDLTKPYI	L33	DTYACWHHSI	L10;L25;L20	EYPIIGDEL	L9;L72;L71;L8;L66;L62;L57
3356	TDQSSYIV	L33	DVSSAINR	L19;L17;L21	FACVVADAV	L67;L59;L61;L50;L47;L70;L68
3357	TDYKHWPQIA	L46	DVSSAINRP	L11;L10;L19	FAFACPDGV	L58;L69;L47;L70;L20;L50;L67
3358	TECSNLLLQ	L41	DVTDVTQLYL	L20;L11;L10	FANKHADF	L59;L58;L74;L63;L60;L49;L70
3359	TEDDYQGKPLEF	L41	DVVAIDYKH	L11;L20;L19	FASEAARV	L70;L69;L47;L58;L63;L50;L64
3360	TEERLKLFDRY	L41	DVVAIDYKHY	L10;L11;L14	FAVHFISN	L59;L61;L67;L50;L60;L69;L70
3361	TEEVGHTD	L45	DVVNQNAQAL	L10;L20;L11	FAVHFISNSW	L49;L10;L54;L61;L52;L69;L31
3362	TEEVGHTDLM	L36	DVVQEGVLT	L19;L11;L20	FAWWTAFV	L47;L70;L58;L59;L50;L69;L68
3363	TEEVGHTDLMA	L38	DVVRQCSGV	L11;L10;L20	FAWWTAFVT	L69;L32;L59;L67;L31;L50;L70
3364	TEEVVLKT	L45	DYTEISFML	L9;L8;L66	FFASFYYVW	L9;L8;L10;L12;L69;L54;L49

3365	TEEVVLKTG	L38	EAVEAPLV	L47;L20;L48	FFFLYENAF	L71;L72;L62;L59;L9;L12;L31
3366	TEGLCVDI	L45	EAVKTQFNY	L49;L11;L12	FIDTKRGVY	L1;L18;L58;L14;L63;L12;L68
3367	TEGLCVDIPGI	L41	EAYEQAVAN	L17;L19;L32	FIQQKLAL	L23;L59;L60;L61;L67;L74;L68
3368	TEHSWNAD	L46	ECAQVLSEM	L11;L10;L20	FITESKPSV	L2;L5;L4;L3;L61;L50;L58
3369	TEIYQAGST	L45	ECIKDLLAR	L17;L19;L11	FLARGIVFM	L74;L2;L3;L4;L69;L64;L11
3370	TEKSNIIRG	L45	EDDNLIDSY	L1;L18;L29	FLGRYMSAL	L57;L3;L74;L2;L4;L67;L61
3371	TEKWESGV	L45	EEAALCTF	L29;L41;L33	FLPGVYSV	L5;L57;L2;L3;L64;L4;L62
3372	TELEPPCR	L29	EEAKKVKP	L42;L46;L38	FPQSAPHGV	L50;L47;L32;L51;L39;L2;L22
3373	TEMLAKALR	L40	EEAKKVKPTV	L42;L37;L45	FPQSAPHGVVF	L31;L39;L22;L56;L50;L32;L49
3374	TEMLAKALRKV	L45	EEFEPSTQ	L29;L48;L25	FTIGTVTLK	L7;L19;L6;L17;L13;L58;L11
3375	TENLTKEG	L29	EEFEPSTQYEY	L41;L40;L29	FTTVDNINL	L53;L60;L68;L61;L20;L70;L58
3376	TERSEKSY	L29	EEKFKEGV	L45;L42;L23	FVDDIVKTD	L5;L68;L49;L32;L63;L60;L58
3377	TETDLTKG	L45	EEMLDNRAT	L40;L42;L41	FVDSDVETK	L68;L49;L63;L5;L67;L1;L7
3378	TEVNEFAC	L29	EEQEEDWLD	L42;L40;L38	FVFLVLLPLV	L20;L50;L47;L5;L2;L3;L4
3379	TEVPVAIH	L29	EERLKLFDRY	L29;L40;L41	FYLCFLAF	L72;L71;L9;L59;L66;L8;L62
3380	TEVVGDIILKP	L38	EETFKLSY	L29;L41;L40	GAMDTTSY	L43;L59;L27;L26;L58;L70;L18
3381	TFDSEYCR	L62	EETGLLMPL	L41;L40;L20	GETLGVLV	L45;L48;L37;L36;L38;L46;L33
3382	TFDSEYCRH	L62	EETIYNLL	L29;L25;L45	GETLGVLVP	L46;L38;L42;L37;L45;L36;L41
3383	TFEEAALC	L62	EETIYNLLK	L42;L41;L40	GEVPVSIIN	L36;L37;L46;L38;L29;L45;L41
3384	TFELDERI	L62	EEVGHTDL	L25;L29;L37	GLEAPFLYL	L5;L6;L2;L1;L18;L4;L74
3385	TFFIYNKI	L48	EEVLSEARQH	L41;L40;L29	GLLPPKNSI	L24;L2;L4;L16;L23;L44;L5
3386	TFFIYNKIV	L48	EFLTRNPAW	L9;L71;L8	GSKSPIQY	L55;L70;L43;L26;L13;L58;L27
3387	TFFIYNKIVD	L65	EHVNNSYEC	L35;L34;L28	GSLPINVIV	L73;L24;L69;L52;L20;L70;L2
3388	TFFKLVNK	L17	EIDFLELAM	L68;L1;L67	GVDIAANTV	L68;L63;L5;L28;L18;L24;L45
3389	TFFPDLNGD	L8	EIDPKLDNYY	L1;L11;L18	GVKDCVVL	L23;L39;L67;L26;L44;L56;L13

3390	TFHLDGEV	L62	EILDITPCSF	L10;L11; L16	GYQPYRVVVL	L72;L71;L65;L66;L9;L8;L44
3391	TFHLDGEVITF	L8	EIPRRNVATL	L10;L57; L11	HEHEIAWYT	L29;L37;L38;L45;L41;L40;L36
3392	TFKVSIWNLDY	L12	EIVGGQIVT	L20;L10; L19	HHWLLLTI	L48;L34;L35;L47;L25;L28;L24
3393	TFLKKDAPYI	L8	EIVKFISTC	L10;L11; L19	HPTQAPTHL	L56;L32;L22;L49;L39;L31;L50
3394	TFNGECPNFV	L62	EKTHVQLSL	L44;L35; L20	HSYGADLKSF	L10;L53;L52;L43;L26;L58;L54
3395	TFNGECPNFVF	L8	ELAMDEFIER	L19;L17; L21	HTTDPSFLGR	L19;L17;L21;L15;L7;L11;L6
3396	TFNVPMEK	L62	ELEGIQYGR	L17;L19; L21	HVGEIPVAYR	L19;L21;L17;L15;L11;L20;L6
3397	TFSSTFNVP	L8	ELPTGVHAG	L11;L57; L10	IAIAMACL	L61;L60;L59;L74;L70;L67;L47
3398	TFTYASALW	L9	ELSPVALR	L19;L17; L21	IAIVMVTI	L47;L48;L70;L59;L68;L61;L69
3399	TFVTHSKGLYR	L17	ELVIGAVILR	L19;L17; L21	IAKKPTETI	L43;L70;L49;L47;L53;L52;L58
3400	TGDFVKATC	L68	ELYSPIFL	L74;L23; L20	IATVREVL	L59;L61;L60;L67;L68;L70;L23
3401	TGDLQPLEQ	L68	ELYSPIFLIV	L20;L11; L24	IAWNSNNL	L47;L68;L60;L61;L63;L70;L74
3402	TGDSCNNY	L1	ENPDILRV	L48;L11; L20	IEVNSFSGY	L29;L41;L40;L46;L26;L27;L45
3403	TGDSCNNYM	L63	EPEEHVQIH	L49;L32; L31	IEYPIIGDEL	L36;L67;L37;L29;L45;L41;L40
3404	TGKIADYNY	L14	EPEEHVQIHTI	L49;L39; L32	IFLEGETL	L72;L71;L8;L9;L62;L67;L25
3405	TGLLMPLKA	L50	EPEYFNSV	L50;L23; L47	IIIGGAKL	L60;L74;L61;L63;L58;L67;L59
3406	TGLYPTLNI	L8	EQPYVFIKR	L19;L17; L15	IINLIIKNL	L60;L4;L39;L64;L73;L58;L5
3407	TGNTLQCI	L48	EQYVFCTV	L48;L24; L25	IPTNFTISV	L50;L51;L47;L39;L22;L32;L56
3408	TGNYQCGHY	L14	ERDISTEI	L35;L25; L34	IPVAYRKVL	L39;L32;L22;L56;L31;L47;L25
3409	TGQAITVTP	L38	ERLKLFDRY	L30;L14; L12	ISDYDYYRY	L1;L18;L54;L14;L53;L52;L49
3410	TGRLQSLQTY	L26	ERYKLEGYAF	L30;L35; L34	ITLATCELY	L18;L12;L52;L1;L54;L14;L16
3411	TGYRVTKN	L48	ESGLKTILR	L17;L19; L21	ITREVGFVV	L13;L20;L53;L70;L73;L58;L39
3412	THDVSSAINR	L34	ESLVPGFNEK	L19;L17; L7	IVDTVSALV	L5;L63;L62;L68;L18;L1;L20
3413	THDVSSAINRP	L34	ESNKKFLPF	L10;L11; L73	KAGGTTEML	L74;L67;L54;L58;L70;L65;L63
3414	THGLNLEEA	L28	ESVQTFFKL	L20;L10; L11	KCSAYTVEL	L44;L56;L73;L65;L66;L16;L39

3415	THSDKFTDG	L35	ETAQNSVRV	L20;L11;L10	KEGSSVEL	L37;L33;L36;L45;L65;L56;L44
3416	THWFVTQRN	L34	ETAQNSVRVL	L10;L20;L11	KEIKESVQT	L38;L37;L36;L46;L42;L45;L44
3417	THWFVTQRNF	L34	ETFKLSYGI	L20;L10;L11	KESPFELED	L65;L38;L42;L45;L46;L36;L37
3418	TIAEILLIIM	L20	ETGTLIVNS	L17;L20;L19	KFLTENLLLY	L12;L14;L8;L18;L13;L6;L52
3419	TIAKNTVKSV	L3	ETIYNLLKD	L11;L20;L10	KKNNLPFKL	L44;L66;L73;L16;L64;L27;L4
3420	TIANYAKPF	L43	ETKAIVSTIQR	L17;L19;L21	KLFAAETL	L55;L16;L54;L44;L24;L23;L4
3421	TIATYCTGSI	L10	ETKCTLKSF	L10;L11;L52	KLFDRYFKYW	L16;L6;L52;L3;L13;L21;L10
3422	TIAYIICISTK	L19	ETKFLTENL	L20;L11;L10	KLMGHFAWW	L16;L54;L6;L21;L10;L3;L14
3423	TIDGSSGVVN	L68	ETLKATEETF	L53;L52;L10	KNTCDGTTF	L53;L54;L55;L9;L26;L27;L8
3424	TIEYPIIGDEL	L67	ETLPTEVL	L25;L23;L20	KPREQIDGY	L14;L26;L49;L27;L31;L18;L16
3425	TIGPDMFL	L74	ETSNSFDVL	L20;L10;L67	KRGDKSVYY	L65;L66;L30;L64;L14;L12;L18
3426	TIKKPNELSR	L17	EVAKNLNES	L20;L10;L11	KSREETGLL	L55;L53;L13;L73;L14;L54;L52
3427	TIKVFTTVD	L43	EVAKNLNESL	L20;L10;L11	KTFPPTEPK	L13;L6;L7;L16;L21;L54;L52
3428	TILGSALL	L74	EVARDLSLQ	L20;L11;L10	KTSVDCTMY	L18;L53;L54;L14;L16;L52;L1
3429	TILRKGGRTI	L10	EVARDLSLQF	L11;L10;L20	KVQIGEYTF	L16;L53;L54;L26;L55;L52;L14
3430	TILTSLLV	L48	EVFAQVKQIY	L11;L10;L12	KVYYGNAL	L67;L59;L55;L60;L56;L61;L71
3431	TILTSLLVLV	L4	EVGPEHSL	L20;L67;L23	KYDFTEERL	L62;L63;L9;L8;L68;L34;L36
3432	TIQRKYKGI	L10	EVGPEHSLAEY	L11;L14;L10	LADKFPVLH	L63;L74;L68;L49;L32;L62;L1
3433	TISVTTEI	L48	EVLSEARQH	L11;L17;L10	LAHIQWMVM	L70;L61;L59;L32;L47;L69;L31
3434	TITVEELKK	L7	EVNSFSGYL	L11;L20;L10	LASHMYCSF	L43;L49;L32;L59;L58;L31;L70
3435	TIYNLLKD	L48	EVNSFSGYLK	L19;L17;L7	LAVFDKNLY	L31;L49;L12;L52;L1;L18;L58
3436	TIYSLLLC	L48	EVQELYSPI	L10;L20;L11	LAWLYAAVI	L47;L68;L67;L31;L50;L70;L59
3437	TKAIVSTI	L48	EVTGDSCNNY	L11;L10;L14	LCLTPVYSF	L8;L9;L52;L12;L31;L16;L65
3438	TKAIVSTIQR	L19	EVVENPTIQKD	L11;L19;L10	LEILQKEKV	L45;L38;L37;L46;L29;L36;L42
3439	TKFKTEGL	L27	EVVGDIIL	L74;L20;L67	LEIPRRNV	L45;L48;L38;L37;L29;L46;L25

3440	TKFLTENLLL	L44	EVVLKKLKK	L19;L11;L7	LESELVIGA	L42;L46;L38;L37;L29;L41;L50
3441	TKFLTENLLLY	L27	EVVLKTGDL	L11;L10;L20	LFLAFVVF	L72;L9;L71;L62;L8;L59;L47
3442	TKGGRFVL	L66	EWFLAYIL	L25;L23;L35	LHKPIVWHV	L3;L28;L64;L69;L70;L58;L4
3443	TKGSLPINV	L64	EWSMATYYL	L20;L34;L9	LHPDSATL	L57;L28;L35;L66;L71;L72;L62
3444	TKGTLEPEY	L66	EYADVFHLYL	L8;L9;L20	LLDDFVEI	L5;L68;L62;L63;L2;L1;L67
3445	TKHFYWFFSNY	L27	EYCPIFFIT	L8;L9;L17	LLDKRTTCF	L63;L62;L1;L5;L74;L68;L49
3446	TKIKPHNSH	L27	EYKGPITDVF	L9;L8;L10	LLNKHIDAY	L26;L43;L18;L14;L12;L1;L16
3447	TKMSECVL	L44	FACPDGVKHVY	L31;L52;L49	LLTPLGIDL	L74;L56;L5;L61;L2;L4;L64
3448	TKNSKVQIGEY	L14	FADDLNQLTGY	L1;L18;L31	LLYDANYFL	L2;L4;L5;L61;L3;L74;L68
3449	TKRFDNPVL	L44	FAFPFTIYSLLL	L61;L31;L74	LPFAMGIIA	L50;L51;L31;L47;L56;L32;L22
3450	TKTSVDCTM	L32	FAMGIIAMS	L58;L69;L70	LPFGWLIVG	L50;L31;L47;L51;L32;L56;L39
3451	TKTSVDCTMY	L27	FAMGIIAMSAF	L31;L58;L61	LPFGWLIVGV	L50;L51;L47;L56;L31;L3;L20
3452	TKYTMADLVY	L27	FAMMFVKHK	L69;L70;L59	LPIGINITRF	L31;L49;L32;L11;L50;L56;L39
3453	TLACFVLAAVY	L14	FAQDGNAA	L50;L59;L61	LPTGTLLVD	L49;L51;L32;L50;L31;L65;L56
3454	TLADAGFIKQ	L2	FAQVKQIY	L59;L70;L31	LRANSAVKL	L64;L35;L66;L30;L34;L28;L25
3455	TLAILTALRL	L4	FARTRSMWSF	L58;L43;L59	LRPDTRYVL	L66;L65;L64;L35;L57;L5;L25
3456	TLDNQDLN	L1	FASVYAWNR	L17;L19;L15	LSDRELHL	L63;L1;L68;L74;L60;L62;L67
3457	TLEETKFLT	L1	FAVHFISNSWL	L67;L61;L60	LSLPVLQVR	L15;L52;L17;L55;L21;L53;L7
3458	TLETAQNSV	L2	FCALILAY	L59;L1;L31	LVIGAVILR	L19;L21;L7;L17;L15;L6;L20
3459	TLKEILVTYN	L3	FCDLKGKYV	L62;L63;L68	LVSDIDITFL	L20;L5;L4;L60;L31;L74;L3
3460	TLKGVEAVM	L14	FCGVDAVNL	L74;L62;L34	LYYPSARI	L47;L9;L62;L48;L8;L71;L72
3461	TLKQGEIKDA	L3	FCLEASFNYL	L60;L61;L67	LYYPSARIVY	L71;L72;L12;L27;L66;L14;L31
3462	TLKSFTVE	L23	FCNDPFLGVY	L14;L31;L59	MAAYVDNSSL	L61;L32;L67;L31;L70;L20;L60
3463	TLLALHRSYL	L4	FCSQHTMLV	L64;L73;L58	MADSNGTITV	L63;L32;L68;L49;L70;L50;L18
3464	TLLFLMSF	L23	FDNLKTLL	L33;L23;L62	MEVTPSGTW	L40;L41;L46;L29;L36;L49;L45

3465	TLLLQLCTFTR	L21	FEHIVYGDF	L29;L41; L40	MFVKHKHAF	L71;L8;L72;L49; L9;L33;L29
3466	TLLTKGTL	L23	FEYYHTTDP	L46;L38; L42	MHANYIFWR	L19;L17;L21;L3 4;L15;L7;L35
3467	TLNDFNLVAMK	L6	FFAQDGNAA	L72;L71; L50	MLDMYSVML	L5;L62;L68;L63; L74;L2;L1
3468	TLPKGFYAE	L57	FFFAQDGNAA	L71;L72; L50	MLVYCFLGY	L12;L6;L26;L10; L11;L1;L18
3469	TLPKGIMM	L57	FFFLYENAFL	L72;L62; L71	MSNLGMPSY	L59;L43;L1;L18; L14;L52;L70
3470	TLPKGIMMN	L57	FFKLVNKF	L62;L72; L71	MVMCGGSLY	L11;L14;L26;L1 8;L10;L1;L12
3471	TLPTEVLTEEV	L5	FFKLVNKFL	L62;L72; L71	MVTNNTFTL	L20;L60;L16;L3 2;L61;L56;L10
3472	TLVKQLSSN	L10	FFLYENAF	L71;L72; L62	NAGIVGVLTL	L67;L31;L32;L4 9;L69;L61;L68
3473	TLVPQEHY	L26	FFPDLNGD	L71;L62; L72	NAQALNTL	L70;L59;L25;L6 7;L47;L60;L23
3474	TLVTMPLGYV	L3	FFPDLNGDVV	L72;L71; L62	NATRFASVY	L70;L31;L69;L5 8;L59;L14;L49
3475	TLYCIDGALL	L2	FFSNVTWFH	L72;L12; L71	NCYLATAL	L25;L23;L71;L7 2;L28;L67;L35
3476	TMADLVYA	L3	FFTYICGF	L62;L72; L71	NFGAISSVL	L72;L71;L8;L9;L 28;L35;L62
3477	TMLFTMLR	L17	FFYVLGLAAI	L71;L72; L62	NFNQHEVLL	L62;L8;L71;L9;L 34;L64;L72
3478	TMLVKQGDDY	L14	FGDDTVIE	L62;L63; L68	NLLLLFVTV	L2;L4;L5;L24;L5 0;L23;L3
3479	TMPLGYVTH	L57	FGPLVRKI	L47;L48; L64	NLVAVPTGY	L12;L26;L6;L14; L10;L27;L11
3480	TNDNTSRYW	L49	FGWLIVGV	L47;L48; L50	NPAWRKAVF	L39;L49;L23;L2 2;L31;L32;L56
3481	TNDVSFLAH	L68	FHLDGEVI	L35;L34; L28	NTCDGTTFTY	L11;L18;L10;L1; L16;L14;L12
3482	TNGDFLHF	L65	FIAGLIAIVM	L69;L58; L67	NTVKSVGKF	L11;L10;L53;L5 4;L58;L49;L52
3483	TNGTKRFD	L65	FIASFRLFAR	L17;L19; L21	NVVIKVCEF	L10;L11;L23;L4 9;L26;L58;L29
3484	TNGVGYQPY	L43	FIEDLLFNK	L7;L19;L 6	NVVTTKIAL	L23;L32;L20;L6 7;L56;L60;L74
3485	TNIFGTVY	L26	FIKQYGDCL	L58;L67; L60	NYAKPFLNK	L13;L17;L7;L8;L 9;L6;L19
3486	TNIFGTVYEK	L19	FIRQEEVQEL	L3;L58;L 10	PSKPSKRSF	L43;L55;L52;L6 5;L26;L53;L58
3487	TNMFTPLI	L48	FKEGVEFL	L62;L63; L68	PYRVVVLSF	L9;L72;L66;L8;L 65;L71;L43
3488	TNNVAFQTV	L73	FKLNIKLL	L66;L64; L44	QAVGACVL	L67;L70;L61;L6 9;L74;L60;L55
3489	TNSFTRGVY	L14	FKVSIWNL	L66;L74; L44	QEFKPRSQM	L29;L36;L45;L4 6;L37;L33;L41

3490	TNSPRRAR	L17	FLELAMDEF	L62;L1;L68	QEYADVFHL	L36;L37;L41;L40;L29;L33;L45
3491	TNSSPDDQI	L34	FLFVAAIF	L59;L62;L74	QFAPSASAF	L72;L71;L9;L28;L62;L12;L8
3492	TNVLEGSVA	L46	FLHFLPRV	L2;L4;L3	QLSLPVLQV	L4;L3;L24;L2;L5;L28;L73
3493	TPAFDKSA	L51	FLHVTYVPA	L43;L2;L50	QSADAQSF	L55;L54;L43;L53;L70;L52;L59
3494	TPEANMDQES	L32	FLKRGDKSVY	L43;L26;L14	QSRNLQEF	L59;L43;L55;L53;L26;L58;L52
3495	TPGDSSSGW	L49	FLLFLVLIML	L2;L4;L74	QTFFKLVNK	L7;L13;L6;L19;L15;L21;L17
3496	TPGSSRGTSP	L51	FLLLSVCL	L74;L23;L62	QWSLFFFLY	L12;L40;L41;L1;L18;L29;L14
3497	TPKDHIGT	L51	FLQSINFV	L2;L4;L3	RAKVGILCI	L24;L70;L69;L53;L55;L52;L49
3498	TPKDHIGTRNPA	L51	FLQSINFVRI	L5;L2;L4	RELGVVHNQ	L33;L36;L37;L41;L40;L38;L42
3499	TPKYKFVR	L23	FLRDGWEI	L43;L59;L2	REVGFVVP	L38;L46;L37;L42;L45;L29;L65
3500	TPKYKFVRIQ	L39	FLTWICLL	L74;L64;L23	RFDNPVLPF	L62;L8;L9;L72;L71;L12;L68

Table 1B. Peptides and Alleles

	Set 1	**Set 1**	**Set 2**	**Set 2**
	Peptide	**Allele**	**Peptide**	**Allele**
1	RFLYIIKLI	L8;L24;L48;L9;L55;L13;L40	NLSDRVVFV	L2;L3;L4;L64;L5;L20;L23;L69;L24;L73
2	RLQSLQTY	L26;L14;L18;L16;L27;L55;L24	NLYDKLVSSF	L10;L11;L16;L26;L43;L71;L3;L72;L12;L27
3	RLRAKHYVY	L26;L18;L16;L14;L27;L13;L12	NNAAIVLQL	L20;L35;L73;L64;L28;L69;L3;L34;L31;L41
4	RLYECLYRN	L24;L4;L16;L6;L2;L3;L21	NRFLYIIKL	L35;L64;L66;L25;L30;L65;L34;L29;L69;L28
5	RNIKPVPEV	L73;L24;L13;L4;L3;L51;L48	NRFNVAITR	L19;L30;L66;L35;L17;L25;L34;L21;L15;L64
6	RTILGSAL	L60;L55;L61;L59;L71;L72;L54	NYNYLYRLF	L8;L9;L66;L62;L64;L71;L12;L72;L40;L41
7	RVFSAVGNICY	L16;L14;L6;L18;L52;L54;L7	PTDNYITTY	L18;L1;L10;L11;L16;L53;L54;L14;L58;L12
8	RVVRSIFSR	L15;L21;L7;L19;L17;L6;L16	QAWQPGVAM	L61;L31;L67;L32;L68;L43;L59;L22;L70;L63
9	RVYANLGER	L21;L15;L6;L7;L17;L19;L14	QEILGTVSW	L40;L41;L29;L42;L38;L45;L46;L36;L37;L52
10	RYWEPEFY	L72;L71;L65;L14;L62;L66;L12	QLIKVTLVF	L26;L9;L27;L16;L8;L11;L12;L10;L43;L74
11	SAFFGMSRI	L47;L70;L69;L49;L24;L20;L10	QLYLGGMSY	L43;L26;L27;L6;L14;L1;L16;L18;L12;L11
12	SASKIITLK	L19;L7;L6;L17;L58;L49;L13	QPYRVVVL	L56;L47;L39;L22;L23;L32;L25;L48;L65;L31

13	SEARQHLKD	L42;L41;L46;L45;L37;L38;L29	QSADAQSFL	L73;L70;L20;L58;L61;L60;L53;L69;L74;L55
14	SEDKRAKV	L45;L37;L33;L38;L63;L42;L29	QTIEVNSF	L54;L55;L11;L53;L10;L52;L29;L26;L70;L72
15	SEFRVYSSA	L46;L42;L38;L37;L29;L41;L45	RIIPARARV	L73;L24;L3;L5;L4;L13;L20;L14;L16;L58
16	SEKQVEQKI	L45;L37;L24;L36;L41;L40;L42	RLFARTRSM	L16;L33;L27;L21;L3;L6;L24;L13;L14;L26
17	SELVIGAV	L33;L29;L48;L37;L45;L25;L46	RLITGRLQSL	L3;L4;L16;L24;L44;L2;L10;L56;L26;L53
18	SELVIGAVIL	L36;L37;L40;L41;L29;L44;L45	RQEEVQELY	L27;L18;L26;L14;L1;L54;L16;L24;L12;L44
19	SEYKGPITD	L37;L45;L46;L29;L36;L42;L38	RQWLPTGTL	L44;L27;L26;L24;L16;L68;L33;L56;L22;L48
20	SFKKGAKLL	L8;L13;L39;L72;L71;L9;L62	RTTNGDFLHF	L16;L52;L53;L54;L18;L10;L8;L12;L73;L9
21	SHVVAFNTL	L34;L28;L35;L60;L44;L61;L8	RVVVLSFEL	L53;L56;L44;L16;L54;L60;L73;L55;L20;L65
22	SLLSKGRLI	L4;L24;L55;L2;L8;L23;L16	RVYSTGSNVF	L16;L54;L26;L27;L53;L65;L52;L11;L8;L14
23	SLRPDTRYV	L3;L13;L2;L4;L43;L64;L5	RYLALYNKY	L14;L12;L8;L13;L71;L72;L16;L9;L30;L27
24	SPDDQIGYY	L49;L31;L1;L18;L14;L12;L11	SAGFSLWVY	L58;L59;L69;L31;L14;L70;L43;L12;L18;L52
25	SPSGVYQCA	L51;L49;L39;L56;L50;L22;L32	SASVYYSQL	L70;L60;L61;L58;L74;L67;L57;L69;L59;L43
26	SQSIIAYTM	L24;L28;L35;L26;L34;L44;L29	SEYDYVIFT	L42;L46;L45;L37;L41;L38;L36;L29;L40;L69
27	SRLSFKELL	L30;L34;L35;L65;L25;L64;L66	SIKNFKSVL	L23;L58;L43;L39;L26;L56;L69;L3;L13;L10
28	SRVLGLKTL	L25;L64;L30;L35;L66;L34;L28	SLINTLNDL	L4;L3;L2;L74;L5;L24;L8;L57;L26;L11
29	STTTNIVTR	L19;L21;L7;L17;L15;L11;L52	SLYVNKHAF	L43;L26;L16;L23;L12;L49;L27;L59;L72;L11
30	SVIYLYLTFY	L12;L11;L14;L6;L7;L10;L58	SNFGAISSV	L3;L28;L69;L20;L51;L4;L70;L64;L58;L73
31	SVKGLQPSV	L13;L51;L58;L20;L39;L3;L5	SSFKWDLTAF	L53;L16;L10;L43;L26;L27;L58;L59;L52;L54
32	SVRVVTTF	L26;L43;L58;L29;L23;L52;L59	SSRLSFKEL	L59;L60;L13;L73;L39;L57;L58;L27;L61;L68
33	SVTTEILPV	L20;L24;L13;L3;L7;L4;L11	STAALGVLM	L58;L20;L19;L7;L53;L21;L12;L52;L11;L70
34	SVYAWNRKR	L7;L21;L15;L17;L19;L6;L11	STFEEAALC	L7;L19;L14;L20;L13;L53;L11;L12;L21;L52
35	SWMESEFRVY	L27;L14;L10;L26;L40;L41;L29	STKHFYWFF	L58;L43;L53;L13;L10;L11;L52;L12;L70;L69
36	SWVMRIMTW	L49;L10;L69;L8;L54;L9;L25	SVFNICQAV	L24;L20;L13;L3;L64;L58;L4;L69;L5;L28
37	SYFAVHFI	L48;L71;L72;L64;L9;L47;L62	SYIVDSVTV	L72;L71;L28;L13;L9;L8;L38;L62;L35;L45

38	SYFVVKRHTF	L8;L71;L72;L9;L16;L12;L52	TASWFTAL	L67;L59;L61;L60;L57;L74;L68;L23;L70;L32
39	TEIDPKLDN	L46;L41;L36;L45;L38;L37;L40	TEVVGDIIL	L36;L37;L29;L41;L38;L40;L45;L32;L25;L34
40	TEMLAKAL	L33;L29;L25;L37;L45;L23;L40	TFFKLVNKF	L8;L9;L29;L72;L12;L62;L49;L71;L16;L34
41	TETDLTKGP	L46;L38;L42;L41;L40;L45;L37	TGYHFREL	L23;L59;L65;L25;L48;L61;L55;L47;L64;L66
42	TEVLTEEVV	L45;L36;L37;L38;L29;L46;L42	TPFEIKLAK	L31;L50;L49;L19;L7;L6;L32;L51;L56;L13
43	TGVEHVTFF	L69;L8;L65;L33;L9;L29;L49	TPKGPKVKY	L31;L49;L39;L26;L51;L65;L14;L56;L13;L12
44	THLSVDTKF	L34;L8;L35;L28;L27;L9;L12	TRFQTLLAL	L35;L25;L65;L64;L30;L34;L66;L28;L4;L3
45	TIKGTHHWL	L23;L39;L58;L67;L60;L10;L74	TSVVLLSVL	L69;L73;L70;L53;L60;L61;L67;L59;L55;L64
46	TIQITISSF	L26;L10;L28;L43;L16;L72;L39	TTIKPVTY	L54;L55;L58;L26;L70;L52;L29;L69;L53;L43
47	TLLALHRSY	L12;L14;L16;L27;L26;L10;L55	TTKGGRFVL	L70;L65;L16;L53;L39;L55;L69;L10;L20;L58
48	TLPVNVAF	L57;L62;L26;L71;L72;L43;L23	TVEEAKTVL	L63;L68;L32;L39;L23;L31;L62;L56;L67;L34
49	TNGDFLHFL	L65;L73;L4;L64;L20;L34;L69	TVNVLAWLY	L12;L14;L18;L1;L31;L26;L52;L55;L6;L16
50	TNLPLQLGF	L12;L8;L52;L41;L9;L40;L16	TVYDDGARR	L19;L17;L15;L21;L11;L6;L7;L20;L14;L10
51	TPAFDKSAF	L31;L49;L22;L32;L39;L56;L23	TVYDPLQPEL	L67;L20;L60;L28;L61;L5;L2;L4;L6;L13
52	TPGSGVPVV	L47;L51;L39;L32;L50;L22;L56	VAAGLEAPF	L58;L31;L74;L70;L43;L49;L12;L59;L52;L53
53	TQLGIEFLKR	L15;L7;L17;L21;L30;L19;L6	VAKNLNESL	L43;L67;L70;L58;L69;L53;L68;L60;L61;L56
54	TQSRNLQEF	L26;L34;L58;L24;L27;L8;L35	VCINGLMLL	L8;L34;L9;L74;L61;L69;L73;L60;L4;L59
55	TRFASVYAW	L35;L25;L65;L30;L34;L66;L16	VGYLQPRTF	L55;L27;L47;L26;L52;L69;L9;L48;L59;L65
56	TRFFYVLGL	L65;L35;L30;L25;L64;L66;L34	VLDWLEEKF	L5;L62;L63;L68;L1;L9;L12;L49;L74;L18
57	TSFGPLVRK	L7;L6;L19;L13;L20;L17;L15	VLLPLTQY	L26;L59;L27;L43;L6;L14;L12;L1;L4;L18
58	TSKTTVASL	L65;L70;L23;L57;L10;L58;L39	VLYENQKLI	L48;L3;L2;L24;L5;L16;L55;L64;L4;L9
59	TSLSGFKLK	L7;L13;L19;L17;L6;L15;L55	VPWDTIANY	L49;L31;L43;L14;L12;L65;L51;L47;L18;L27
60	TTAAKLMVV	L20;L73;L70;L69;L3;L10;L58	VSDADSTL	L63;L68;L62;L60;L1;L67;L74;L55;L61;L54
61	TTADIVVFD	L20;L19;L64;L69;L7;L17;L65	VSDIDYVPL	L68;L63;L67;L1;L60;L74;L62;L53;L43;L61
62	TTIKPVTYK	L13;L7;L19;L6;L17;L20;L15	VTANVNALL	L20;L53;L70;L73;L54;L58;L60;L1;L52;L61

63	TTYPGQGLNGY	L11;L14;L1;L18;L6;L16;L10	VTVYSHLLL	L73;L60;L61;L67;L70;L53;L1;L8;L20;L69
64	TVATSRTLSY	L10;L18;L11;L12;L6;L14;L26	VVAIDYKHY	L26;L14;L11;L10;L18;L52;L43;L12;L1;L58
65	TVIEVQGYK	L7;L13;L6;L19;L20;L14;L11	VVDSYYSLL	L63;L68;L5;L74;L1;L62;L67;L18;L60;L58
66	TVKPGNFNK	L7;L13;L19;L17;L15;L6;L21	VVFLHVTY	L26;L29;L59;L27;L12;L52;L18;L54;L31;L58
67	TYTGAIKL	L62;L72;L66;L71;L8;L64;L9	WLIVGVALL	L74;L3;L2;L4;L5;L20;L16;L34;L62;L28
68	VAIDYKHY	L43;L58;L70;L59;L69;L14;L26	WLMWLIINL	L4;L2;L5;L74;L3;L64;L13;L65;L20;L69
69	VANGDSEVV	L58;L70;L49;L32;L68;L43;L67	WTAGAAAYY	L14;L11;L58;L1;L18;L12;L10;L54;L70;L52
70	VAVPTGYVD	L49;L61;L67;L32;L60;L70;L54	YANRNRFL	L60;L61;L70;L58;L74;L59;L64;L63;L68;L55
71	VELGTEVNEF	L41;L40;L8;L36;L9;L29;L37	YANRNRFLY	L58;L12;L1;L59;L70;L49;L69;L31;L18;L14
72	VENPDILRVY	L40;L41;L29;L14;L26;L52;L27	YCNKTVGEL	L65;L32;L58;L74;L57;L66;L62;L61;L71;L72
73	VEVQPQLEM	L36;L29;L45;L37;L46;L38;L41	YENFNQHEV	L45;L37;L38;L42;L46;L29;L48;L33;L36;L73
74	VFLFVAAIF	L72;L62;L9;L12;L8;L71;L31	YGDFSHSQL	L68;L63;L62;L28;L60;L67;L61;L34;L57;L1
75	VFNGVSFSTF	L8;L9;L62;L72;L71;L26;L12	YLNSTNVTI	L2;L4;L24;L5;L3;L34;L49;L16;L44;L8
76	VINGDRWFL	L58;L60;L16;L73;L74;L4;L63	YLTNDVSFL	L74;L4;L2;L3;L5;L64;L57;L61;L62;L44
77	VIPDYNTY	L43;L66;L26;L57;L59;L72;L71	YMPYFFTLL	L57;L5;L64;L67;L62;L9;L66;L8;L59;L74
78	VKNGSIHLY	L14;L27;L66;L18;L12;L26;L58	YPLECIKDL	L32;L39;L47;L31;L56;L23;L22;L25;L50;L49
79	VLSEARQHL	L4;L2;L5;L57;L16;L3;L9	YSDVENPHL	L68;L63;L60;L1;L74;L61;L62;L34;L5;L54
80	VLTEEVVLK	L7;L6;L13;L2;L19;L4;L21	YSKHTPINL	L74;L58;L70;L60;L69;L43;L61;L67;L73;L64
81	VLVPHVGEI	L3;L5;L4;L2;L74;L49;L69	YTNDKACPL	L61;L73;L60;L70;L43;L58;L59;L72;L57;L71
82	VLYNSASF	L43;L26;L27;L72;L59;L71;L62	YVRNLQHRL	L58;L20;L4;L10;L67;L11;L60;L5;L44;L39
83	VPANSTVL	L22;L56;L39;L47;L25;L51;L31	AASGNLLL	L74;L70;L67;L61;L73;L69;L60;L68;L58;L64;L63
84	VPHISRQRL	L56;L39;L22;L32;L49;L31;L25	AEAELAKNV	L45;L46;L42;L38;L37;L40;L41;L36;L33;L29;L24
85	VSLDNVLSTF	L53;L52;L54;L8;L16;L9;L59	AIMQLFFSY	L12;L26;L7;L6;L14;L16;L18;L10;L40;L27;L1
86	VTDVTQLY	L18;L1;L54;L62;L63;L52;L68	ALYNKYKYF	L43;L10;L16;L26;L69;L27;L12;L11;L9;L3;L6
87	VTFQSAVKR	L19;L7;L15;L21;L17;L6;L52	ANGDSEVVL	L44;L67;L65;L35;L73;L66;L34;L28;L36;L69;L56

88	VTIAEILL	L74;L73;L70;L60;L53;L67;L55	AQNSVRVL	L65;L44;L48;L27;L64;L35;L55;L26;L73;L24;L69
89	VVDDPCPIHFY	L18;L14;L1;L12;L11;L5;L6	ASFDNFKFV	L73;L70;L69;L13;L45;L58;L48;L64;L20;L3;L24
90	VVFVLWAHGF	L16;L12;L26;L52;L53;L11;L31	ASLPFGWLI	L55;L53;L52;L73;L48;L54;L24;L7;L8;L16;L69
91	VVIGTSKF	L58;L26;L74;L11;L54;L63;L60	ATLPKGIMM	L73;L7;L13;L6;L53;L70;L52;L61;L60;L58;L69
92	VVRIKIVQM	L13;L26;L11;L58;L43;L39;L23	AVINGDRWF	L10;L11;L26;L52;L55;L16;L58;L27;L14;L43;L53
93	VYEKLKPVL	L9;L8;L66;L62;L72;L71;L63	DLNETLVTM	L11;L4;L23;L2;L5;L49;L3;L10;L62;L32;L26
94	VYYTSNPTTF	L8;L9;L71;L72;L62;L12;L66	EPVLKGVKL	L23;L56;L39;L32;L22;L49;L31;L50;L25;L20;L11
95	WADNNCYL	L68;L63;L74;L67;L62;L60;L70	ETTADIVVF	L11;L10;L53;L20;L52;L54;L31;L49;L9;L19;L70
96	WKYPQVNGL	L27;L44;L64;L25;L28;L66;L3	FACPDGVKH	L59;L43;L58;L49;L31;L67;L32;L69;L70;L61;L68
97	WLDDVVYC	L62;L5;L63;L68;L74;L1;L2	FAIGLALY	L59;L58;L69;L70;L12;L31;L14;L74;L43;L49;L1
98	WLIVGVAL	L23;L61;L59;L71;L43;L72;L74	FAYTKRNVI	L70;L69;L47;L59;L61;L67;L58;L64;L32;L49;L68
99	WLPTGTLLV	L5;L24;L2;L57;L64;L3;L4	FFSYFAVHF	L62;L72;L71;L12;L9;L59;L58;L66;L69;L8;L31
100	YEKLKPVL	L23;L37;L29;L33;L45;L36;L25	FLAFVVFL	L74;L2;L62;L64;L3;L4;L68;L23;L69;L61;L20
101	YENQKLIAN	L46;L29;L37;L45;L38;L42;L33	FLWLLWPVTL	L2;L5;L62;L3;L67;L68;L4;L74;L44;L57;L69
102	YFLQSINF	L71;L72;L9;L8;L62;L12;L33	FLYENAFL	L74;L2;L62;L61;L68;L59;L5;L3;L4;L57;L63
103	YFMRFRRAF	L71;L72;L59;L9;L12;L8;L62	FNPETNILL	L64;L57;L5;L62;L66;L67;L74;L68;L63;L71;L61
104	YFRLTLGVY	L72;L27;L14;L71;L12;L26;L59	FSLWVYKQF	L60;L59;L53;L52;L55;L58;L43;L61;L70;L69;L10
105	YFYTSKTTV	L71;L72;L45;L62;L48;L46;L47	FSYFAVHFI	L70;L69;L73;L47;L64;L55;L61;L68;L74;L67;L20
106	YGADLKSF	L59;L43;L23;L27;L26;L69;L66	FVFKNIDGY	L58;L26;L11;L10;L12;L16;L14;L49;L31;L1;L18
107	YHTTDPSFL	L28;L34;L74;L35;L44;L60;L61	GGAPTKVTF	L27;L26;L44;L65;L54;L49;L52;L34;L53;L9;L8
108	YIKWPWYIWL	L43;L60;L13;L58;L39;L67;L68	GLFCLLNRY	L12;L26;L6;L14;L27;L18;L16;L4;L10;L11;L3
109	YLDAYNMMI	L5;L68;L1;L2;L34;L24;L63	GVVFLHVTY	L26;L12;L27;L7;L52;L14;L49;L13;L31;L18;L10
110	YLEGSVRVV	L3;L2;L64;L24;L5;L63;L4	GYKSVNITF	L8;L9;L66;L13;L26;L27;L12;L72;L53;L71;L52
111	YMPYFFTL	L57;L66;L5;L59;L67;L47;L71	HLKDGTCGL	L43;L3;L11;L10;L2;L26;L13;L23;L4;L44;L16
112	YPVASPNEC	L49;L32;L31;L50;L51;L47;L22	IAIVMVTIM	L70;L69;L61;L59;L32;L67;L74;L31;L60;L58;L47

113	YTNSFTRGV	L73;L58;L64;L70;L11;L48;L3	IANYAKPFL	L61;L60;L58;L63;L59;L74;L68;L70;L73;L31;L47
114	YWFFSNYL	L62;L71;L72;L60;L61;L74;L59	IFFITGNTL	L72;L71;L8;L9;L62;L28;L48;L34;L25;L61;L67
115	YYKKDNSYF	L8;L9;L58;L72;L71;L66;L12	IIWFLLLSV	L5;L4;L24;L73;L3;L50;L2;L47;L67;L18;L69
116	YYPDKVFRS	L66;L8;L12;L9;L72;L64;L71	IKWPWYIWL	L44;L66;L27;L64;L74;L25;L61;L67;L65;L69;L60
117	AAAYYVGYL	L74;L69;L67;L70;L58;L61;L64;L60	ISTKHFYWF	L53;L54;L55;L8;L52;L59;L73;L74;L9;L58;L60
118	AALQIPFAM	L61;L31;L67;L12;L32;L60;L70;L69	ITILDGISQY	L11;L18;L10;L14;L52;L1;L26;L53;L12;L16;L27
119	AAYYVGYL	L74;L67;L69;L70;L61;L58;L59;L60	IYNDKVAGF	L72;L9;L8;L62;L71;L66;L12;L26;L11;L43;L58
120	AEILLIIM	L29;L37;L33;L45;L36;L42;L46;L38	KACPLIAAV	L69;L70;L73;L3;L67;L58;L5;L51;L64;L20;L50
121	AEIPKEEVK	L36;L37;L42;L38;L46;L45;L40;L41	KENSYTTTI	L45;L37;L36;L38;L48;L24;L46;L41;L8;L42;L33
122	AEIPKEEVKP	L46;L38;L42;L36;L37;L40;L41;L45	KFTDGVCLF	L8;L9;L54;L62;L72;L16;L12;L71;L52;L53;L14
123	AHFPREGVF	L27;L28;L34;L35;L33;L69;L26;L44	KIEELFYSY	L18;L14;L16;L12;L1;L26;L13;L54;L27;L5;L6
124	AIVVTCLAY	L43;L12;L26;L18;L6;L14;L59;L16	KLKPVLDWL	L3;L5;L4;L16;L2;L13;L74;L26;L14;L53;L39
125	ALEPLVDL	L62;L23;L63;L74;L68;L4;L5;L1	KMFDAYVNTF	L16;L53;L26;L54;L9;L52;L8;L27;L3;L72;L71
126	ALLSDLQDL	L4;L2;L24;L5;L3;L16;L44;L74	LADKFPVL	L68;L63;L67;L74;L61;L60;L47;L59;L32;L70;L62
127	AQKFNGLTV	L24;L48;L26;L3;L58;L13;L27;L45	LIISVTSNY	L26;L43;L58;L14;L11;L12;L6;L18;L10;L1;L59
128	AQTGIAVL	L44;L35;L27;L28;L24;L26;L25;L48	LLLDDFVEI	L2;L5;L4;L24;L3;L8;L16;L9;L67;L47;L49
129	ASIKNFKSV	L73;L48;L46;L70;L69;L58;L45;L13	LPPAYTNSF	L31;L39;L49;L22;L47;L32;L56;L72;L71;L57;L9
130	ASQSIIAY	L18;L43;L26;L1;L70;L14;L27;L59	LQTPFEIKL	L44;L64;L69;L74;L28;L24;L58;L73;L26;L35;L34
131	AVHECFVKR	L15;L21;L7;L19;L17;L6;L13;L11	LRSDVLLPL	L66;L64;L30;L35;L34;L65;L67;L59;L25;L61;L4
132	AVITREVGF	L26;L10;L11;L58;L52;L12;L54;L16	LTKHPNQEY	L43;L58;L26;L13;L70;L12;L1;L52;L14;L53;L18
133	AYKIEELFY	L12;L14;L72;L13;L65;L71;L66;L26	LVRDLPQGF	L58;L52;L26;L43;L12;L16;L49;L11;L53;L10;L31
134	CANDPVGF	L58;L59;L43;L62;L70;L54;L49;L69	MSAPPAQY	L70;L54;L1;L18;L59;L43;L69;L14;L58;L26;L55
135	CEIVGGQIV	L45;L37;L38;L36;L42;L46;L29;L24	NATNVVIKV	L20;L70;L69;L64;L47;L58;L24;L73;L49;L50;L19
136	CESHGKQVV	L37;L45;L42;L38;L24;L46;L36;L29	NSIAIPTNF	L58;L54;L53;L52;L70;L9;L74;L69;L60;L55;L49
137	CPDGVKHVY	L31;L49;L32;L65;L14;L18;L39;L1	QPTESIVRF	L49;L31;L56;L39;L32;L22;L34;L11;L50;L9;L29

138	DEFIERYKL	L29;L37;L25;L36;L41;L40;L45;L33	RAMPNMLRI	L73;L69;L24;L54;L47;L70;L52;L53;L55;L8;L49
139	DEFTPFDVV	L29;L45;L37;L46;L47;L25;L36;L42	REHEHEIAW	L38;L33;L46;L42;L37;L41;L40;L29;L36;L45;L54
140	DLNGDVVAI	L10;L49;L3;L4;L2;L23;L24;L11	REHEHEIAWY	L14;L29;L41;L40;L38;L27;L46;L26;L36;L42;L43
141	DVFYKENSY	L11;L10;L29;L16;L12;L26;L14;L19	REVLSDREL	L36;L37;L45;L40;L41;L38;L33;L55;L27;L65;L29
142	DYQGKPLEF	L8;L9;L72;L71;L66;L12;L10;L62	RSFIEDLLF	L53;L54;L52;L55;L16;L73;L18;L65;L27;L26;L9
143	EAARYMRSL	L10;L32;L60;L70;L61;L20;L11;L69	RTNVYLAVF	L16;L53;L54;L52;L73;L65;L58;L26;L18;L14;L59
144	EKFKEGVEF	L27;L44;L34;L11;L10;L49;L26;L8	RYFKYWDQTY	L16;L14;L26;L71;L65;L8;L27;L54;L72;L12;L66
145	EMLDNRATL	L8;L16;L25;L4;L10;L34;L40;L41	SALWEIQQV	L24;L4;L47;L69;L70;L32;L73;L64;L58;L2;L13
146	ENPDILRVY	L11;L10;L40;L41;L64;L14;L66;L26	SANNCTFEY	L58;L43;L59;L49;L70;L12;L14;L69;L26;L31;L27
147	EQFKKGVQI	L24;L48;L44;L34;L35;L20;L27;L25	SEAVEAPLV	L38;L45;L42;L36;L37;L40;L46;L28;L41;L24;L29
148	ETIQITISSF	L11;L10;L20;L52;L19;L53;L41;L40	SEDNQTTTI	L45;L37;L34;L36;L42;L41;L68;L38;L40;L48;L24
149	EVVGDIILK	L19;L7;L20;L11;L17;L6;L10;L13	SEFDRDAAM	L29;L46;L36;L37;L33;L40;L38;L45;L25;L42;L41
150	EWFLAYILF	L9;L41;L40;L8;L34;L62;L29;L31	SEIIGYKAI	L45;L40;L41;L37;L48;L36;L42;L46;L38;L29;L25
151	EYADVFHL	L9;L8;L66;L20;L72;L71;L65;L35	SFNPETNIL	L62;L72;L71;L28;L8;L9;L34;L32;L65;L64;L35
152	EYFNSVCRL	L8;L9;L72;L71;L20;L34;L64;L10	SHKPPISF	L43;L28;L23;L27;L66;L58;L35;L26;L39;L29;L70
153	FAAETLKAT	L59;L43;L61;L69;L60;L58;L70;L32	SSSDNIAL	L67;L61;L70;L68;L60;L56;L59;L35;L57;L73;L74
154	FAFPFTIYSLL	L67;L61;L31;L74;L60;L69;L58;L70	SVLNDILSR	L7;L15;L17;L6;L19;L21;L11;L16;L13;L4;L10
155	FEIKLAKKF	L29;L41;L40;L37;L45;L58;L36;L49	SWNADLYKL	L4;L8;L34;L62;L56;L9;L32;L35;L37;L30;L39
156	FELEDFIPM	L29;L46;L45;L36;L42;L40;L31;L37	SYSGQSTQL	L9;L72;L8;L66;L71;L28;L65;L35;L64;L62;L56
157	FLAHIQWMV	L2;L20;L4;L24;L5;L3;L69;L64	TELEPPCRF	L29;L41;L40;L33;L36;L45;L37;L8;L9;L38;L46
158	FLAYILFTR	L19;L21;L17;L15;L4;L2;L3;L20	TLIVNSVLL	L74;L2;L4;L28;L62;L34;L26;L9;L8;L5;L44
159	FNPETNIL	L57;L66;L62;L67;L71;L72;L59;L64	TPFDVVRQC	L32;L31;L49;L51;L39;L47;L64;L65;L19;L56;L50
160	FPDLNGDVV	L50;L32;L47;L68;L22;L62;L39;L31	TPSGTWLTY	L49;L31;L65;L32;L26;L12;L18;L22;L51;L39;L14
161	FQPTNGVGY	L26;L27;L58;L71;L12;L11;L72;L66	VASKILGL	L74;L70;L61;L60;L58;L59;L23;L73;L67;L56;L47
162	FRYMNSQGL	L25;L64;L35;L30;L66;L28;L34;L61	VDTDFVNEF	L9;L8;L59;L66;L43;L29;L58;L49;L72;L69;L26

163	FSASTSAF	L59;L58;L43;L60;L70;L61;L74;L54	VIYLYLTFY	L6;L12;L43;L58;L26;L59;L1;L18;L14;L69;L27
164	FTDGVCLF	L63;L62;L1;L58;L68;L70;L74;L60	VLYENQKL	L2;L24;L74;L4;L25;L5;L3;L55;L68;L63;L64
165	FVAAIFYLI	L20;L12;L47;L5;L49;L64;L74;L24	VMFTPLVPF	L9;L43;L26;L59;L6;L16;L71;L72;L52;L31;L12
166	FVLALLSDL	L74;L60;L4;L67;L61;L59;L31;L5	VSDIDITF	L63;L68;L54;L1;L53;L62;L18;L74;L52;L55;L60
167	FVSLAIDAY	L31;L1;L59;L14;L12;L26;L58;L18	VTIDYTEISF	L53;L52;L16;L10;L43;L11;L8;L58;L12;L26;L9
168	FYEDFLEY	L12;L59;L72;L71;L66;L1;L62;L18	VVDDPCPIHF	L5;L63;L68;L62;L60;L12;L74;L58;L16;L52;L9
169	FYLTNDVSF	L71;L72;L9;L8;L66;L12;L62;L52	VVDYGARFY	L18;L1;L14;L55;L12;L63;L58;L68;L52;L62;L49
170	GEAANFCAL	L37;L36;L46;L45;L40;L41;L44;L38	VVNQNAQAL	L60;L57;L39;L61;L56;L32;L68;L58;L16;L59;L26
171	GEIPVAYRK	L37;L36;L45;L7;L41;L40;L38;L29	VVVNAANVY	L26;L12;L14;L31;L58;L52;L10;L16;L54;L69;L59
172	GEIPVAYRKV	L45;L37;L38;L46;L36;L41;L40;L24	YANSVFNIC	L59;L60;L61;L32;L58;L70;L49;L69;L67;L31;L47
173	GELGDVRET	L37;L45;L46;L41;L40;L36;L38;L42	YFTEQPIDL	L62;L72;L74;L71;L9;L8;L64;L61;L67;L60;L66
174	GEVFNATRF	L37;L40;L41;L29;L45;L36;L27;L33	YFVVKRHTF	L71;L72;L8;L9;L49;L62;L12;L43;L59;L29;L60
175	GIITTVAAF	L10;L26;L11;L58;L27;L28;L12;L43	YIVDSVTV	L58;L28;L43;L48;L61;L20;L2;L59;L73;L67;L69
176	GNFKNLREF	L27;L26;L10;L52;L55;L37;L49;L58	YKKPASREL	L66;L27;L60;L64;L44;L61;L58;L59;L43;L39;L70
177	GVYSVIYLYL	L6;L74;L67;L10;L13;L7;L20;L11	YSFLPGVY	L1;L59;L70;L69;L55;L27;L58;L26;L43;L14;L66
178	GWIFGTTL	L28;L71;L37;L72;L60;L48;L61;L35	YSVIYLYL	L61;L74;L60;L73;L67;L59;L65;L69;L1;L70;L55
179	GYAFEHIVY	L12;L66;L27;L72;L26;L71;L14;L65	YYTSNPTTF	L9;L8;L66;L72;L71;L62;L58;L12;L49;L60;L27
180	HEFCSQHTM	L29;L37;L36;L45;L46;L32;L33;L38	AANFCALIL	L73;L61;L69;L70;L74;L59;L67;L60;L32;L68;L31;L58
181	HFAIGLALY	L12;L14;L18;L11;L72;L71;L26;L49	ACFVLAAVY	L14;L27;L12;L26;L40;L31;L69;L41;L72;L18;L71;L16
182	HSYFTSDYY	L14;L18;L1;L65;L54;L43;L58;L12	AELEGIQY	L29;L41;L40;L27;L45;L33;L37;L42;L46;L26;L38;L36
183	HTTDPSFL	L73;L60;L20;L70;L62;L55;L61;L63	ALCEKALKY	L12;L18;L6;L14;L16;L26;L1;L11;L43;L10;L13;L27
184	HVQLSLPVL	L28;L32;L39;L59;L56;L31;L67;L60	ALLTKSSEY	L26;L12;L14;L27;L16;L18;L6;L43;L10;L72;L71;L1
185	IADYNYKL	L63;L68;L67;L62;L74;L60;L54;L70	ALWEIQQVV	L5;L24;L2;L4;L3;L64;L13;L16;L69;L46;L44;L37
186	IAEILLIIM	L31;L32;L69;L63;L67;L68;L70;L47	ATSRTLSYY	L1;L14;L18;L58;L6;L12;L54;L52;L11;L53;L7;L10
187	IIIWFLLL	L74;L73;L60;L61;L67;L59;L47;L48	AVVCFNSTY	L26;L14;L11;L10;L16;L43;L12;L18;L58;L54;L27;L52

188	ILFTRFFYV	L5;L4;L3;L2;L6;L69;L73;L20	AYILFTRFF	L9;L72;L71;L8;L40;L64;L62;L12;L27;L41;L66;L26
189	ILTSLLVLV	L2;L4;L5;L3;L24;L64;L73;L20	DEDDSEPVL	L36;L29;L35;L28;L37;L41;L34;L32;L68;L25;L40;L63
190	IPRRNVATL	L22;L56;L39;L32;L47;L51;L31;L49	EEHVQIHTI	L45;L37;L42;L41;L29;L48;L40;L24;L34;L36;L25;L46
191	IQITISSF	L26;L27;L43;L58;L28;L48;L71;L72	EIKESVQTF	L10;L11;L26;L23;L43;L58;L16;L9;L39;L34;L8;L49
192	ISDEFSSNV	L63;L68;L18;L1;L5;L62;L70;L73	ELTPVVQTI	L24;L20;L3;L10;L4;L49;L9;L8;L34;L5;L55;L2
193	IVDTVSALVY	L18;L1;L12;L14;L68;L52;L6;L54	ELYSPIFLI	L24;L20;L11;L4;L17;L10;L16;L6;L2;L9;L8;L34
194	IVVTCLAYY	L11;L12;L14;L58;L10;L18;L52;L6	FAYANRNRF	L58;L70;L69;L59;L60;L49;L74;L61;L47;L31;L12;L32
195	KAALLADKF	L53;L54;L52;L58;L55;L12;L31;L69	FGDSVEEVL	L67;L68;L63;L62;L32;L34;L44;L61;L5;L31;L28;L74
196	KATYKPNTW	L54;L52;L49;L53;L16;L69;L55;L70	FHLDGEVITF	L34;L35;L28;L72;L27;L71;L9;L31;L8;L60;L52;L12
197	KAYKIEELFY	L12;L14;L18;L58;L54;L52;L27;L69	FPFTIYSL	L23;L32;L56;L47;L50;L31;L25;L66;L39;L22;L61;L49
198	KFLTENLLL	L8;L9;L71;L72;L13;L53;L73;L16	FSYFAVHF	L59;L74;L58;L70;L60;L55;L69;L68;L62;L61;L43;L54
199	KIILFLAL	L73;L59;L67;L60;L61;L23;L74;L68	FTEERLKLF	L1;L58;L60;L62;L10;L63;L69;L52;L70;L11;L59;L12
200	KKFLPFQQF	L27;L16;L44;L33;L26;L9;L53;L52	FTNVYADSF	L53;L58;L59;L43;L71;L72;L62;L54;L52;L12;L60;L16
201	KLDDKDPNF	L5;L63;L2;L16;L9;L54;L62;L18	FVFPLNSI	L59;L47;L20;L64;L69;L48;L3;L25;L67;L50;L68;L61
202	KLFIRQEEV	L3;L2;L24;L5;L4;L16;L23;L73	FVVSTGYHF	L58;L60;L11;L10;L12;L74;L49;L54;L59;L31;L9;L52
203	KLLHKPIVW	L16;L52;L6;L54;L4;L2;L21;L53	GAVDINKL	L74;L70;L69;L60;L64;L61;L67;L58;L44;L37;L59;L55
204	KLMVVIPDY	L26;L14;L12;L6;L18;L16;L43;L13	GSVRVVTTF	L53;L54;L52;L26;L27;L55;L65;L10;L49;L58;L60;L74
205	KLQDVVNQN	L4;L16;L2;L5;L14;L21;L3;L24	GVVDYGARF	L10;L11;L12;L26;L49;L58;L54;L52;L43;L14;L20;L27
206	KNLSDRVVF	L16;L53;L52;L27;L54;L9;L8;L55	HAFHTPAF	L59;L49;L31;L58;L32;L70;L50;L60;L54;L43;L61;L47
207	KQASLNGVTL	L44;L56;L27;L26;L16;L24;L34;L13	HVVAFNTLL	L20;L32;L56;L74;L31;L44;L64;L53;L34;L73;L11;L28
208	KQFDTYNL	L44;L24;L16;L27;L26;L33;L48;L65	HWFVTQRNF	L49;L8;L9;L53;L52;L27;L65;L55;L62;L71;L34;L29
209	KSAGFPFNK	L7;L6;L13;L54;L21;L55;L19;L15	IAAVITREV	L70;L64;L69;L58;L43;L47;L59;L49;L73;L61;L20;L32
210	KSAPLIELC	L52;L53;L54;L55;L18;L73;L16;L69	IAIILASF	L59;L43;L54;L47;L58;L52;L60;L26;L53;L31;L23;L61
211	KVAGFAKF	L54;L26;L58;L16;L53;L11;L52;L74	IAMACLVGL	L59;L31;L58;L60;L67;L56;L61;L69;L70;L74;L47;L63
212	KVKPTVVV	L13;L51;L39;L23;L58;L69;L73;L26	IFTIGTVTL	L72;L62;L71;L9;L8;L28;L56;L61;L68;L49;L67;L34

213	KVKPTVVVN	L13;L26;L52;L16;L51;L69;L21;L39	IFVDGVPFV	L71;L72;L64;L4;L8;L2;L62;L47;L20;L69;L9;L5
214	KYLYFIKGL	L8;L9;L13;L71;L72;L66;L16;L65	ILKPANNSL	L3;L43;L23;L5;L26;L4;L68;L57;L2;L16;L39;L9
215	KYPQVNGL	L66;L72;L71;L9;L62;L8;L57;L33	IQFPNTYL	L25;L28;L58;L26;L74;L44;L35;L48;L69;L27;L68;L64
216	LAAECTIF	L59;L70;L69;L74;L58;L31;L47;L60	IRQEEVQEL	L66;L65;L64;L35;L34;L25;L28;L30;L72;L4;L71;L32
217	LALGGSVAI	L47;L61;L32;L67;L50;L49;L59;L31	ITVNVLAWL	L20;L53;L60;L61;L73;L67;L59;L58;L10;L70;L69;L54
218	LATHGLAAV	L50;L59;L61;L47;L32;L70;L20;L58	IVAIVVTCL	L74;L20;L67;L64;L60;L56;L26;L53;L61;L68;L39;L28
219	LAVPYNMRV	L69;L70;L47;L58;L73;L32;L50;L61	KTIGPDMFL	L73;L60;L53;L61;L55;L54;L16;L58;L13;L20;L70;L69
220	LCFLAFLLF	L31;L12;L9;L47;L59;L41;L52;L40	LAAIMQLFF	L59;L58;L31;L49;L52;L12;L47;L74;L60;L69;L53;L70
221	LEMELTPVV	L38;L29;L45;L46;L42;L37;L36;L50	LAFVVFLL	L47;L74;L69;L70;L61;L60;L59;L31;L64;L55;L68;L23
222	LEPEYFNSV	L45;L5;L57;L46;L38;L37;L29;L42	LEYHDVRVV	L45;L37;L46;L38;L47;L64;L42;L69;L29;L48;L70;L36
223	LHFLPRVF	L28;L55;L27;L59;L29;L35;L52;L47	LIVNSVLLF	L12;L58;L60;L9;L74;L52;L8;L31;L26;L69;L49;L16
224	LIDFYLCFL	L68;L5;L63;L60;L74;L62;L1;L67	LLDDFVEII	L5;L2;L68;L62;L63;L3;L1;L49;L24;L4;L67;L34
225	LIKVTLVFL	L58;L23;L56;L39;L60;L74;L59;L62	LLFLAFVVF	L26;L59;L27;L31;L9;L16;L12;L62;L52;L69;L50;L5
226	LINIIIWFL	L4;L5;L73;L60;L58;L61;L64;L74	LLLDRLNQL	L4;L2;L5;L23;L3;L59;L25;L8;L6;L16;L74;L64
227	LPAPRTLL	L22;L47;L56;L23;L39;L31;L25;L32	LTNDVSFL	L62;L70;L60;L73;L55;L61;L63;L58;L59;L68;L64;L1
228	LPFAMGIIAM	L31;L50;L32;L39;L22;L56;L47;L51	LVAELEGIQY	L12;L26;L18;L11;L6;L14;L31;L1;L52;L13;L43;L10
229	LPIGINITR	L32;L31;L19;L50;L17;L49;L56;L21	LYIIKLIFL	L9;L72;L8;L71;L62;L64;L23;L74;L73;L60;L61;L69
230	LPKEITVAT	L50;L51;L39;L56;L31;L32;L43;L22	MPYFFTLLL	L47;L31;L50;L22;L32;L49;L39;L73;L64;L69;L25;L56
231	LPNDDTLRV	L49;L47;L50;L51;L32;L39;L31;L4	NALDQAISM	L70;L31;L61;L67;L32;L59;L69;L60;L71;L72;L47;L58
232	LPYPDPSRI	L47;L49;L50;L32;L31;L22;L39;L51	NCYFPLQSY	L43;L26;L27;L31;L12;L59;L29;L14;L10;L11;L41;L40
233	LPYPDPSRIL	L32;L39;L47;L22;L31;L56;L49;L51	NTNPIQLSSY	L11;L14;L10;L1;L43;L18;L16;L58;L12;L26;L6;L52
234	LQIPFAMQM	L69;L58;L28;L26;L61;L27;L59;L70	NVFAFPFTI	L20;L69;L16;L47;L24;L55;L3;L64;L49;L34;L4;L12
235	LRIMASLVL	L35;L25;L66;L61;L28;L34;L30;L64	PANNAAIVL	L61;L67;L70;L69;L32;L60;L58;L74;L68;L31;L59;L56
236	LSDLQDLKW	L1;L54;L18;L52;L68;L63;L53;L49	PQIGVVREF	L26;L27;L58;L65;L43;L8;L64;L10;L34;L9;L69;L24
237	LSYFIASF	L59;L43;L60;L52;L70;L26;L55;L54	RANSAVKL	L55;L73;L63;L54;L74;L56;L70;L58;L53;L44;L69;L39

238	LSYGIATV	L48;L47;L70;L73;L69;L59;L43;L58	RARSVSPKL	L13;L58;L53;L44;L56;L54;L55;L39;L22;L70;L73;L63
239	LVATAEAEL	L20;L56;L67;L61;L60;L28;L74;L32	RFKESPFEL	L56;L8;L72;L9;L62;L71;L13;L39;L55;L66;L16;L65
240	LYLYALVYF	L9;L8;L62;L72;L71;L12;L52;L31	RGWIFGTTL	L44;L53;L55;L56;L27;L57;L65;L48;L26;L8;L16;L37
241	LYYDSMSY	L71;L72;L66;L43;L12;L65;L59;L14	RITGLYPTL	L44;L56;L73;L16;L13;L39;L60;L54;L4;L5;L24;L61
242	MADQAMTQM	L63;L68;L32;L49;L70;L31;L60;L74	RLYYDSMSY	L27;L26;L14;L43;L16;L6;L18;L65;L12;L13;L1;L54
243	MLSDTLKNL	L4;L3;L2;L5;L64;L57;L74;L16	RQEEVQEL	L24;L44;L65;L27;L63;L26;L33;L68;L35;L48;L55;L25
244	MPLSAPTL	L47;L50;L31;L22;L32;L56;L39;L25	SAKSASVYY	L58;L70;L43;L13;L69;L14;L12;L26;L49;L27;L52;L31
245	MPYFFTLL	L47;L50;L22;L31;L23;L25;L74;L39	SAVVLLILM	L69;L58;L31;L70;L74;L64;L32;L52;L49;L59;L19;L60
246	MSMTYGQQF	L53;L55;L54;L52;L43;L58;L70;L60	SLIYSTAAL	L3;L4;L57;L2;L28;L5;L72;L61;L43;L71;L59;L10
247	MTYRRLISM	L69;L70;L25;L10;L11;L58;L59;L53	SLLSVLLSM	L4;L6;L2;L5;L12;L16;L3;L7;L59;L24;L11;L15
248	MVSLLSVLL	L20;L74;L64;L31;L28;L56;L32;L67	SMWALIISV	L2;L4;L3;L5;L48;L13;L24;L69;L51;L64;L50;L20
249	MYASAVVL	L71;L72;L66;L62;L35;L28;L9;L64	SQMEIDFLEL	L44;L67;L34;L73;L61;L27;L35;L8;L26;L4;L2;L5
250	NARDGCVPL	L67;L43;L70;L61;L59;L69;L58;L60	STDVVYRAF	L62;L68;L43;L52;L53;L10;L60;L63;L1;L49;L58;L54
251	NELSPVAL	L25;L29;L37;L36;L23;L35;L33;L40	SVASQSIIAY	L10;L26;L11;L6;L12;L7;L14;L43;L16;L18;L19;L27
252	NLHSSRLSF	L16;L57;L12;L43;L27;L26;L72;L10	TEETFKLSY	L41;L29;L18;L46;L40;L42;L1;L38;L45;L65;L12;L36
253	NLIDSYFVV	L5;L2;L3;L24;L4;L35;L20;L11	TSNPTTFHL	L65;L73;L55;L60;L54;L8;L61;L74;L70;L58;L68;L53
254	NLWNTFTRL	L5;L4;L74;L2;L24;L57;L8;L3	TTFTYASAL	L71;L20;L70;L10;L61;L72;L60;L65;L57;L69;L28;L16
255	NQTTTIQTI	L24;L48;L34;L35;L28;L8;L25;L49	TVAYFNMVY	L26;L11;L12;L14;L65;L31;L10;L18;L16;L58;L1;L69
256	NSKVQIGEY	L43;L14;L26;L10;L70;L1;L58;L18	VAKHDFFKF	L58;L49;L53;L70;L52;L12;L43;L8;L9;L69;L31;L59
257	NTLLFLMSF	L53;L52;L16;L59;L10;L12;L11;L31	VANGDSEVVL	L67;L32;L68;L31;L44;L56;L53;L63;L58;L70;L74;L60
258	NVFAFPFTIY	L11;L6;L12;L10;L31;L26;L29;L14	VAYFNMVYM	L70;L69;L58;L59;L74;L61;L67;L60;L47;L43;L68;L63
259	NVKDFMSL	L23;L39;L67;L10;L59;L66;L25;L60	VFLGIITTV	L48;L8;L72;L2;L71;L4;L9;L24;L47;L3;L62;L51
260	NVPLHGTIL	L57;L67;L63;L39;L66;L74;L11;L64	VLNEKCSAY	L43;L26;L14;L16;L6;L12;L18;L10;L72;L27;L1;L57
261	NWITGGIAI	L8;L35;L71;L34;L28;L72;L9;L25	VLWAHGFEL	L4;L2;L5;L57;L68;L61;L16;L59;L74;L39;L67;L63
262	NYGDSATL	L66;L72;L71;L9;L62;L8;L65;L35	VRDPQTLEI	L35;L34;L68;L64;L65;L66;L62;L5;L63;L25;L49;L67

263	NYLKRRVVF	L8;L71;L9;L72;L23;L66;L25;L27	VTLAILTAL	L4;L60;L73;L59;L67;L53;L61;L6;L20;L31;L16;L56
264	PQADVEWKF	L44;L24;L26;L8;L9;L34;L58;L27	VVNAANVYL	L58;L68;L56;L73;L74;L62;L60;L63;L5;L4;L20;L61
265	QIITTDNTF	L54;L9;L34;L26;L10;L11;L8;L32	WVYKQFDTY	L26;L10;L14;L12;L49;L11;L16;L27;L58;L18;L59;L6
266	QLTPTWRVY	L26;L43;L14;L27;L16;L55;L65;L69	YFIASFRLF	L9;L8;L12;L72;L71;L62;L27;L49;L31;L60;L58;L34
267	QVVDMSMTY	L11;L10;L26;L12;L43;L14;L16;L58	YFIKGLNNL	L8;L71;L72;L9;L74;L34;L62;L58;L67;L64;L3;L59
268	REFVFKNID	L46;L37;L45;L36;L29;L42;L38;L65	YIDIGNYTV	L68;L5;L63;L2;L1;L35;L28;L24;L34;L18;L67;L32
269	RELHLSWEV	L33;L45;L38;L24;L37;L42;L46;L36	YTTTIKPVTY	L52;L12;L58;L54;L69;L1;L10;L43;L70;L49;L18;L14
270	REQIDGYVM	L36;L38;L37;L42;L29;L33;L45;L40	AEILLIIMR	L40;L41;L42;L37;L45;L36;L7;L38;L29;L21;L15;L46;L19
271	RKSAPLIEL	L44;L56;L27;L73;L39;L66;L22;L64	APFLYLYAL	L56;L22;L39;L23;L31;L32;L50;L25;L44;L33;L51;L4;L67
272	RLDKVEAEV	L5;L24;L2;L63;L18;L62;L68;L3	ASLNGVTL	L55;L61;L53;L67;L60;L54;L59;L44;L73;L56;L71;L74;L72
273	RSGETLGVL	L65;L73;L53;L55;L54;L44;L56;L14	AYITGGVVQL	L9;L8;L71;L72;L56;L44;L13;L28;L37;L36;L34;L66;L4
274	RSIFSRTL	L55;L73;L65;L60;L48;L54;L61;L53	CVEEVTTTL	L60;L68;L63;L5;L32;L67;L39;L61;L62;L44;L56;L20;L34
275	RTIAFGGCVF	L54;L16;L53;L52;L55;L26;L10;L8	DTYNLWNTF	L10;L11;L53;L52;L49;L16;L54;L25;L29;L58;L70;L19;L69
276	RVDGQVDL	L63;L68;L74;L62;L67;L54;L56;L39	DVFHLYLQY	L10;L11;L12;L49;L6;L14;L29;L31;L19;L16;L18;L26;L13
277	RVYSTGSNV	L13;L24;L51;L58;L6;L14;L16;L3	FAPSASAFF	L58;L57;L59;L62;L63;L12;L61;L60;L74;L70;L9;L31;L72
278	RYKLEGYAF	L9;L8;L71;L72;L26;L66;L27;L14	FIAGLIAIV	L3;L20;L58;L69;L2;L64;L4;L73;L67;L5;L11;L28;L24
279	SAKNRARTV	L70;L58;L69;L13;L23;L64;L43;L39	FKEGSSVEL	L44;L27;L68;L66;L61;L62;L67;L63;L32;L60;L34;L35;L28
280	SAKSASVY	L58;L70;L43;L69;L14;L59;L26;L27	FLFLTWICL	L74;L2;L69;L64;L4;L5;L62;L67;L3;L59;L61;L23;L68
281	SEHDYQIGG	L42;L37;L46;L38;L36;L41;L29;L40	FLIVAAIVF	L59;L43;L26;L72;L74;L12;L62;L69;L71;L31;L61;L9;L68
282	SELLTPLGI	L45;L41;L40;L36;L37;L48;L42;L33	FTDGVCLFW	L1;L68;L54;L18;L49;L63;L62;L60;L58;L67;L53;L52;L73
283	SEYTGNYQC	L42;L45;L37;L46;L38;L29;L36;L41	HANEYRLY	L55;L49;L14;L43;L18;L59;L70;L65;L58;L54;L31;L64;L52
284	SFGPLVRKI	L64;L8;L9;L48;L24;L41;L45;L62	HEGKTFYVL	L37;L36;L65;L44;L45;L29;L35;L32;L40;L41;L8;L42;L33
285	SFKELLVY	L72;L71;L43;L26;L12;L14;L59;L66	IATNGPLKV	L73;L70;L69;L47;L58;L64;L24;L50;L63;L49;L20;L67;L61
286	SFKWDLTAF	L43;L72;L71;L9;L8;L26;L10;L58	IIFLEGETL	L60;L28;L26;L68;L16;L67;L34;L61;L31;L53;L59;L36;L54
287	SGKPVPYCY	L14;L66;L65;L43;L26;L12;L69;L13	ISNSWLMWL	L73;L61;L55;L60;L53;L59;L58;L74;L69;L70;L57;L4;L64

288	SLDTYPSL	L63;L68;L5;L62;L74;L2;L28;L57	KENDSKEGF	L33;L41;L36;L16;L40;L37;L29;L26;L65;L27;L8;L38;L54
289	SLPGVFCGV	L5;L2;L3;L57;L24;L4;L20;L11	KIQEGVVDY	L14;L26;L16;L18;L65;L43;L13;L6;L54;L12;L58;L27;L72
290	SNYLKRRVV	L73;L25;L48;L64;L23;L45;L46;L69	KMVSLLSVL	L44;L69;L16;L56;L8;L73;L67;L3;L53;L36;L4;L27;L5
291	SPYNSQNAV	L51;L47;L22;L50;L39;L25;L28;L32	KPVPEVKIL	L39;L32;L56;L69;L22;L31;L65;L64;L44;L66;L55;L49;L47
292	SSDNIALL	L63;L62;L68;L74;L1;L18;L60;L73	KRVDWTIEY	L65;L64;L66;L30;L26;L43;L27;L16;L69;L14;L58;L12;L18
293	SSVELKHF	L59;L52;L58;L54;L53;L10;L43;L70	KVDGVDVELF	L63;L54;L52;L18;L53;L5;L16;L68;L49;L62;L34;L1;L12
294	STSAFVETV	L20;L70;L73;L3;L58;L69;L4;L64	KVVKVTIDY	L26;L14;L54;L18;L12;L16;L58;L13;L6;L52;L27;L11;L53
295	SVCLGSLIY	L18;L12;L1;L14;L26;L11;L7;L6	LAWPLIVTA	L50;L69;L31;L47;L49;L51;L32;L52;L67;L70;L61;L5;L43
296	SVSPKLFIR	L15;L7;L21;L19;L17;L6;L20;L11	LAWPLIVTAL	L67;L31;L61;L60;L68;L69;L74;L32;L47;L57;L56;L59;L50
297	SVVLLSVL	L59;L25;L67;L74;L23;L60;L56;L68	LEAPFLYLY	L29;L40;L41;L12;L31;L1;L46;L18;L42;L38;L26;L52;L14
298	SYEDQDALF	L62;L8;L9;L12;L72;L34;L71;L66	LLLTILTSL	L4;L5;L2;L3;L44;L23;L6;L56;L74;L59;L57;L8;L16
299	SYFIASFRL	L9;L8;L72;L71;L66;L65;L62;L64	LPFNDGVYF	L49;L31;L32;L56;L39;L50;L22;L47;L52;L58;L9;L34;L12
300	SYFIASFRLF	L9;L8;L12;L72;L71;L40;L41;L52	LQAENVTGL	L44;L3;L26;L28;L4;L25;L58;L35;L27;L56;L34;L64;L24
301	TAPHGHVMV	L57;L69;L70;L63;L64;L47;L32;L20	MADLVYAL	L68;L67;L63;L62;L74;L60;L61;L59;L23;L47;L32;L70;L33
302	TAYANSVF	L70;L58;L47;L59;L54;L69;L31;L68	NAAIVLQL	L74;L70;L67;L69;L47;L25;L61;L59;L60;L64;L23;L31;L35
303	TEILPVSM	L29;L45;L37;L36;L33;L38;L25;L46	NLHPDSATL	L28;L3;L57;L5;L35;L2;L4;L26;L43;L34;L23;L16;L66
304	TEISFMLWC	L46;L45;L37;L41;L38;L42;L40;L36	NTASWFTAL	L20;L60;L61;L25;L10;L35;L67;L11;L70;L73;L59;L28;L16
305	TEVPANSTVL	L36;L37;L41;L45;L40;L29;L28;L38	NYSGVVTTV	L64;L20;L66;L35;L8;L72;L9;L24;L3;L71;L28;L70;L62
306	TEVPVAIHA	L38;L46;L42;L37;L29;L41;L36;L40	QTFSVLACY	L11;L14;L12;L10;L6;L1;L18;L16;L52;L58;L69;L54;L70
307	TGVEHVTF	L29;L23;L54;L26;L25;L33;L49;L27	QWLPTGTLL	L9;L8;L28;L34;L40;L36;L41;L74;L62;L61;L71;L22;L30
308	TLMNVLTLV	L2;L4;L3;L5;L24;L20;L6;L64	RIQPGQTF	L54;L26;L16;L55;L33;L39;L53;L58;L43;L60;L59;L9;L72
309	TLVTMPLGY	L12;L6;L26;L18;L16;L10;L14;L1	RTFKVSIWNL	L53;L44;L65;L20;L16;L13;L21;L54;L55;L56;L73;L6;L7
310	TSDLATNNL	L68;L63;L1;L62;L60;L74;L67;L34	RTIKGTHHW	L54;L53;L16;L52;L10;L55;L49;L14;L11;L18;L21;L8;L73
311	TTDPSFLGR	L1;L7;L19;L17;L15;L18;L21;L6	RTILGSALL	L53;L73;L55;L54;L13;L16;L60;L20;L14;L18;L36;L52;L44
312	TVEELKKLL	L32;L39;L63;L23;L20;L1;L5;L68	SAPHGVVF	L59;L58;L63;L57;L66;L49;L70;L43;L72;L56;L69;L62;L71

313	TVKNGSIHL	L13;L20;L10;L58;L56;L39;L74;L26	SAVVLLIL	L59;L74;L61;L60;L69;L67;L70;L47;L73;L25;L23;L31;L68
314	TVKNGSIHLY	L14;L11;L10;L26;L12;L16;L52;L18	SEYDYVIF	L29;L33;L37;L27;L41;L45;L40;L43;L36;L25;L38;L66;L65
315	TYLEGSVRV	L8;L2;L9;L71;L4;L72;L45;L62	SSDNIALLV	L73;L18;L1;L63;L68;L24;L58;L5;L70;L64;L62;L20;L69
316	VAAGLEAPFL	L74;L67;L58;L60;L61;L70;L69;L31	TIVEVQPQL	L4;L5;L20;L60;L67;L28;L2;L61;L32;L74;L39;L8;L56
317	VAGGIVAIV	L70;L69;L58;L64;L67;L20;L47;L73	TQAPTHLSV	L24;L35;L28;L48;L3;L25;L69;L34;L73;L58;L64;L26;L4
318	VAVKMFDAY	L59;L43;L31;L67;L58;L12;L14;L49	VAIVVTCL	L74;L61;L60;L59;L70;L67;L69;L47;L68;L63;L72;L23;L62
319	VAYRKVLLR	L19;L69;L17;L15;L47;L7;L6;L21	VASQSIIAY	L58;L70;L69;L31;L59;L49;L43;L26;L18;L12;L27;L14;L52
320	VEEVTTTL	L37;L45;L25;L33;L36;L48;L29;L62	VLMDGSIIQF	L26;L16;L9;L8;L2;L11;L43;L4;L10;L27;L6;L12;L5
321	VEIIKSQDL	L37;L36;L45;L40;L25;L33;L41;L29	VPMEKLKTL	L39;L23;L22;L56;L32;L47;L25;L31;L49;L8;L4;L3;L51
322	VEKGVLPQL	L37;L36;L39;L45;L13;L56;L29;L41	VSTSGRWVL	L55;L70;L60;L61;L53;L69;L73;L65;L44;L16;L67;L58;L54
323	VENPHLMGW	L41;L40;L33;L29;L45;L52;L54;L38	WTFGAGAAL	L61;L60;L20;L10;L59;L58;L16;L28;L70;L67;L53;L11;L57
324	VLLAPLLSA	L2;L51;L6;L4;L3;L50;L5;L46	YASAVVLLIL	L67;L69;L31;L60;L61;L59;L74;L32;L70;L73;L58;L20;L47
325	VMPLSAPTL	L57;L5;L9;L72;L66;L62;L71;L47	YIGDPAQL	L74;L60;L61;L67;L59;L66;L3;L73;L58;L4;L63;L62;L28
326	VPFVVSTGY	L31;L49;L26;L43;L12;L65;L27;L56	YLQPRTFLL	L4;L74;L23;L2;L5;L64;L9;L1;L3;L61;L8;L66;L69
327	VPLNIIPL	L47;L56;L50;L22;L23;L39;L25;L31	YVDNSSLTI	L68;L5;L34;L49;L1;L63;L24;L28;L67;L62;L32;L45;L61
328	VQAGNVQL	L44;L35;L26;L28;L56;L25;L74;L58	YVLPNDDTL	L67;L60;L32;L61;L4;L74;L5;L2;L44;L34;L31;L53;L59
329	VRDVLVRGF	L30;L62;L34;L49;L64;L66;L65;L52	AAIVFITL	L67;L59;L61;L74;L60;L70;L23;L69;L73;L68;L56;L58;L47;L43
330	VRIKIVQML	L64;L66;L35;L65;L25;L34;L30;L8	AELAKNVSL	L37;L33;L36;L44;L40;L42;L45;L41;L46;L23;L25;L38;L56;L35
331	VSDADSTLI	L63;L1;L68;L18;L53;L55;L62;L54	AHAEETRKL	L28;L34;L35;L64;L44;L10;L41;L27;L37;L40;L3;L55;L24;L4
332	VSLVKPSFY	L43;L1;L52;L14;L12;L18;L58;L54	ALNTLVKQL	L4;L3;L2;L64;L5;L44;L16;L56;L57;L39;L13;L26;L74;L69
333	VSSPDAVTAY	L18;L43;L1;L52;L26;L14;L54;L53	ANKDGIIWV	L13;L3;L43;L51;L69;L24;L70;L73;L64;L4;L45;L2;L42;L58
334	VTPSGTWLTY	L18;L1;L11;L43;L12;L16;L10;L52	ASAVVLLIL	L73;L69;L61;L74;L59;L67;L60;L70;L53;L55;L56;L44;L64;L54
335	VVDSYYSL	L63;L68;L67;L62;L74;L60;L5;L1	ASFSTFKCY	L14;L26;L27;L70;L69;L43;L58;L18;L13;L16;L10;L7;L52;L1

336	VVFDEISMA	L51;L3;L11;L13;L2;L69;L24;L20	EEFEPSTQY	L29;L41;L11;L40;L27;L26;L45;L42;L46;L10;L65;L37;L31;L36
337	VVQEGVLTA	L51;L3;L2;L50;L13;L42;L7;L38	FAFPFTIYS	L58;L70;L69;L59;L74;L64;L60;L61;L31;L67;L47;L50;L43;L20
338	VYADSFVIR	L17;L15;L9;L19;L21;L8;L66;L7	FAMQMAYRF	L58;L59;L49;L69;L53;L32;L74;L31;L12;L60;L70;L61;L63;L54
339	VYANGGKGF	L9;L8;L72;L71;L43;L26;L12;L66	FLFVAAIFY	L12;L26;L59;L69;L1;L31;L6;L43;L72;L18;L71;L14;L2;L64
340	VYDDGARRV	L62;L64;L63;L45;L5;L72;L71;L8	FPFTIYSLL	L31;L32;L56;L47;L49;L22;L50;L64;L69;L44;L58;L39;L20;L61
341	VYNPFMIDV	L64;L72;L62;L71;L8;L66;L73;L9	FSNSGSDVL	L61;L60;L67;L58;L73;L70;L55;L59;L68;L74;L57;L53;L32;L69
342	VYRGTTTY	L72;L71;L66;L26;L43;L27;L65;L14	HFYWFFSNY	L12;L13;L14;L72;L71;L27;L49;L26;L43;L59;L65;L29;L11;L10
343	VYSTGSNVF	L9;L8;L72;L71;L66;L62;L65;L53	HSLSHFVNL	L73;L53;L61;L60;L67;L74;L44;L13;L55;L65;L54;L20;L59;L69
344	VYSVIYLY	L66;L12;L14;L72;L9;L62;L71;L18	IASEFSSL	L61;L67;L60;L59;L70;L57;L74;L68;L47;L63;L69;L58;L66;L31
345	VYSVIYLYL	L9;L66;L8;L64;L72;L62;L71;L73	ISTSHKLVL	L73;L61;L60;L69;L67;L53;L70;L59;L74;L65;L55;L54;L68;L58
346	WLDMVDTSL	L5;L68;L63;L74;L2;L32;L62;L1	IVNNWLKQL	L4;L64;L39;L73;L60;L58;L3;L16;L5;L56;L10;L26;L59;L69
347	WNLDYIINL	L4;L65;L73;L74;L44;L2;L13;L8	IVSTIQRKY	L14;L12;L52;L58;L26;L55;L18;L64;L49;L54;L11;L6;L16;L13
348	WPLIVTAL	L23;L47;L25;L22;L56;L31;L50;L39	KFKEGVEF	L62;L72;L71;L9;L43;L8;L26;L55;L27;L39;L56;L53;L23;L66
349	YEDLLIRKS	L45;L46;L29;L41;L37;L38;L40;L42	KIADYNYKL	L16;L4;L2;L44;L73;L54;L24;L58;L8;L5;L20;L53;L3;L66
350	YFTSDYYQL	L8;L9;L32;L72;L71;L62;L67;L44	KNFKSVLYY	L65;L12;L27;L69;L16;L6;L18;L14;L73;L26;L58;L52;L54;L13
351	YGIATVREV	L64;L48;L69;L3;L73;L47;L46;L70	KPNELSRVL	L39;L56;L55;L32;L22;L65;L51;L44;L64;L31;L73;L66;L49;L16
352	YHDVRVVL	L35;L28;L62;L68;L34;L63;L60;L25	KQFDTYNLW	L16;L54;L44;L52;L24;L27;L26;L49;L8;L21;L14;L9;L13;L15
353	YIIKLIFLWL	L67;L60;L74;L73;L61;L10;L5;L11	KSDGTGTIY	L18;L54;L1;L14;L63;L53;L27;L58;L55;L65;L68;L26;L52;L70
354	YIINLIIKN	L69;L24;L11;L12;L4;L58;L10;L19	KVAGFAKFL	L73;L64;L55;L58;L69;L20;L13;L16;L74;L60;L39;L53;L56;L44
355	YIINLIIKNL	L10;L60;L3;L69;L4;L20;L11;L5	LQLPQGTTL	L44;L27;L61;L25;L26;L8;L28;L35;L60;L34;L4;L72;L71;L9

356	YKVYYGNAL	L44;L67;L66;L61;L27;L60;L71;L72	LTNIFGTVY	L1;L26;L59;L18;L52;L58;L31;L12;L14;L53;L43;L65;L55;L6
357	YLDGADVTKI	L5;L63;L2;L68;L62;L3;L1;L24	NSFTRGVYY	L70;L69;L58;L1;L18;L14;L49;L27;L52;L11;L13;L12;L54;L29
358	YLNTLTLAV	L3;L4;L2;L5;L73;L24;L57;L64	PANSTVLSF	L58;L49;L59;L43;L70;L32;L31;L54;L69;L60;L9;L52;L65;L74
359	YLQPRTFL	L74;L23;L62;L59;L2;L72;L4;L61	RQLLFVVEV	L48;L24;L73;L44;L4;L27;L13;L33;L30;L26;L2;L64;L69;L37
360	YLYLTFYL	L74;L23;L59;L67;L68;L62;L2;L4	RSKNPLLY	L18;L55;L1;L14;L52;L13;L54;L70;L58;L26;L43;L53;L73;L69
361	YPNASFDNF	L49;L31;L32;L22;L39;L47;L56;L9	SAYENFNQH	L59;L69;L49;L67;L58;L60;L7;L70;L43;L11;L61;L10;L6;L19
362	YPSLETIQI	L49;L47;L32;L31;L22;L50;L39;L34	SCNNYMLTY	L43;L12;L26;L27;L16;L58;L18;L59;L14;L72;L49;L71;L29;L10
363	YRYNLPTM	L66;L59;L25;L28;L48;L47;L35;L64	SGVPVVDSY	L26;L14;L65;L31;L29;L66;L27;L12;L54;L69;L43;L52;L49;L11
364	YSGVVTTVM	L59;L70;L61;L43;L58;L73;L60;L69	SSAKSASVY	L58;L26;L18;L14;L1;L52;L54;L27;L43;L70;L53;L69;L10;L11
365	YSSANNCTF	L58;L54;L53;L70;L34;L60;L55;L52	SSLPSYAAF	L43;L52;L59;L53;L27;L54;L61;L60;L10;L26;L16;L9;L58;L14
366	YTVEEAKTV	L70;L69;L20;L58;L64;L73;L10;L11	SSVELKHFF	L53;L54;L58;L52;L49;L69;L60;L73;L40;L14;L55;L11;L70;L9
367	YVYIGDPAQL	L3;L60;L67;L74;L20;L61;L28;L59	TANPKTPKY	L58;L70;L49;L59;L31;L43;L69;L14;L12;L54;L52;L11;L32;L18
368	YYHTTDPSF	L71;L66;L9;L72;L8;L62;L12;L32	TIKPVTYKL	L39;L58;L23;L8;L3;L4;L5;L20;L66;L74;L26;L10;L13;L16
369	YYPSARIVY	L66;L71;L72;L12;L9;L64;L27;L8	TILTSLLVL	L4;L73;L8;L61;L23;L60;L6;L59;L67;L25;L35;L16;L74;L10
370	YYSLLMPIL	L66;L9;L64;L62;L67;L72;L28;L71	TLQPVSEL	L23;L4;L3;L74;L57;L72;L28;L62;L71;L26;L2;L68;L66;L59
371	AAFHQECSL	L67;L69;L32;L70;L61;L44;L60;L74;L58	TVYEKLKPV	L3;L20;L23;L2;L10;L11;L5;L4;L51;L43;L64;L39;L48;L69
372	AARVVRSIF	L43;L58;L59;L52;L70;L69;L27;L26;L22	VAMPNLYKM	L58;L70;L69;L59;L32;L61;L52;L31;L54;L53;L60;L63;L47;L74
373	AEIRASANL	L36;L37;L40;L45;L41;L42;L38;L33;L46	VAPGTAVL	L57;L63;L59;L61;L67;L70;L68;L74;L66;L60;L47;L62;L58;L56
374	AEIVDTVSA	L38;L42;L46;L37;L36;L45;L40;L41;L43	VATSRTLSY	L58;L59;L70;L43;L69;L49;L12;L18;L31;L52;L54;L61;L27;L14
375	AEVQIDRLI	L40;L45;L41;L37;L36;L38;L42;L55;L46	VAYRKVLL	L74;L23;L47;L67;L70;L63;L60;L61;L69;L59;L68;L58;L56;L53
376	AGLEAPFLY	L12;L14;L7;L40;L16;L6;L52;L27;L41	VLSDRELHL	L74;L2;L4;L5;L3;L57;L73;L64;L9;L8;L16;L69;L24;L67
377	ALDISASIV	L63;L18;L5;L68;L62;L1;L2;L24;L28	VMYMGTLSY	L43;L26;L27;L59;L6;L16;L18;L14;L71;L72;L12;L69;L1;L49

378	ALVYFLQSI	L24;L3;L4;L5;L10;L2;L16;L45;L64	VSDIDITFL	L63;L68;L74;L53;L1;L62;L18;L60;L73;L67;L34;L61;L5;L58
379	ASFDNFKF	L54;L55;L53;L52;L70;L58;L69;L16;L26	VSIINNTVY	L26;L43;L52;L54;L18;L27;L1;L53;L58;L70;L14;L69;L55;L59
380	ASLNGVTLI	L24;L53;L55;L73;L52;L48;L7;L16;L34	VTDVTQLYL	L68;L1;L63;L62;L18;L60;L67;L73;L53;L61;L74;L5;L58;L70
381	AVLDMCASL	L4;L16;L67;L10;L61;L5;L44;L72;L2	VVFLHVTYV	L3;L64;L69;L47;L20;L73;L58;L5;L4;L13;L2;L33;L48;L67
382	AVMYMGTLSY	L26;L18;L6;L12;L16;L1;L14;L10;L7	VYIGDPAQL	L9;L8;L72;L71;L74;L62;L66;L67;L3;L28;L64;L60;L34;L13
383	CPAEIVDTV	L47;L20;L50;L39;L32;L51;L49;L31;L3	YADVFHLY	L1;L18;L59;L58;L49;L68;L63;L70;L31;L62;L12;L60;L47;L54
384	CSFGGVSVI	L70;L69;L48;L55;L65;L16;L10;L53;L64	YIKWDLLKY	L58;L43;L12;L26;L11;L10;L59;L14;L1;L13;L18;L69;L6;L16
385	DLDDFSKQL	L5;L2;L63;L68;L10;L62;L11;L1;L35	YPIIGDEL	L23;L56;L47;L22;L32;L67;L31;L50;L61;L71;L59;L39;L25;L72
386	DLFMRIFTI	L23;L47;L25;L24;L20;L3;L10;L4;L16	AAISDYDYY	L58;L14;L43;L12;L52;L69;L18;L49;L11;L67;L54;L70;L10;L31;L27
387	DLTKGPHEF	L11;L10;L49;L16;L9;L23;L74;L26;L29	ADAGFIKQY	L26;L69;L27;L14;L40;L70;L10;L29;L43;L41;L11;L65;L58;L16;L64
388	DTVIEVQGY	L11;L10;L52;L29;L49;L26;L19;L65;L1	ASRELKVTF	L53;L52;L43;L26;L54;L58;L27;L65;L16;L55;L13;L69;L56;L44;L70
389	DVLLPLTQY	L11;L10;L17;L29;L6;L31;L26;L14;L12	CQYLNTLTL	L48;L25;L44;L27;L26;L24;L35;L28;L61;L34;L16;L73;L69;L67;L59
390	EAARVVRSI	L20;L10;L47;L49;L32;L19;L69;L70;L64	DAALALLLL	L47;L74;L31;L67;L60;L73;L61;L59;L69;L20;L64;L70;L58;L23;L25
391	EAFEKMVSLL	L20;L10;L11;L69;L70;L31;L23;L74;L32	DAVRDPQTL	L32;L74;L49;L67;L60;L25;L53;L31;L10;L47;L20;L70;L61;L69;L58
392	EAFLIGCNY	L31;L11;L43;L49;L19;L58;L17;L12;L70	DVTDVTQLY	L11;L10;L12;L14;L49;L19;L20;L31;L26;L1;L18;L58;L52;L29;L16
393	EIAIILASF	L11;L10;L20;L26;L40;L19;L41;L43;L23	FAPSASAF	L57;L59;L58;L72;L43;L63;L61;L71;L60;L70;L66;L74;L47;L68;L62
394	ELDSFKEEL	L5;L68;L23;L63;L1;L2;L34;L20;L62	FVDGVPFVV	L5;L63;L68;L2;L67;L20;L58;L62;L69;L32;L73;L50;L1;L64;L61
395	ERSEKSYEL	L35;L66;L65;L25;L34;L23;L64;L28;L20	FVSNGTHWF	L58;L49;L59;L60;L16;L10;L11;L26;L32;L69;L74;L34;L12;L61;L53
396	ESLIDLQEL	L53;L23;L55;L25;L10;L67;L59;L20;L73	GTFTCASEY	L14;L18;L26;L58;L12;L10;L27;L16;L52;L11;L70;L54;L13;L1;L7

397	ETISLAGSY	L11;L10;L14;L1;L12;L20;L19;L40;L18	GTITSGWTF	L53;L52;L54;L10;L55;L11;L26;L27;L58;L16;L34;L9;L12;L60;L8
398	FADDLNQLT	L68;L67;L63;L1;L49;L31;L32;L58;L70	HAASGNLL	L74;L61;L60;L70;L58;L55;L63;L56;L67;L44;L54;L59;L49;L23;L32
399	FLAFLLFLV	L2;L4;L3;L20;L64;L5;L24;L12;L69	HCANFNVLF	L34;L53;L31;L44;L12;L52;L8;L9;L58;L40;L35;L49;L54;L28;L26
400	FLLPSLATV	L3;L2;L4;L5;L59;L50;L47;L23;L24	IAFGGCVFSY	L31;L70;L69;L58;L49;L43;L12;L16;L27;L26;L52;L14;L54;L59;L18
401	FLLVTLAIL	L2;L4;L74;L59;L5;L61;L62;L23;L3	IAIPTNFTI	L70;L47;L54;L67;L8;L69;L61;L49;L32;L52;L53;L34;L68;L55;L9
402	FLTENLLL	L74;L2;L61;L68;L62;L4;L23;L5;L59	KADETQAL	L68;L63;L67;L61;L60;L62;L54;L70;L59;L57;L55;L74;L43;L5;L56
403	FLYIIKLIF	L59;L12;L69;L43;L49;L26;L74;L23;L16	KALNLGETF	L53;L52;L54;L16;L8;L55;L58;L9;L27;L31;L26;L60;L49;L12;L70
404	FLYIIKLIFL	L2;L74;L4;L5;L3;L69;L20;L64;L6	KAPKEIIFL	L74;L57;L53;L69;L64;L63;L58;L44;L56;L5;L73;L70;L66;L61;L68
405	FQVTIAEIL	L44;L69;L67;L58;L28;L61;L34;L35;L60	KHWPQIAQF	L16;L27;L53;L28;L34;L54;L52;L8;L35;L26;L9;L65;L49;L44;L33
406	FSAVGNICY	L43;L58;L70;L1;L18;L69;L59;L52;L26	KPVETSNSF	L54;L49;L39;L31;L56;L32;L27;L22;L16;L8;L51;L53;L9;L26;L65
407	FTEERLKL	L63;L1;L60;L68;L62;L61;L73;L70;L59	KSHKPPISF	L43;L53;L16;L54;L52;L55;L26;L58;L70;L73;L27;L63;L60;L69;L56
408	FTIKGSFL	L58;L60;L61;L59;L74;L70;L63;L55;L73	KVNSTLEQY	L14;L16;L54;L26;L18;L58;L11;L13;L6;L52;L12;L27;L53;L10;L49
409	FTIYSLLL	L61;L73;L60;L1;L59;L70;L67;L55;L58	LATALLTL	L59;L61;L47;L60;L70;L67;L74;L69;L56;L23;L73;L31;L55;L68;L58
410	FVDGVPFV	L63;L68;L62;L5;L2;L58;L74;L1;L47	LLFLVLIML	L5;L74;L4;L2;L3;L6;L64;L59;L69;L56;L44;L23;L26;L31;L62
411	FVKHKHAFL	L23;L58;L74;L60;L63;L20;L61;L59;L69	LTDEMIAQY	L18;L1;L14;L11;L12;L49;L62;L58;L53;L52;L70;L63;L5;L10;L68
412	FVNEFYAY	L59;L12;L66;L43;L29;L26;L14;L1;L58	LTNDNTSRY	L1;L58;L18;L14;L11;L26;L12;L16;L52;L10;L43;L70;L6;L54;L49
413	FVTVYSHLL	L60;L61;L74;L58;L64;L20;L68;L73;L32	NYMPYFFTL	L66;L8;L9;L72;L71;L65;L35;L67;L34;L61;L25;L60;L62;L64;L4

414	FYGGWHNML	L9;L66;L71;L72;L74;L64;L8;L62;L25	RTIKVFTTV	L73;L13;L20;L24;L53;L54;L58;L3;L16;L15;L45;L37;L48;L11;L8
415	FYLCFLAFL	L72;L71;L62;L9;L8;L64;L66;L4;L59	SIIQFPNTY	L26;L58;L12;L43;L11;L16;L69;L10;L14;L59;L29;L6;L27;L7;L3
416	FYLITPVHV	L62;L72;L71;L50;L9;L2;L47;L64;L4	SILSPLYAF	L16;L59;L12;L10;L43;L4;L6;L8;L26;L11;L7;L60;L9;L58;L30
417	FYWFFSNYL	L72;L62;L71;L64;L9;L66;L68;L61;L8	STGYHFREL	L65;L73;L60;L13;L61;L59;L67;L64;L70;L10;L55;L39;L69;L58;L20
418	GDYGDAVVY	L27;L26;L14;L65;L31;L29;L49;L43;L12	STQDLFLPF	L7;L12;L10;L11;L16;L73;L59;L53;L60;L52;L58;L72;L9;L6;L13
419	GETLPTEVL	L36;L37;L45;L41;L29;L44;L40;L46;L28	TIAEILLII	L20;L3;L24;L69;L4;L73;L10;L64;L34;L67;L47;L6;L11;L2;L16
420	GIVGVLTL	L74;L67;L60;L65;L61;L24;L48;L28;L59	TSNQVAVLY	L55;L14;L54;L53;L1;L18;L65;L52;L12;L26;L58;L31;L49;L19;L69
421	GQINDMILSL	L44;L27;L24;L34;L28;L3;L26;L35;L4	TTTIKPVTY	L52;L26;L12;L69;L18;L54;L70;L55;L53;L14;L16;L1;L58;L10;L49
422	GSIPCSVCL	L74;L44;L61;L53;L55;L60;L54;L73;L28	VAFNTLLF	L58;L70;L59;L69;L74;L47;L54;L52;L60;L49;L12;L31;L9;L43;L53
423	GTYEGNSPF	L11;L53;L10;L16;L27;L26;L43;L52;L54	VASLINTL	L70;L59;L74;L67;L60;L68;L47;L61;L69;L23;L57;L64;L55;L63;L58
424	HADQLTPTW	L49;L54;L52;L53;L63;L32;L68;L31;L67	VTIAEILLI	L73;L24;L53;L55;L20;L7;L8;L52;L69;L70;L47;L34;L12;L10;L9
425	HEETIYNLL	L36;L37;L41;L45;L40;L29;L44;L34;L38	VTRELMREL	L13;L55;L64;L70;L73;L53;L60;L58;L59;L10;L39;L52;L43;L69;L61
426	HEIAWYTER	L46;L37;L29;L17;L15;L21;L38;L45;L36	YIIKLIFLW	L12;L54;L10;L49;L52;L16;L69;L4;L58;L9;L8;L24;L11;L74;L19
427	HEVLLAPLL	L29;L37;L36;L41;L40;L45;L33;L28;L44	YLYALVYFL	L2;L4;L74;L64;L3;L5;L69;L67;L20;L44;L24;L73;L62;L61;L66
428	HHANEYRLY	L34;L28;L14;L11;L10;L27;L18;L12;L49	YPDPSRIL	L32;L39;L22;L47;L62;L65;L68;L63;L49;L31;L60;L61;L66;L28;L23
429	HSQLGGLHL	L60;L61;L73;L55;L53;L18;L68;L59;L63	AALTNNVAF	L52;L59;L54;L53;L31;L58;L60;L27;L61;L12;L71;L32;L43;L72;L56;L40
430	HTIDGSSGV	L11;L20;L10;L13;L58;L28;L24;L3;L73	AANTVIWDY	L58;L14;L69;L43;L12;L65;L31;L18;L26;L70;L49;L66;L59;L52;L54;L27

431	HVMSKHTDF	L11;L10;L49;L26;L23;L12;L58;L8;L53	AVRDPQTL	L43;L55;L56;L3;L39;L58;L65;L26;L67;L59;L13;L23;L66;L22;L60;L63
432	IAKNTVKSV	L70;L69;L58;L43;L47;L64;L39;L13;L3	EYADVFHLY	L12;L9;L14;L8;L11;L66;L10;L17;L20;L31;L40;L41;L65;L1;L19;L72
433	IAQYTSAL	L59;L61;L60;L67;L68;L57;L71;L70;L72	FGDDTVIEV	L2;L5;L63;L62;L68;L67;L64;L69;L35;L58;L70;L61;L32;L73;L47;L49
434	ICAPLTVF	L59;L26;L53;L9;L54;L58;L52;L27;L29	FLAFVVFLL	L74;L4;L2;L20;L64;L3;L5;L69;L68;L61;L44;L1;L9;L67;L66;L34
435	IIKLIFLWL	L13;L67;L60;L73;L39;L59;L58;L74;L23	FLNRFTTTL	L74;L3;L5;L4;L2;L57;L59;L43;L61;L32;L68;L26;L62;L44;L64;L60
436	ILDGISQY	L18;L1;L26;L63;L14;L27;L68;L43;L62	FLYLYALVY	L12;L59;L69;L1;L43;L6;L26;L27;L31;L18;L72;L14;L66;L71;L16;L64
437	ILLIIMRTF	L26;L55;L52;L16;L9;L8;L27;L12;L53	FTISVTTEI	L61;L70;L20;L67;L60;L59;L73;L10;L69;L53;L58;L3;L11;L49;L55;L68
438	ILMTARTVY	L26;L18;L16;L43;L12;L14;L27;L72;L1	GEYSHVVAF	L37;L46;L33;L27;L29;L36;L41;L38;L40;L45;L26;L42;L43;L65;L49;L28
439	INITRFQTL	L73;L23;L25;L8;L61;L60;L9;L32;L28	HFIETISL	L72;L71;L23;L62;L35;L25;L48;L44;L8;L28;L61;L37;L67;L29;L59;L43
440	ISMDNSPNL	L61;L60;L53;L73;L70;L54;L63;L58;L68	IADKYVRNL	L63;L68;L74;L60;L32;L67;L61;L58;L70;L49;L64;L62;L5;L47;L65;L69
441	ISNEKQEIL	L73;L54;L53;L60;L67;L61;L55;L63;L70	IAQVDVVNF	L53;L49;L31;L52;L43;L58;L32;L54;L26;L63;L70;L59;L74;L9;L60;L69
442	ISRQRLTKY	L43;L58;L26;L18;L52;L14;L53;L1;L27	ITVEELKKL	L53;L10;L60;L73;L11;L20;L69;L70;L64;L54;L55;L52;L8;L58;L4;L5
443	ITDAVDCAL	L68;L67;L63;L62;L60;L32;L1;L5;L61	KFADDLNQL	L8;L9;L53;L4;L44;L72;L16;L71;L64;L3;L56;L36;L34;L62;L13;L2
444	ITGGVVQL	L70;L73;L67;L53;L65;L64;L54;L63;L74	KQGDDYVYL	L44;L65;L13;L73;L34;L26;L24;L58;L27;L67;L69;L2;L66;L64;L16;L4
445	IVDEPEEHV	L5;L63;L68;L62;L2;L67;L20;L18;L28	KSVNITFEL	L73;L53;L55;L54;L69;L70;L60;L67;L16;L61;L44;L20;L58;L8;L52;L56
446	IVNSVLLF	L74;L54;L58;L73;L52;L49;L12;L62;L26	KTLQPVSEL	L53;L16;L73;L65;L55;L60;L61;L13;L54;L6;L67;L52;L4;L70;L63;L8
447	IWFLLLSV	L48;L47;L50;L25;L59;L45;L33;L46;L62	KTYERHSL	L55;L16;L53;L70;L73;L54;L60;L25;L65;L61;L67;L69;L39;L59;L63;L71

448	KHITSKETL	L34;L28;L35;L44;L36;L8;L27;L16;L53	LAFVVFLLV	L47;L73;L69;L50;L59;L70;L20;L61;L31;L64;L58;L49;L24;L5;L32;L67
449	KIFVDGVPF	L16;L53;L43;L54;L26;L6;L52;L58;L56	LMDGSIIQF	L5;L62;L49;L34;L68;L63;L1;L31;L74;L27;L26;L18;L58;L32;L60;L9
450	KLAKKFDTF	L16;L26;L53;L9;L8;L54;L27;L10;L12	LSDDAVVCF	L63;L68;L62;L53;L1;L58;L54;L60;L49;L52;L70;L74;L5;L18;L69;L34
451	KLLEQWNLV	L2;L4;L5;L3;L16;L73;L24;L6;L13	LSDRVVFVL	L68;L63;L65;L53;L1;L60;L67;L32;L74;L61;L55;L70;L54;L73;L5;L62
452	KLWAQCVQL	L2;L5;L4;L16;L44;L3;L56;L6;L27	LTIKKPNEL	L61;L60;L73;L58;L70;L53;L67;L20;L55;L23;L59;L69;L74;L8;L16;L64
453	KQLIKVTL	L44;L23;L33;L25;L48;L27;L24;L65;L26	LTYTGAIKL	L55;L69;L53;L70;L60;L73;L64;L58;L61;L74;L20;L13;L63;L68;L47;L52
454	KSHNIALIW	L52;L54;L53;L16;L55;L73;L69;L18;L70	LVKPSFYVY	L26;L59;L14;L58;L12;L52;L13;L18;L1;L43;L16;L31;L11;L66;L10;L69
455	KTIQPRVEK	L13;L7;L6;L16;L21;L15;L53;L19;L54	MEIDFLEL	L29;L25;L59;L37;L45;L61;L67;L73;L36;L41;L60;L40;L35;L33;L48;L46
456	KVSIWNLDY	L18;L16;L14;L26;L12;L6;L54;L1;L52	MYASAVVLL	L9;L64;L62;L66;L8;L74;L72;L71;L28;L20;L69;L31;L34;L56;L35;L44
457	LADNKFAL	L68;L63;L60;L67;L61;L23;L59;L32;L62	REVRTIKVF	L37;L40;L29;L41;L36;L27;L33;L45;L38;L46;L52;L26;L65;L8;L53;L44
458	LAIDAYPL	L61;L67;L59;L60;L74;L70;L55;L47;L32	RVDGQVDLF	L54;L63;L18;L53;L62;L52;L74;L5;L14;L16;L1;L68;L58;L12;L49;L34
459	LANTCTERL	L32;L49;L58;L74;L60;L61;L63;L31;L70	SEFSSLPSY	L29;L41;L40;L46;L27;L36;L45;L38;L37;L14;L26;L12;L16;L31;L6;L11
460	LAYYFMRF	L59;L47;L60;L58;L49;L70;L74;L69;L43	SLPINVIVF	L26;L9;L57;L5;L27;L72;L64;L11;L62;L66;L16;L8;L12;L71;L10;L69
461	LEAPFLYL	L29;L45;L74;L61;L33;L59;L36;L37;L25	SSPDDQIGY	L43;L26;L11;L18;L12;L14;L58;L27;L13;L1;L10;L7;L53;L66;L52;L54
462	LEIKDTEKY	L29;L41;L26;L49;L40;L27;L36;L37;L45	TQYNRYLAL	L25;L23;L61;L35;L28;L24;L27;L43;L44;L73;L67;L69;L10;L3;L48;L71
463	LFLAFVVFL	L72;L71;L62;L9;L8;L4;L31;L64;L47	TVYSHLLLV	L73;L3;L64;L47;L24;L20;L69;L6;L4;L58;L11;L5;L2;L48;L51;L7
464	LFLALITL	L71;L72;L47;L62;L56;L23;L25;L8;L59	VAKSHNIAL	L43;L67;L60;L70;L58;L61;L59;L68;L69;L23;L56;L39;L74;L57;L63;L32

465	LLFNKVTL	L23;L56;L4;L25;L2;L44;L26;L74;L59	VENPDILRV	L45;L37;L73;L29;L38;L48;L24;L42;L4;L36;L46;L40;L41;L33;L3;L64
466	LLLLFVTVY	L26;L12;L27;L6;L31;L59;L1;L16;L14	VLLSVLQQL	L4;L2;L5;L3;L74;L8;L44;L16;L56;L6;L9;L24;L53;L39;L55;L59
467	LMNVLTLVY	L18;L26;L31;L1;L12;L43;L59;L16;L14	VVAFNTLLF	L12;L58;L9;L74;L52;L11;L18;L6;L16;L26;L60;L1;L8;L49;L31;L54
468	LPINVIVF	L31;L47;L50;L56;L39;L32;L23;L49;L22	VVFNGVSF	L26;L43;L58;L59;L54;L71;L52;L72;L60;L53;L56;L16;L27;L39;L55;L23
469	LTKGPHEF	L58;L70;L55;L53;L52;L59;L60;L43;L26	YAKPFLNKV	L69;L70;L58;L47;L3;L59;L64;L73;L43;L50;L48;L20;L51;L67;L5;L4
470	LVIGAVIL	L74;L67;L60;L61;L59;L32;L55;L56;L69	YASAVVLLI	L70;L47;L69;L64;L73;L74;L49;L20;L67;L24;L31;L32;L61;L34;L58;L55
471	LVIGFLFL	L74;L60;L61;L73;L59;L67;L20;L58;L47	YTVELGTEV	L20;L58;L61;L67;L70;L73;L69;L11;L64;L5;L2;L10;L59;L50;L60;L45
472	LVNKFLAL	L59;L73;L60;L61;L23;L56;L67;L39;L74	CVADYSVLY	L12;L11;L26;L58;L18;L6;L14;L1;L7;L10;L16;L19;L31;L54;L13;L69;L65
473	LYLQYIRKL	L8;L64;L9;L71;L72;L55;L65;L66;L4	DAFKLNIKL	L20;L74;L32;L47;L58;L69;L70;L31;L25;L44;L49;L19;L53;L64;L29;L56;L11
474	LYSPIFLIV	L64;L73;L9;L47;L69;L8;L50;L20;L66	ELFENKTTL	L23;L20;L2;L3;L10;L11;L4;L44;L5;L25;L26;L16;L24;L34;L35;L8;L56
475	LYYPSARIV	L64;L47;L72;L69;L70;L71;L66;L62;L28	FAMGIIAM	L59;L61;L67;L70;L58;L60;L69;L74;L68;L31;L32;L50;L43;L47;L63;L66;L72
476	MEIDFLELA	L46;L42;L38;L41;L50;L37;L40;L29;L45	FASEAARVV	L69;L70;L64;L61;L58;L59;L47;L67;L32;L73;L50;L31;L57;L49;L68;L60;L63
477	MFDAYVNTF	L62;L34;L9;L72;L71;L49;L32;L68;L8	FLTENLLLY	L12;L1;L6;L2;L18;L59;L3;L11;L69;L26;L14;L4;L16;L64;L5;L49;L10
478	MIAQYTSAL	L61;L10;L60;L28;L59;L3;L57;L67;L74	GWLIVGVAL	L44;L71;L56;L67;L72;L8;L36;L35;L28;L61;L25;L37;L30;L34;L60;L27;L23
479	MMISAGFSL	L61;L60;L28;L35;L8;L34;L32;L4;L72	HAFLCLFLL	L69;L32;L31;L47;L59;L64;L74;L70;L20;L53;L50;L60;L44;L67;L73;L58;L61
480	MSFTVLCL	L65;L69;L70;L74;L73;L48;L61;L59;L60	IAFGGCVF	L59;L58;L70;L60;L54;L69;L31;L43;L47;L61;L52;L27;L26;L53;L49;L74;L55
481	MYTPHTVL	L66;L71;L72;L25;L9;L62;L8;L74;L61	ICAPLTVFF	L9;L58;L53;L52;L69;L31;L34;L12;L8;L74;L26;L54;L49;L64;L27;L40;L62

482	NASFDNFKF	L49;L31;L53;L12;L70;L32;L54;L58;L52	ISDEVARDL	L55;L68;L60;L63;L62;L61;L53;L1;L67;L64;L54;L73;L5;L74;L65;L32;L70
483	NESGLKTIL	L37;L36;L29;L41;L40;L45;L35;L42;L25	KAYKIEELF	L54;L53;L58;L52;L49;L69;L55;L74;L70;L27;L16;L26;L12;L9;L31;L8;L63
484	NLCPFGEVF	L43;L26;L16;L9;L8;L27;L34;L11;L59	KEIDRLNEV	L45;L46;L37;L38;L3;L73;L36;L33;L42;L24;L4;L25;L48;L2;L64;L69;L29
485	NLDYIINLI	L5;L24;L62;L68;L1;L34;L2;L49;L63	KEIKESVQTF	L37;L36;L26;L40;L54;L8;L41;L53;L27;L16;L33;L29;L52;L38;L46;L45;L55
486	NLNESLIDL	L4;L2;L5;L3;L57;L23;L62;L74;L56	KHIDAYKTF	L27;L34;L43;L16;L8;L53;L26;L54;L52;L28;L35;L9;L10;L55;L58;L44;L41
487	NLVIGFLFL	L74;L5;L61;L67;L2;L20;L73;L4;L8	KLVNKFLAL	L73;L23;L16;L5;L4;L6;L3;L2;L61;L44;L8;L67;L59;L10;L13;L57;L56
488	NSHEGKTF	L55;L43;L70;L26;L60;L29;L54;L53;L59	LAILTALRL	L74;L60;L61;L67;L31;L69;L32;L47;L59;L70;L73;L58;L49;L68;L63;L64;L50
489	NSIDAFKL	L55;L70;L60;L54;L73;L67;L69;L35;L61	NIIIWFLLL	L73;L67;L60;L74;L61;L23;L8;L34;L6;L20;L11;L69;L59;L5;L28;L4;L25
490	NSVLLFLAF	L60;L59;L67;L29;L52;L40;L27;L73;L31	NTFTRLQSL	L25;L23;L10;L70;L20;L69;L64;L60;L58;L16;L11;L3;L53;L73;L61;L59;L57
491	NTSNQVAVL	L20;L70;L35;L69;L28;L67;L73;L53;L10	NVLEGSVAY	L12;L11;L26;L31;L10;L14;L27;L16;L43;L6;L29;L71;L13;L7;L72;L49;L54
492	PYPDPSRIL	L66;L9;L8;L64;L72;L71;L65;L62;L57	RIFTIGTVTL	L16;L44;L56;L26;L54;L13;L24;L37;L21;L3;L39;L53;L4;L6;L20;L5;L36
493	QECVRGTTV	L45;L33;L38;L42;L48;L46;L25;L37;L29	RMYIFFASF	L27;L16;L26;L43;L59;L53;L54;L9;L65;L8;L12;L48;L72;L33;L6;L14;L52
494	QKFNGLTVL	L44;L27;L28;L64;L66;L69;L25;L34;L35	RVVFNGVSF	L26;L54;L16;L53;L52;L43;L27;L56;L44;L58;L60;L12;L11;L39;L55;L8;L49
495	QSAPHGVVFL	L73;L53;L69;L20;L74;L55;L64;L70;L61	SAFYILPSI	L47;L69;L70;L20;L48;L50;L49;L59;L32;L64;L4;L67;L31;L3;L58;L24;L52
496	REVRTIKV	L45;L33;L37;L48;L29;L38;L46;L36;L24	SSSSDNIAL	L53;L56;L67;L57;L35;L44;L68;L70;L20;L61;L32;L34;L60;L73;L58;L74;L28
497	RNAPRITF	L54;L65;L27;L33;L53;L26;L55;L52;L16	TAFGLVAEW	L49;L69;L31;L54;L52;L10;L70;L19;L67;L20;L58;L32;L64;L53;L16;L47;L59
498	RPDTRYVLM	L22;L39;L32;L18;L49;L63;L56;L33;L62	TTIQTIVEV	L20;L73;L70;L64;L4;L69;L3;L35;L58;L2;L24;L19;L11;L28;L48;L10;L13

499	RSDVLLPL	L68;L63;L73;L18;L1;L54;L60;L59;L62	VARDLSLQF	L58;L59;L43;L49;L70;L53;L52;L12;L26;L27;L60;L31;L69;L9;L13;L11;L54
500	RSLKVPATV	L73;L54;L53;L55;L24;L13;L48;L52;L16	VPFWITIAY	L43;L31;L49;L50;L51;L26;L12;L27;L56;L29;L32;L39;L69;L72;L22;L47;L6
501	RVDWTIEY	L18;L1;L65;L26;L54;L68;L58;L63;L14	VVYRGTTTY	L26;L43;L11;L58;L27;L14;L10;L6;L12;L49;L16;L59;L54;L18;L52;L53;L69
502	RVLGLKTL	L39;L55;L56;L16;L53;L54;L73;L23;L60	VYDPLQPEL	L62;L9;L67;L66;L8;L68;L5;L63;L72;L28;L71;L60;L74;L64;L61;L1;L34
503	RVWTLMNVL	L16;L44;L53;L65;L13;L56;L73;L68;L39	YCYDTNVL	L59;L25;L67;L61;L66;L71;L35;L72;L60;L70;L28;L69;L47;L64;L48;L68;L58
504	SADAQSFL	L63;L68;L74;L62;L60;L58;L70;L67;L61	YLFDESGEF	L26;L43;L10;L27;L11;L12;L59;L9;L49;L2;L72;L3;L5;L16;L66;L58;L8
505	SEAARVVRS	L42;L46;L33;L38;L40;L29;L41;L45;L37	YTPSKLIEY	L58;L11;L59;L12;L10;L1;L69;L43;L64;L70;L66;L26;L72;L18;L57;L71;L6
506	SEAARVVRSI	L40;L45;L41;L42;L38;L37;L36;L33;L46	AMDEFIERY	L18;L1;L27;L12;L5;L26;L43;L14;L49;L16;L41;L40;L29;L34;L2;L54;L62;L10
507	SELVIGAVI	L45;L41;L36;L40;L37;L42;L29;L38;L48	DSKEGFFTY	L10;L11;L43;L55;L26;L14;L29;L13;L52;L53;L16;L58;L1;L70;L18;L65;L17;L49
508	SEVVLKKL	L29;L37;L45;L25;L33;L41;L48;L36;L40	FADDLNQL	L67;L68;L63;L74;L59;L60;L61;L58;L70;L62;L69;L5;L47;L32;L64;L1;L31;L49
509	SFLPGVYSV	L4;L72;L71;L2;L8;L48;L35;L13;L9	FAVDAAKAY	L59;L70;L58;L61;L43;L31;L69;L60;L67;L49;L12;L10;L71;L66;L72;L32;L14;L64
510	SFYYVWKSY	L13;L71;L43;L72;L27;L14;L12;L26;L69	FTIGTVTL	L61;L67;L60;L59;L70;L58;L69;L74;L20;L73;L68;L71;L63;L53;L55;L62;L54;L72
511	SHFAIGLALY	L12;L14;L41;L40;L34;L27;L31;L18;L6	FTSDYYQLY	L58;L12;L1;L70;L64;L69;L18;L14;L11;L49;L43;L10;L31;L59;L52;L16;L66;L55
512	SLSSTASAL	L57;L4;L28;L3;L44;L2;L74;L56;L72	HANEYRLYL	L73;L32;L61;L60;L67;L70;L69;L74;L58;L49;L59;L65;L57;L64;L63;L31;L68;L43
513	SPIFLIVAA	L51;L50;L22;L32;L42;L31;L56;L38;L39	LAYILFTRF	L49;L59;L31;L47;L60;L52;L58;L53;L69;L12;L74;L43;L70;L26;L27;L50;L32;L61
514	SSGDATTAY	L43;L26;L14;L58;L18;L1;L59;L10;L54	LITGRLQSL	L23;L60;L59;L61;L58;L39;L3;L4;L56;L25;L10;L74;L64;L57;L5;L43;L32;L69
515	SSGVTREL	L59;L65;L60;L61;L73;L70;L43;L55;L48	RLNEVAKNL	L4;L2;L5;L13;L16;L44;L39;L55;L57;L56;L3;L24;L26;L73;L14;L21;L64;L6

516	STDTGVEHV	L63;L18;L68;L1;L20;L62;L5;L58;L2	SIIIGGAKL	L11;L28;L60;L10;L61;L58;L20;L56;L63;L26;L24;L74;L34;L8;L68;L4;L36;L37
517	STFNVPMEK	L7;L13;L6;L19;L20;L69;L17;L73;L21	TLNDLNETL	L4;L2;L5;L34;L16;L3;L8;L26;L68;L57;L44;L35;L32;L9;L20;L24;L62;L56
518	TAAKLMVVI	L47;L70;L69;L49;L32;L20;L67;L53;L64	TTADIVVF	L70;L65;L53;L69;L58;L52;L54;L10;L20;L55;L26;L11;L59;L35;L43;L29;L31;L66
519	TCDGTTFTY	L18;L1;L65;L49;L14;L34;L12;L27;L26	TTLPVNVAF	L53;L52;L54;L16;L31;L8;L12;L9;L20;L59;L26;L35;L60;L55;L6;L11;L40;L10
520	TCFSTQFAF	L35;L16;L9;L34;L40;L27;L12;L8;L65	VRFPNITNL	L66;L64;L65;L25;L30;L35;L34;L74;L3;L28;L69;L4;L60;L44;L8;L9;L61;L70
521	TEVLTEEV	L33;L29;L45;L48;L37;L38;L46;L25;L36	VRIQPGQTF	L34;L30;L43;L26;L8;L9;L35;L66;L28;L65;L27;L53;L52;L49;L58;L60;L12;L54
522	TEVPANSTV	L45;L37;L38;L36;L46;L29;L28;L41;L33	YAFEHIVYG	L70;L69;L58;L64;L61;L47;L59;L49;L67;L74;L31;L60;L20;L32;L50;L43;L73;L3
523	TIDYTEISF	L68;L62;L63;L34;L32;L28;L1;L74;L5	YLITPVHVM	L61;L32;L5;L69;L11;L70;L2;L59;L67;L3;L28;L4;L26;L71;L43;L72;L10;L27
524	TLMNVLTL	L23;L4;L3;L2;L57;L72;L74;L71;L68	YVNTFSSTF	L58;L26;L10;L59;L43;L54;L11;L60;L49;L9;L12;L16;L32;L71;L53;L27;L72;L52
525	TLQPVSELL	L2;L4;L5;L28;L9;L8;L34;L74;L20	AIASEFSSL	L10;L3;L61;L60;L28;L16;L44;L58;L26;L4;L74;L56;L39;L22;L6;L11;L67;L43;L57
526	TMCDIRQLL	L64;L34;L16;L8;L5;L40;L20;L41;L4	FAFPFTIY	L59;L70;L69;L58;L31;L47;L61;L66;L74;L67;L60;L43;L27;L12;L26;L29;L49;L64;L50
527	TPHTVLQAV	L51;L50;L47;L39;L32;L56;L23;L22;L24	FCYMHHMEL	L59;L61;L60;L67;L25;L69;L74;L73;L58;L71;L70;L66;L43;L28;L23;L64;L68;L72;L57
528	TPINLVRDL	L32;L39;L64;L31;L56;L22;L49;L34;L47	FVSEETGTL	L60;L61;L10;L32;L68;L20;L58;L74;L67;L3;L5;L49;L11;L2;L4;L44;L31;L57;L59
529	TPVVQTIEV	L50;L47;L51;L32;L39;L22;L49;L31;L56	FVVEVVDKY	L12;L31;L58;L11;L14;L69;L10;L26;L49;L1;L20;L54;L59;L5;L52;L29;L67;L66;L64
530	TRPLLESEL	L64;L66;L57;L35;L65;L34;L28;L62;L67	GADPIHSL	L68;L63;L67;L60;L74;L61;L70;L23;L32;L55;L62;L59;L54;L35;L58;L49;L69;L28;L66
531	TTYPGQGL	L55;L25;L60;L61;L54;L70;L28;L53;L20	KATEETFKL	L54;L53;L55;L69;L70;L60;L44;L73;L63;L49;L24;L74;L32;L58;L16;L8;L61;L68;L52
532	TVIEVQGY	L11;L26;L10;L43;L14;L29;L54;L12;L55	LALSKGVHF	L59;L58;L52;L60;L31;L12;L49;L53;L61;L47;L74;L54;L32;L9;L8;L43;L63;L70;L50

533	TVVIGTSKF	L11;L26;L10;L49;L52;L54;L16;L58;L53	LVAEWFLAY	L12;L59;L6;L10;L26;L1;L31;L18;L11;L43;L16;L7;L58;L14;L27;L49;L69;L52;L61
534	TYFTQSRNL	L71;L72;L8;L64;L65;L9;L66;L13;L62	LVSDIDITF	L49;L26;L58;L32;L52;L31;L5;L12;L53;L16;L9;L20;L56;L54;L69;L39;L60;L55;L34
535	VADYSVLY	L1;L18;L63;L68;L62;L58;L70;L54;L49	SEVGPEHSL	L37;L36;L29;L40;L41;L45;L28;L44;L32;L42;L38;L67;L34;L65;L33;L56;L35;L46;L61
536	VAELEGIQY	L1;L31;L18;L27;L26;L58;L49;L12;L70	SIIAYTMSL	L43;L60;L61;L4;L58;L10;L3;L28;L73;L74;L59;L71;L16;L72;L67;L5;L22;L57;L69
537	VATAEAEL	L74;L59;L67;L61;L70;L60;L63;L68;L56	SQLGGLHLL	L44;L4;L24;L34;L8;L30;L2;L14;L27;L16;L35;L25;L58;L73;L64;L26;L28;L56;L40
538	VENPTIQKD	L37;L29;L45;L40;L41;L36;L49;L38;L65	STNVTIATY	L14;L43;L11;L26;L10;L18;L16;L58;L65;L54;L12;L52;L27;L49;L1;L53;L7;L6;L70
539	VIYLYLTF	L59;L43;L26;L60;L47;L74;L48;L58;L23	SVVSKVVKV	L20;L73;L69;L3;L4;L58;L11;L2;L64;L13;L5;L24;L10;L63;L51;L49;L19;L7;L45
540	VLIMLIIFW	L4;L69;L74;L2;L12;L5;L3;L9;L6	TTNGDFLHF	L53;L10;L73;L52;L11;L58;L16;L49;L8;L65;L9;L54;L12;L18;L59;L26;L31;L1;L60
541	VLKGVKLHY	L12;L26;L14;L43;L18;L13;L16;L6;L1	AWPLIVTAL	L57;L62;L72;L71;L64;L67;L5;L56;L9;L66;L33;L44;L40;L36;L22;L68;L41;L39;L28;L8
542	VLKKLKKSL	L23;L39;L43;L3;L56;L26;L44;L13;L16	FVCNLLLLF	L12;L58;L69;L11;L74;L59;L31;L52;L64;L5;L62;L34;L60;L73;L49;L53;L10;L9;L1;L16
543	VLTEEVVL	L74;L44;L62;L23;L67;L2;L68;L63;L56	FVFLVLLPL	L59;L67;L61;L74;L60;L20;L69;L64;L73;L31;L68;L6;L50;L5;L4;L58;L3;L47;L2;L32
544	VRSIFSRTL	L64;L65;L66;L25;L35;L28;L34;L55;L30	HLVDFQVTI	L24;L20;L5;L3;L2;L49;L44;L34;L4;L10;L16;L48;L8;L32;L69;L64;L45;L53;L26;L35
545	VSNGTHWF	L58;L54;L70;L55;L59;L60;L43;L74;L26	HSIGFDYVY	L14;L54;L65;L26;L55;L18;L52;L32;L11;L69;L53;L58;L70;L43;L27;L29;L59;L10;L12;L49
546	VSQPFLMDL	L73;L60;L59;L61;L69;L70;L74;L53;L58	IVNGVRRSF	L16;L26;L52;L59;L60;L39;L43;L58;L55;L10;L54;L53;L49;L32;L12;L14;L11;L65;L27;L31
547	VVADAVIKTL	L10;L3;L20;L39;L60;L56;L16;L4;L11	KAIDGGVTR	L15;L19;L21;L17;L43;L54;L67;L7;L61;L69;L53;L55;L13;L58;L52;L70;L49;L60;L44;L27
548	VVIGTSKFY	L14;L58;L26;L12;L11;L13;L43;L27;L10	LLMPILTL	L4;L61;L74;L59;L3;L23;L2;L5;L55;L25;L47;L68;L73;L64;L57;L43;L69;L26;L62;L67
549	VVQQLPETY	L26;L14;L12;L16;L52;L18;L31;L29;L58	LSFKELLVY	L69;L1;L58;L26;L52;L18;L59;L53;L27;L54;L70;L31;L55;L65;L16;L14;L43;L73;L12;L49

550	VYFLQSINF	L9;L72;L71;L8;L62;L12;L66;L26;L27	LWLLWPVTL	L62;L25;L9;L67;L60;L4;L8;L31;L47;L61;L50;L71;L44;L55;L56;L73;L23;L59;L74;L72
551	WRNTNPIQL	L64;L66;L65;L35;L30;L25;L34;L28;L74	NVIPTITQM	L11;L19;L74;L69;L10;L58;L28;L5;L60;L32;L20;L31;L26;L29;L17;L35;L49;L3;L34;L6
552	WTLMNVLTL	L73;L16;L61;L60;L53;L55;L4;L69;L10	QASLNGVTL	L32;L67;L61;L60;L56;L70;L68;L44;L31;L55;L69;L58;L39;L59;L22;L63;L57;L74;L28;L53
553	YAADPAMHA	L61;L50;L69;L58;L60;L59;L70;L43;L67	QSAPHGVVF	L53;L54;L52;L70;L69;L59;L43;L55;L58;L65;L61;L26;L28;L9;L60;L73;L27;L66;L11;L74
554	YADSFVIRG	L74;L32;L63;L49;L68;L69;L58;L70;L67	RTAPHGHVM	L53;L54;L70;L65;L73;L61;L55;L52;L58;L16;L69;L18;L11;L14;L60;L59;L21;L39;L15;L26
555	YANGGKGF	L58;L59;L60;L43;L49;L70;L61;L27;L26	SLIDFYLCF	L43;L26;L11;L12;L10;L8;L59;L16;L5;L9;L27;L6;L69;L3;L49;L4;L34;L2;L74;L72
556	YCIDGALL	L61;L60;L59;L28;L71;L74;L67;L72;L62	SSPDAVTAY	L43;L57;L72;L71;L26;L66;L10;L58;L14;L11;L59;L1;L64;L69;L12;L27;L7;L18;L65;L6
557	YFKYWDQTY	L12;L43;L26;L72;L71;L58;L27;L14;L13	SVGPKQASL	L20;L10;L39;L56;L43;L65;L28;L58;L74;L67;L5;L44;L61;L16;L4;L22;L3;L23;L60;L11
558	YHPNCVNCL	L28;L64;L57;L35;L34;L71;L72;L66;L62	TAQNSVRVL	L70;L32;L69;L61;L60;L64;L31;L59;L39;L67;L28;L58;L55;L68;L56;L57;L65;L72;L66;L47
559	YIFFASFYY	L12;L1;L58;L26;L14;L18;L6;L59;L69	TILDGISQY	L14;L11;L10;L26;L6;L16;L43;L12;L27;L4;L18;L7;L17;L58;L13;L31;L69;L29;L19;L59
560	YIIKLIFL	L74;L58;L23;L59;L60;L73;L61;L67;L69	TLDSKTQSL	L23;L5;L2;L63;L68;L32;L35;L1;L62;L34;L57;L4;L43;L28;L39;L3;L16;L49;L74;L10
561	YLYALVYF	L74;L59;L62;L26;L43;L69;L27;L12;L58	VMVELVAEL	L67;L5;L3;L4;L2;L64;L62;L69;L56;L61;L72;L31;L60;L66;L71;L8;L44;L9;L20;L73
562	YQDVNCTEV	L24;L68;L63;L62;L28;L48;L35;L58;L5	AAYVDNSSL	L43;L61;L67;L68;L70;L60;L59;L69;L58;L57;L53;L63;L32;L44;L56;L72;L31;L74;L54;L26;L28
563	YRVVVLSF	L66;L65;L35;L25;L71;L59;L72;L64;L30	EYHDVRVVL	L66;L8;L71;L72;L9;L35;L20;L32;L62;L44;L67;L34;L25;L17;L41;L65;L56;L39;L13;L23;L64
564	YSTAALGVL	L61;L60;L59;L73;L58;L70;L74;L67;L69	FAIGLALYY	L69;L59;L12;L70;L31;L58;L67;L74;L64;L61;L49;L60;L43;L14;L11;L1;L18;L52;L32;L73;L55
565	YTSNPTTF	L58;L70;L60;L54;L59;L53;L62;L69;L55	HVGEIPVAY	L43;L12;L26;L11;L14;L31;L6;L49;L29;L10;L16;L20;L58;L13;L66;L54;L18;L52;L69;L65;L44

566	YYQLYSTQL	L71;L72;L9;L66;L62;L8;L28;L65;L60	KAYNVTQAF	L59;L43;L54;L58;L53;L69;L70;L49;L52;L16;L27;L60;L61;L26;L55;L31;L12;L56;L72;L71;L14
567	YYRSLPGVF	L66;L9;L8;L72;L62;L71;L12;L58;L27	KLFDRYFKY	L16;L12;L6;L14;L26;L18;L27;L43;L69;L13;L11;L4;L10;L54;L21;L2;L24;L5;L55;L66;L3
568	AALALLLL	L74;L73;L59;L61;L47;L67;L60;L23;L69;L70	KSAPLIEL	L73;L59;L55;L74;L69;L70;L53;L67;L54;L61;L60;L58;L65;L64;L66;L56;L43;L26;L33;L18;L44
569	AEIPKEEV	L45;L37;L33;L38;L46;L42;L36;L29;L48;L23	NSFSGYLKL	L25;L73;L70;L69;L55;L35;L74;L67;L60;L10;L53;L61;L16;L49;L58;L64;L11;L20;L54;L13;L24
570	AEWFLAYIL	L37;L36;L40;L42;L41;L44;L45;L33;L38;L29	SLDNVLSTF	L5;L62;L68;L63;L26;L34;L10;L43;L9;L27;L12;L2;L53;L1;L49;L16;L18;L74;L8;L3;L4
571	AFPFTIYSL	L72;L71;L62;L57;L8;L9;L66;L65;L5;L44	STVFPPTSF	L43;L60;L53;L52;L58;L16;L12;L10;L54;L26;L11;L70;L7;L28;L27;L20;L69;L59;L61;L9;L65
572	AIFYLITPV	L24;L3;L4;L69;L20;L2;L5;L7;L6;L13	TMADLVYAL	L4;L2;L35;L67;L3;L20;L34;L44;L64;L56;L28;L32;L16;L31;L5;L66;L65;L40;L69;L8;L36
573	AVFDKNLY	L14;L18;L26;L12;L1;L65;L16;L58;L54;L6	TVFPPTSF	L26;L43;L29;L58;L16;L54;L59;L74;L52;L23;L28;L65;L69;L55;L25;L60;L31;L62;L53;L12;L72
574	AVKTQFNYY	L13;L14;L26;L58;L12;L10;L6;L18;L11;L1	VMYASAVVL	L67;L25;L69;L28;L72;L71;L61;L35;L44;L31;L60;L66;L62;L70;L56;L39;L68;L74;L47;L64;L27
575	AVTANVNAL	L56;L10;L61;L16;L60;L67;L4;L44;L3;L74	VVFLLVTL	L59;L67;L74;L23;L56;L25;L60;L48;L47;L26;L68;L39;L62;L69;L44;L64;L20;L55;L53;L63;L33
576	CTDDNALAY	L1;L18;L12;L14;L68;L59;L11;L58;L10;L16	YASAVVLL	L74;L69;L70;L67;L64;L58;L61;L60;L47;L63;L31;L59;L73;L62;L56;L68;L49;L23;L32;L66;L20
577	CYFPLQSY	L71;L72;L66;L59;L12;L29;L26;L14;L64;L43	GVYSVIYLY	L12;L14;L6;L7;L11;L26;L58;L18;L24;L27;L16;L13;L10;L49;L55;L54;L52;L1;L65;L19;L53;L69
578	DFYLCFLAF	L25;L72;L9;L71;L29;L59;L47;L12;L8;L11	ILFLALITL	L2;L4;L3;L5;L26;L64;L68;L74;L59;L69;L23;L6;L56;L67;L16;L44;L62;L27;L53;L47;L57;L61
579	DTYPSLETI	L47;L10;L20;L25;L53;L11;L16;L52;L34;L49	KAYKIEEL	L74;L67;L59;L70;L58;L55;L54;L69;L73;L23;L53;L61;L63;L60;L66;L68;L43;L65;L27;L44;L25;L56

580	EAIRHVRAW	L10;L49;L52;L54;L11;L61;L69;L17;L40;L32	LAFLLFLVL	L67;L59;L61;L47;L60;L69;L31;L70;L73;L50;L74;L32;L68;L64;L58;L56;L44;L55;L25;L49;L52;L53
581	EHFIETISL	L34;L28;L35;L25;L23;L20;L44;L27;L10;L41	LANECAQVL	L32;L61;L60;L70;L59;L31;L69;L58;L67;L55;L64;L68;L57;L47;L63;L49;L39;L73;L53;L56;L43;L23
582	EIVDTVSAL	L10;L11;L20;L67;L61;L28;L60;L35;L19;L32	LLADKFPVL	L2;L4;L5;L3;L61;L59;L69;L74;L9;L39;L23;L44;L8;L43;L56;L67;L66;L28;L20;L6;L64;L16
583	ELDERIDKV	L5;L2;L24;L1;L11;L23;L4;L20;L63;L3	SAPPAQYEL	L57;L67;L61;L59;L66;L60;L58;L64;L5;L65;L69;L74;L70;L63;L32;L68;L53;L56;L20;L39;L62;L43
584	FAQDGNAAI	L61;L59;L67;L68;L49;L32;L70;L43;L50;L20	SASKIITL	L74;L70;L58;L69;L23;L56;L61;L32;L67;L60;L64;L39;L59;L44;L53;L63;L73;L68;L49;L47;L35;L66
585	FATSACVL	L61;L74;L67;L70;L59;L60;L69;L58;L55;L68	SHFAIGLAL	L35;L28;L34;L25;L44;L56;L61;L20;L60;L71;L27;L72;L31;L22;L41;L37;L39;L32;L64;L67;L40;L36
586	FAYANRNRFL	L60;L61;L58;L69;L70;L74;L64;L67;L68;L32	SSSDNIALL	L73;L74;L20;L58;L64;L69;L70;L53;L34;L61;L60;L44;L4;L65;L1;L63;L56;L19;L35;L3;L28;L68
587	FCNDPFLGV	L73;L5;L59;L50;L58;L61;L4;L3;L2;L47	SVIYLYLTF	L10;L11;L12;L49;L58;L26;L16;L52;L43;L53;L7;L8;L9;L34;L27;L59;L54;L73;L60;L41;L69;L32
588	FFITGNTL	L72;L71;L62;L61;L59;L60;L67;L9;L8;L68	TLKEILVTY	L43;L26;L3;L14;L13;L12;L10;L11;L27;L16;L69;L6;L4;L2;L23;L5;L49;L18;L58;L55;L17;L15
589	FLAFLLFL	L74;L59;L2;L3;L4;L61;L64;L68;L23;L1	VAFNTLLFL	L69;L74;L60;L58;L59;L61;L70;L67;L47;L73;L64;L31;L68;L53;L4;L20;L44;L63;L56;L57;L49;L32
590	FLHFLPRVF	L69;L59;L64;L43;L26;L12;L62;L27;L74;L66	YADVFHLYL	L67;L68;L74;L59;L61;L60;L63;L32;L70;L62;L1;L73;L58;L69;L5;L49;L31;L64;L57;L18;L47;L34
591	FLMSFTVL	L74;L59;L61;L57;L23;L68;L67;L2;L62;L72	YAFEHIVY	L59;L70;L69;L31;L58;L27;L66;L67;L26;L29;L47;L43;L61;L49;L54;L50;L12;L72;L71;L64;L60;L25
592	FSSEIIGY	L1;L58;L69;L70;L43;L18;L59;L26;L66;L55	ANDPVGFTL	L68;L34;L35;L5;L63;L28;L67;L65;L61;L60;L62;L55;L39;L36;L32;L66;L53;L44;L41;L22;L54;L8;L73

593	FTSDYYQL	L67;L60;L70;L61;L59;L66;L20;L58;L73;L55	FVNEFYAYL	L60;L5;L61;L58;L59;L74;L67;L64;L62;L73;L20;L4;L68;L10;L11;L3;L69;L2;L57;L43;L63;L66;L32
594	FVAAIFYL	L74;L20;L58;L60;L61;L64;L69;L59;L67;L4	FVSDADSTL	L60;L61;L67;L58;L32;L20;L68;L74;L5;L57;L63;L59;L2;L28;L4;L34;L69;L66;L3;L10;L44;L64;L31
595	FVCNLLLL	L74;L59;L67;L60;L73;L61;L68;L64;L62;L58	HAASGNLLL	L74;L32;L44;L61;L70;L67;L69;L58;L73;L49;L64;L31;L60;L53;L20;L34;L56;L54;L35;L63;L68;L11;L28
596	FVFPLNSII	L69;L20;L64;L67;L47;L3;L16;L74;L61;L32	IVAGGIVAI	L20;L3;L10;L24;L49;L11;L67;L39;L4;L16;L64;L28;L53;L34;L32;L19;L51;L6;L68;L74;L2;L69;L26
597	FVLTSHTVM	L61;L59;L71;L60;L32;L31;L74;L72;L67;L58	IVNSVLLFL	L73;L74;L4;L5;L58;L60;L6;L64;L56;L61;L20;L59;L53;L68;L39;L67;L31;L3;L62;L63;L32;L8;L69
598	GAAAYYVGY	L43;L58;L12;L27;L31;L49;L18;L14;L10;L26	SLIDLQEL	L4;L59;L2;L3;L23;L43;L24;L74;L5;L64;L26;L67;L61;L57;L72;L25;L56;L68;L10;L71;L69;L37;L20
599	GLNDNLLEI	L3;L24;L4;L2;L5;L16;L10;L73;L6;L8	VLNDILSRL	L4;L5;L3;L2;L43;L8;L16;L64;L26;L62;L44;L74;L57;L63;L6;L56;L24;L73;L9;L69;L11;L14;L10
600	GRVDGQVDL	L30;L35;L65;L64;L66;L34;L44;L25;L28;L36	VVIPDYNTY	L43;L11;L26;L10;L14;L52;L12;L54;L58;L59;L16;L49;L18;L27;L53;L31;L13;L6;L29;L55;L69;L7;L1
601	GSLPINVIVF	L52;L53;L55;L54;L26;L27;L69;L65;L16;L44	YFFTLLLQL	L71;L72;L64;L69;L9;L8;L4;L62;L73;L59;L3;L67;L44;L31;L61;L60;L34;L12;L58;L35;L25;L20;L74
602	GVYDYLVST	L6;L7;L43;L3;L24;L2;L4;L10;L15;L44	YVYSRVKNL	L74;L60;L64;L61;L58;L69;L23;L25;L3;L10;L4;L73;L39;L67;L49;L20;L11;L5;L59;L32;L70;L47;L16
603	HAEETRKL	L63;L32;L49;L60;L68;L70;L61;L55;L23;L62	DADSKIVQL	L32;L74;L63;L23;L49;L68;L60;L70;L67;L35;L58;L69;L31;L61;L34;L20;L47;L10;L62;L11;L5;L17;L19;L53
604	HAFLCLFL	L74;L69;L59;L70;L60;L47;L61;L67;L73;L25	IIFWFSLEL	L59;L60;L73;L61;L65;L67;L58;L64;L69;L43;L5;L68;L16;L74;L3;L26;L6;L4;L32;L57;L28;L2;L20;L72
605	HFAIGLAL	L72;L71;L25;L35;L23;L28;L61;L59;L62;L67	KSFDLGDEL	L55;L67;L53;L73;L54;L44;L69;L16;L70;L58;L13;L60;L61;L66;L56;L20;L65;L52;L14;L27;L64;L26;L59;L18

606	HVVAFNTL	L60;L20;L67;L25;L56;L59;L61;L10;L23;L29	QSASKIITL	L70;L69;L73;L55;L53;L20;L74;L44;L61;L64;L58;L56;L65;L10;L60;L32;L23;L39;L43;L34;L54;L67;L16;L35
607	IAGLIAIVM	L70;L67;L69;L31;L58;L68;L32;L59;L61;L47	SAFVNLKQL	L69;L59;L60;L70;L58;L64;L61;L56;L74;L32;L25;L44;L10;L73;L31;L39;L3;L49;L4;L13;L47;L20;L57;L53
608	IEDLLFNKV	L45;L46;L29;L37;L38;L42;L36;L33;L5;L62	SAPHGVVFL	L74;L57;L63;L69;L64;L67;L58;L68;L61;L70;L32;L56;L49;L20;L66;L62;L60;L5;L59;L72;L31;L44;L47;L73
609	ILDITPCSF	L62;L68;L63;L43;L5;L18;L1;L74;L9;L26	SAQTGIAVL	L61;L32;L60;L70;L69;L56;L28;L58;L68;L74;L65;L59;L63;L44;L67;L39;L10;L31;L72;L57;L64;L53;L66;L49
610	ISAGFSLWVY	L18;L14;L1;L43;L26;L52;L58;L69;L53;L54	SLLMPILTL	L4;L2;L5;L6;L16;L3;L61;L23;L44;L74;L24;L27;L8;L73;L9;L34;L26;L10;L67;L59;L56;L28;L13;L39
611	ITVATSRTL	L55;L60;L61;L53;L70;L54;L65;L10;L64;L73	VADAVIKTL	L60;L68;L63;L32;L67;L70;L61;L5;L74;L58;L69;L62;L39;L49;L47;L31;L44;L55;L53;L56;L64;L73;L43;L59
612	IVAAIVFITL	L20;L56;L67;L31;L60;L10;L39;L5;L6;L53	YVFCTVNAL	L59;L60;L61;L67;L32;L64;L4;L20;L10;L58;L74;L3;L69;L71;L5;L72;L44;L68;L28;L16;L31;L65;L57;L26
613	IVDTVSAL	L68;L63;L62;L67;L74;L60;L28;L61;L5;L1	AGIVGVLTL	L61;L73;L69;L34;L44;L67;L35;L72;L71;L28;L27;L16;L59;L24;L8;L26;L3;L65;L64;L25;L4;L43;L37;L60;L55
614	KFKEGVEFL	L13;L72;L8;L62;L9;L71;L3;L55;L16;L44	AMYTPHTVL	L25;L61;L28;L67;L44;L56;L27;L68;L69;L71;L72;L35;L26;L66;L36;L60;L70;L39;L65;L59;L22;L16;L3;L8;L74
615	KFLPFQQF	L8;L9;L71;L33;L72;L54;L55;L27;L53;L52	AQLPAPRTL	L44;L55;L61;L27;L73;L4;L26;L16;L64;L28;L35;L69;L24;L48;L25;L60;L34;L3;L40;L30;L13;L66;L41;L8;L67
616	KHADFDTWF	L34;L53;L54;L28;L27;L16;L35;L26;L8;L9	FAFPFTIYSL	L67;L61;L32;L60;L59;L69;L70;L31;L20;L58;L74;L3;L50;L64;L43;L66;L47;L65;L44;L4;L49;L68;L53;L10;L5
617	KLHDELTGH	L3;L6;L2;L4;L26;L24;L21;L43;L16;L5	GVAPGTAVL	L28;L44;L20;L74;L10;L3;L67;L56;L61;L26;L22;L58;L60;L11;L16;L35;L59;L53;L4;L64;L39;L2;L54;L36;L34
618	KLIFLWLLW	L16;L52;L54;L12;L6;L24;L18;L9;L73;L21	HLDGEVITF	L34;L63;L5;L49;L62;L32;L68;L26;L53;L2;L27;L65;L74;L10;L18;L16;L35;L54;L24;L12;L9;L28;L11;L1;L31

619	KLINIIIWFL	L4;L3;L5;L2;L16;L44;L6;L20;L13;L24	KLINIIIWF	L16;L26;L69;L43;L5;L53;L8;L27;L4;L11;L6;L13;L9;L52;L74;L12;L24;L54;L21;L3;L2;L64;L10;L44;L55
620	KLNIKLLGV	L3;L73;L4;L2;L5;L23;L24;L18;L6;L16	KVDGVDVEL	L5;L63;L68;L67;L74;L62;L32;L56;L53;L54;L60;L2;L39;L73;L44;L18;L58;L20;L16;L65;L49;L13;L55;L34;L61
621	KLSYGIATV	L3;L2;L4;L24;L5;L16;L18;L73;L20;L21	QINDMILSL	L73;L4;L65;L43;L16;L61;L5;L69;L3;L10;L23;L60;L39;L64;L68;L59;L58;L66;L32;L11;L6;L35;L57;L72;L67
622	KSYELQTPF	L53;L54;L55;L52;L16;L43;L27;L26;L73;L58	SALEPLVDL	L60;L67;L61;L59;L31;L74;L56;L68;L4;L44;L58;L69;L53;L63;L32;L39;L23;L70;L73;L43;L2;L50;L49;L5;L47
623	KVATVQSKM	L54;L14;L53;L58;L6;L13;L18;L52;L16;L11	YQPYRVVVL	L44;L64;L57;L69;L66;L23;L27;L65;L67;L25;L71;L28;L58;L35;L72;L61;L26;L5;L62;L33;L48;L63;L39;L24;L73
624	LAKDTTEAF	L43;L58;L59;L49;L70;L52;L31;L26;L60;L32	AVASKILGL	L3;L10;L4;L11;L16;L6;L73;L20;L7;L74;L56;L58;L69;L24;L39;L44;L23;L61;L13;L2;L60;L5;L64;L22;L43;L26
625	LAMDEFIER	L17;L59;L15;L19;L31;L7;L61;L21;L60;L69	EAFEKMVSL	L23;L32;L20;L69;L10;L61;L60;L70;L67;L31;L25;L43;L44;L59;L11;L19;L35;L58;L49;L56;L64;L74;L47;L17;L63;L50
626	LATNNLVVM	L70;L59;L69;L58;L61;L31;L32;L60;L50;L47	FVVFLLVTL	L67;L60;L20;L74;L61;L59;L69;L58;L5;L64;L31;L32;L68;L73;L50;L4;L44;L3;L56;L49;L10;L34;L2;L19;L53;L26
627	LNNDYYRSL	L43;L65;L32;L73;L64;L55;L61;L66;L39;L60	HSSGVTREL	L65;L60;L55;L73;L70;L64;L32;L61;L53;L44;L58;L49;L59;L69;L67;L57;L20;L39;L54;L35;L56;L66;L34;L43;L24;L74
628	LPFFSNVTW	L49;L31;L50;L47;L32;L56;L52;L39;L22;L51	LMIERFVSL	L61;L23;L60;L4;L5;L67;L25;L3;L59;L69;L32;L43;L73;L8;L2;L72;L39;L71;L56;L44;L26;L31;L9;L28;L74;L57
629	LPVNVAFEL	L32;L56;L31;L39;L47;L50;L22;L49;L65;L61	TVASLINTL	L20;L4;L10;L3;L64;L34;L16;L35;L28;L32;L56;L44;L74;L69;L19;L67;L39;L11;L53;L49;L58;L31;L26;L55;L24;L2
630	LVDSDLNDF	L1;L68;L49;L63;L5;L53;L62;L58;L31;L52	HVISTSHKL	L11;L32;L10;L24;L20;L44;L60;L54;L49;L58;L53;L8;L63;L28;L34;L35;L73;L74;L61;L16;L13;L14;L37;L67;L5;L55;L39
631	LVQAGNVQL	L56;L32;L39;L60;L4;L28;L20;L31;L61;L74	ITFDNLKTL	L70;L60;L69;L53;L64;L58;L10;L55;L61;L73;L20;L16;L59;L3;L4;L52;L11;L13;L26;L39;L25;L54;L67;L8;L5;L2;L37

632	LYDKLVSSF	L62;L9;L8;L72;L63;L71;L68;L49;L12;L66	SFYEDFLEY	L71;L12;L72;L27;L14;L13;L59;L43;L49;L26;L6;L31;L65;L10;L11;L8;L16;L66;L18;L29;L69;L58;L7;L1;L9;L67;L41
633	MLFTMLRKL	L64;L3;L4;L10;L69;L2;L16;L5;L74;L24	YLATALLTL	L3;L4;L2;L74;L10;L61;L5;L59;L44;L64;L69;L67;L57;L73;L9;L28;L16;L23;L68;L1;L24;L34;L66;L56;L26;L60;L8
634	MLIIFWFSL	L4;L23;L5;L43;L2;L16;L69;L61;L20;L26	VAAIVFITL	L67;L61;L60;L59;L74;L70;L69;L68;L53;L47;L32;L58;L31;L56;L20;L73;L44;L49;L39;L43;L64;L9;L23;L66;L55;L26;L52;L50;L54
635	MVDTSLSGF	L10;L63;L11;L1;L68;L62;L58;L18;L5;L49	KVDGVVQQL	L5;L63;L68;L2;L74;L54;L53;L13;L16;L67;L73;L39;L60;L24;L62;L55;L56;L58;L34;L64;L65;L44;L49;L18;L32;L20;L4;L3;L14;L26
636	NASSSEAFL	L74;L67;L70;L58;L31;L20;L32;L60;L57;L61	ATIPIQASL	L61;L20;L67;L53;L54;L16;L58;L73;L43;L60;L28;L70;L10;L69;L55;L44;L52;L4;L11;L13;L3;L40;L59;L36;L5;L14;L26;L35;L37;L22;L7;L6;L41
637	NELSRVLGL	L25;L33;L40;L41;L37;L23;L45;L36;L29;L8	YITGGVVQL	L74;L60;L2;L61;L58;L4;L67;L3;L69;L44;L20;L64;L73;L28;L63;L56;L68;L32;L59;L10;L34;L5;L35;L49;L11;L26;L39;L65;L66;L70;L43;L19;L16;L24
638	NFKDQVILL	L62;L13;L8;L72;L71;L64;L9;L69;L70;L66	FGADPIHSL	L61;L60;L67;L59;L44;L69;L64;L43;L4;L31;L65;L66;L68;L32;L35;L28;L20;L2;L70;L34;L58;L10;L3;L16;L39;L5;L11;L63;L47;L23;L49;L72;L26;L57;L56

[000224] The viral genome comprises multiple genes encoded by multiple reading frames spanning a single polynucleotide stretch. For example, the nucleocapsid protein is an abundantly expressed protein in 2019 SARS CoV-2 virus. A short protein ORF9b is encoded by another reading frame spanning the region nucleocapsid sequence. These highly expressed proteins expand the number of potential targets for T cell immunity. **Table 1C** and **Table 2B** shows predicted MHC-I binding epitopes and MHC-II binding epitopes from Orf9b respectively.

Table 1C. MHC I–binding Epitopes from Orf9b

Set 1 Peptides	**Set 1 Alleles**	**Set 2 Peptides**	**Set 2 Alleles**
ALRLVDPQI	HLA-A02:04	RMENAVGR	HLA-A31:01; HLA-A74:01
EELPDEFV	HLA-B18:01	SPLSLNMA	HLA-B54:01; HLA-B55:01
ELPDEFVV	HLA-A02:07	TKLATTEEL	HLA-B48:01; HLA-B15:03
EMHPALRL	HLA-B52:01	TPIAVQMTK	HLA-B35:03; HLA-A68:01
GPKVYPII	HLA-B51:01	VDPQIQLAV	HLA-C01:02; HLA-A02:07

GPKVYPIILR	HLA-A31:01	VTRMENAVGR	HLA-A74:01; HLA-A31:01
GRDQNNVGPK	HLA-B27:05	DEFVVVTVK	HLA-B18:01; HLA-B14:02; HLA-A68:01
GRDQNNVGPKV	HLA-B27:05	FQLTPIAV	HLA-B52:01; HLA-B54:01; HLA-B14:02
ILRLGSPL	HLA-C01:02	HPALRLVDP	HLA-B55:01; HLA-B08:01; HLA-B54:01
IQLAVTRM	HLA-B52:01	ISEMHPALRL	HLA-C05:01; HLA-A36:01; HLA-A01:01
ISEMHPALR	HLA-A01:01	KLATTEEL	HLA-C17:01; HLA-A02:01; HLA-A02:03
KTLNSLED	HLA-B58:02	KTLNSLEDK	HLA-A03:01; HLA-A11:01; HLA-A30:01
KTLNSLEDKAF	HLA-B57:01	LEDKAFQLTP	HLA-B41:01; HLA-B50:01; HLA-B45:01
LATTEELPDEF	HLA-B57:01	LVDPQIQLAV	HLA-A02:07; HLA-C08:02; HLA-A01:01
LEDKAFQLT	HLA-B49:01	MHPALRLV	HLA-C06:02; HLA-B51:01; HLA-B52:01
LNMARKTL	HLA-B14:02	PQIQLAVTR	HLA-A74:01; HLA-A31:01; HLA-A68:01
LPDEFVVVTVK	HLA-B35:01	RLVDPQIQLA	HLA-A02:01; HLA-B13:02; HLA-A02:03
LRLGSPLSLN	HLA-B27:05	SPLSLNMAR	HLA-A33:03; HLA-A31:01; HLA-A74:01
LRLGSPLSLNM	HLA-B27:05	TEELPDEF	HLA-B18:01; HLA-B37:01; HLA-C04:01
LRLVDPQIQ	HLA-B27:05	VGPKVYPIIL	HLA-C01:02; HLA-B48:01; HLA-C07:02
LRLVDPQIQL	HLA-B27:05	VYPIILRLG	HLA-A24:02; HLA-C06:02; HLA-A23:01
LSLNMARKT	HLA-B58:02	AFQLTPIAV	HLA-C14:03; HLA-C04:01; HLA-C14:02; HLA-B41:01
NAVGRDQNN	HLA-B53:01	ATTEELPDEF	HLA-B57:01; HLA-B58:01; HLA-B57:03; HLA-A29:02
NMARKTLNSL	HLA-A25:01	DPQIQLAV	HLA-B51:01; HLA-B08:01; HLA-B14:02; HLA-B54:01
NNVGPKVY	HLA-B18:01	EMHPALRLV	HLA-B52:01; HLA-C06:02; HLA-A02:03; HLA-A68:02
NNVGPKVYP	HLA-C07:01	GPKVYPIIL	HLA-B42:01; HLA-B81:01; HLA-B07:02; HLA-B08:01
NSLEDKAF	HLA-B58:02	HPALRLVD	HLA-B08:01; HLA-B55:01; HLA-B14:02; HLA-B54:01
NVGPKVYPI	HLA-A68:02	KVYPIILRLG	HLA-B57:01; HLA-A30:02; HLA-A03:01; HLA-A32:01
NVGPKVYPIIL	HLA-C08:01	TEELPDEFV	HLA-B41:01; HLA-B40:01; HLA-B49:01; HLA-B45:01
NVGPKVYPIILR	HLA-A68:01	TEELPDEFVV	HLA-B41:01; HLA-B40:01; HLA-B45:01; HLA-B49:01
PKVYPIILR	HLA-A68:01	TEELPDEFVVV	HLA-B40:01; HLA-B41:01; HLA-B45:01; HLA-B49:01

QIQLAVTR	HLA-A74:01	ARKTLNSL	HLA-C07:02; HLA-B14:02; HLA-B08:01; HLA-C06:02; HLA-B39:01
QNNVGPKV	HLA-B52:01	ELPDEFVVVTV	HLA-A26:01; HLA-A02:07; HLA-A68:02; HLA-A02:01; HLA-A02:03
QNNVGPKVY	HLA-B18:01	KAFQLTPIAV	HLA-C12:02; HLA-B54:01; HLA-C12:03; HLA-A02:03; HLA-A68:02
RDQNNVGP	HLA-B37:01	LEDKAFQL	HLA-B37:01; HLA-B40:02; HLA-C05:01; HLA-B49:01; HLA-B18:01
RDQNNVGPKVY	HLA-A30:02	LVDPQIQLA	HLA-A02:07; HLA-A01:01; HLA-A36:01; HLA-C05:01; HLA-C08:02
RKTLNSLED	HLA-B15:03	TPIAVQMTKL	HLA-B35:03; HLA-B81:01; HLA-B07:02; HLA-B35:01; HLA-B42:01
RLGSPLSLN	HLA-A03:01	TRMENAVGR	HLA-B27:05; HLA-A68:01; HLA-A33:03; HLA-A31:01; HLA-A74:01
RLGSPLSLNM	HLA-A03:01	ISEMHPAL	HLA-C08:02; HLA-C05:01; HLA-C08:01; HLA-C03:03; HLA-C03:04; HLA-C03:02
TTEELPDEFV	HLA-A68:02	SEMHPALRLV	HLA-B49:01; HLA-B45:01; HLA-B41:01; HLA-B44:02; HLA-B40:02; HLA-B44:03
VGPKVYPII	HLA-B51:01	SLNMARKTL	HLA-C01:02; HLA-A02:04; HLA-A32:01; HLA-B42:01; HLA-B08:01; HLA-A02:03
VGRDQNNV	HLA-B52:01	KVYPIILR	HLA-A74:01; HLA-A31:01; HLA-A03:01; HLA-A11:01; HLA-A33:03; HLA-A68:01; HLA-A30:01
YPIILRLG	HLA-B51:01	MARKTLNSL	HLA-C03:02; HLA-B35:03; HLA-C02:02; HLA-C17:01; HLA-C12:03; HLA-C03:03; HLA-C01:02
YPIILRLGS	HLA-B54:01	SLEDKAFQL	HLA-A02:04; HLA-A02:01; HLA-A02:07; HLA-C05:01; HLA-B08:01; HLA-B42:01; HLA-C08:02
YPIILRLGSP	HLA-B54:01	DEFVVVTV	HLA-B18:01; HLA-B52:01; HLA-B14:02; HLA-B51:01; HLA-B49:01; HLA-B37:01; HLA-B40:02; HLA-B08:01
YPIILRLGSPL	HLA-B07:02	EELPDEFVV	HLA-B45:01; HLA-B40:02; HLA-B44:02; HLA-B18:01; HLA-B41:01; HLA-B49:01; HLA-B44:03; HLA-B40:01
DQNNVGPKV	HLA-B13:02; HLA-B52:01	IAVQMTKL	HLA-C17:01; HLA-C03:03; HLA-C03:04; HLA-C05:01; HLA-C12:03; HLA-B51:01; HLA-C08:01; HLA-C03:02
DQNNVGPKVY	HLA-B15:01; HLA-A30:02	LPDEFVVVT	HLA-B35:01; HLA-B35:03; HLA-B54:01; HLA-B53:01; HLA-B51:01; HLA-B42:01; HLA-B81:01; HLA-B55:01
EDKAFQLTP	HLA-B45:01; HLA-B50:01	LPDEFVVVTV	HLA-B54:01; HLA-B51:01; HLA-B35:03; HLA-A02:07; HLA-B35:01; HLA-B42:01; HLA-B53:01; HLA-B55:01

EELPDEFVVVT	HLA-B44:03; HLA-B44:02	EELPDEFVVV	HLA-B45:01; HLA-B44:02; HLA-B50:01; HLA-B40:02; HLA-B44:03; HLA-B49:01; HLA-B18:01; HLA-B41:01; HLA-B40:01
GPKVYPIILRL	HLA-B81:01; HLA-B42:01	RLGSPLSL	HLA-C17:01; HLA-C15:02; HLA-B58:02; HLA-C01:02; HLA-A02:03; HLA-A32:01; HLA-B81:01; HLA-B48:01; HLA-A02:04
GRDQNNVGP	HLA-B39:01; HLA-B27:05	SEMHPALRL	HLA-B40:02; HLA-B40:01; HLA-B49:01; HLA-B44:03; HLA-B44:02; HLA-B18:01; HLA-B37:01; HLA-B45:01; HLA-B41:01
IILRLGSPL	HLA-C03:03; HLA-C03:04	ELPDEFVVV	HLA-A02:07; HLA-A68:02; HLA-B13:02; HLA-A02:01; HLA-A26:01; HLA-C01:02; HLA-A02:03; HLA-A25:01; HLA-A02:04; HLA-C06:02
ILRLGSPLSL	HLA-A02:03; HLA-B07:02	LVDPQIQL	HLA-C17:01; HLA-C05:01; HLA-C08:02; HLA-A02:07; HLA-C08:01; HLA-A01:01; HLA-C03:03; HLA-C04:01; HLA-C03:04; HLA-B15:09
KAFQLTPIA	HLA-C12:02; HLA-B54:01	TTEELPDEF	HLA-A01:01; HLA-C04:01; HLA-B57:03; HLA-A29:02; HLA-B57:01; HLA-C05:01; HLA-A36:01; HLA-B35:01; HLA-B53:01; HLA-B38:01
KISEMHPALR	HLA-A74:01; HLA-A03:01	VYPIILRL	HLA-C14:03; HLA-C04:01; HLA-C07:02; HLA-A24:02; HLA-C14:02; HLA-A23:01; HLA-C06:02; HLA-B52:01; HLA-B51:01; HLA-C01:02
KISEMHPALRL	HLA-C15:02; HLA-A32:01	LRLGSPLSL	HLA-B14:02; HLA-B39:01; HLA-B27:05; HLA-C07:02; HLA-C07:01; HLA-C06:02; HLA-C03:04; HLA-B38:01; HLA-C03:03; HLA-B15:09; HLA-C08:01
MDPKISEM	HLA-B37:01; HLA-C01:02	KISEMHPAL	HLA-A02:04; HLA-C08:01; HLA-A32:01; HLA-A02:07; HLA-C15:02; HLA-C01:02; HLA-C03:03; HLA-C03:04; HLA-C07:02; HLA-A02:01; HLA-C03:02; HLA-B42:01
NSLEDKAFQL	HLA-B58:02; HLA-B57:03	LPDEFVVV	HLA-B51:01; HLA-B54:01; HLA-B42:01; HLA-C04:01; HLA-B55:01; HLA-B35:03; HLA-C08:02; HLA-C05:01; HLA-B08:01; HLA-A02:07; HLA-B53:01; HLA-B07:02
QLTPIAVQM	HLA-A02:07; HLA-A02:04	RLVDPQIQL	HLA-A02:01; HLA-A02:07; HLA-B48:01; HLA-A32:01; HLA-A30:01; HLA-A02:04; HLA-A03:01; HLA-B15:01; HLA-C07:01; HLA-B81:01; HLA-C17:01; HLA-B15:03; HLA-B40:01; HLA-B13:02; HLA-A23:01; HLA-A02:03; HLA-A68:02; HLA-B40:02; HLA-B57:03; HLA-B42:01;

			HLA-C15:02; HLA-C12:02; HLA-C03:04
-	-	KVYPIILRL	HLA-A32:01;HLA-C06:02;HLA-C15:02;HLA-C12:02;HLA-A02:04;HLA-A68:02;HLA-C17:01;HLA-B13:02;HLA-A02:03;HLA-A02:07;HLA-B57:03;HLA-A03:01;HLA-C07:01;HLA-B58:01;HLA-C02:02;HLA-A26:01;HLA-C08:01;HLA-C03:03;HLA-A30:01;HLA-B57:01;HLA-A02:01;HLA-A29:02;HLA-B58:02;HLA-B48:01;HLA-C03:04;HLA-A23:01;HLA-B81:01;HLA-B46:01;HLA-B15:01;HLA-C12:03;HLA-B42:01;HLA-A25:01;HLA-A36:01;HLA-B53:01;HLA-A11:01;HLA-A30:02;HLA-C07:02;HLA-B15:03;HLA-B14:02;HLA-B55:01;HLA-C05:01;HLA-B40:02;HLA-B52:01

Table 1D. (Tables 1A-B Allele key)

Allele	Alias	Allele	Alias	Allele	Alias	Allele	Alias
HLA-A01:01	L1	HLA-A68:01	L19	HLA-B40:02	L37	HLA-B58:02	L55
HLA-A02:01	L2	HLA-A68:02	L20	HLA-B41:01	L38	HLA-B81:01	L56
HLA-A02:03	L3	HLA-A74:01	L21	HLA-B42:01	L39	HLA-C01:02	L57
HLA-A02:04	L4	HLA-B07:02	L22	HLA-B44:02	L40	HLA-C02:02	L58
HLA-A02:07	L5	HLA-B08:01	L23	HLA-B44:03	L41	HLA-C03:02	L59
HLA-A03:01	L6	HLA-B13:02	L24	HLA-B45:01	L42	HLA-C03:03	L60
HLA-A11:01	L7	HLA-B14:02	L25	HLA-B46:01	L43	HLA-C03:04	L61
HLA-A23:01	L8	HLA-B15:01	L26	HLA-B48:01	L44	HLA-C04:01	L62
HLA-A24:02	L9	HLA-B15:03	L27	HLA-B49:01	L45	HLA-C05:01	L63
HLA-A25:01	L10	HLA-B15:09	L28	HLA-B50:01	L46	HLA-C06:02	L64
HLA-A26:01	L11	HLA-B18:01	L29	HLA-B51:01	L47	HLA-C07:01	L65
HLA-A29:02	L12	HLA-B27:05	L30	HLA-B52:01	L48	HLA-C07:02	L66
HLA-A30:01	L13	HLA-B35:01	L31	HLA-B53:01	L49	HLA-C08:01	L67
HLA-A30:02	L14	HLA-B35:03	L32	HLA-B54:01	L50	HLA-C08:02	L68
HLA-A31:01	L15	HLA-B37:01	L33	HLA-B55:01	L51	HLA-C12:02	L69
HLA-A32:01	L16	HLA-B38:01	L34	HLA-B57:01	L52	HLA-C12:03	L70
HLA-A33:03	L17	HLA-B39:01	L35	HLA-B57:03	L53	HLA-C14:02	L71
HLA-A36:01	L18	HLA-B40:01	L36	HLA-B58:01	L54	HLA-C14:03	L72
-	-	-	-	-	-	HLA-C15:02	L73
-	-	-	-	--	-	HLA-C17:01	L74

Table 2Ai. Peptides and Alleles

	Set 1	Set 1	Set 2	Set 2
	Peptide	**Allele**	**Peptide**	**Allele**
1	RGPEQTQGNFGDQELI RQGTDYKHW	M51	QSSYIVDSVTVKNGSI HLYFDKAGQ	M36;M12;M48;M36;M12;M 48
2	GPEQTQGNFGDQELIR QGTDYKHWP	M51	SRILGAGCFVDDIVKT DGTLMIERF	M9;M10;M6;M63;M8;M11
3	LLNVPLHGTILTRPLLE SELVIGAV	M28	RILGAGCFVDDIVKTD GTLMIERFV	M9;M10;M6;M63;M8;M11
4	TSSIVITSGDGTTSPISE HDYQIGG	M28	AALALLLLDRLNQLE SKMSGKGQQQ	M58;M10;M53;M51;M17;M 11
5	NILLNVPLHGTILTRPL LESELVIG	M28	DAALALLLLDRLNQL ESKMSGKGQQ	M58;M10;M53;M51;M17;M 11
6	VTSSIVITSGDGTTSPIS EHDYQIG	M28	SLRLIDAMMFTSDLA TNNLVVMAYI	M50;M36;M44;M50;M36;M 44
7	SSIVITSGDGTTSPISEH DYQIGGY	M28	RLIDAMMFTSDLATN NLVVMAYITG	M50;M36;M44;M50;M36;M 44
8	SVTSSIVITSGDGTTSPI SEHDYQI	M28	LRLIDAMMFTSDLAT NNLVVMAYIT	M50;M36;M44;M50;M36;M 44
9	ILLNVPLHGTILTRPLL ESELVIGA	M28	LIDAMMFTSDLATNN LVVMAYITGG	M50;M36;M44;M50;M36;M 44
10	VPLHGTILTRPLLESEL VIGAVILR	M28	YPDPSRILGAGCFVDD IVKTDGTLM	M12;M57;M63;M8;M9;M20
11	SIVITSGDGTTSPISEHD YQIGGYT	M28	PDPSRILGAGCFVDDI VKTDGTLMI	M12;M57;M63;M8;M9;M20
12	LNVPLHGTILTRPLLES ELVIGAVI	M28	PTESIVRFPNITNLCPF GEVFNATR	M21;M28;M66;M45;M48;M 41
13	IVITSGDGTTSPISEHD YQIGGYTE	M28	VNVSLVKPSFYVYSR VKNLNSSRVP	M40;M71;M12;M16;M33;M 8
14	NVPLHGTILTRPLLESE LVIGAVIL	M28	IVNVSLVKPSFYVYSR VKNLNSSRV	M40;M71;M12;M16;M33;M 8
15	FVSGNCDVVIGIVNNT VYDPLQPEL	M72	CTGYREGYLNSTNVT IATYCTGSIP	M48;M14;M8;M48;M14;M8
16	VATEGALNTPKDHIGT RNPANNAAI	M72	IADYNYKLPDDFTGC VIAWNSNNLD	M13;M12;M14;M29;M38;M 67
17	TFVSGNCDVVIGIVNN TVYDPLQPE	M72	ATPSDFVRATATIPIQ ASLPFGWLI	M14;M34;M29;M45;M33;M 9
18	NTFVSGNCDVVIGIVN NTVYDPLQP	M72	ITREVGFVVPGLPGTI LRTTNGDFL	M1;M12;M6;M1;M12;M6
19	IWVATEGALNTPKDHI GTRNPANNA	M72	GDISGINASVVNIQKEI DRLNEVAK	M28;M14;M70;M80;M35;M 47
20	WVATEGALNTPKDHI GTRNPANNAA	M72	DISGINASVVNIQKEID RLNEVAKN	M28;M14;M70;M80;M35;M 47
21	TEGALNTPKDHIGTRN PANNAAIVL	M72	DGGCINANQVIVNNL DKSAGFPFNK	M73;M58;M50;M33;M51;M 17
22	VSGNCDVVIGIVNNTV YDPLQPELD	M72	YDGGCINANQVIVNN LDKSAGFPFN	M73;M58;M50;M33;M51;M 17
23	ATEGALNTPKDHIGTR NPANNAAIV	M72	NLHSSRLSFKELLVYA ADPAMHAAS	M48;M57;M36;M41;M49;M 20
24	KHFFFAQDGNAAISDY DYYRYNLPT	M67	MLDMYSVMLTNDNT SRYWEPEFYEA	M64;M7;M34;M61;M36;M2 2

25	FFAQDGNAAISDYDY YRYNLPTMCD	M67	HMLDMYSVMLTNDN TSRYWEPEFYE	M64;M7;M34;M61;M36;M2 2
26	YQIGGYTEKWESGVK DCVVLHSYFT	M67	KPSKRSFIEDLLFNKV TLADAGFIK	M73;M44;M63;M67;M11;M 47
27	HFFFAQDGNAAISDYD YYRYNLPTM	M67	DPSKPSKRSFIEDLLF NKVTLADAG	M73;M44;M63;M67;M11;M 47
28	DYQIGGYTEKWESGV KDCVVLHSYF	M67	PSKPSKRSFIEDLLFN KVTLADAGF	M73;M44;M63;M67;M11;M 47
29	FFFAQDGNAAISDYDY YRYNLPTMC	M67	SKPSKRSFIEDLLFNK VTLADAGFI	M73;M44;M63;M67;M11;M 47
30	SHFAIGLALYYPSARIV YTACSHAA	M5	GMEVTPSGTWLTYTG AIKLDDKDPN	M19;M41;M8;M35;M11;M2 3
31	HFAIGLALYYPSARIV YTACSHAAV	M5	RTIKVFTTVDNINLHT QVVDMSMTY	M51;M26;M67;M51;M26;M 67
32	SDYDYYRYNLPTMCD IRQLLFVVEV	M74	GSLAATVRLQAGNAT EVPANSTVLS	M55;M51;M10;M55;M51;M 10
33	LLNKHIDAYKTFPPTE PKKDKKKKA	M41	PINLVRDLPQGFSALE PLVDLPIGI	M31;M34;M45;M36;M52;M 47
34	LNKHIDAYKTFPPTEP KKDKKKKAD	M41	DSYYSLLMPILTLTRA LTAESHVDT	M12;M16;M58;M8;M17;M1 5
35	ILLNKHIDAYKTFPPTE PKKDKKKK	M41	CFDKFKVNSTLEQYV FCTVNALPET	M40;M29;M6;M50;M18;M4 4
36	RQGTDYKHWPQIAQF APSASAFFGM	M82	FDKFKVNSTLEQYVF CTVNALPETT	M40;M29;M6;M50;M18;M4 4
37	IRQGTDYKHWPQIAQF APSASAFFG	M82	QDVNLHSSRLSFKELL VYAADPAMH	M53;M38;M48;M57;M36;M 20
38	QGTDYKHWPQIAQFA PSASAFFGMS	M82	PFGEVFNATRFASVY AWNRKRISNC	M19;M55;M25;M53;M2;M2 0
39	LAATKMSECVLGQSK RVDFCGKGYH	M27	FGEVFNATRFASVYA WNRKRISNCV	M19;M55;M25;M53;M2;M2 0
40	APATVCGPKKSTNLV KNKCVNFNFN	M27	QALNTLVKQLSSNFG AISSVLNDIL	M53;M6;M45;M15;M46;M2 2
41	CGPKKSTNLVKNKCV NFNFNGLTGT	M27	NRKRISNCVADYSVL YNSASFSTFK	M7;M74;M67;M27;M15;M4 4
42	VCGPKKSTNLVKNKC VNFNFNGLTG	M27	KYLPIDKCSRIIPARAR VECFDKFK	M13;M28;M14;M29;M33;M 26
43	ANLAATKMSECVLGQ SKRVDFCGKG	M27	LKYLPIDKCSRIIPARA RVECFDKF	M13;M28;M14;M29;M33;M 26
44	SFELLHAPATVCGPKK STNLVKNKC	M27	YLPIDKCSRIIPARARV ECFDKFKV	M13;M28;M14;M29;M33;M 26
45	LLHAPATVCGPKKSTN LVKNKCVNF	M27	ALKYLPIDKCSRIIPAR ARVECFDK	M13;M28;M14;M29;M33;M 26
46	FELLHAPATVCGPKKS TNLVKNKCV	M27	LPIDKCSRIIPARARVE CFDKFKVN	M13;M28;M14;M29;M33;M 26
47	NLAATKMSECVLGQS KRVDFCGKGY	M27	DGVYFASTEKSNIIRG WIFGTTLDS	M64;M24;M10;M6;M45;M2 2
48	TVCGPKKSTNLVKNK CVNFNFNGLT	M27	VVDSYYSLLMPILTLT RALTAESHV	M58;M16;M8;M17;M15;M3 9
49	ATVCGPKKSTNLVKN KCVNFNFNGL	M27	VDSYYSLLMPILTLTR ALTAESHVD	M58;M16;M8;M17;M15;M3 9

50	HAPATVCGPKKSTNL VKNKCVNFNF	M27	HTNCYDYCIPYNSVT SSIVITSGDG	M12;M29;M45;M43;M62;M 42
51	PATVCGPKKSTNLVK NKCVNFNFNG	M27	GEIKDATPSDFVRATA TIPIQASLP	M9;M34;M45;M33;M8;M11
52	ELLHAPATVCGPKKST NLVKNKCVN	M27	YRGTTTYKLNVGDYF VLTSHTVMPL	M16;M34;M43;M42;M39;M 44
53	LHAPATVCGPKKSTNL VKNKCVNFN	M27	IYNDKVAGFAKFLKT NCCRFQEKDE	M4;M73;M55;M78;M79;M8
54	YYRRATRRIRGGDGK MKDLSPRWYF	M60	KKPRQKRTATKAYN VTQAFGRRGPE	M19;M70;M78;M5;M25;M2
55	TRRIRGGDGKMKDLSP RWYFYYLGT	M60	PPGDQFKHLIPLMYK GLPWNVVRIK	M56;M12;M1;M60;M18;M3 9
56	YRRATRRIRGGDGKM KDLSPRWYFY	M60	FCTQLNRALTGIAVE QDKNTQEVFA	M28;M14;M70;M67;M27;M 20
57	ATRRIRGGDGKMKDL SPRWYFYYLG	M60	SFCTQLNRALTGIAVE QDKNTQEVF	M28;M14;M70;M67;M27;M 20
58	RATRRIRGGDGKMKD LSPRWYFYYL	M60	CTQLNRALTGIAVEQ DKNTQEVFAQ	M28;M14;M70;M67;M27;M 20
59	RRATRRIRGGDGKMK DLSPRWYFYY	M60	TQLNRALTGIAVEQD KNTQEVFAQV	M28;M14;M70;M67;M27;M 20
60	YFTQSRNLQEFKPRSQ MEIDFLELA	M75	FLKKDAPYIVGDVVQ EGVLTAVVIP	M7;M30;M14;M7;M30;M14
61	LTNDNTSRYWEPEFYE AMYTPHTVL	M75	TPSGTWLTYTGAIKL DDKDPNFKDQ	M10;M7;M41;M8;M35;M11
62	RVIHFGAGSDKGVAPG TAVLRQWLP	M13	YRAFDIYNDKVAGFA KFLKTNCCRF	M4;M55;M7;M78;M79;M41
63	FTQSRNLQEFKPRSQM EIDFLELAM	M75	RAFDIYNDKVAGFAK FLKTNCCRFQ	M4;M55;M7;M78;M79;M41
64	KKKADETQALPQRQK KQQTVTLLPA	M13	TTCFSVAALTNNVAF QTVKPGNFNK	M73;M1;M29;M6;M22;M59
65	PTEPKKDKKKKADET QALPQRQKKQ	M13	CFSVAALTNNVAFQT VKPGNFNKDF	M73;M1;M29;M6;M22;M59
66	KADETQALPQRQKKQ QTVTLLPAAD	M13	TCFSVAALTNNVAFQ TVKPGNFNKD	M73;M1;M29;M6;M22;M59
67	DKKKKADETQALPQR QKKQQTVTLL	M13	LSYFIASFRLFARTRS MWSFNPETN	M64;M40;M16;M30;M8;M1 5
68	KKADETQALPQRQKK QQTVTLLPAA	M13	WLSYFIASFRLFARTR SMWSFNPET	M64;M40;M16;M30;M8;M1 5
69	EPKKDKKKKADETQA LPQRQKKQQT	M13	SYFIASFRLFARTRSM WSFNPETNI	M64;M40;M16;M30;M8;M1 5
70	TEPKKDKKKKADETQ ALPQRQKKQQ	M13	FIASFRLFARTRSMWS FNPETNILL	M64;M40;M16;M30;M8;M1 5
71	KKKKADETQALPQRQ KKQQTVTLLP	M13	YFIASFRLFARTRSM WSFNPETNIL	M64;M40;M16;M30;M8;M1 5
72	KKDKKKKADETQALP QRQKKQQTVT	M13	ALDISASIVAGGIVAIV VTCLAYYF	M22;M12;M14;M22;M12;M 14
73	KDKKKKADETQALPQ RQKKQQTVTL	M13	LDISASIVAGGIVAIVV TCLAYYFM	M22;M12;M14;M22;M12;M 14
74	PKKDKKKKADETQAL PQRQKKQQTV	M13	FDTFNGECPNFVFPLN SIIKTIQPR	M19;M45;M61;M19;M45;M 61

75	TQSRNLQEFKPRSQME IDFLELAMD	M75	NVAKYTQLCQYLNTL TLAVPYNMRV	M78;M34;M48;M41;M8;M4 9
76	QSRNLQEFKPRSQMEI DFLELAMDE	M75	MNVAKYTQLCQYLN TLTLAVPYNMR	M78;M34;M48;M41;M8;M4 9
77	PEFYEAMYTPHTVLQ AVGACVLCNS	M75	DADSKIVQLSEISMDN SPNLAWPLI	M7;M36;M49;M7;M36;M49
78	SRNLQEFKPRSQMEID FLELAMDEF	M75	GDKSVYYTSNPTTFH LDGEVITFDN	M50;M45;M44;M50;M45;M 44
79	LHLLIGLAKRFKESPFE LEDFIPMD	M3;M20	RGDKSVYYTSNPTTF HLDGEVITFD	M50;M45;M44;M50;M45;M 44
80	SGVKDCVVLHSYFTSD YYQLYSTQL	M3;M20	IASFRLFARTRSMWSF NPETNILLN	M64;M40;M16;M30;M8;M4 2
81	GLHLLIGLAKRFKESPF ELEDFIPM	M3;M20	FDIYNDKVAGFAKFL KTNCCRFQEK	M4;M73;M55;M7;M78;M79
82	FGRRGPEQTQGNFGD QELIRQGTDY	M51;M63	TTIKPVTYKLDGVVC TEIDPKLDNY	M36;M6;M59;M36;M6;M59
83	RRGPEQTQGNFGDQE LIRQGTDYKH	M51;M63	SVAALTNNVAFQTVK PGNFNKDFYD	M73;M1;M25;M29;M6;M59
84	GRRGPEQTQGNFGDQ ELIRQGTDYK	M51;M63	KLSYGIATVREVLSDR ELHLSWEVG	M7;M5;M6;M49;M11;M59
85	TVSCLPFTINCQEPKLG SLVVRCSF	M50;M51	SGFKLKDCVMYASA VVLLILMTART	M33;M12;M14;M33;M12;M 14
86	NYTVSCLPFTINCQEP KLGSLVVRC	M50;M51	GFKLKDCVMYASAV VLLILMTARTV	M33;M12;M14;M33;M12;M 14
87	GNYTVSCLPFTINCQE PKLGSLVVR	M50;M51	SLSGFKLKDCVMYAS AVVLLILMTA	M33;M12;M14;M33;M12;M 14
88	VSCLPFTINCQEPKLGS LVVRCSFY	M50;M51	LSGFKLKDCVMYASA VVLLILMTAR	M33;M12;M14;M33;M12;M 14
89	YTVSCLPFTINCQEPKL GSLVVRCS	M50;M51	DLLIRKSNHNFLVQA GNVQLRVIGH	M12;M14;M70;M12;M14;M 70
90	GTSPARMAGNGGDAA LALLLLDRLN	M51;M13	LLIRKSNHNFLVQAG NVQLRVIGHS	M12;M14;M70;M12;M14;M 70
91	TSPARMAGNGGDAAL ALLLLDRLNQ	M51;M13	LIRKSNHNFLVQAGN VQLRVIGHSM	M12;M14;M70;M12;M14;M 70
92	PLSAPTLVPQEHYVRIT GLYPTLNI	M51;M69	TQQLIRAAEIRASANL AATKMSECV	M64;M40;M12;M48;M22;M 23
93	SPARMAGNGGDAALA LLLLDRLNQL	M51;M13	QALPQRQKKQQTVTL LPAADLDDFS	M54;M14;M60;M29;M26;M 39
94	FYYLGTGPEAGLPYGA NKDGIIWVA	M12;M6	FLNRFTTTLNDFNLV AMKYNYEPLT	M14;M63;M66;M14;M63;M 66
95	YFYYLGTGPEAGLPYG ANKDGIIWV	M12;M6	WFLNRFTTTLNDFNL VAMKYNYEPL	M14;M63;M66;M14;M63;M 66
96	ELKHFFFAQDGNAAIS DYDYYRYNL	M36;M67	DRWFLNRFTTTLNDF NLVAMKYNYE	M14;M63;M66;M14;M63;M 66
97	LKHFFFAQDGNAAISD YDYYRYNLP	M36;M67	NGDRWFLNRFTTTLN DFNLVAMKYN	M14;M63;M66;M14;M63;M 66
98	SVMLTNDNTSRYWEP EFYEAMYTPH	M36;M22	GDRWFLNRFTTTLND FNLVAMKYNY	M14;M63;M66;M14;M63;M 66
99	KEGQINDMILSLLSKG RLIIRENNR	M55;M19	VINGDRWFLNRFTTT LNDFNLVAMK	M14;M63;M66;M14;M63;M 66

100	EGQINDMILSLLSKGR LIIRENNRV	M55;M19	RWFLNRFTTTLNDFN LVAMKYNYEP	M14;M63;M66;M14;M63;M 66
101	LKEGQINDMILSLLSK GRLIIRENN	M55;M19	INGDRWFLNRFTTTL NDFNLVAMKY	M14;M63;M66;M14;M63;M 66
102	KNHTSPDVDLGDISGI NASVVNIQK	M80;M45	LIRAAEIRASANLAAT KMSECVLGQ	M4;M64;M40;M48;M22;M2 3
103	IVQMLSDTLKNLSDRV VFVLWAHGF	M36;M61	QLIRAAEIRASANLAA TKMSECVLG	M4;M64;M40;M48;M22;M2 3
104	KIVQMLSDTLKNLSDR VVFVLWAHG	M36;M61	KCSRIIPARARVECFD KFKVNSTLE	M28;M10;M50;M33;M9;M4 4
105	PHEFCSQHTMLVKQG DDYVYLPYPD	M29;M14	CSRIIPARARVECFDK FKVNSTLEQ	M28;M10;M50;M33;M9;M4 4
106	HEFCSQHTMLVKQGD DYVYLPYPDP	M29;M14	TVLPPLLTDEMIAQYT SALLAGTIT	M7;M38;M48;M41;M49;M2 6
107	TGPEAGLPYGANKDGI IWVATEGAL	M57;M14	VLPPLLTDEMIAQYTS ALLAGTITS	M7;M38;M48;M41;M49;M2 6
108	GYTEKWESGVKDCVV LHSYFTSDYY	M67;M14	LKITEEVGHTDLMAA YVDNSSLTIK	M63;M14;M70;M63;M14;M 70
109	SYSLFDMSKFPLKLRG TAVMSLKEG	M67;M14	NFRVQPTESIVRFPNIT NLCPFGEV	M21;M28;M48;M41;M26;M 22
110	IGGYTEKWESGVKDC VVLHSYFTSD	M67;M14	FRVQPTESIVRFPNITN LCPFGEVF	M21;M28;M48;M41;M26;M 22
111	YSLFDMSKFPLKLRGT AVMSLKEGQ	M67;M14	KGYGCSCDQLREPML QSADAQSFLN	M33;M12;M45;M33;M12;M 45
112	QIGGYTEKWESGVKD CVVLHSYFTS	M67;M14	RELMRELNGGAYTRY VDNNFCGPDG	M63;M14;M41;M63;M14;M 41
113	GGYTEKWESGVKDCV VLHSYFTSDY	M67;M14	MRELNGGAYTRYVD NNFCGPDGYPL	M63;M14;M41;M63;M14;M 41
114	DGIIWVATEGALNTPK DHIGTRNPA	M72;M6	LMRELNGGAYTRYV DNNFCGPDGYP	M63;M14;M41;M63;M14;M 41
115	IIWVATEGALNTPKDH IGTRNPANN	M72;M6	ELMRELNGGAYTRY VDNNFCGPDGY	M63;M14;M41;M63;M14;M 41
116	GIIWVATEGALNTPKD HIGTRNPAN	M72;M6	RELNGGAYTRYVDN NFCGPDGYPLE	M63;M14;M41;M63;M14;M 41
117	HSQLGGLHLLIGLAKR FKESPFELE	M19;M61	LSPRWYFYYLGTGPE AGLPYGANKD	M32;M12;M31;M6;M68;M5 2
118	DFSHSQLGGLHLLIGL AKRFKESPF	M19;M61	TSLSGFKLKDCVMYA SAVVLLILMT	M75;M12;M14;M75;M12;M 14
119	FSHSQLGGLHLLIGLA KRFKESPFE	M19;M61	TNNTFTLKGGAPTKV TFGDDTVIEV	M63;M11;M12;M63;M11;M 12
120	GDFSHSQLGGLHLLIG LAKRFKESP	M19;M61	NTFTLKGGAPTKVTF GDDTVIEVQG	M63;M11;M12;M63;M11;M 12
121	SHSQLGGLHLLIGLAK RFKESPFEL	M19;M61	NNTFTLKGGAPTKVT FGDDTVIEVQ	M63;M11;M12;M63;M11;M 12
122	YGDFSHSQLGGLHLLI GLAKRFKES	M19;M61	VTNNTFTLKGGAPTK VTFGDDTVIE	M63;M11;M12;M63;M11;M 12
123	TDNTFVSGNCDVVIGI VNNTVYDPL	M72;M12	TDLMAAYVDNSSLTI KKPNELSRVL	M63;M9;M44;M63;M9;M44
124	TTDNTFVSGNCDVVIG IVNNTVYDP	M72;M12	RQKKQQTVTLLPAAD LDDFSKQLQQ	M54;M14;M60;M46;M26;M 39

125	ITTDNTFVSGNCDVVIGIVNNTVYD	M72;M12	MPSYCTGYREGYLNSTNVTIATYCT	M49;M45;M8;M49;M45;M8
126	DNTFVSGNCDVVIGIVNNTVYDPLQ	M72;M12	TTEMLAKALRKVPTDNYITTYPGQG	M48;M14;M49;M48;M14;M49
127	DAVVYRGTTTYKLNVGDYFVLTSHT	M42;M44	TEMLAKALRKVPTDNYITTYPGQGL	M48;M14;M49;M48;M14;M49
128	AVVYRGTTTYKLNVGDYFVLTSHTV	M42;M44	TETDLTKGPHEFCSQHTMLVKQGDD	M30;M6;M18;M43;M42;M39
129	DLKFPRGQGVPINTNSSPDDQIGYY	M73;M44	YHKNNKSWMESEFRVYSSANNCTFE	M70;M5;M2;M48;M41;M82
130	KFPRGQGVPINTNSSPDDQIGYYRR	M73;M44	ELTGHMLDMYSVMLTNDNTSRYWEP	M64;M31;M34;M61;M36;M22
131	EDLKFPRGQGVPINTNSSPDDQIGY	M73;M44	MESEFRVYSSANNCTFEYVSQPFLM	M64;M5;M2;M48;M41;M82
132	LKFPRGQGVPINTNSSPDDQIGYYR	M73;M44	KNNKSWMESEFRVYSSANNCTFEYV	M64;M5;M2;M48;M41;M82
133	FPRGQGVPINTNSSPDDQIGYYRRA	M73;M44	NKSWMESEFRVYSSANNCTFEYVSQ	M64;M5;M2;M48;M41;M82
134	PRGQGVPINTNSSPDDQIGYYRRAT	M73;M44	KSWMESEFRVYSSANNCTFEYVSQP	M64;M5;M2;M48;M41;M82
135	GDAVVYRGTTTYKLNVGDYFVLTSH	M9;M44	NNKSWMESEFRVYSSANNCTFEYVS	M64;M5;M2;M48;M41;M82
136	RTCCLCDRRATCFSTASDTYACWHH	M4;M72	SWMESEFRVYSSANNCTFEYVSQPF	M64;M5;M2;M48;M41;M82
137	CDRRATCFSTASDTYACWHHSIGFD	M4;M72	WMESEFRVYSSANNCTFEYVSQPFL	M64;M5;M2;M48;M41;M82
138	LCDRRATCFSTASDTYACWHHSIGF	M4;M72	GLPWNVVRIKIVQMLSDTLKNLSDR	M61;M57;M36;M46;M9;M20
139	CLCDRRATCFSTASDTYACWHHSIG	M4;M72	KGLPWNVVRIKIVQMLSDTLKNLSD	M61;M57;M36;M46;M9;M20
140	CCLCDRRATCFSTASDTYACWHHSI	M4;M72	YKGLPWNVVRIKIVQMLSDTLKNLS	M61;M57;M36;M46;M9;M20
141	TCCLCDRRATCFSTASDTYACWHHS	M4;M72	DDYIATNGPLKVGGSCVLSGHNLAK	M80;M29;M14;M80;M29;M14
142	QVILLNKHIDAYKTFPPTEPKKDKK	M41;M14	VNARLRAKHYVYIGDPAQLPAPRTL	M40;M31;M1;M30;M37;M57
143	VILLNKHIDAYKTFPPTEPKKDKKK	M41;M14	VVNARLRAKHYVYIGDPAQLPAPRT	M40;M31;M1;M30;M37;M57
144	LPKGFYAEGSRGGSQASSRSSSRSR	M5;M45	LFTRFFYVLGLAAIMQLFFSYFAVH	M5;M48;M45;M5;M48;M45
145	TLPKGFYAEGSRGGSQASSRSSSRS	M5;M45	FTRFFYVLGLAAIMQLFFSYFAVHF	M5;M48;M45;M5;M48;M45
146	TKVDGVDVELFENKTTLPVNVAFEL	M29;M48	ASYQTQTNSPRRARSVASQSIIAYT	M31;M5;M2;M6;M50;M18
147	YTKVDGVDVELFENKTTLPVNVAFE	M29;M48	TVGQQDGSEDNQTTTIQTIVEVQPQ	M14;M28;M59;M14;M28;M59
148	QILPDPSKPSKRSFIEDLLFNKVTL	M63;M67	VGQQDGSEDNQTTTIQTIVEVQPQL	M14;M28;M59;M14;M28;M59
149	ILPDPSKPSKRSFIEDLLFNKVTLA	M63;M67	SEDNQTTTIQTIVEVQPQLEMELTP	M14;M28;M59;M14;M28;M59

150	QSKRVDFCGKGYHLM SFPQSAPHGV	M1;M52	DGSEDNQTTTIQTIVE VQPQLEMEL	M14;M28;M59;M14;M28;M 59
151	LGQSKRVDFCGKGYH LMSFPQSAPH	M1;M52	QQDGSEDNQTTTIQTI VEVQPQLEM	M14;M28;M59;M14;M28;M 59
152	GQSKRVDFCGKGYHL MSFPQSAPHG	M1;M52	QDGSEDNQTTTIQTIV EVQPQLEME	M14;M28;M59;M14;M28;M 59
153	LIIKNLSKSLTENKYSQ LDEEQPME	M11;M28	GSEDNQTTTIQTIVEV QPQLEMELT	M14;M28;M59;M14;M28;M 59
154	IIKNLSKSLTENKYSQL DEEQPMEI	M11;M28	GQQDGSEDNQTTTIQ TIVEVQPQLE	M14;M28;M59;M14;M28;M 59
155	GVDVELFENKTTLPVN VAFELWAKR	M29;M28	VSTSGRWVLNNDYY RSLPGVFCGVD	M33;M39;M44;M33;M39;M 44
156	VDVELFENKTTLPVNV AFELWAKRN	M29;M28	NLQHRLYECLYRNRD VDTDFVNEFY	M6;M2;M59;M35;M52;M47
157	DVELFENKTTLPVNVA FELWAKRNI	M29;M28	KATNNAMQVESDDYI ATNGPLKVGG	M29;M11;M44;M29;M11;M 44
158	ELFENKTTLPVNVAFE LWAKRNIKP	M29;M28	CNVDRYPANSIVCRF DTRVLSNLNL	M5;M2;M48;M50;M18;M9
159	LFENKTTLPVNVAFEL WAKRNIKPV	M29;M28	NCNVDRYPANSIVCR FDTRVLSNLN	M5;M2;M48;M50;M18;M9
160	VELFENKTTLPVNVAF ELWAKRNIK	M29;M28	NVDRYPANSIVCRFD TRVLSNLNLP	M5;M2;M48;M50;M18;M9
161	VAAGLEAPFLYLYAL VYFLQSINFV	M54;M12	ATLPKGIMMNVAKYT QLCQYLNTLT	M73;M58;M78;M34;M11;M 44
162	LVAAGLEAPFLYLYAL VYFLQSINF	M54;M12	LGLAAIMQLFFSYFA VHFISNSWLM	M48;M9;M45;M48;M9;M45
163	IVLQLPQGTTLPKGFY AEGSRGGSQ	M75;M45	GISQYSLRLIDAMMFT SDLATNNLV	M57;M36;M54;M57;M36;M 54
164	AIVLQLPQGTTLPKGF YAEGSRGGS	M75;M45	ISQYSLRLIDAMMFTS DLATNNLVV	M57;M36;M54;M57;M36;M 54
165	VLQLPQGTTLPKGFYA EGSRGGSQA	M75;M45	SQYSLRLIDAMMFTS DLATNNLVVM	M57;M36;M54;M57;M36;M 54
166	LQLPQGTTLPKGFYAE GSRGGSQAS	M75;M45	SNNLDSKVGGNYNYL YRLFRKSNLK	M71;M16;M1;M37;M18;M1 5
167	AATKMSECVLGQSKR VDFCGKGYHL	M1;M27	NSNNLDSKVGGNYN YLYRLFRKSNL	M71;M16;M1;M37;M18;M1 5
168	GGNYNYLYRLFRKSN LKPFERDIST	M1;M37	WNSNNLDSKVGGNY NYLYRLFRKSN	M71;M16;M1;M37;M18;M1 5
169	RVYSTGSNVFQTRAG CLIGAEHVNN	M75;M8	NNLDSKVGGNYNYL YRLFRKSNLKP	M71;M16;M1;M37;M18;M1 5
170	WRVYSTGSNVFQTRA GCLIGAEHVN	M75;M8	CPLIAAVITREVGFVV PGLPGTILR	M32;M63;M12;M32;M63;M 12
171	VYSTGSNVFQTRAGCL IGAEHVNNS	M75;M8	DLFLPFFSNVTWFHAI HVSGTNGTK	M29;M45;M49;M15;M46;M 26
172	YSTGSNVFQTRAGCLI GAEHVNNSY	M75;M8	QDLFLPFFSNVTWFH AIHVSGTNGT	M29;M45;M49;M15;M46;M 26
173	STGSNVFQTRAGCLIG AEHVNNSYE	M75;M8	TQDLFLPFFSNVTWF HAIHVSGTNG	M29;M45;M49;M15;M46;M 26
174	TWRVYSTGSNVFQTR AGCLIGAEHV	M75;M8	YDKLQFTSLEIPRRNV ATLQAENVT	M28;M6;M38;M27;M59;M2 0

175	SANLAATKMSECVLG QSKRVDFCGK	M4;M27	DLYDKLQFTSLEIPRR NVATLQAEN	M28;M6;M38;M27;M59;M2 0
176	ASANLAATKMSECVL GQSKRVDFCG	M4;M27	LYDKLQFTSLEIPRRN VATLQAENV	M28;M6;M38;M27;M59;M2 0
177	RASANLAATKMSECV LGQSKRVDFC	M4;M27	LSTDGNKIADKYVRN LQHRLYECLY	M54;M60;M57;M27;M44;M 20
178	HPTQAPTHLSVDTKFK TEGLCVDIP	M7;M35	ALLSTDGNKIADKYV RNLQHRLYEC	M54;M60;M57;M27;M44;M 20
179	LHPTQAPTHLSVDTKF KTEGLCVDI	M7;M35	LLSTDGNKIADKYVR NLQHRLYECL	M54;M60;M57;M27;M44;M 20
180	TQAPTHLSVDTKFKTE GLCVDIPGI	M7;M35	STDGNKIADKYVRNL QHRLYECLYR	M54;M60;M57;M27;M44;M 20
181	PTQAPTHLSVDTKFKT EGLCVDIPG	M7;M35	DEISMATNYDLSVVN ARLRAKHYVY	M19;M25;M50;M18;M33;M 26
182	TGLHPTQAPTHLSVDT KFKTEGLCV	M7;M35	FDEISMATNYDLSVV NARLRAKHYV	M19;M25;M50;M18;M33;M 26
183	GLHPTQAPTHLSVDTK FKTEGLCVD	M7;M35	MYSFVSEETGTLIVNS VLLFLAFVV	M56;M73;M50;M18;M11;M 44
184	SIVCRFDTRVLSNLNLP GCDGGSLY	M5;M2	GVSICSTMTNRQFHQ KLLKSIAATR	M64;M1;M60;M30;M37;M2 2
185	TLMIERFVSLAIDAYPL TKHPNQEY	M5;M2	VSICSTMTNRQFHQK LLKSIAATRG	M64;M1;M60;M30;M37;M2 2
186	AAEASKKPRQKRTAT KAYNVTQAFG	M5;M2	VSFCYMHHMELPTGV HAGTDLEGNF	M43;M6;M28;M43;M6;M28
187	ANSIVCRFDTRVLSNL NLPGCDGGS	M5;M2	DGYPLECIKDLLARA GKASCTLSEQ	M64;M12;M28;M64;M12;M 28
188	NSIVCRFDTRVLSNLN LPGCDGGSL	M5;M2	WDYPKCDRAMPNML RIMASLVLARK	M21;M12;M41;M46;M39;M 23
189	LMIERFVSLAIDAYPLT KHPNQEYA	M5;M2	MFDAYVNTFSSTFNV PMEKLKTLVA	M28;M8;M70;M28;M8;M70
190	QHRLYECLYRNRDVD TDFVNEFYAY	M6;M59	FDAYVNTFSSTFNVP MEKLKTLVAT	M28;M8;M70;M28;M8;M70
191	LYECLYRNRDVDTDF VNEFYAYLRK	M6;M59	VKMFDAYVNTFSSTF NVPMEKLKTL	M28;M8;M70;M28;M8;M70
192	VCRLMKTIGPDMFLGT CRRCPAEIV	M6;M37	KMFDAYVNTFSSTFN VPMEKLKTLV	M28;M8;M70;M28;M8;M70
193	RLYECLYRNRDVDTD FVNEFYAYLR	M6;M59	DAYVNTFSSTFNVPM EKLKTLVATA	M28;M8;M70;M28;M8;M70
194	HRLYECLYRNRDVDT DFVNEFYAYL	M6;M59	LPTGVHAGTDLEGNF YGPFVDRQTA	M6;M28;M37;M6;M28;M37
195	PQIITTDNTFVSGNCDV VIGIVNNT	M12;M23	MELPTGVHAGTDLEG NFYGPFVDRQ	M6;M28;M37;M6;M28;M37
196	MPNLYKMQRMLLEKC DLQNYGDSAT	M12;M23	HMELPTGVHAGTDLE GNFYGPFVDR	M6;M28;M37;M6;M28;M37
197	FIKGLNNLNRGMVLGS LAATVRLQA	M12;M12	ELPTGVHAGTDLEGN FYGPFVDRQT	M6;M28;M37;M6;M28;M37
198	SDLATNNLVVMAYIT GGVVQLTSQW	M12;M12	IGAGICASYQTQTNSP RRARSVASQ	M19;M31;M70;M25;M50;M 18
199	YFIKGLNNLNRGMVL GSLAATVRLQ	M12;M12	PIGAGICASYQTQTNS PRRARSVAS	M19;M31;M70;M25;M50;M 18

200	IDKCSRIIPARARVECFDKFKVNST	M33;M28	CTNYMPYFFTLLLQLCTFTRSTNSR	M25;M29;M19;M25;M29;M19
201	RFYRLANECAQVLSEMVMCGGSLYV	M79;M28	TNYMPYFFTLLLQLCTFTRSTNSRI	M25;M29;M19;M25;M29;M19
202	FYRLANECAQVLSEMVMCGGSLYVK	M79;M28	SMATNYDLSVVNARLRAKHYVYIGD	M19;M25;M37;M50;M18;M26
203	NSYECDIPIGAGICASYQTQTNSPR	M28;M70	MATNYDLSVVNARLRAKHYVYIGDP	M19;M25;M37;M50;M18;M26
204	QIHTIDGSSGVVNPVMEPIYDEPTT	M38;M28	NARDGCVPLNIIPLTTAAKLMVVIP	M22;M19;M24;M22;M19;M24
205	HVQIHTIDGSSGVVNPVMEPIYDEP	M38;M28	NNARDGCVPLNIIPLTTAAKLMVVI	M22;M19;M24;M22;M19;M24
206	EHVQIHTIDGSSGVVNPVMEPIYDE	M38;M28	GPLKVGGSCVLSGHNLAKHCLHVVG	M80;M14;M37;M80;M14;M37
207	HTIDGSSGVVNPVMEPIYDEPTTTT	M38;M28	VAIVVTCLAYYFMRFRRAFGEYSHV	M71;M6;M16;M71;M6;M16
208	EEHVQIHTIDGSSGVVNPVMEPIYD	M38;M28	GTGTIYTELEPPCRFVTDTPKGPKV	M6;M2;M59;M6;M2;M59
209	IHTIDGSSGVVNPVMEPIYDEPTTT	M38;M28	DGTGTIYTELEPPCRFVTDTPKGPK	M6;M2;M59;M6;M2;M59
210	VQIHTIDGSSGVVNPVMEPIYDEPT	M38;M28	TGTIYTELEPPCRFVTDTPKGPKVK	M6;M2;M59;M6;M2;M59
211	PDDQIGYYRRATRRIRGGDGKMKDL	M71;M16	EFLKRGDKSVYYTSNPTTFHLDGEV	M50;M22;M44;M50;M22;M44
212	SPDDQIGYYRRATRRIRGGDGKMKD	M71;M16	FLKRGDKSVYYTSNPTTFHLDGEVI	M50;M22;M44;M50;M22;M44
213	PINTNSSPDDQIGYYRRATRRIRGG	M55;M71	ETKFLTENLLLYIDINGNLHPDSAT	M50;M36;M70;M50;M36;M70
214	INTNSSPDDQIGYYRRATRRIRGGD	M55;M71	EETKFLTENLLLYIDINGNLHPDSA	M50;M36;M70;M50;M36;M70
215	TNILLNVPLHGTILTRPLLESELVI	M73;M28	EWSMATYYLFDESGEFKLASHMYCS	M52;M36;M23;M52;M36;M23
216	PETNILLNVPLHGTILTRPLLESEL	M73;M28	MATYYLFDESGEFKLASHMYCSFYP	M52;M36;M23;M52;M36;M23
217	ETNILLNVPLHGTILTRPLLESELV	M73;M28	WSMATYYLFDESGEFKLASHMYCSF	M52;M36;M23;M52;M36;M23
218	PLEFGATSAALQPEEEQEEDWLDDD	M28;M28	SMATYYLFDESGEFKLASHMYCSFY	M52;M36;M23;M52;M36;M23
219	LEFGATSAALQPEEEQEEDWLDDDS	M28;M28	LKKRWQLALSKGVHFVCNLLLLFVT	M50;M33;M8;M42;M11;M23
220	EFGATSAALQPEEEQEEDWLDDDSQ	M28;M28	EQYVFCTVNALPETTADIVVFDEIS	M40;M29;M38;M6;M18;M49
221	IQTIVEVQPQLEMELTPVVQTIEVN	M28;M28	LEQYVFCTVNALPETTADIVVFDEI	M40;M29;M38;M6;M18;M49
222	FGLYKNTCVGSDNVTDFNAIATCDW	M28;M59	ARIVYTACSHAAVDALCEKALKYLP	M28;M60;M29;M38;M67;M49
223	TIQTIVEVQPQLEMELTPVVQTIEV	M28;M28	TFTRSTNSRIKASMPTTIAKNTVKS	M33;M11;M14;M33;M11;M14
224	TTIQTIVEVQPQLEMELTPVVQTIE	M28;M28	FTRSTNSRIKASMPTTIAKNTVKSV	M33;M11;M14;M33;M11;M14

225	FGATSAALQPEEEQEE DWLDDDSQQ	M28;M28	IGIVNNTVYDPLQPEL DSFKEELDK	M70;M34;M63;M72;M59;M 47
226	FVNEFYAYLRKHFSM MILSDDAVVC	M57;M71	VNNTVYDPLQPELDS FKEELDKYFK	M70;M34;M63;M72;M59;M 47
227	VNEFYAYLRKHFSMM ILSDDAVVCF	M57;M71	IVNNTVYDPLQPELDS FKEELDKYF	M70;M34;M63;M72;M59;M 47
228	ATRGATVVIGTSKFYG GWHNMLKTV	M72;M17	GIVNNTVYDPLQPEL DSFKEELDKY	M70;M34;M63;M72;M59;M 47
229	AATRGATVVIGTSKFY GGWHNMLKT	M72;M17	GYPNMFITREEAIRHV RAWIGFDVE	M64;M32;M14;M57;M69;M 20
230	TRGATVVIGTSKFYGG WHNMLKTVY	M72;M17	CLWSTKPVETSNSFD VLKSEDAQGM	M39;M6;M41;M39;M6;M41
231	KVVKVTIDYTEISFML WCKDGHVET	M71;M67	QAMTQMYKQARSED KRAKVTSAMQT	M25;M19;M74;M25;M19;M 74
232	NLLLDKRTTCFSVAAL TNNVAFQTV	M29;M22	AMTQMYKQARSEDK RAKVTSAMQTM	M25;M19;M74;M25;M19;M 74
233	SGNLLLDKRTTCFSVA ALTNNVAFQ	M29;M22	DQAMTQMYKQARSE DKRAKVTSAMQ	M25;M19;M74;M25;M19;M 74
234	GNLLLDKRTTCFSVAA LTNNVAFQT	M29;M22	RHVICTSEDMLNPNY EDLLIRKSNH	M29;M72;M28;M29;M72;M 28
235	ATVVIGTSKFYGGWH NMLKTVYSDV	M18;M72	HVICTSEDMLNPNYE DLLIRKSNHN	M29;M72;M28;M29;M72;M 28
236	QINDMILSLLSKGRLII RENNRVVI	M55;M9	RQVVNVVTTKIALKG GKIVNNWLKQ	M57;M29;M12;M57;M29;M 12
237	AQDGNAAISDYDYYR YNLPTMCDIR	M67;M74	NVVTTKIALKGGKIV NNWLKQLIKV	M57;M11;M12;M57;M11;M 12
238	QDGNAAISDYDYYRY NLPTMCDIRQ	M67;M74	VNVVTTKIALKGGKI VNNWLKQLIK	M57;M11;M12;M57;M11;M 12
239	FAQDGNAAISDYDYY RYNLPTMCDI	M67;M74	TDPYEDFQENWNTKH SSGVTRELMR	M44;M61;M74;M44;M61;M 74
240	VLSNLNLPGCDGGSLY VNKHAFHTP	M11;M73	ERSEAGVCVSTSGRW VLNNDYYRSL	M38;M24;M44;M38;M24;M 44
241	RVLSNLNLPGCDGGSL YVNKHAFHT	M11;M73	RSEAGVCVSTSGRWV LNNDYYRSLP	M38;M24;M44;M38;M24;M 44
242	TRVLSNLNLPGCDGGS LYVNKHAFH	M11;M73	CERSEAGVCVSTSGR WVLNNDYYRS	M38;M24;M44;M38;M24;M 44
243	EFYAYLRKHFSMMILS DDAVVCFNS	M57;M13	SEAGVCVSTSGRWVL NNDYYRSLPG	M38;M24;M44;M38;M24;M 44
244	RNRATRVECTTIVNGV RRSFYVYAN	M29;M29	TCERSEAGVCVSTSG RWVLNNDYYR	M38;M24;M44;M38;M24;M 44
245	YKRNRATRVECTTIVN GVRRSFYVY	M29;M29	LTYNKVENMTPRDLG ACIDCSARHI	M14;M67;M74;M14;M67;M 74
246	ADETQALPQRQKKQQ TVTLLPAADL	M13;M29	MLTYNKVENMTPRD LGACIDCSARH	M14;M67;M74;M14;M67;M 74
247	KRNRATRVECTTIVNG VRRSFYVYA	M29;M29	PLKLRGTAVMSLKEG QINDMILSLL	M54;M60;M6;M67;M49;M5 9
248	VNVAFELWAKRNIKP VPEVKILNNL	M66;M74	YPNASFDNFKFVCDNI KFADDLNQL	M64;M25;M19;M64;M25;M 19
249	CEEEEFEPSTQYEYGT EDDYQGKPL	M67;M67	DLGDELGTDPYEDFQ ENWNTKHSSG	M44;M61;M70;M44;M61;M 70

250	NINLHTQVVDMSMTY GQQFGPTYLD	M67;M67	GDELGTDPYEDFQEN WNTKHSSGVT	M44;M61;M70;M44;M61;M 70
251	FGWLIVGVALLAVFQS ASKIITLKK	M26;M61	FDLGDELGTDPYEDF QENWNTKHSS	M44;M61;M70;M44;M61;M 70
252	GWLIVGVALLAVFQS ASKIITLKKR	M26;M61	SFDLGDELGTDPYED FQENWNTKHS	M44;M61;M70;M44;M61;M 70
253	LNTLTLAVPYNMRVIH FGAGSDKGV	M5;M70	LGDELGTDPYEDFQE NWNTKHSSGV	M44;M61;M70;M44;M61;M 70
254	NTLTLAVPYNMRVIHF GAGSDKGVA	M5;M70	SVTSNYSGVVTTVMF LARGIVFMCV	M29;M38;M14;M29;M38;M 14
255	TLTLAVPYNMRVIHFG AGSDKGVAP	M5;M70	ENMTPRDLGACIDCS ARHINAQVAK	M64;M67;M14;M64;M67;M 14
256	TLAVPYNMRVIHFGA GSDKGVAPGT	M5;M70	NKVENMTPRDLGACI DCSARHINAQ	M64;M67;M14;M64;M67;M 14
257	QYLNTLTLAVPYNMR VIHFGAGSDK	M5;M70	NMTPRDLGACIDCSA RHINAQVAKS	M64;M67;M14;M64;M67;M 14
258	YLNTLTLAVPYNMRVI HFGAGSDKG	M5;M70	KVENMTPRDLGACID CSARHINAQV	M64;M67;M14;M64;M67;M 14
259	LTLAVPYNMRVIHFGA GSDKGVAPG	M5;M70	TPRDLGACIDCSARHI NAQVAKSHN	M64;M67;M14;M64;M67;M 14
260	GSDKGVAPGTAVLRQ WLPTGTLLVD	M33;M70	TYNKVENMTPRDLG ACIDCSARHIN	M64;M67;M14;M64;M67;M 14
261	DKGVAPGTAVLRQWL PTGTLLVDSD	M33;M70	YNKVENMTPRDLGA CIDCSARHINA	M64;M67;M14;M64;M67;M 14
262	SDKGVAPGTAVLRQW LPTGTLLVDS	M33;M70	VENMTPRDLGACIDC SARHINAQVA	M64;M67;M14;M64;M67;M 14
263	KGVAPGTAVLRQWLP TGTLLVDSDL	M33;M70	MTPRDLGACIDCSAR HINAQVAKSH	M64;M67;M14;M64;M67;M 14
264	LSFELLHAPATVCGPK KSTNLVKNK	M46;M27	QRNFYEPQIITTDNTF VSGNCDVVI	M64;M10;M7;M30;M9;M23
265	PAFDKSAFVNLKQLPF FYYSDSPCE	M60;M54	TQRNFYEPQIITTDNT FVSGNCDVV	M64;M10;M7;M30;M9;M23
266	PLVSSQCVNLTTRTQL PPAYTNSFT	M9;M24	DTFNGECPNFVFPLNS IIKTIQPRV	M50;M19;M61;M50;M19;M 61
267	LLPLVSSQCVNLTTRT QLPPAYTNS	M9;M24	TFNGECPNFVFPLNSII KTIQPRVE	M50;M19;M61;M50;M19;M 61
268	LPLVSSQCVNLTTRTQ LPPAYTNSF	M9;M24	LEILQKEKVNINIVGD FKLNEEIAI	M35;M27;M44;M35;M27;M 44
269	GTDYKHWPQIAQFAPS ASAFFGMSR	M82;M70	EILQKEKVNINIVGDF KLNEEIAII	M35;M27;M44;M35;M27;M 44
270	RIIMRLWLCWKCRSK NPLLYDANYF	M75;M76	LLEILQKEKVNINIVG DFKLNEEIA	M35;M27;M44;M35;M27;M 44
271	VRIIMRLWLCWKCRS KNPLLYDANY	M75;M76	YTPSFKKGAKLLHKPI VWHVNNATN	M1;M27;M16;M1;M27;M16
272	FVRIIMRLWLCWKCRS KNPLLYDAN	M75;M76	SDDAVVCFNSTYASQ GLVASIKNFK	M13;M21;M53;M48;M49;M 22
273	IIMRLWLCWKCRSKNP LLYDANYFL	M75;M76	LSDDAVVCFNSTYAS QGLVASIKNF	M13;M21;M53;M48;M49;M 22
274	ESGVKDCVVLHSYFTS DYYQLYSTQ	M46;M20	LLSVLLSMQGAVDIN KLCEEMLDNR	M67;M45;M49;M67;M45;M 49

275	GVITHDVSSAINRPQIG VVREFLTR	M21;M70	SLLSVLLSMQGAVDI NKLCEEMLDN	M67;M45;M49;M67;M45;M 49
276	GMSRIGMEVTPSGTW LTYTGAIKLD	M5;M23	KLIEYTDFATSACVLA AECTIFKDA	M29;M14;M62;M29;M14;M 62
277	FGMSRIGMEVTPSGT WLTYTGAIKL	M5;M23	IEYTDFATSACVLAAE CTIFKDASG	M29;M14;M62;M29;M14;M 62
278	LVAEWFLAYILFTRFF YVLGLAAIM	M5;M5	LIEYTDFATSACVLAA ECTIFKDAS	M29;M14;M62;M29;M14;M 62
279	LALHRSYLTPGDSSSG WTAGAAAYY	M5;M75	SKLIEYTDFATSACVL AAECTIFKD	M29;M14;M62;M29;M14;M 62
280	QNSVRVLQKAAITILD GISQYSLRL	M5;M5	SRVSAKPPPGDQFKH LIPLMYKGLP	M54;M16;M60;M34;M52;M 39
281	FGLVAEWFLAYILFTR FFYVLGLAA	M5;M5	GGSCVLSGHNLAKHC LHVVGPNVNK	M1;M80;M37;M1;M80;M37
282	ALHRSYLTPGDSSSGW TAGAAAYYV	M5;M75	VGGSCVLSGHNLAKH CLHVVGPNVN	M1;M80;M37;M1;M80;M37
283	GLVAEWFLAYILFTRF FYVLGLAAI	M5;M5	EVGPEHSLAEYHNES GLKTILRKGG	M13;M39;M48;M13;M39;M 48
284	LLALHRSYLTPGDSSS GWTAGAAAY	M5;M75	VGPEHSLAEYHNESG LKTILRKGGR	M13;M39;M48;M13;M39;M 48
285	HFGAGSDKGVAPGTA VLRQWLPTGT	M13;M26	LHNWNCVNCDTFCA GSTFISDEVAR	M57;M45;M70;M57;M45;M 70
286	GAGSDKGVAPGTAVL RQWLPTGTLL	M13;M26	NSYTTTIKPVTYKLDG VVCTEIDPK	M36;M59;M20;M36;M59;M 20
287	FGAGSDKGVAPGTAV LRQWLPTGTL	M13;M26	KSAPLIELCVDEAGSK SPIQYIDIG	M64;M40;M21;M7;M22;M2 3
288	IHFGAGSDKGVAPGTA VLRQWLPTG	M13;M26	SAPLIELCVDEAGSKS PIQYIDIGN	M64;M40;M21;M7;M22;M2 3
289	VIHFGAGSDKGVAPGT AVLRQWLPT	M13;M26	GARKSAPLIELCVDEA GSKSPIQYI	M64;M40;M21;M7;M22;M2 3
290	AHKDKSAQCFKMFYK GVITHDVSSA	M13;M52	RKSAPLIELCVDEAGS KSPIQYIDI	M64;M40;M21;M7;M22;M2 3
291	KAHKDKSAQCFKMFY KGVITHDVSS	M13;M52	ARKSAPLIELCVDEAG SKSPIQYID	M64;M40;M21;M7;M22;M2 3
292	HKDKSAQCFKMFYKG VITHDVSSAI	M13;M52	VSFSTFEEAALCTFLL NKEMYLKLR	M13;M44;M49;M13;M44;M 49
293	LKAHKDKSAQCFKMF YKGVITHDVS	M13;M52	GAISSVLNDILSRLDK VEAEVQIDR	M58;M53;M48;M50;M17;M 15
294	KLKAHKDKSAQCFKM FYKGVITHDV	M13;M52	VNINIVGDFKLNEEIAI ILASFSAS	M35;M73;M44;M35;M73;M 44
295	EQIDGYVMHANYIFW RNTNPIQLSS	M41;M9	QQTVTLLPAADLDDF SKQLQQSMSS	M54;M58;M55;M53;M26;M 39
296	KPREQIDGYVMHANYI FWRNTNPIQ	M41;M9	KQQTVTLLPAADLDD FSKQLQQSMS	M54;M58;M55;M53;M26;M 39
297	PREQIDGYVMHANYIF WRNTNPIQL	M41;M9	LMWLSYFIASFRLFAR TRSMWSFNP	M64;M40;M16;M30;M15;M 35
298	REQIDGYVMHANYIF WRNTNPIQLS	M41;M9	LPNNTASWFTALTQH GKEDLKFPRG	M40;M28;M70;M29;M18;M 15
299	DYDYYRYNLPTMCDI RQLLFVVEVV	M74;M20	GLPNNTASWFTALTQ HGKEDLKFPR	M40;M28;M70;M29;M18;M 15

300	YDYYRYNLPTMCDIR QLLFVVEVVD	M74;M20	QGLPNNTASWFTALT QHGKEDLKFP	M40;M28;M70;M29;M18;M 15
301	YFVVKRHTFSNYQHE ETIYNLLKDC	M34;M20	LVRDLPQGFSALEPLV DLPIGINIT	M31;M60;M34;M45;M52;M 47
302	FVVKRHTFSNYQHEET IYNLLKDCP	M34;M20	RDLPQGFSALEPLVDL PIGINITRF	M31;M60;M34;M45;M52;M 47
303	SYFVVKRHTFSNYQHE ETIYNLLKD	M34;M20	NLVRDLPQGFSALEPL VDLPIGINI	M31;M60;M34;M45;M52;M 47
304	FDKAGQKTYERHSLS HFVNLDNLRA	M70;M70	VRDLPQGFSALEPLV DLPIGINITR	M31;M60;M34;M45;M52;M 47
305	NMRVIHFGAGSDKGV APGTAVLRQW	M13;M70	LALYNKYKYFSGAM DTTSYREAACC	M1;M67;M66;M1;M67;M66
306	MRVIHFGAGSDKGVA PGTAVLRQWL	M13;M70	KYKFVRIQPGQTFSVL ACYNGSPSG	M48;M27;M16;M48;M27;M 16
307	YFDKAGQKTYERHSL SHFVNLDNLR	M70;M70	RIQPGQTFSVLACYN GSPSGVYQCA	M48;M27;M16;M48;M27;M 16
308	LIRQGTDYKHWPQIAQ FAPSASAFF	M69;M82	VRIQPGQTFSVLACY NGSPSGVYQC	M48;M27;M16;M48;M27;M 16
309	VESSSKLWAQCVQLH NDILLAKDTT	M82;M82	FVRIQPGQTFSVLACY NGSPSGVYQ	M48;M27;M16;M48;M27;M 16
310	LRVESSSKLWAQCVQ LHNDILLAKD	M82;M82	QPGQTFSVLACYNGS PSGVYQCAMR	M48;M27;M16;M48;M27;M 16
311	QLRVESSSKLWAQCV QLHNDILLAK	M82;M82	YKFVRIQPGQTFSVLA CYNGSPSGV	M48;M27;M16;M48;M27;M 16
312	TISSFKWDLTAFGLVA EWFLAYILF	M82;M82	KFVRIQPGQTFSVLAC YNGSPSGVY	M48;M27;M16;M48;M27;M 16
313	ESSSKLWAQCVQLHN DILLAKDTTE	M82;M82	IQPGQTFSVLACYNGS PSGVYQCAM	M48;M27;M16;M48;M27;M 16
314	ITISSFKWDLTAFGLVA EWFLAYIL	M82;M82	KGVHFVCNLLLLFVT VYSHLLLVAA	M21;M6;M50;M43;M22;M2 3
315	DQELIRQGTDYKHWP QIAQFAPSAS	M69;M82	FVCNLLLLFVTVYSH LLLVAAGLEA	M6;M37;M41;M43;M42;M2 2
316	RVESSSKLWAQCVQL HNDILLAKDT	M82;M82	CNLLLLFVTVYSHLLL VAAGLEAPF	M6;M37;M41;M43;M42;M2 2
317	ISSFKWDLTAFGLVAE WFLAYILFT	M82;M82	VCNLLLLFVTVYSHL LLVAAGLEAP	M6;M37;M41;M43;M42;M2 2
318	ELIRQGTDYKHWPQIA QFAPSASAF	M69;M82	CGSVGFNIDYDCVSF CYMHHMELPT	M43;M17;M14;M43;M17;M 14
319	QELIRQGTDYKHWPQI AQFAPSASA	M69;M82	STECSNLLLQYGSFCT QLNRALTGI	M13;M48;M41;M43;M49;M 46
320	ETYFTQSRNLQEFKPR SQMEIDFLE	M75;M31	DSTECSNLLLQYGSFC TQLNRALTG	M13;M48;M41;M43;M49;M 46
321	TYFTQSRNLQEFKPRS QMEIDFLEL	M75;M31	GDSTECSNLLLQYGSF CTQLNRALT	M13;M48;M41;M43;M49;M 46
322	YLQYIRKLHDELTGH MLDMYSVMLT	M32;M38	GTITVEELKKLLEQW NLVIGFLFLT	M4;M58;M25;M53;M17;M4 7
323	CALDPLSETKCTLKSF TVEKGIYQT	M75;M21	CASYQTQTNSPRRAR SVASQSIIAY	M31;M5;M25;M6;M50;M18
324	TLATCELYHYQECVR GTTVLLKEPC	M27;M20	QPRVEKKKLDGFMG RIRSVYPVASP	M57;M26;M6;M57;M26;M6

325	LATCELYHYQECVRG TTVLLKEPCS	M27;M20	RFASVYAWNRKRISN CVADYSVLYN	M16;M55;M53;M74;M67;M 27
326	AITRAKVGILCIMSDR DLYDKLQFT	M32;M68	FASVYAWNRKRISNC VADYSVLYNS	M16;M55;M53;M74;M67;M 27
327	TRAKVGILCIMSDRDL YDKLQFTSL	M32;M68	LPNDDTLRVEAFEYY HTTDPSFLGR	M29;M6;M41;M29;M6;M41
328	AKVGILCIMSDRDLYD KLQFTSLEI	M32;M68	PNDDTLRVEAFEYYH TTDPSFLGRY	M29;M6;M41;M29;M6;M41
329	RAKVGILCIMSDRDLY DKLQFTSLE	M32;M68	SVVNIQKEIDRLNEVA KNLNESLID	M78;M65;M2;M61;M79;M8 2
330	ITRAKVGILCIMSDRDL YDKLQFTS	M32;M68	LSRVLGLKTLATHGL AAVNSVPWDT	M22;M6;M54;M22;M6;M54
331	KLASHMYCSFYPPDED EEEGDCEEE	M20;M20	IWFLLLSVCLGSLIYS TAALGVLMS	M29;M6;M31;M29;M6;M31
332	ENFNQHEVLLAPLLSA GIFGADPIH	M20;M20	KGIMMNVAKYTQLC QYLNTLTLAVP	M73;M78;M34;M48;M41;M 49
333	NLAKHCLHVVGPNVN KGEDIQLLKS	M77;M77	PKGIMMNVAKYTQL CQYLNTLTLAV	M73;M78;M34;M48;M41;M 49
334	TWLDMVDTSLSGFKL KDCVMYASAV	M75;M75	TGCVIAWNSNNLDSK VGGNYNYLYR	M32;M48;M50;M68;M49;M 26
335	CHNKCAYWVPRASAN IGCNHTGVVG	M75;M75	FTGCVIAWNSNNLDS KVGGNYNYLY	M32;M48;M50;M68;M49;M 26
336	EFKLASHMYCSFYPPD EDEEEGDCE	M20;M20	NIDGYFKIYSKHTPIN LVRDLPQGF	M64;M40;M71;M16;M15;M 52
337	VGCHNKCAYWVPRAS ANIGCNHTGV	M75;M75	SDVGDSAEVAVKMF DAYVNTFSSTF	M26;M14;M37;M26;M14;M 37
338	NFNQHEVLLAPLLSAG IFGADPIHS	M20;M20	VSDVGDSAEVAVKM FDAYVNTFSST	M26;M14;M37;M26;M14;M 37
339	YVGCHNKCAYWVPR ASANIGCNHTG	M75;M75	LNQLTGYKKPASREL KVTFFPDLNG	M57;M63;M70;M57;M63;M 70
340	LAKHCLHVVGPNVNK GEDIQLLKSA	M77;M77	VGTPVCINGLMLLEIK DTEKYCALA	M14;M9;M61;M14;M9;M61
341	AKHCLHVVGPNVNKG EDIQLLKSAY	M77;M77	PLVGTPVCINGLMLLE IKDTEKYCA	M14;M9;M61;M14;M9;M61
342	FKLASHMYCSFYPPDE DEEEGDCEE	M20;M20	GTPVCINGLMLLEIKD TEKYCALAP	M14;M9;M61;M14;M9;M61
343	GCHNKCAYWVPRASA NIGCNHTGVV	M75;M75	LVGTPVCINGLMLLEI KDTEKYCAL	M14;M9;M61;M14;M9;M61
344	YEGNSPFHPLADNKFA LTCFSTQFA	M1;M3;M7 0	TPVCINGLMLLEIKDT EKYCALAPN	M14;M9;M61;M14;M9;M61
345	TYEGNSPFHPLADNKF ALTCFSTQF	M1;M3;M7 0	TDDNALAYYNTTKG GRFVLALLSDL	M21;M22;M6;M21;M22;M6
346	EIRASANLAATKMSEC VLGQSKRVD	M4;M27;M 3	MGRIRSVYPVASPNE CNQMCLSTLM	M68;M29;M6;M68;M29;M6
347	IRASANLAATKMSECV LGQSKRVDF	M4;M27;M 3	QGAVDINKLCEEMLD NRATLQAIAS	M21;M45;M49;M21;M45;M 49
348	DGTLMIERFVSLAIDA YPLTKHPNQ	M5;M2;M3	GAVDINKLCEEMLDN RATLQAIASE	M21;M45;M49;M21;M45;M 49
349	GTLMIERFVSLAIDAY PLTKHPNQE	M5;M2;M3	DMVDTSLSGFKLKDC VMYASAVVLL	M15;M75;M14;M15;M75;M 14

350	SGTYEGNSPFHPLADN KFALTCFST	M3;M44;M 70	WLDMVDTSLSGFKLK DCVMYASAVV	M15;M75;M14;M15;M75;M 14
351	VIGTSKFYGGWHNML KTVYSDVENP	M18;M3;M 6	MVDTSLSGFKLKDCV MYASAVVLLI	M15;M75;M14;M15;M75;M 14
352	CRSKNPLLYDANYFLC WHTNCYDYC	M18;M21; M3	LDMVDTSLSGFKLKD CVMYASAVVL	M15;M75;M14;M15;M75;M 14
353	RSKNPLLYDANYFLC WHTNCYDYCI	M18;M21; M3	AGTTQTACTDDNALA YYNTTKGGRF	M22;M27;M6;M22;M27;M6
354	GVKDCVVLHSYFTSD YYQLYSTQLS	M42;M3;M 20	STQYEYGTEDDYQGK PLEFGATSAA	M1;M67;M37;M1;M67;M37
355	VEIIKSQDLSVVSKVV KVTIDYTEI	M51;M1;M 18	PSTQYEYGTEDDYQG KPLEFGATSA	M1;M67;M37;M1;M67;M37
356	KSQDLSVVSKVVKVTI DYTEISFML	M51;M1;M 18	EPSTQYEYGTEDDYQ GKPLEFGATS	M1;M67;M37;M1;M67;M37
357	IIKSQDLSVVSKVVKV TIDYTEISF	M51;M1;M 18	QYEYGTEDDYQGKPL EFGATSAALQ	M1;M22;M37;M1;M22;M37
358	IKSQDLSVVSKVVKVT IDYTEISFM	M51;M1;M 18	EYGTEDDYQGKPLEF GATSAALQPE	M1;M22;M37;M1;M22;M37
359	EIIKSQDLSVVSKVVK VTIDYTEIS	M51;M1;M 18	YEYGTEDDYQGKPLE FGATSAALQP	M1;M22;M37;M1;M22;M37
360	FVEIIKSQDLSVVSKVV KVTIDYTE	M51;M1;M 18	LKLKVDTANPKTPKY KFVRIQPGQT	M77;M34;M14;M77;M34;M 14
361	YVIFTQTTETAHSCNV NRFNVAITR	M51;M6;M 59	CTLKSFTVEKGIYQTS NFRVQPTES	M75;M25;M37;M41;M8;M2 3
362	DYVIFTQTTETAHSCN VNRFNVAIT	M51;M6;M 59	AVIKTLQPVSELLTPL GIDLDEWSM	M78;M45;M49;M78;M45;M 49
363	AQTGSSKCVCSVIDLL LDDFVEIIK	M4;M51;M 59	VIKTLQPVSELLTPLGI DLDEWSMA	M78;M45;M49;M78;M45;M 49
364	QTGSSKCVCSVIDLLL DDFVEIIKS	M4;M51;M 59	PRHVICTSEDMLNPN YEDLLIRKSN	M72;M28;M59;M72;M28;M 59
365	LNDFVSDADSTLIGDC ATVHTANKW	M7;M6;M3 6	AGTDTTITVNVLAWL YAAVINGDRW	M56;M32;M14;M56;M32;M 14
366	DLNDFVSDADSTLIGD CATVHTANK	M7;M6;M3 6	DVVNQNAQALNTLV KQLSSNFGAIS	M58;M16;M53;M17;M15;M 22
367	MPLSAPTLVPQEHYVR ITGLYPTLN	M51;M69; M28	VVNQNAQALNTLVK QLSSNFGAISS	M58;M16;M53;M17;M15;M 22
368	TVMPLSAPTLVPQEHY VRITGLYPT	M51;M69; M28	CDIPIGAGICASYQTQ TNSPRRARS	M28;M31;M70;M25;M50;M 18
369	HTVMPLSAPTLVPQEH YVRITGLYP	M51;M69; M28	ECDIPIGAGICASYQT QTNSPRRAR	M28;M31;M70;M25;M50;M 18
370	VMPLSAPTLVPQEHYV RITGLYPTL	M51;M69; M28	YECDIPIGAGICASYQ TQTNSPRRA	M28;M31;M70;M25;M50;M 18
371	NHTSPDVDLGDISGIN ASVVNIQKE	M14;M80; M45	EVAVKMFDAYVNTFS STFNVPMEKL	M41;M8;M70;M41;M8;M70
372	SKVVKVTIDYTEISFM LWCKDGHVE	M71;M67; M51	VAVKMFDAYVNTFSS TFNVPMEKLK	M41;M8;M70;M41;M8;M70
373	ANTVIWDYKRDAPAH ISTIGVCSMT	M36;M11; M6	GYLPQNAVVKIYCPA CHNSEVGPEH	M35;M11;M28;M35;M11;M 28
374	TVIWDYKRDAPAHIST IGVCSMTDI	M36;M11; M6	EVPVAIHADQLTPTW RVYSTGSNVF	M58;M24;M16;M5;M41;M1 7

375	NTVIWDYKRDAPAHISTIGVCSMTD	M36;M11;M6	TEVPVAIHADQLTPTWRVYSTGSNV	M58;M24;M16;M5;M41;M17
376	VIWDYKRDAPAHISTIGVCSMTDIA	M36;M11;M6	CTEVPVAIHADQLTPTWRVYSTGSN	M58;M24;M16;M5;M41;M17
377	MYSVMLTNDNTSRYWEPEFYEAMYT	M7;M22;M36	QKVGMQKYSTLQGPPGTGKSHFAIG	M34;M29;M41;M42;M43;M39
378	YSVMLTNDNTSRYWEPEFYEAMYTP	M7;M22;M36	KVGMQKYSTLQGPPGTGKSHFAIGL	M34;M29;M41;M42;M43;M39
379	YFDCYDGGCINANQVIVNNLDKSAG	M50;M73;M51	VDADSKIVQLSEISMDNSPNLAWPL	M7;M54;M49;M7;M54;M49
380	FDCYDGGCINANQVIVNNLDKSAGF	M50;M73;M51	GEAANFCALILAYCNKTVGELGDVR	M41;M48;M49;M41;M48;M49
381	DCYDGGCINANQVIVNNLDKSAGFP	M50;M73;M51	RAGEAANFCALILAYCNKTVGELGD	M41;M48;M49;M41;M48;M49
382	SAPTLVPQEHYVRITGLYPTLNISD	M51;M69;M34	AGEAANFCALILAYCNKTVGELGDV	M41;M48;M49;M41;M48;M49
383	APTLVPQEHYVRITGLYPTLNISDE	M51;M69;M34	LVATAEAELAKNVSLDNVLSTFISA	M7;M29;M73;M7;M29;M73
384	PTLVPQEHYVRITGLYPTLNISDEF	M51;M69;M34	VATAEAELAKNVSLDNVLSTFISAA	M7;M29;M73;M7;M29;M73
385	LSAPTLVPQEHYVRITGLYPTLNIS	M51;M69;M34	PGVYSVIYLYLTFYLTNDVSFLAHI	M50;M48;M49;M50;M48;M49
386	PTMCDIRQLLFVVEVVDKYFDCYDG	M51;M70;M20	LPGVYSVIYLYLTFYLTNDVSFLAH	M50;M48;M49;M50;M48;M49
387	IRQLLFVVEVVDKYFDCYDGGCINA	M51;M70;M37	NFCALILAYCNKTVGELGDVRETMS	M79;M41;M48;M79;M41;M48
388	NLPTMCDIRQLLFVVEVVDKYFDCY	M51;M70;M20	CALILAYCNKTVGELGDVRETMSYL	M79;M41;M48;M79;M41;M48
389	LPTMCDIRQLLFVVEVVDKYFDCYD	M51;M70;M20	FCALILAYCNKTVGELGDVRETMSY	M79;M41;M48;M79;M41;M48
390	RYNLPTMCDIRQLLFVVEVVDKYFD	M51;M70;M20	KSNHNFLVQAGNVQLRVIGHSMQNC	M12;M58;M70;M12;M58;M70
391	DIRQLLFVVEVVDKYFDCYDGGCIN	M51;M70;M37	RKSNHNFLVQAGNVQLRVIGHSMQN	M12;M58;M70;M12;M58;M70
392	YNLPTMCDIRQLLFVVEVVDKYFDC	M51;M70;M20	RYFRLTLGVYDYLVSTQEFRYMNSQ	M43;M6;M31;M43;M6;M31
393	VDCTMYICGDSTECSNLLLQYGSFC	M48;M39;M45	LMSFPQSAPHGVVFLHVTYVPAQEK	M64;M21;M28;M70;M53;M9
394	DCTMYICGDSTECSNLLLQYGSFCT	M48;M39;M45	NALAYYNTTKGGRFVLALLSDLQDL	M33;M6;M20;M33;M6;M20
395	EQTQGNFGDQELIRQGTDYKHWPQI	M64;M69;M51	YQGKPLEFGATSAALQPEEEQEEDW	M38;M22;M28;M38;M22;M28
396	QGNFGDQELIRQGTDYKHWPQIAQF	M64;M69;M51	KPLEFGATSAALQPEEEQEEDWLDD	M38;M22;M28;M38;M22;M28
397	TQGNFGDQELIRQGTDYKHWPQIAQ	M64;M69;M51	DYQGKPLEFGATSAALQPEEEQEED	M38;M22;M28;M38;M22;M28
398	PEQTQGNFGDQELIRQGTDYKHWPQ	M64;M69;M51	DDYQGKPLEFGATSAALQPEEEQEE	M38;M22;M28;M38;M22;M28
399	QTQGNFGDQELIRQGTDYKHWPQIA	M64;M69;M51	QGKPLEFGATSAALQPEEEQEEDWL	M38;M22;M28;M38;M22;M28

400	GNFGDQELIRQGTDYK HWPQIAQFA	M64;M69; M51	GKPLEFGATSAALQP EEEQEEDWLD	M38;M22;M28;M38;M22;M 28
401	FGDQELIRQGTDYKH WPQIAQFAPS	M64;M69; M51	VMFTPLVPFWITIAYII CISTKHFY	M60;M56;M8;M60;M56;M8
402	NFGDQELIRQGTDYKH WPQIAQFAP	M64;M69; M51	KGGKIVNNWLKQLIK VTLVFLFVAA	M57;M55;M11;M57;M55;M 11
403	FVSDADSTLIGDCATV HTANKWDLI	M7;M24;M 36	FKLKDCVMYASAVV LLILMTARTVY	M33;M75;M12;M33;M75;M 12
404	VSDADSTLIGDCATVH TANKWDLII	M7;M24;M 36	PQTSITSAVLQSGFRK MAFPSGKVE	M1;M38;M62;M1;M38;M62
405	DFVSDADSTLIGDCAT VHTANKWDL	M7;M24;M 36	QTSITSAVLQSGFRKM AFPSGKVEG	M1;M38;M62;M1;M38;M62
406	LPDPSKPSKRSFIEDLL FNKVTLAD	M63;M67; M44	LNRFTTTLNDFNLVA MKYNYEPLTQ	M63;M73;M66;M63;M73;M 66
407	KLLKSIAATRGATVVI GTSKFYGGW	M72;M2;M 14	PINVIVFDGKSKCEES SAKSASVYY	M7;M56;M52;M7;M56;M52
408	PGDQFKHLIPLMYKGL PWNVVRIKI	M1;M39;M 12	QLSLPVLQVRDVLVR GFGDSVEEVL	M43;M63;M70;M43;M63;M 70
409	GDQFKHLIPLMYKGLP WNVVRIKIV	M1;M39;M 12	HVQLSLPVLQVRDVL VRGFGDSVEE	M43;M63;M70;M43;M63;M 70
410	SLFDMSKFPLKLRGTA VMSLKEGQI	M67;M14; M8	VQLSLPVLQVRDVLV RGFGDSVEEV	M43;M63;M70;M43;M63;M 70
411	AETLKATEETFKLSYG IATVREVLS	M33;M6;M 44	LSLPVLQVRDVLVRG FGDSVEEVLS	M43;M63;M70;M43;M63;M 70
412	ETLKATEETFKLSYGI ATVREVLSD	M33;M6;M 44	EDDYQGKPLEFGATS AALQPEEEQE	M22;M28;M37;M22;M28;M 37
413	VQELYSPIFLIVAAIVFI TLCFTLK	M25;M12; M14	TEDDYQGKPLEFGAT SAALQPEEEQ	M22;M28;M37;M22;M28;M 37
414	ELYSPIFLIVAAIVFITL CFTLKRK	M25;M12; M14	YLFQHANLDSCKRVL NVVCKTCGQQ	M5;M27;M2;M5;M27;M2
415	EVQELYSPIFLIVAAIV FITLCFTL	M25;M12; M14	IDRLITGRLQSLQTYV TQQLIRAAE	M34;M29;M38;M49;M46;M 22
416	QELYSPIFLIVAAIVFIT LCFTLKR	M25;M12; M14	VQIDRLITGRLQSLQT YVTQQLIRA	M34;M29;M38;M49;M46;M 22
417	MMGFKMNYQVNGYP NMFITREEAIR	M44;M48; M49	QIDRLITGRLQSLQTY VTQQLIRAA	M34;M29;M38;M49;M46;M 22
418	MGFKMNYQVNGYPN MFITREEAIRH	M44;M48; M49	EVQIDRLITGRLQSLQ TYVTQQLIR	M34;M29;M38;M49;M46;M 22
419	ISMMGFKMNYQVNGY PNMFITREEA	M44;M48; M49	PKSDGTGTIYTELEPP CRFVTDTPK	M38;M6;M59;M38;M6;M59
420	SMMGFKMNYQVNGY PNMFITREEAI	M44;M48; M49	YCPIFFITGNTLQCIML VYCFLGYF	M40;M39;M11;M40;M39;M 11
421	LISMMGFKMNYQVNG YPNMFITREE	M44;M48; M49	EYCPIFFITGNTLQCIM LVYCFLGY	M40;M39;M11;M40;M39;M 11
422	KGDYGDAVVYRGTTT YKLNVGDYFV	M9;M8;M4 4	IVFMCVEYCPIFFITGN TLQCIMLV	M40;M39;M11;M40;M39;M 11
423	DYGDAVVYRGTTTYK LNVGDYFVLT	M9;M8;M4 4	CVEYCPIFFITGNTLQ CIMLVYCFL	M40;M39;M11;M40;M39;M 11
424	YGDAVVYRGTTTYKL NVGDYFVLTS	M9;M8;M4 4	MCVEYCPIFFITGNTL QCIMLVYCF	M40;M39;M11;M40;M39;M 11

425	GDYGDAVVYRGTTTY KLNVGDYFVL	M9;M8;M4 4	VEYCPIFFITGNTLQCI MLVYCFLG	M40;M39;M11;M40;M39;M 11
426	SVELKHFFFAQDGNA AISDYDYYRY	M36;M39; M67	FMCVEYCPIFFITGNT LQCIMLVYC	M40;M39;M11;M40;M39;M 11
427	SSVELKHFFFAQDGNA AISDYDYYR	M36;M39; M67	VFMCVEYCPIFFITGN TLQCIMLVY	M40;M39;M11;M40;M39;M 11
428	VELKHFFFAQDGNAAI SDYDYYRYN	M36;M39; M67	SDLQDLKWARFPKSD GTGTIYTELE	M4;M60;M38;M4;M60;M38
429	EGSSVELKHFFFAQDG NAAISDYDY	M36;M39; M67	PKGPKVKYLYFIKGL NNLNRGMVLG	M64;M52;M2;M64;M52;M2
430	GSSVELKHFFFAQDGN AAISDYDYY	M36;M39; M67	DTPKGPKVKYLYFIK GLNNLNRGMV	M64;M52;M2;M64;M52;M2
431	TFEKGDYGDAVVYRG TTTYKLNVGD	M9;M12;M 44	TPKGPKVKYLYFIKG LNNLNRGMVL	M64;M52;M2;M64;M52;M2
432	REPMLQSADAQSFLNR VCGVSAARL	M33;M12; M45	TDTPKGPKVKYLYFI KGLNNLNRGM	M64;M52;M2;M64;M52;M2
433	YGCSCDQLREPMLQS ADAQSFLNRV	M33;M12; M45	VLSGHNLAKHCLHVV GPNVNKGEDI	M1;M77;M37;M1;M77;M37
434	CSCDQLREPMLQSAD AQSFLNRVCG	M33;M12; M45	LSGHNLAKHCLHVVG PNVNKGEDIQ	M1;M77;M37;M1;M77;M37
435	GYGCSCDQLREPMLQ SADAQSFLNG	M33;M12; M45	RELKVTFFPDLNGDV VAIDYKHYTP	M60;M21;M63;M60;M21;M 63
436	DQLREPMLQSADAQS FLNRVCGVSA	M33;M12; M45	VLQVRDVLVRGFGDS VEEVLSEARQ	M63;M68;M70;M63;M68;M 70
437	QLREPMLQSADAQSFL NRVCGVSAA	M33;M12; M45	LQVRDVLVRGFGDSV EEVLSEARQH	M63;M68;M70;M63;M68;M 70
438	CDQLREPMLQSADAQ SFLNRVCGVS	M33;M12; M45	QVRDVLVRGFGDSVE EVLSEARQHL	M63;M68;M70;M63;M68;M 70
439	GYGCSCDQLREPMLQ SADAQSFLNR	M33;M12; M45	PVLQVRDVLVRGFGD SVEEVLSEAR	M63;M68;M70;M63;M68;M 70
440	SCDQLREPMLQSADA QSFLNRVCGV	M33;M12; M45	RKHTTCCSLSHRFYR LANECAQVLS	M5;M60;M79;M43;M42;M3 9
441	LREPMLQSADAQSFLN RVCGVSAAR	M33;M12; M45	YQKVGMQKYSTLQG PPGTGKSHFAI	M21;M34;M41;M42;M43;M 39
442	GCSCDQLREPMLQSA DAQSFLNRVC	M33;M12; M45	ANYQKVGMQKYSTL QGPPGTGKSHF	M21;M34;M41;M42;M43;M 39
443	IGPERTCCLCDRRATC FSTASDTYA	M4;M7;M7 2	NYQKVGMQKYSTLQ GPPGTGKSHFA	M21;M34;M41;M42;M43;M 39
444	GPERTCCLCDRRATCF STASDTYAC	M4;M7;M7 2	VANYQKVGMQKYST LQGPPGTGKSH	M21;M34;M41;M42;M43;M 39
445	FKNLREFVFKNIDGYF KIYSKHTPI	M71;M19; M16	VRRSFYVYANGGKGF CKLHNWNCVN	M39;M11;M41;M39;M11;M 41
446	VRFPNITNLCPFGEVFN ATRFASVY	M45;M28; M66	AKNRARTVAGVSICS TMTNRQFHQK	M64;M32;M60;M30;M22;M 23
447	IVRFPNITNLCPFGEVF NATRFASV	M45;M28; M66	VAGVSICSTMTNRQF HQKLLKSIAA	M64;M32;M60;M30;M22;M 23
448	ESIVRFPNITNLCPFGE VFNATRFA	M45;M28; M66	AGVSICSTMTNRQFH QKLLKSIAAT	M64;M32;M60;M30;M22;M 23
449	TESIVRFPNITNLCPFG EVFNATRF	M45;M28; M66	ARTVAGVSICSTMTN RQFHQKLLKS	M64;M32;M60;M30;M22;M 23

450	SIVRFPNITNLCPFGEV FNATRFAS	M45;M28; M66	TVAGVSICSTMTNRQ FHQKLLKSIA	M64;M32;M60;M30;M22;M 23
451	HQKLLKSIAATRGATV VIGTSKFYG	M25;M2;M 14	RARTVAGVSICSTMT NRQFHQKLLK	M64;M32;M60;M30;M22;M 23
452	QKLLKSIAATRGATVV IGTSKFYGG	M25;M2;M 14	NRARTVAGVSICSTM TNRQFHQKLL	M64;M32;M60;M30;M22;M 23
453	FHQKLLKSIAATRGAT VVIGTSKFY	M25;M2;M 14	RTVAGVSICSTMTNR QFHQKLLKSI	M64;M32;M60;M30;M22;M 23
454	VTIDYTEISFMLWCKD GHVETFYPK	M71;M36; M67	KNRARTVAGVSICST MTNRQFHQKL	M64;M32;M60;M30;M22;M 23
455	TEISFMLWCKDGHVET FYPKLQSSQ	M71;M36; M67	SAKNRARTVAGVSIC STMTNRQFHQ	M64;M32;M60;M30;M22;M 23
456	VVKVTIDYTEISFMLW CKDGHVETF	M71;M36; M67	GHVMVELVAELEGIQ YGRSGETLGV	M60;M54;M28;M60;M54;M 28
457	IDYTEISFMLWCKDGH VETFYPKLQ	M71;M36; M67	PHGHVMVELVAELEG IQYGRSGETL	M60;M54;M28;M60;M54;M 28
458	YTEISFMLWCKDGHV ETFYPKLQSS	M71;M36; M67	RTAPHGHVMVELVA ELEGIQYGRSG	M60;M54;M28;M60;M54;M 28
459	VKVTIDYTEISFMLWC KDGHVETFY	M71;M36; M67	HGHVMVELVAELEGI QYGRSGETLG	M60;M54;M28;M60;M54;M 28
460	TIDYTEISFMLWCKDG HVETFYPKL	M71;M36; M67	TAPHGHVMVELVAEL EGIQYGRSGE	M60;M54;M28;M60;M54;M 28
461	KVTIDYTEISFMLWCK DGHVETFYP	M71;M36; M67	HVMVELVAELEGIQY GRSGETLGVL	M60;M54;M28;M60;M54;M 28
462	DYTEISFMLWCKDGH VETFYPKLQS	M71;M36; M67	APHGHVMVELVAELE GIQYGRSGET	M60;M54;M28;M60;M54;M 28
463	NSIAIPTNFTISVTTEIL PVSMTKT	M33;M28; M45	SHGKQVVSDIDYVPL KSATCITRCN	M25;M34;M18;M43;M42;M 39
464	AIPTNFTISVTTEILPVS MTKTSVD	M33;M28; M45	KQVVSDIDYVPLKSA TCITRCNLGG	M25;M34;M18;M43;M42;M 39
465	SNNSIAIPTNFTISVTTE ILPVSMT	M33;M28; M45	GKQVVSDIDYVPLKS ATCITRCNLG	M25;M34;M18;M43;M42;M 39
466	IPTNFTISVTTEILPVSM TKTSVDC	M33;M28; M45	HGKQVVSDIDYVPLK SATCITRCNL	M25;M34;M18;M43;M42;M 39
467	YSNNSIAIPTNFTISVTT EILPVSM	M33;M28; M45	VVSDIDYVPLKSATCI TRCNLGGAV	M25;M34;M18;M43;M42;M 39
468	IAIPTNFTISVTTEILPV SMTKTSV	M33;M28; M45	QVVSDIDYVPLKSAT CITRCNLGGA	M25;M34;M18;M43;M42;M 39
469	AYSNNSIAIPTNFTISV TTEILPVS	M33;M28; M45	RFQTLLALHRSYLTPG DSSSGWTAG	M21;M24;M70;M55;M5;M2 3
470	SIAIPTNFTISVTTEILP VSMTKTS	M33;M28; M45	FQTLLALHRSYLTPG DSSSGWTAGA	M21;M24;M70;M55;M5;M2 3
471	NNSIAIPTNFTISVTTEI LPVSMTK	M33;M28; M45	IDKVLNEKCSAYTVE LGTEVNEFAC	M57;M43;M39;M57;M43;M 39
472	VAYSNNSIAIPTNFTIS VTTEILPV	M33;M28; M45	KVLNEKCSAYTVELG TEVNEFACVV	M57;M43;M39;M57;M43;M 39
473	PKDMTYRRLISMMGF KMNYQVNGYP	M46;M39; M44	DKVLNEKCSAYTVEL GTEVNEFACV	M57;M43;M39;M57;M43;M 39
474	KDMTYRRLISMMGFK MNYQVNGYPN	M46;M39; M44	ERIDKVLNEKCSAYT VELGTEVNEF	M57;M43;M39;M57;M43;M 39

475	KCVPQADVEWKFYDA QPCSDKAYKI	M41;M6;M 8	DERIDKVLNEKCSAY TVELGTEVNE	M57;M43;M39;M57;M43;M 39
476	MFHLVDFQVTIAEILLI IMRTFKVS	M4;M61;M 8	VLNEKCSAYTVELGT EVNEFACVVA	M57;M43;M39;M57;M43;M 39
477	EETFKLSYGIATVREV LSDRELHLS	M12;M6;M 59	RIDKVLNEKCSAYTV ELGTEVNEFA	M57;M43;M39;M57;M43;M 39
478	TFKLSYGIATVREVLS DRELHLSWE	M12;M6;M 59	YFTSDYYQLYSTQLS TDTGVEHVTF	M40;M41;M43;M42;M39;M 20
479	FKLSYGIATVREVLSD RELHLSWEV	M12;M6;M 59	LHSYFTSDYYQLYST QLSTDTGVEH	M40;M41;M43;M42;M39;M 20
480	ETFKLSYGIATVREVL SDRELHLSW	M12;M6;M 59	VVLHSYFTSDYYQLY STQLSTDTGV	M40;M41;M43;M42;M39;M 20
481	KVDGVDVELFENKTT LPVNVAFELW	M29;M28; M48	HSYFTSDYYQLYSTQ LSTDTGVEHV	M40;M41;M43;M42;M39;M 20
482	DGVDVELFENKTTLPV NVAFELWAK	M29;M28; M48	SYFTSDYYQLYSTQLS TDTGVEHVT	M40;M41;M43;M42;M39;M 20
483	VDGVDVELFENKTTLP VNVAFELWA	M29;M28; M48	FTSDYYQLYSTQLST DTGVEHVTFF	M40;M41;M43;M42;M39;M 20
484	YQTQTNSPRRARSVAS QSIIAYTMS	M5;M2;M6	VLHSYFTSDYYQLYS TQLSTDTGVE	M40;M41;M43;M42;M39;M 20
485	SYQTQTNSPRRARSVA SQSIIAYTM	M5;M2;M6	ELWAKRNIKPVPEVKI LNNLGVDIA	M54;M66;M74;M57;M49;M 9
486	AKKPTETICAPLTVFFD GRVDGQVD	M7;M63;M 49	KIQDSLSSTASALGKL QDVVNQNAQ	M40;M64;M29;M79;M22;M 47
487	IAKKPTETICAPLTVFF DGRVDGQV	M7;M63;M 49	IGKIQDSLSSTASALG KLQDVVNQN	M40;M64;M29;M79;M22;M 47
488	KKPTETICAPLTVFFDG RVDGQVDL	M7;M63;M 49	SAIGKIQDSLSSTASA LGKLQDVVN	M40;M64;M29;M79;M22;M 47
489	PTETICAPLTVFFDGRV DGQVDLFR	M7;M63;M 49	IQDSLSSTASALGKLQ DVVNQNAQA	M40;M64;M29;M79;M22;M 47
490	TETICAPLTVFFDGRV DGQVDLFRN	M7;M63;M 49	AIGKIQDSLSSTASAL GKLQDVVNQ	M40;M64;M29;M79;M22;M 47
491	KPTETICAPLTVFFDGR VDGQVDLF	M7;M63;M 49	GKIQDSLSSTASALGK LQDVVNQNA	M40;M64;M29;M79;M22;M 47
492	YPANSIVCRFDTRVLS NLNLPGCDG	M5;M2;M4 8	AARVVRSIFSRTLETA QNSVRVLQK	M34;M2;M59;M34;M2;M59
493	PANSIVCRFDTRVLSN LNLPGCDGG	M5;M2;M4 8	NAVVKIYCPACHNSE VGPEHSLAEY	M68;M28;M35;M68;M28;M 35
494	DGNAAISDYDYYRYN LPTMCDIRQL	M11;M74; M44	SIIKTIQPRVEKKKLD GFMGRIRSV	M26;M29;M72;M26;M29;M 72
495	ISDYDYYRYNLPTMC DIRQLLFVVE	M11;M74; M44	YLTSSSKTPEEHFIETI SLAGSYKD	M40;M29;M16;M40;M29;M 16
496	AISDYDYYRYNLPTM CDIRQLLFVV	M11;M74; M44	GEDIQLLKSAYENFN QHEVLLAPLL	M38;M60;M28;M38;M60;M 28
497	GNAAISDYDYYRYNL PTMCDIRQLL	M11;M74; M44	GIFGADPIHSLRVCVD TVRTNVYLA	M68;M28;M31;M68;M28;M 31
498	AAISDYDYYRYNLPT MCDIRQLLFV	M11;M74; M44	IFGADPIHSLRVCVDT VRTNVYLAV	M68;M28;M31;M68;M28;M 31
499	NAAISDYDYYRYNLPT MCDIRQLLF	M11;M74; M44	YVGYLQPRTFLLKYN ENGTITDAVD	M58;M24;M49;M15;M11;M 47

500	SGVPVVDSYYSLLMPILTLTRALTA	M34;M39;M14	GYLQPRTFLLKYNENGTITDAVDCA	M58;M24;M49;M15;M11;M47
501	PGSGVPVVDSYYSLLMPILTLTRAL	M34;M39;M14	YLQPRTFLLKYNENGTITDAVDCAL	M58;M24;M49;M15;M11;M47
502	GSGVPVVDSYYSLLMPILTLTRALT	M34;M39;M14	VGYLQPRTFLLKYNENGTITDAVDC	M58;M24;M49;M15;M11;M47
503	IKIVQMLSDTLKNLSDRVVFVLWAH	M46;M61;M36	YYVGYLQPRTFLLKYNENGTITDAV	M58;M24;M49;M15;M11;M47
504	RIKIVQMLSDTLKNLSDRVVFVLWA	M46;M61;M36	LQDLKWARFPKSDGTGTIYTELEPP	M38;M28;M59;M38;M28;M59
505	GQINDMILSLLSKGRLIIRENNRVV	M55;M9;M19	AIGLALYYPSARIVYTACSHAAVDA	M64;M21;M5;M29;M38;M17
506	KVFRSSVLHSTQDLFLPFFSNVTWF	M72;M67;M6	FQEKDEDDNLIDSYFVVKRHTFSNY	M71;M54;M18;M15;M52;M47
507	RSSVLHSTQDLFLPFFSNVTWFHAI	M72;M67;M6	RFQEKDEDDNLIDSYFVVKRHTFSN	M71;M54;M18;M15;M52;M47
508	VFRSSVLHSTQDLFLPFFSNVTWFH	M72;M67;M6	LHVVGPNVNKGEDIQLLKSAYENFN	M60;M77;M28;M60;M77;M28
509	SSVLHSTQDLFLPFFSNVTWFHAIH	M72;M67;M6	HCLHVVGPNVNKGEDIQLLKSAYEN	M60;M77;M28;M60;M77;M28
510	FRSSVLHSTQDLFLPFFSNVTWFHA	M72;M67;M6	CLHVVGPNVNKGEDIQLLKSAYENF	M60;M77;M28;M60;M77;M28
511	TLDSKTQSLLIVNNATNVVIKVCEF	M11;M73;M44	LEPPCRFVTDTPKGPKVKYLYFIKG	M77;M2;M59;M77;M2;M59
512	GTTLDSKTQSLLIVNNATNVVIKVC	M11;M73;M44	YTELEPPCRFVTDTPKGPKVKYLYF	M77;M2;M59;M77;M2;M59
513	DSKTQSLLIVNNATNVVIKVCEFQF	M11;M73;M44	PPCRFVTDTPKGPKVKYLYFIKGLN	M77;M2;M59;M77;M2;M59
514	TTLDSKTQSLLIVNNATNVVIKVCE	M11;M73;M44	ELEPPCRFVTDTPKGPKVKYLYFIK	M77;M2;M59;M77;M2;M59
515	LDSKTQSLLIVNNATNVVIKVCEFQ	M11;M73;M44	EPPCRFVTDTPKGPKVKYLYFIKGL	M77;M2;M59;M77;M2;M59
516	FKIYSKHTPINLVRDLPQGFSALEP	M64;M36;M40	TELEPPCRFVTDTPKGPKVKYLYFI	M77;M2;M59;M77;M2;M59
517	YSKHTPINLVRDLPQGFSALEPLVD	M64;M36;M40	ECTTIVNGVRRSFYVYANGGKGFCK	M5;M39;M41;M5;M39;M41
518	IYSKHTPINLVRDLPQGFSALEPLV	M64;M36;M40	CTTIVNGVRRSFYVYANGGKGFCKL	M5;M39;M41;M5;M39;M41
519	SKHTPINLVRDLPQGFSALEPLVDL	M64;M36;M40	YTERSEKSYELQTPFEIKLAKKFDT	M25;M34;M39;M25;M34;M39
520	GYFKIYSKHTPINLVRDLPQGFSAL	M64;M36;M40	WYTERSEKSYELQTPFEIKLAKKFD	M25;M34;M39;M25;M34;M39
521	YFKIYSKHTPINLVRDLPQGFSALE	M64;M36;M40	AWYTERSEKSYELQTPFEIKLAKKF	M25;M34;M39;M25;M34;M39
522	KIYSKHTPINLVRDLPQGFSALEPL	M64;M36;M40	FYTSKTTVASLINTLNDLNETLVTM	M57;M72;M68;M57;M72;M68
523	PISFPLCANGQVFGLYKNTCVGSDN	M73;M28;M48	SKTTVASLINTLNDLNETLVTMPLG	M57;M72;M68;M57;M72;M68
524	EYVSQPFLMDLEGKQGNFKNLREFV	M46;M36;M20	YTSKTTVASLINTLNDLNETLVTMP	M57;M72;M68;M57;M72;M68

525	KGVITHDVSSAINRPQIGVVREFLT	M36;M21;M70	TSKTTVASLINTLNDLNETLVTMPL	M57;M72;M68;M57;M72;M68
526	RPLLESELVIGAVILRGHLRIAGHH	M55;M53;M14	KTTVASLINTLNDLNETLVTMPLGY	M57;M72;M68;M57;M72;M68
527	PLLESELVIGAVILRGHLRIAGHHL	M55;M53;M14	EHEIAWYTERSEKSYELQTPFEIKL	M25;M30;M49;M25;M30;M49
528	LLESELVIGAVILRGHLRIAGHHLG	M55;M53;M14	HEHEIAWYTERSEKSYELQTPFEIK	M25;M30;M49;M25;M30;M49
529	FMLWCKDGHVETFYPKLQSSQAWQP	M15;M36;M47	ARFYFYTSKTTVASLINTLNDLNET	M29;M72;M68;M29;M72;M68
530	MLWCKDGHVETFYPKLQSSQAWQPG	M15;M36;M47	RFYFYTSKTTVASLINTLNDLNETL	M29;M72;M68;M29;M72;M68
531	KDKSAQCFKMFYKGVITHDVSSAIN	M13;M52;M36	FYFYTSKTTVASLINTLNDLNETLV	M29;M72;M68;M29;M72;M68
532	ETAHSCNVNRFNVAITRAKVGILCI	M33;M25;M19	IIKTIQPRVEKKKLDGFMGRIRSVY	M57;M26;M29;M57;M26;M29
533	SCNVNRFNVAITRAKVGILCIMSDR	M33;M25;M19	PQLEQPYVFIKRSDARTAPHGHVMV	M15;M46;M16;M15;M46;M16
534	HSCNVNRFNVAITRAKVGILCIMSD	M33;M25;M19	QLEQPYVFIKRSDARTAPHGHVMVE	M15;M46;M16;M15;M46;M16
535	AHSCNVNRFNVAITRAKVGILCIMS	M33;M25;M19	LEQPYVFIKRSDARTAPHGHVMVEL	M15;M46;M16;M15;M46;M16
536	TAHSCNVNRFNVAITRAKVGILCIM	M33;M25;M19	VLPQLEQPYVFIKRSDARTAPHGHV	M15;M46;M16;M15;M46;M16
537	CQEPKLGSLVVRCSFYEDFLEYHDV	M29;M14;M70	LPQLEQPYVFIKRSDARTAPHGHVM	M15;M46;M16;M15;M46;M16
538	QEPKLGSLVVRCSFYEDFLEYHDVR	M29;M14;M70	NKEMYLKLRSDVLLPLTQYNRYLAL	M39;M61;M53;M39;M61;M53
539	LFMRIFTIGTVTLKQGEIKDATPSD	M5;M72;M6	LNKEMYLKLRSDVLLPLTQYNRYLA	M43;M39;M61;M43;M39;M61
540	FMRIFTIGTVTLKQGEIKDATPSDF	M5;M72;M6	TLVSDIDITFLKKDAPYIVGDVVQE	M57;M11;M58;M57;M11;M58
541	VATLQAENVTGLFKDCSKVITGLHP	M36;M38;M47	LVSDIDITFLKKDAPYIVGDVVQEG	M57;M11;M58;M57;M11;M58
542	LQAENVTGLFKDCSKVITGLHPTQA	M36;M38;M47	VSDIDITFLKKDAPYIVGDVVQEGV	M57;M11;M58;M57;M11;M58
543	ATLQAENVTGLFKDCSKVITGLHPT	M36;M38;M47	NYLKSPNFSKLINIIIWFLLLSVCL	M42;M39;M74;M42;M39;M74
544	TLQAENVTGLFKDCSKVITGLHPTQ	M36;M38;M47	YLKSPNFSKLINIIIWFLLLSVCLG	M42;M39;M74;M42;M39;M74
545	AENVTGLFKDCSKVITGLHPTQAPT	M36;M38;M47	SFNYLKSPNFSKLINIIIWFLLLSV	M42;M39;M74;M42;M39;M74
546	QAENVTGLFKDCSKVITGLHPTQAP	M36;M38;M47	FNYLKSPNFSKLINIIIWFLLLSVC	M42;M39;M74;M42;M39;M74
547	NVATLQAENVTGLFKDCSKVITGLH	M36;M38;M47	EVNEFACVVADAVIKTLQPVSELLT	M78;M34;M39;M78;M34;M39
548	TSRTLSYYKLGASQRVAGDSGFAAY	M25;M19;M70	EEAARYMRSLKVPATVSVSSPDAVT	M5;M72;M35;M5;M72;M35
549	ATSRTLSYYKLGASQRVAGDSGFAA	M25;M19;M70	EVEKGVLPQLEQPYVFIKRSDARTA	M15;M16;M74;M15;M16;M74

550	PFTINCQEPKLGSLVV RCSFYEDFL	M29;M82; M14	KKDWYDFVENPDILR VYANLGERVR	M64;M21;M32;M49;M43;M 22
551	TINCQEPKLGSLVVRC SFYEDFLEY	M29;M82; M14	KIQEGVVDYGARFYF YTSKTTVASL	M29;M67;M41;M29;M67;M 41
552	FTINCQEPKLGSLVVR CSFYEDFLE	M29;M82; M14	IKIQEGVVDYGARFYF YTSKTTVAS	M29;M67;M41;M29;M67;M 41
553	NRALTGIAVEQDKNT QEVFAQVKQI	M67;M14; M70	GIKIQEGVVDYGARF YFYTSKTTVA	M29;M67;M41;M29;M67;M 41
554	VYGDFSHSQLGGLHLL IGLAKRFKE	M33;M19; M61	ELKFNPPALQDAYYR ARAGEAANFC	M75;M39;M74;M75;M39;M 74
555	EHVTFFIYNKIVDEPEE HVQIHTID	M50;M44; M49	NGTHWFVTQRNFYEP QIITTDNTFV	M24;M31;M5;M79;M50;M1 8
556	VTFFIYNKIVDEPEEHV QIHTIDGS	M50;M44; M49	AIDYKHYTPSFKKGA KLLHKPIVWH	M82;M27;M16;M82;M27;M 16
557	HVTFFIYNKIVDEPEEH VQIHTIDG	M50;M44; M49	IDYKHYTPSFKKGAK LLHKPIVWHV	M82;M27;M16;M82;M27;M 16
558	DWTIEYPIIGDELKINA ACRKVQHM	M73;M17; M44	DYKHYTPSFKKGAKL LHKPIVWHVN	M82;M27;M16;M82;M27;M 16
559	IIGDELKINAACRKVQ HMVVKAALL	M73;M17; M44	VAIDYKHYTPSFKKG AKLLHKPIVW	M82;M27;M16;M82;M27;M 16
560	VDWTIEYPIIGDELKIN AACRKVQH	M73;M17; M44	GVFVSNGTHWFVTQR NFYEPQIITT	M24;M31;M79;M50;M18;M 35
561	IGDELKINAACRKVQH MVVKAALLA	M73;M17; M44	VFVSNGTHWFVTQRN FYEPQIITTD	M24;M31;M79;M50;M18;M 35
562	VTLACFVLAAVYRIN WITGGIAIAM	M33;M58; M44	IETISLAGSYKDWSYS GQSTQLGIE	M64;M30;M68;M64;M30;M 68
563	TTADIVVFDEISMATN YDLSVVNAR	M33;M55; M48	ETISLAGSYKDWSYS GQSTQLGIEF	M64;M30;M68;M64;M30;M 68
564	CWTETDLTKGPHEFCS QHTMLVKQG	M18;M39; M6	FGGCVFSYVGCHNKC AYWVPRASAN	M40;M75;M55;M40;M75;M 55
565	WTETDLTKGPHEFCSQ HTMLVKQGD	M18;M39; M6	GGCVFSYVGCHNKC AYWVPRASANI	M40;M75;M55;M40;M75;M 55
566	VVYRGTTTYKLNVGD YFVLTSHTVM	M42;M34; M44	FSYVGCHNKCAYWV PRASANIGCNH	M40;M75;M55;M40;M75;M 55
567	ACFVLAAVYRINWITG GIAIAMACL	M50;M58; M44	GCVFSYVGCHNKCA YWVPRASANIG	M40;M75;M55;M40;M75;M 55
568	DKVAGFAKFLKTNCC RFQEKDEDDN	M55;M73; M8	CVFSYVGCHNKCAY WVPRASANIGC	M40;M75;M55;M40;M75;M 55
569	DETQALPQRQKKQQT VTLLPAADLD	M13;M29; M14	SYVGCHNKCAYWVP RASANIGCNHT	M40;M75;M55;M40;M75;M 55
570	IGEYTFEKGDYGDAV VYRGTTTYKL	M39;M9;M 12	VFSYVGCHNKCAYW VPRASANIGCN	M40;M75;M55;M40;M75;M 55
571	QIGEYTFEKGDYGDA VVYRGTTTYK	M39;M9;M 12	GICASYQTQTNSPRRA RSVASQSII	M31;M70;M5;M25;M50;M1 8
572	TVVIGTSKFYGGWHN MLKTVYSDVE	M18;M72; M6	ICASYQTQTNSPRRAR SVASQSIIA	M31;M70;M5;M25;M50;M1 8
573	FPPTSFGPLVRKIFVDG VPFVVSTG	M71;M1;M 54	LVRGFGDSVEEVLSE ARQHLKDGTC	M55;M10;M70;M55;M10;M 70
574	VLFSTVFPPTSFGPLVR KIFVDGVP	M71;M1;M 54	VRGFGDSVEEVLSEA RQHLKDGTCG	M55;M10;M70;M55;M10;M 70

575	VFPPTSFGPLVRKIFVD GVPFVVST	M71;M1;M 54	ATRVECTTIVNGVRR SFYVYANGGK	M5;M29;M41;M5;M29;M41
576	FSTVFPPTSFGPLVRKI FVDGVPFV	M71;M1;M 54	TRVECTTIVNGVRRSF YVYANGGKG	M5;M29;M41;M5;M29;M41
577	TVFPPTSFGPLVRKIFV DGVPFVVS	M71;M1;M 54	VECTTIVNGVRRSFY VYANGGKGFC	M5;M29;M41;M5;M29;M41
578	LFSTVFPPTSFGPLVRK IFVDGVPF	M71;M1;M 54	RVECTTIVNGVRRSFY VYANGGKGF	M5;M29;M41;M5;M29;M41
579	STVFPPTSFGPLVRKIF VDGVPFVV	M71;M1;M 54	RATRVECTTIVNGVR RSFYVYANGG	M5;M29;M41;M5;M29;M41
580	STDTGVEHVTFFIYNKI VDEPEEHV	M50;M47; M44	NRYLALYNKYKYFSG AMDTTSYREA	M67;M66;M31;M67;M66;M 31
581	LSTDTGVEHVTFFIYN KIVDEPEEH	M50;M47; M44	RYLALYNKYKYFSGA MDTTSYREAA	M67;M66;M31;M67;M66;M 31
582	VECFDKFKVNSTLEQY VFCTVNALP	M50;M18; M44	FRRAFGEYSHVVAFN TLLFLMSFTV	M55;M60;M56;M55;M60;M 56
583	PARARVECFDKFKVNS TLEQYVFCT	M50;M18; M44	RAFGEYSHVVAFNTL LFLMSFTVLC	M55;M60;M56;M55;M60;M 56
584	ARVECFDKFKVNSTLE QYVFCTVNA	M50;M18; M44	AFGEYSHVVAFNTLL FLMSFTVLCL	M55;M60;M56;M55;M60;M 56
585	RVECFDKFKVNSTLEQ YVFCTVNAL	M50;M18; M44	RRAFGEYSHVVAFNT LLFLMSFTVL	M55;M60;M56;M55;M60;M 56
586	ARARVECFDKFKVNS TLEQYVFCTV	M50;M18; M44	RFRRAFGEYSHVVAF NTLLFLMSFT	M55;M60;M56;M55;M60;M 56
587	RARVECFDKFKVNSTL EQYVFCTVN	M50;M18; M44	TILDGISQYSLRLIDA MMFTSDLAT	M57;M60;M54;M57;M60;M 54
588	AWNSNNLDSKVGGNY NYLYRLFRKS	M1;M16;M 37	ILDGISQYSLRLIDAM MFTSDLATN	M57;M60;M54;M57;M60;M 54
589	SQLGGLHLLIGLAKRF KESPFELED	M19;M61; M20	SRIKASMPTTIAKNTV KSVGKFCLE	M11;M9;M24;M11;M9;M24
590	LGGLHLLIGLAKRFKE SPFELEDFI	M19;M61; M20	SVLQQLRVESSSKLW AQCVQLHNDI	M11;M34;M82;M11;M34;M 82
591	GGLHLLIGLAKRFKES PFELEDFIP	M19;M61; M20	SEFDRDAAMQRKLEK MADQAMTQMY	M57;M82;M50;M57;M82;M 50
592	QLGGLHLLIGLAKRFK ESPFELEDF	M19;M61; M20	KSEFDRDAAMQRKLE KMADQAMTQM	M57;M82;M50;M57;M82;M 50
593	RIGMEVTPSGTWLTYT GAIKLDDKD	M41;M19; M23	AKSEFDRDAAMQRK LEKMADQAMTQ	M57;M82;M50;M57;M82;M 50
594	IAATRGATVVIGTSKF YGGWHNMLK	M72;M2;M 17	VAKSEFDRDAAMQR KLEKMADQAMT	M57;M82;M50;M57;M82;M 50
595	KSIAATRGATVVIGTS KFYGGWHNM	M72;M2;M 17	RQCSGVTFQSAVKRTI KGTHHWLLL	M33;M9;M71;M33;M9;M71
596	SIAATRGATVVIGTSKF YGGWHNML	M72;M2;M 17	HINAQVAKSHNIALI WNVKDFMSLS	M32;M72;M68;M32;M72;M 68
597	LPFGWLIVGVALLAVF QSASKIITL	M14;M26; M61	RHINAQVAKSHNIALI WNVKDFMSL	M32;M72;M68;M32;M72;M 68
598	SLPFGWLIVGVALLAV FQSASKIIT	M14;M26; M61	MTARTVYDDGARRV WTLMNVLTLVY	M5;M11;M20;M5;M11;M20
599	DLLKYDFTEERLKLFD RYFKYWDQT	M55;M7;M 53	GDCLGDIAARDLICA QKFNGLTVLP	M58;M78;M65;M10;M79;M 50

600	CRLMKTIGPDMFLGTC RRCPAEIVD	M6;M16;M 37	MMSAPPAQYELKHG TFTCASEYTGN	M33;M65;M66;M33;M65;M 66
601	INDMILSLLSKGRLIIRE NNRVVIS	M55;M9;M 48	PAQYELKHGTFTCAS EYTGNYQCGH	M33;M65;M66;M33;M65;M 66
602	NDMILSLLSKGRLIIRE NNRVVISS	M55;M9;M 48	MSAPPAQYELKHGTF TCASEYTGNY	M33;M65;M66;M33;M65;M 66
603	MIERFVSLAIDAYPLT KHPNQEYAD	M55;M5;M 2	APPAQYELKHGTFTC ASEYTGNYQC	M33;M65;M66;M33;M65;M 66
604	SIGFDYVVNPFMIDVQ QWGFTGNLQ	M57;M1;M 20	SAPPAQYELKHGTFT CASEYTGNYQ	M33;M65;M66;M33;M65;M 66
605	IGFDYVVNPFMIDVQQ WGFTGNLQS	M57;M1;M 20	AQYELKHGTFTCASE YTGNYQCGHY	M33;M65;M66;M33;M65;M 66
606	RVYSSANNCTFEYVSQ PFLMDLEGK	M57;M1;M 20	PPAQYELKHGTFTCA SEYTGNYQCG	M33;M65;M66;M33;M65;M 66
607	GFDYVVNPFMIDVQQ WGFTGNLQSN	M57;M1;M 20	LARKHTTCCSLSHRF YRLANECAQV	M81;M5;M60;M79;M43;M4 2
608	PSASAFFGMSRIGMEV TPSGTWLTY	M5;M28;M 16	QPITNCVKMLCTHTG TGQAITVTPE	M64;M22;M58;M64;M22;M 58
609	KFALTCFSTQFAFACP DGVKHVYQL	M33;M22; M6	PITNCVKMLCTHTGT GQAITVTPEA	M64;M22;M58;M64;M22;M 58
610	FALTCFSTQFAFACPD GVKHVYQLR	M33;M22; M6	ITNCVKMLCTHTGTG QAITVTPEAN	M64;M22;M58;M64;M22;M 58
611	NKFALTCFSTQFAFAC PDGVKHVYQ	M33;M22; M6	NWNTKHSSGVTREL MRELNGGAYTR	M60;M22;M74;M60;M22;M 74
612	IGDPAQLPAPRTLLTK GTLEPEYFN	M29;M6;M 58	VTTTLEETKFLTENLL LYIDINGNL	M50;M11;M20;M50;M11;M 20
613	GDPAQLPAPRTLLTKG TLEPEYFNS	M29;M6;M 58	EVTTTLEETKFLTENL LLYIDINGN	M50;M11;M20;M50;M11;M 20
614	YIGDPAQLPAPRTLLT KGTLEPEYF	M29;M6;M 58	EEKFKEGVEFLRDGW EIVKFISTCA	M57;M27;M20;M57;M27;M 20
615	DPAQLPAPRTLLTKGT LEPEYFNSV	M29;M6;M 58	LEEKFKEGVEFLRDG WEIVKFISTC	M57;M27;M20;M57;M27;M 20
616	WESGVKDCVVLHSYF TSDYYQLYST	M46;M14; M20	WLEEKFKEGVEFLRD GWEIVKFIST	M57;M27;M20;M57;M27;M 20
617	EKWESGVKDCVVLHS YFTSDYYQLY	M46;M14; M20	FLQSINFVRIIMRLWL CWKCRSKNP	M75;M24;M10;M76;M9;M2 3
618	KWESGVKDCVVLHSY FTSDYYQLYS	M46;M14; M20	LQSINFVRIIMRLWLC WKCRSKNPL	M75;M24;M10;M76;M9;M2 3
619	SVFNICQAVTANVNAL LSTDGNKIA	M11;M9;M 8	GVTRDIASTDTCFAN KHADFDTWFS	M64;M22;M47;M64;M22;M 47
620	PQIAQFAPSASAFFGM SRIGMEVTP	M28;M16; M70	VTRDIASTDTCFANK HADFDTWFSQ	M64;M22;M47;M64;M22;M 47
621	WPQIAQFAPSASAFFG MSRIGMEVT	M28;M16; M70	HWFVTQRNFYEPQIIT TDNTFVSGN	M64;M10;M5;M79;M9;M23
622	NKTTLPVNVAFELWA KRNIKPVPEV	M55;M28; M74	EDEFTPFDVVRQCSG VTFQSAVKRT	M46;M60;M54;M46;M60;M 54
623	ENKTTLPVNVAFELW AKRNIKPVPE	M55;M28; M74	AIDGGVTRDIASTDTC FANKHADFD	M64;M9;M22;M64;M9;M22
624	HFRELGVVHNQDVNL HSSRLSFKEL	M53;M38; M14	YKAIDGGVTRDIAST DTCFANKHAD	M64;M9;M22;M64;M9;M22

625	NTNSSPDDQIGYYRRATRRIRGGDG	M55;M16;M71	GYKAIDGGVTRDIASTDTCFANKHA	M64;M9;M22;M64;M9;M22
626	NSSPDDQIGYYRRATRRIRGGDGKM	M55;M16;M71	IDGGVTRDIASTDTCFANKHADFDT	M64;M9;M22;M64;M9;M22
627	TNSSPDDQIGYYRRATRRIRGGDGK	M55;M16;M71	KAIDGGVTRDIASTDTCFANKHADF	M64;M9;M22;M64;M9;M22
628	SSPDDQIGYYRRATRRIRGGDGKMK	M55;M16;M71	DGGVTRDIASTDTCFANKHADFDTW	M64;M9;M22;M64;M9;M22
629	DKRTTCFSVAALTNNVAFQTVKPGN	M1;M22;M73	VYFLQSINFVRIIMRLWLCWKCRSK	M75;M24;M10;M25;M9;M23
630	WKFYDAQPCSDKAYKIEELFYSYAT	M29;M6;M59	MTWLDMVDTSLSGFKLKDCVMYASA	M64;M75;M22;M64;M75;M22
631	FYDAQPCSDKAYKIEELFYSYATHS	M29;M6;M59	IQQVVDADSKIVQLSEISMDNSPNL	M60;M54;M49;M60;M54;M49
632	YDAQPCSDKAYKIEELFYSYATHSD	M29;M6;M59	EIQQVVDADSKIVQLSEISMDNSPN	M60;M54;M49;M60;M54;M49
633	KFYDAQPCSDKAYKIEELFYSYATH	M29;M6;M59	TAVVIPTKKAGGTTEMLAKALRKVP	M78;M58;M17;M78;M58;M17
634	EWKFYDAQPCSDKAYKIEELFYSYA	M29;M6;M59	VETKAIVSTIQRKYKGIKIQEGVVD	M40;M5;M60;M40;M5;M60
635	YTKRNVIPTITQMNLKYAISAKNRA	M14;M58;M59	ETKAIVSTIQRKYKGIKIQEGVVDY	M40;M5;M60;M40;M5;M60
636	QTGKIADYNYKLPDDFTGCVIAWNS	M13;M67;M12	EQKIAEIPKEEVKPFITESKPSVEQ	M10;M26;M24;M10;M26;M24
637	GQTGKIADYNYKLPDDFTGCVIAWN	M13;M67;M12	TFQSAVKRTIKGTHHWLLLTILTSL	M52;M9;M24;M52;M9;M24
638	GVYFASTEKSNIIRGWIFGTTLDSK	M6;M24;M70	QSAVKRTIKGTHHWLLLTILTSLLV	M52;M9;M24;M52;M9;M24
639	NLKQLPFFYYSDSPCESHGKQVVSD	M32;M41;M45	FQSAVKRTIKGTHHWLLLTILTSLL	M52;M9;M24;M52;M9;M24
640	LKQLPFFYYSDSPCESHGKQVVSDI	M32;M41;M45	VTFQSAVKRTIKGTHHWLLLTILTS	M52;M9;M24;M52;M9;M24
641	FVNLKQLPFFYYSDSPCESHGKQVV	M32;M41;M45	GSALLEDEFTPFDVVRQCSGVTFQS	M46;M60;M41;M46;M60;M41
642	VNLKQLPFFYYSDSPCESHGKQVVS	M32;M41;M45	MDTTSYREAACCHLAKALNDFSNSG	M78;M5;M79;M78;M5;M79
643	AFVNLKQLPFFYYSDSPCESHGKQV	M32;M41;M45	AMDTTSYREAACCHLAKALNDFSNS	M78;M5;M79;M78;M5;M79
644	LRKHFSMMILSDDAVVCFNSTYASQ	M57;M13;M7	HGGGVAGALNKATNNAMQVESDDYI	M78;M79;M33;M78;M79;M33
645	YAYLRKHFSMMILSDDAVVCFNSTY	M57;M13;M7	GGGVAGALNKATNNAMQVESDDYIA	M78;M79;M33;M78;M79;M33
646	YLRKHFSMMILSDDAVVCFNSTYAS	M57;M13;M7	YLKHGGGVAGALNKATNNAMQVESD	M78;M79;M33;M78;M79;M33
647	FYAYLRKHFSMMILSDDAVVCFNST	M57;M13;M7	GVAGALNKATNNAMQVESDDYIATN	M78;M79;M33;M78;M79;M33
648	AYLRKHFSMMILSDDAVVCFNSTYA	M57;M13;M7	VAGALNKATNNAMQVESDDYIATNG	M78;M79;M33;M78;M79;M33
649	LSDRELHLSWEVGKPRPPLNRNYVF	M5;M12;M70	LKHGGGVAGALNKATNNAMQVESDD	M78;M79;M33;M78;M79;M33

650	SDRELHLSWEVGKPRPPLNRNYVFT	M5;M12;M70	KHGGGVAGALNKATNNAMQVESDDY	M78;M79;M33;M78;M79;M33
651	DALFAYTKRNVIPTITQMNLKYAIS	M14;M59;M10	GGVAGALNKATNNAMQVESDDYIAT	M78;M79;M33;M78;M79;M33
652	LQSLQTYVTQQLIRAAEIRASANLA	M21;M12;M49	HTKKWKYPQVNGLTSIKWADNNCYL	M60;M54;M74;M60;M54;M74
653	GRLQSLQTYVTQQLIRAAEIRASAN	M21;M12;M49	KSEKQVEQKIAEIPKEEVKPFITES	M10;M24;M74;M10;M24;M74
654	RLQSLQTYVTQQLIRAAEIRASANL	M21;M12;M49	MKSEKQVEQKIAEIPKEEVKPFITE	M10;M24;M74;M10;M24;M74
655	LPQGTTLPKGFYAEGSRGGSQASSR	M75;M42;M45	EMKSEKQVEQKIAEIPKEEVKPFIT	M10;M24;M74;M10;M24;M74
656	QLPQGTTLPKGFYAEGSRGGSQASS	M75;M42;M45	SEKQVEQKIAEIPKEEVKPFITESK	M10;M24;M74;M10;M24;M74
657	PQGTTLPKGFYAEGSRGGSQASSRS	M75;M42;M45	EKQVEQKIAEIPKEEVKPFITESKP	M10;M24;M74;M10;M24;M74
658	QGTTLPKGFYAEGSRGGSQASSRSS	M75;M42;M45	SFLEMKSEKQVEQKIAEIPKEEVKP	M10;M24;M74;M10;M24;M74
659	PFLGVYYHKNNKSWMESEFRVYSSA	M22;M28;M70	FLEMKSEKQVEQKIAEIPKEEVKPF	M10;M24;M74;M10;M24;M74
660	DGYVMHANYIFWRNTNPIQLSSYSL	M41;M9;M8	LEMKSEKQVEQKIAEIPKEEVKPFI	M10;M24;M74;M10;M24;M74
661	MHANYIFWRNTNPIQLSSYSLFDMS	M41;M9;M8	IGGAKLKALNLGETFVTHSKGLYRK	M18;M27;M24;M18;M27;M24
662	GYVMHANYIFWRNTNPIQLSSYSLF	M41;M9;M8	DSAEVAVKMFDAYVNTFSSTFNVPM	M26;M41;M37;M26;M41;M37
663	VMHANYIFWRNTNPIQLSSYSLFDM	M41;M9;M8	VGDSAEVAVKMFDAYVNTFSSTFNV	M26;M41;M37;M26;M41;M37
664	HANYIFWRNTNPIQLSSYSLFDMSK	M41;M9;M8	GDSAEVAVKMFDAYVNTFSSTFNVP	M26;M41;M37;M26;M41;M37
665	YVMHANYIFWRNTNPIQLSSYSLFD	M41;M9;M8	KGLYRKCVKSREETGLLMPLKAPKE	M60;M54;M38;M60;M54;M38
666	AGLEAPFLYLYALVYFLQSINFVRI	M60;M54;M12	PSYAAFATAQEAYEQAVANGDSEVV	M33;M68;M31;M33;M68;M31
667	AAGLEAPFLYLYALVYFLQSINFVR	M60;M54;M12	SKGLYRKCVKSREETGLLMPLKAPK	M52;M38;M47;M52;M38;M47
668	KLFDRYFKYWDQTYHPNCVNCLDDR	M50;M18;M8	LGPLSAQTGIAVLDMCASLKELLQN	M32;M24;M59;M32;M24;M59
669	FDRYFKYWDQTYHPNCVNCLDDRCI	M50;M18;M8	KKWKYPQVNGLTSIKWADNNCYLAT	M60;M54;M23;M60;M54;M23
670	WDQTYHPNCVNCLDDRCILHCANFN	M50;M18;M8	TKKWKYPQVNGLTSIKWADNNCYLA	M60;M54;M23;M60;M54;M23
671	KYWDQTYHPNCVNCLDDRCILHCAN	M50;M18;M8	KWKYPQVNGLTSIKWADNNCYLATA	M60;M54;M23;M60;M54;M23
672	RYFKYWDQTYHPNCVNCLDDRCILH	M50;M18;M8	YPQVNGLTSIKWADNNCYLATALLT	M60;M54;M23;M60;M54;M23
673	YWDQTYHPNCVNCLDDRCILHCANF	M50;M18;M8	WKYPQVNGLTSIKWADNNCYLATAL	M60;M54;M23;M60;M54;M23
674	LFDRYFKYWDQTYHPNCVNCLDDRC	M50;M18;M8	KYPQVNGLTSIKWADNNCYLATALL	M60;M54;M23;M60;M54;M23

675	FKYWDQTYHPNCVNCLDDRCILHCA	M50;M18;M8	VCINGLMLLEIKDTEKYCALAPNMM	M78;M9;M61;M78;M9;M61
676	YFKYWDQTYHPNCVNCLDDRCILHC	M50;M18;M8	PVCINGLMLLEIKDTEKYCALAPNM	M78;M9;M61;M78;M9;M61
677	DRYFKYWDQTYHPNCVNCLDDRCIL	M50;M18;M8	CINGLMLLEIKDTEKYCALAPNMMV	M78;M9;M61;M78;M9;M61
678	TVKPGNFNKDFYDFAVSKGFFKEGS	M33;M63;M70	NEKQEILGTVSWNLREMLAHAEETR	M75;M9;M24;M75;M9;M24
679	AFQTVKPGNFNKDFYDFAVSKGFFK	M33;M63;M70	SNEKQEILGTVSWNLREMLAHAEET	M75;M9;M24;M75;M9;M24
680	VKPGNFNKDFYDFAVSKGFFKEGSS	M33;M63;M70	YLKLRSDVLLPLTQYNRYLALYNKY	M69;M53;M61;M69;M53;M61
681	FQTVKPGNFNKDFYDFAVSKGFFKE	M33;M63;M70	EMYLKLRSDVLLPLTQYNRYLALYN	M69;M53;M61;M69;M53;M61
682	QTVKPGNFNKDFYDFAVSKGFFKEG	M33;M63;M70	MYLKLRSDVLLPLTQYNRYLALYNK	M69;M53;M61;M69;M53;M61
683	AISAKNRARTVAGVSICSTMTNRQF	M60;M22;M2	AAFATAQEAYEQAVANGDSEVVLKK	M33;M47;M59;M33;M47;M59
684	EFRVYSSANNCTFEYVSQPFLMDLE	M1;M82;M20	AFATAQEAYEQAVANGDSEVVLKKL	M33;M47;M59;M33;M47;M59
685	NLIIKNLSKSLTENKYSQLDEEQPM	M11;M73;M28	YAAFATAQEAYEQAVANGDSEVVLK	M33;M47;M59;M33;M47;M59
686	DLLFNKVTLADAGFIKQYGDCLGDI	M41;M48;M70	GARRVWTLMNVLTLVYKVYYGNALD	M37;M24;M20;M37;M24;M20
687	KQGNFKNLREFVFKNIDGYFKIYSK	M6;M54;M59	DTKRGVYCCREHEHEIAWYTERSEK	M75;M27;M74;M75;M27;M74
688	PFLMDLEGKQGNFKNLREFVFKNID	M6;M54;M59	ESGEFKLASHMYCSFYPPDEDEEEG	M23;M52;M20;M23;M52;M20
689	QPFLMDLEGKQGNFKNLREFVFKNI	M6;M54;M59	DESGEFKLASHMYCSFYPPDEDEEE	M23;M52;M20;M23;M52;M20
690	GKQGNFKNLREFVFKNIDGYFKIYS	M6;M54;M59	TAQEAYEQAVANGDSEVVLKKLKKS	M33;M13;M59;M33;M13;M59
691	TNSPRRARSVASQSIIAYTMSLGAE	M5;M6;M59	SSSKLWAQCVQLHNDILLAKDTTEA	M32;M82;M68;M32;M82;M68
692	PYNSVTSSIVITSGDGTTSPISEHD	M29;M28;M62	IICISTKHFYWFFSNYLKRRVVFNG	M50;M18;M23;M50;M18;M23
693	ECLYRNRDVDTDFVNEFYAYLRKHF	M26;M6;M59	TCANDPVGFTLKNTVCTVCGMWKGY	M15;M75;M10;M15;M75;M10
694	YECLYRNRDVDTDFVNEFYAYLRKH	M26;M6;M59	IPTTCANDPVGFTLKNTVCTVCGMW	M15;M75;M10;M15;M75;M10
695	PTWRVYSTGSNVFQTRAGCLIGAEH	M75;M82;M8	TTCANDPVGFTLKNTVCTVCGMWKG	M15;M75;M10;M15;M75;M10
696	IAWNSNNLDSKVGGNYNYLYRLFRK	M50;M1;M37	PTTCANDPVGFTLKNTVCTVCGMWK	M15;M75;M10;M15;M75;M10
697	TSTDVVYRAFDIYNDKVAGFAKFLK	M79;M7;M41	QIPTTCANDPVGFTLKNTVCTVCGM	M15;M75;M10;M15;M75;M10
698	MLRIMASLVLARKHTTCCSLSHRFY	M5;M2;M35	VQIPTTCANDPVGFTLKNTVCTVCG	M15;M75;M10;M15;M75;M10
699	NMLRIMASLVLARKHTTCCSLSHRF	M5;M2;M35	FIETISLAGSYKDWSYSGQSTQLGI	M64;M32;M68;M64;M32;M68

700	EASKKPRQKRTATKAYNVTQAFGRR	M5;M2;M70	LPTEVLTEEVVLKTGDLQPLEQPTS	M60;M38;M62;M60;M38;M62
701	AEASKKPRQKRTATKAYNVTQAFGR	M5;M2;M70	GLDYKAFKQIVESCGNFKVTKGKAK	M23;M42;M37;M23;M42;M37
702	PIDKCSRIIPARARVECFDKFKVNS	M33;M26;M28	LDYKAFKQIVESCGNFKVTKGKAKK	M23;M42;M37;M23;M42;M37
703	EPEFYEAMYTPHTVLQAVGACVLCN	M75;M39;M16	PFLNKVVSTTTNIVTRCLNRVCTNY	M78;M23;M37;M78;M23;M37
704	NDNTSRYWEPEFYEAMYTPHTVLQA	M75;M39;M16	KCAYWVPRASANIGCNHTGVVGEGS	M75;M9;M38;M75;M9;M38
705	TNDNTSRYWEPEFYEAMYTPHTVLQ	M75;M39;M16	CAYWVPRASANIGCNHTGVVGEGSE	M75;M9;M38;M75;M9;M38
706	WEPEFYEAMYTPHTVLQAVGACVLC	M75;M39;M16	SGSDVLYQPPQTSITSAVLQSGFRK	M38;M81;M62;M38;M81;M62
707	CQAVTANVNALLSTDGNKIADKYVR	M10;M9;M8	GSDVLYQPPQTSITSAVLQSGFRKM	M38;M81;M62;M38;M81;M62
708	FWNCNVDRYPANSIVCRFDTRVLSN	M50;M18;M48	ALEPLVDLPIGINITRFQTLLALHR	M4;M5;M1;M3;M2;M22;M20
709	WNCNVDRYPANSIVCRFDTRVLSNL	M50;M18;M48	LEPLVDLPIGINITRFQTLLALHRS	M4;M5;M1;M3;M2;M22;M20
710	LLLLFVTVYSHLLLVAAGLEAPFLY	M43;M6;M37	NNCTFEYVSQPFLMDLEGKQGNFKN	M4;M1;M3;M57;M36;M46;M20
711	LLLFVTVYSHLLLVAAGLEAPFLYL	M43;M6;M37	LPAPRTLLTKGTLEPEYFNSVCRLM	M4;M58;M16;M1;M29;M3;M6
712	DNKLKAHKDKSAQCFKMFYKGVITH	M13;M63;M52	RTLLTKGTLEPEYFNSVCRLMKTIG	M4;M13;M16;M1;M3;M6;M15
713	NKLKAHKDKSAQCFKMFYKGVITHD	M13;M63;M52	PAPRTLLTKGTLEPEYFNSVCRLMK	M4;M13;M58;M16;M1;M3;M6
714	ELTSMKYFVKIGPERTCCLCDRRAT	M27;M28;M66	APRTLLTKGTLEPEYFNSVCRLMKT	M4;M13;M58;M16;M1;M3;M6
715	AHGFELTSMKYFVKIGPERTCCLCD	M27;M28;M66	CLDDRCILHCANFNVLFSTVFPPTS	M4;M64;M24;M1;M3;M48;M23
716	VLWAHGFELTSMKYFVKIGPERTCC	M27;M28;M66	NCVNCLDDRCILHCANFNVLFSTVF	M4;M64;M24;M1;M3;M48;M23
717	TSMKYFVKIGPERTCCLCDRRATCF	M27;M28;M66	CVNCLDDRCILHCANFNVLFSTVFP	M4;M64;M24;M1;M3;M48;M23
718	HGFELTSMKYFVKIGPERTCCLCDR	M27;M28;M66	NCLDDRCILHCANFNVLFSTVFPPT	M4;M64;M24;M1;M3;M48;M23
719	LWAHGFELTSMKYFVKIGPERTCCL	M27;M28;M66	VNCLDDRCILHCANFNVLFSTVFPP	M4;M64;M24;M1;M3;M48;M23
720	GFELTSMKYFVKIGPERTCCLCDRR	M27;M28;M66	FLYLYALVYFLQSINFVRIIMRLWL	M4;M12;M54;M19;M60;M25;M3
721	FVLWAHGFELTSMKYFVKIGPERTC	M27;M28;M66	PFLYLYALVYFLQSINFVRIIMRLW	M4;M12;M54;M19;M60;M25;M3
722	FELTSMKYFVKIGPERTCCLCDRRA	M27;M28;M66	NRDVDTDFVNEFYAYLRKHFSMMIL	M4;M71;M16;M3;M6;M52;M26
723	WAHGFELTSMKYFVKIGPERTCCLC	M27;M28;M66	LYLYALVYFLQSINFVRIIMRLWLC	M4;M54;M19;M60;M25;M3;M9
724	VFVLWAHGFELTSMKYFVKIGPERT	M27;M28;M66	AGCFVDDIVKTDGTLMIERFVSLAI	M9;M10;M7;M3;M6;M8;M11

725	LTSMKYFVKIGPERTC CLCDRRATC	M27;M28; M66	GAGCFVDDIVKTDGT LMIERFVSLA	M9;M10;M7;M3;M6;M8;M11
726	LQHRLYECLYRNRDV DTDFVNEFYA	M47;M6;M59	LKSFTVEKGIYQTSNF RVQPTESIV	M1;M25;M3;M37;M41;M8;M23
727	SSQCVNLTTRTQLPPA YTNSFTRGV	M9;M2;M24	TLKSFTVEKGIYQTSN FRVQPTESI	M1;M25;M3;M37;M41;M8;M23
728	LVSSQCVNLTTRTQLP PAYTNSFTR	M9;M2;M24	AEIRASANLAATKMS ECVLGQSKRV	M4;M64;M40;M3;M48;M27;M23
729	VSSQCVNLTTRTQLPP AYTNSFTRG	M9;M2;M24	AAEIRASANLAATKM SECVLGQSKR	M4;M64;M40;M3;M48;M27;M23
730	VAFQTVKPGNFNKDF YDFAVSKGFF	M63;M59; M70	YGGWHNMLKTVYSD VENPHLMGWDY	M32;M6;M45;M3;M18;M43;M59
731	LGVYYHKNNKSWME SEFRVYSSANN	M41;M28; M70	KFYGGWHNMLKTVY SDVENPHLMGW	M32;M6;M45;M3;M18;M43;M59
732	SSQAWQPGVAMPNLY KMQRMLLEKC	M9;M12;M23	FYGGWHNMLKTVYS DVENPHLMGWD	M32;M6;M45;M3;M18;M43;M59
733	YVFCTVNALPETTADI VVFDEISMA	M38;M28; M49	GGWHNMLKTVYSDV ENPHLMGWDYP	M32;M6;M45;M3;M18;M43;M59
734	MHAASGNLLLDKRTT CFSVAALTNN	M50;M7;M9	SKFYGGWHNMLKTV YSDVENPHLMG	M32;M6;M45;M3;M18;M43;M59
735	AMHAASGNLLLDKRT TCFSVAALTN	M50;M7;M9	FTRGVYYPDKVFRSS VLHSTQDLFL	M4;M12;M14;M1;M29;M72;M67
736	HAASGNLLLDKRTTCF SVAALTNNV	M50;M7;M9	SFTRGVYYPDKVFRS SVLHSTQDLF	M4;M12;M14;M1;M29;M72;M67
737	SVCRLMKTIGPDMFLG TCRRCPAEI	M6;M59;M37	VLTSHTVMPLSAPTL VPQEHYVRIT	M28;M54;M29;M45;M51;M46;M39
738	SYECDIPIGAGICASYQ TQTNSPRR	M31;M28; M70	IPYNSVTSSIVITSGDG TTSPISEH	M28;M14;M12;M29;M45;M62;M43
739	SQCVNLTTRTQLPPAY TNSFTRGVY	M33;M9;M2	EKALKYLPIDKCSRIIP ARARVECF	M13;M28;M14;M29;M51;M33;M22
740	VYDNKLKAHKDKSAQ CFKMFYKGVI	M13;M21; M63	CVVLHSYFTSDYYQL YSTQLSTDTG	M40;M3;M41;M43;M42;M39;M20
741	HRFYRLANECAQVLSE MVMCGGSLY	M79;M43; M28	RFDNPVLPFNDGVYF ASTEKSNIIR	M64;M12;M28;M24;M6;M45;M22
742	LKYAISAKNRARTVA GVSICSTMTN	M35;M2;M18	DCLGDIAARDLICAQ KFNGLTVLPP	M58;M78;M65;M10;M3;M79;M50
743	NLKYAISAKNRARTV AGVSICSTMT	M35;M2;M18	CLGDIAARDLICAQKF NGLTVLPPL	M58;M78;M65;M10;M3;M79;M50
744	VKQIYKTPPIKDFGGF NFSQILPDP	M33;M32; M28	DYFVLTSHTVMPLSA PTLVPQEHYV	M54;M60;M29;M45;M51;M46;M39
745	VDLFRNARNGVLITEG SVKGLQPSV	M33;M30; M22	LGDISGINASVVNIQK EIDRLNEVA	M28;M14;M70;M80;M45;M35;M47
746	QVDLFRNARNGVLITE GSVKGLQPS	M33;M30; M22	DLGDISGINASVVNIQ KEIDRLNEV	M28;M14;M70;M80;M45;M35;M47
747	FNVLFSTVFPPTSFGPL VRKIFVDG	M71;M72; M54	ILGAGCFVDDIVKTD GTLMIERFVS	M9;M10;M7;M6;M63;M8;M11
748	ASAFFGMSRIGMEVTP SGTWLTYTG	M5;M28;M23	LGAGCFVDDIVKTDG TLMIERFVSL	M9;M10;M7;M6;M63;M8;M11
749	AFFGMSRIGMEVTPSG TWLTYTGAI	M5;M28;M23	EIKDATPSDFVRATAT IPIQASLPF	M9;M14;M34;M45;M33;M8;M11

750	SAFFGMSRIGMEVTPSGTWLTYTGA	M5;M28;M23	PFNDGVYFASTEKSNIIRGWIFGTT	M64;M12;M24;M10;M6;M45;M22
751	FFGMSRIGMEVTPSGTWLTYTGAIK	M5;M28;M23	FNDGVYFASTEKSNIIRGWIFGTTL	M64;M12;M24;M10;M6;M45;M22
752	DKCSRIIPARARVECFDKFKVNSTL	M33;M9;M28	NDGVYFASTEKSNIIRGWIFGTTLD	M64;M12;M24;M10;M6;M45;M22
753	YANSVFNICQAVTANVNALLSTDGN	M11;M39;M9	VTPSGTWLTYTGAIKLDDKDPNFKD	M19;M10;M7;M41;M8;M35;M11
754	ANSVFNICQAVTANVNALLSTDGNK	M11;M39;M9	EVTPSGTWLTYTGAIKLDDKDPNFK	M19;M10;M7;M41;M8;M35;M11
755	EVRQIAPGQTGKIADYNYKLPDDFT	M80;M67;M38	SEETGTLIVNSVLLFLAFVVFLLVT	M73;M14;M7;M50;M18;M11;M44
756	IAPGQTGKIADYNYKLPDDFTGCVI	M80;M67;M38	LFDMSKFPLKLRGTAVMSLKEGQIN	M54;M14;M60;M6;M67;M8;M59
757	RQIAPGQTGKIADYNYKLPDDFTGC	M80;M67;M38	GVPVVDSYYSLLMPILTLTRALTAE	M58;M16;M14;M34;M8;M17;M39
758	QIAPGQTGKIADYNYKLPDDFTGCV	M80;M67;M38	TPTWRVYSTGSNVFQTRAGCLIGAE	M75;M14;M5;M6;M41;M8;M82
759	VRQIAPGQTGKIADYNYKLPDDFTG	M80;M67;M38	QLTPTWRVYSTGSNVFQTRAGCLIG	M75;M14;M5;M6;M41;M8;M82
760	QPYRVVVLSFELLHAPATVCGPKKS	M46;M34;M39	LTPTWRVYSTGSNVFQTRAGCLIGA	M75;M14;M5;M6;M41;M8;M82
761	RVVVLSFELLHAPATVCGPKKSTNL	M46;M34;M39	ALPETTADIVVFDEISMATNYDLSV	M28;M55;M7;M38;M48;M33;M49
762	PYRVVVLSFELLHAPATVCGPKKST	M46;M34;M39	NALPETTADIVVFDEISMATNYDLS	M28;M55;M7;M38;M48;M33;M49
763	YQPYRVVVLSFELLHAPATVCGPKK	M46;M34;M39	LPETTADIVVFDEISMATNYDLSVV	M28;M55;M7;M38;M48;M33;M49
764	YRVVVLSFELLHAPATVCGPKKSTN	M46;M34;M39	YYSLLMPILTLTRALTAESHVDTDL	M12;M58;M16;M30;M8;M17;M15
765	VVVLSFELLHAPATVCGPKKSTNLV	M46;M34;M39	SLLMPILTLTRALTAESHVDTDLTK	M12;M58;M16;M30;M8;M17;M15
766	MKTIGPDMFLGTCRRCPAEIVDTVS	M71;M16;M37	YSLLMPILTLTRALTAESHVDTDLT	M12;M58;M16;M30;M8;M17;M15
767	TIGPDMFLGTCRRCPAEIVDTVSAL	M71;M16;M37	SYYSLLMPILTLTRALTAESHVDTD	M12;M58;M16;M30;M8;M17;M15
768	RLMKTIGPDMFLGTCRRCPAEIVDT	M71;M16;M37	LMPILTLTRALTAESHVDTDLTKPY	M12;M58;M16;M30;M8;M17;M15
769	KTIGPDMFLGTCRRCPAEIVDTVSA	M71;M16;M37	LLMPILTLTRALTAESHVDTDLTKP	M12;M58;M16;M30;M8;M17;M15
770	LMKTIGPDMFLGTCRRCPAEIVDTV	M71;M16;M37	TVSALVYDNKLKAHKDKSAQCFKMF	M13;M21;M28;M16;M7;M63;M17
771	IGPDMFLGTCRRCPAEIVDTVSALV	M71;M16;M37	DYILANTCTERLKLFAAETLKATEE	M64;M40;M6;M48;M63;M49;M26
772	GQVFGLYKNTCVGSDNVTDFNAIAT	M73;M28;M59	YILANTCTERLKLFAAETLKATEET	M64;M40;M6;M48;M63;M49;M26
773	VFGLYKNTCVGSDNVTDFNAIATCD	M73;M28;M59	DDFVEIIKSQDLSVVSKVVKVTIDY	M4;M48;M18;M8;M43;M15;M35
774	NGQVFGLYKNTCVGSDNVTDFNAIA	M73;M28;M59	ARMAGNGGDAALALLLLDRLNQLES	M13;M56;M58;M53;M51;M17;M11

775	QVFGLYKNTCVGSDN VTDFNAIATC	M73;M28; M59	SYGIATVREVLSDREL HLSWEVGKP	M28;M7;M5;M6;M49;M11; M59
776	VLSFELLHAPATVCGP KKSTNLVKN	M46;M39; M27	LSYGIATVREVLSDRE LHLSWEVGK	M28;M7;M5;M6;M49;M11; M59
777	SPYNSQNAVASKILGL PTQTVDSSQ	M60;M39; M54	PSRILGAGCFVDDIVK TDGTLMIER	M9;M10;M6;M63;M8;M11; M20
778	GAVILRGHLRIAGHHL GRCDIKDLP	M55;M58; M17	GEVFNATRFASVYAW NRKRISNCVA	M19;M16;M55;M25;M53;M 2;M20
779	TLPVNVAFELWAKRNI KPVPEVKIL	M55;M66; M74	NDPFLGVYYHKNNKS WMESEFRVYS	M4;M21;M28;M70;M1;M37; M22
780	PVNVAFELWAKRNIKP VPEVKILNN	M55;M66; M74	CNDPFLGVYYHKNN KSWMESEFRVY	M4;M21;M28;M70;M1;M37; M22
781	LPVNVAFELWAKRNI KPVPEVKILN	M55;M66; M74	QFCNDPFLGVYYHKN NKSWMESEFR	M4;M21;M28;M70;M1;M37; M22
782	VNFNFNGLTGTGVLTE SNKKFLPFQ	M39;M38; M61	FCNDPFLGVYYHKNN KSWMESEFRV	M4;M21;M28;M70;M1;M37; M22
783	CLVGLMWLSYFIASFR LFARTRSMW	M35;M26; M16	RLQSLENVAFNVVNK GHFDGQQGEV	M4;M71;M16;M24;M1;M27; M15
784	ACLVGLMWLSYFIASF RLFARTRSM	M35;M26; M16	KPVPEVKILNNLGVDI AANTVIWDY	M9;M54;M48;M57;M27;M1 1;M44
785	AARDLICAQKFNGLTV LPPLLTDEM	M78;M39; M58	ISGINASVVNIQKEIDR LNEVAKNL	M28;M14;M70;M80;M35;M 82;M47
786	GATVVIGTSKFYGGW HNMLKTVYSD	M18;M72; M17	LTGHMLDMYSVMLT NDNTSRYWEPE	M64;M31;M7;M34;M61;M3 6;M22
787	RGATVVIGTSKFYGG WHNMLKTVYS	M18;M72; M17	GHMLDMYSVMLTND NTSRYWEPEFY	M64;M31;M7;M34;M61;M3 6;M22
788	NEFYAYLRKHFSMMIL SDDAVVCFN	M57;M13; M71	TGHMLDMYSVMLTN DNTSRYWEPEF	M64;M31;M7;M34;M61;M3 6;M22
789	NKCVNFNFNGLTGTG VLTESNKKFL	M42;M39; M38	TPINLVRDLPQGFSAL EPLVDLPIG	M64;M40;M31;M45;M36;M 52;M47
790	KNKCVNFNFNGLTGT GVLTESNKKF	M42;M39; M38	FPLKLRGTAVMSLKE GQINDMILSL	M54;M14;M60;M6;M67;M4 9;M59
791	KCVNFNFNGLTGTGV LTESNKKFLP	M42;M39; M38	KFPLKLRGTAVMSLK EGQINDMILS	M54;M14;M60;M6;M67;M4 9;M59
792	VKNKCVNFNFNGLTG TGVLTESNKK	M42;M39; M38	DKFKVNSTLEQYVFC TVNALPETTA	M40;M29;M6;M44;M50;M1 8;M47
793	SFVIRGDEVRQIAPGQ TGKIADYNY	M33;M80; M62	PVVDSYYSLLMPILTL TRALTAESH	M58;M16;M34;M8;M17;M1 5;M39
794	DSFVIRGDEVRQIAPG QTGKIADYN	M33;M80; M62	VPVVDSYYSLLMPILT LTRALTAES	M58;M16;M34;M8;M17;M1 5;M39
795	LAMDEFIERYKLEGYA FEHIVYGDF	M15;M58; M16	IDGYFKIYSKHTPINL VRDLPQGFS	M64;M40;M71;M16;M36;M 15;M52
796	EIDFLELAMDEFIERYK LEGYAFEH	M15;M58; M16	NNTVYDPLQPELDSF KEELDKYFKN	M70;M34;M6;M63;M72;M4 7;M59
797	MEIDFLELAMDEFIER YKLEGYAFE	M15;M58; M16	NTVYDPLQPELDSFK EELDKYFKNH	M70;M34;M6;M63;M72;M4 7;M59
798	ELAMDEFIERYKLEGY AFEHIVYGD	M15;M58; M16	YSFVSEETGTLIVNSV LLFLAFVVF	M56;M73;M7;M50;M18;M1 1;M44
799	FLELAMDEFIERYKLE GYAFEHIVY	M15;M58; M16	FSVAALTNNVAFQTV KPGNFNKDFY	M73;M1;M25;M29;M6;M22; M59

800	IDFLELAMDEFIERYKLEGYAFEHI	M15;M58;M16	IMRTFKVSIWNLDYIINLIIKNLSK	M56;M1;M5;M50;M18;M44;M20
801	AMDEFIERYKLEGYAFEHIVYGDFS	M15;M58;M16	RKHFSMMILSDDAVVCFNSTYASQG	M13;M21;M7;M53;M48;M49;M22
802	LELAMDEFIERYKLEGYAFEHIVYG	M15;M58;M16	KHFSMMILSDDAVVCFNSTYASQGL	M13;M21;M7;M53;M48;M49;M22
803	DFLELAMDEFIERYKLEGYAFEHIV	M15;M58;M16	ALPQRQKKQQTVTLLPAADLDDFSK	M54;M14;M60;M29;M46;M26;M39
804	MACLVGLMWLSYFIASFRLFARTRS	M60;M26;M16	LPQRQKKQQTVTLLPAADLDDFSKQ	M54;M14;M60;M29;M46;M26;M39
805	AMACLVGLMWLSYFIASFRLFARTR	M60;M26;M16	QRQKKQQTVTLLPAADLDDFSKQLQ	M54;M14;M60;M29;M46;M26;M39
806	VVIGIVNNTVYDPLQPELDSFKEEL	M34;M72;M47	PQRQKKQQTVTLLPAADLDDFSKQL	M54;M14;M60;M29;M46;M26;M39
807	VIGIVNNTVYDPLQPELDSFKEELD	M34;M72;M47	IPIGAGICASYQTQTNSPRRARSVA	M28;M19;M31;M70;M25;M50;M18
808	DVVIGIVNNTVYDPLQPELDSFKEE	M34;M72;M47	DIPIGAGICASYQTQTNSPRRARSV	M28;M19;M31;M70;M25;M50;M18
809	GNCDVVIGIVNNTVYDPLQPELDSF	M34;M72;M47	LALSKGVHFVCNLLLLFVTVYSHLL	M6;M50;M18;M8;M49;M22;M23
810	CDVVIGIVNNTVYDPLQPELDSFKE	M34;M72;M47	SKGVHFVCNLLLLFVTVYSHLLLVA	M21;M6;M50;M8;M43;M22;M23
811	SGNCDVVIGIVNNTVYDPLQPELDS	M34;M72;M47	LSKGVHFVCNLLLLFVTVYSHLLLV	M21;M6;M50;M8;M43;M22;M23
812	NCDVVIGIVNNTVYDPLQPELDSFK	M34;M72;M47	ADKYVRNLQHRLYECLYRNRDVDTD	M54;M60;M2;M37;M44;M52;M47
813	LLDKRTTCFSVAALTNNVAFQTVKP	M73;M29;M22	REEAIRHVRAWIGFDVEGCHATREA	M64;M32;M14;M48;M57;M69;M20
814	LLLDKRTTCFSVAALTNNVAFQTVK	M73;M29;M22	VTQQLIRAAEIRASANLAATKMSEC	M64;M40;M21;M12;M48;M22;M23
815	YYKKVDGVVQQLPETYFTQSRNLQE	M71;M60;M54	NFYEPQIITTDNTFVSGNCDVVIGI	M64;M12;M10;M7;M30;M9;M23
816	YKKVDGVVQQLPETYFTQSRNLQEF	M71;M60;M54	YEPQIITTDNTFVSGNCDVVIGIVN	M64;M12;M10;M7;M30;M9;M23
817	EQDKNTQEVFAQVKQIYKTPPIKDF	M55;M18;M56	EPQIITTDNTFVSGNCDVVIGIVNN	M64;M12;M10;M7;M30;M9;M23
818	VEQDKNTQEVFAQVKQIYKTPPIKD	M55;M18;M56	FYEPQIITTDNTFVSGNCDVVIGIV	M64;M12;M10;M7;M30;M9;M23
819	AVEQDKNTQEVFAQVKQIYKTPPIK	M55;M18;M56	RNFYEPQIITTDNTFVSGNCDVVIG	M64;M12;M10;M7;M30;M9;M23
820	IAVEQDKNTQEVFAQVKQIYKTPPI	M55;M18;M56	VQPTESIVRFPNITNLCPFGEVFNA	M21;M28;M66;M48;M41;M26;M22
821	QDKNTQEVFAQVKQIYKTPPIKDFG	M55;M18;M56	RVQPTESIVRFPNITNLCPFGEVFN	M21;M28;M66;M48;M41;M26;M22
822	KNTQEVFAQVKQIYKTPPIKDFGGF	M55;M18;M32	ALSKGVHFVCNLLLLFVTVYSHLLL	M6;M50;M18;M8;M43;M22;M23
823	NTQEVFAQVKQIYKTPPIKDFGGFN	M55;M18;M32	VTLADAGFIKQYGDCLGDIAARDLI	M21;M70;M48;M57;M63;M41;M27
824	QPRTFLLKYNENGTITDAVDCALDP	M15;M11;M58	KVTLADAGFIKQYGDCLGDIAARDL	M21;M70;M48;M57;M63;M41;M27

825	ADLVYALRHFDEGNCDTLKEILVTY	M52;M17;M49	NKVTLADAGFIKQYGDCLGDIAARD	M21;M70;M48;M57;M63;M41;M27
826	INRPQIGVVREFLTRNPAWRKAVFI	M11;M73;M49	FNKVTLADAGFIKQYGDCLGDIAAR	M21;M70;M48;M57;M63;M41;M27
827	RPQIGVVREFLTRNPAWRKAVFISP	M11;M73;M49	SNFGAISSVLNDILSRLDKVEAEVQ	M58;M53;M6;M48;M50;M17;M15
828	NRPQIGVVREFLTRNPAWRKAVFIS	M11;M73;M49	NFGAISSVLNDILSRLDKVEAEVQI	M58;M53;M6;M48;M50;M17;M15
829	SAINRPQIGVVREFLTRNPAWRKAV	M11;M73;M49	FGAISSVLNDILSRLDKVEAEVQID	M58;M53;M6;M48;M50;M17;M15
830	AINRPQIGVVREFLTRNPAWRKAVF	M11;M73;M49	LEDFIPMDSTVKNYFITDAQTGSSK	M19;M70;M25;M61;M18;M43;M39
831	PQIGVVREFLTRNPAWRKAVFISPY	M11;M73;M49	EDFIPMDSTVKNYFITDAQTGSSKC	M19;M70;M25;M61;M18;M43;M39
832	SSAINRPQIGVVREFLTRNPAWRKA	M11;M73;M49	HKNNKSWMESEFRVYSSANNCTFEY	M64;M70;M5;M2;M48;M41;M82
833	ANQFNSAIGKIQDSLSSTASALGKL	M79;M29;M64	FGDFIQTTPGSGVPVVDSYYSLLMP	M40;M9;M58;M16;M34;M8;M11
834	TKHPNQEYADVFHLYLQYIRKLHDE	M71;M9;M61	IAQFAPSASAFFGMSRIGMEVTPSG	M71;M28;M16;M70;M5;M18;M17
835	ALALLLLDRLNQLESKMSGKGQQQQ	M53;M11;M58	APSASAFFGMSRIGMEVTPSGTWLT	M71;M28;M16;M70;M5;M18;M17
836	DQDALFAYTKRNVIPTITQMNLKYA	M55;M59;M10	AQFAPSASAFFGMSRIGMEVTPSGT	M71;M28;M16;M70;M5;M18;M17
837	VAGDSGFAAYSRYRIGNYKLNTDHS	M71;M13;M41	QIAQFAPSASAFFGMSRIGMEVTPS	M71;M28;M16;M70;M5;M18;M17
838	QRVAGDSGFAAYSRYRIGNYKLNTD	M71;M13;M41	QFAPSASAFFGMSRIGMEVTPSGTW	M71;M28;M16;M70;M5;M18;M17
839	GASQRVAGDSGFAAYSRYRIGNYKL	M71;M13;M41	FAPSASAFFGMSRIGMEVTPSGTWL	M71;M28;M16;M70;M5;M18;M17
840	ASQRVAGDSGFAAYSRYRIGNYKLN	M71;M13;M41	NVTWFHAIHVSGTNGTKRFDNPVLP	M64;M40;M29;M45;M15;M22;M23
841	RVAGDSGFAAYSRYRIGNYKLNTDH	M71;M13;M41	TDGNKIADKYVRNLQHRLYECLYRN	M54;M60;M37;M57;M27;M44;M20
842	SQRVAGDSGFAAYSRYRIGNYKLNT	M71;M13;M41	GAGICASYQTQTNSPRRARSVASQS	M19;M31;M70;M5;M25;M50;M18
843	PETYFTQSRNLQEFKPRSQMEIDFL	M71;M75;M31	AGICASYQTQTNSPRRARSVASQSI	M19;M31;M70;M5;M25;M50;M18
844	NVAFELWAKRNIKPVPEVKILNNLG	M49;M66;M74	SNGTITVEELKKLLEQWNLVIGFLF	M4;M58;M16;M53;M17;M52;M47
845	VAFELWAKRNIKPVPEVKILNNLGV	M49;M66;M74	ENPDILRVYANLGERVRQALLKTVQ	M64;M11;M21;M32;M48;M49;M22
846	NLNESLIDLQELGKYEQYIKWPWYI	M17;M61;M70	SLSHRFYRLANECAQVLSEMVMCGG	M28;M5;M79;M42;M43;M46;M39
847	NESLIDLQELGKYEQYIKWPWYIWL	M17;M61;M70	LSHRFYRLANECAQVLSEMVMCGGS	M28;M5;M79;M42;M43;M46;M39
848	LNESLIDLQELGKYEQYIKWPWYIW	M17;M61;M70	QTVTLLPAADLDDFSKQLQQSMSSA	M71;M54;M58;M55;M53;M26;M39
849	VPEVKILNNLGVDIAANTVIWDYKR	M57;M9;M27	IRVGARKSAPLIELCVDEAGSKSPI	M64;M40;M21;M7;M57;M22;M23

850	CELYHYQECVRGTTV LLKEPCSSGT	M57;M27; M20	YIRVGARKSAPLIELC VDEAGSKSP	M64;M40;M21;M7;M57;M2 2;M23
851	ELYHYQECVRGTTVL LKEPCSSGTY	M57;M27; M20	RVGARKSAPLIELCV DEAGSKSPIQ	M64;M40;M21;M7;M57;M2 2;M23
852	TCELYHYQECVRGTT VLLKEPCSSG	M57;M27; M20	VGARKSAPLIELCVDE AGSKSPIQY	M64;M40;M21;M7;M57;M2 2;M23
853	ATCELYHYQECVRGT TVLLKEPCSS	M57;M27; M20	WYIRVGARKSAPLIEL CVDEAGSKS	M64;M40;M21;M7;M57;M2 2;M23
854	LSDRVVFVLWAHGFE LTSMKYFVKI	M46;M60; M54	SARIVYTACSHAAVD ALCEKALKYL	M28;M60;M29;M38;M67;M 17;M49
855	LKNLSDRVVFVLWAH GFELTSMKYF	M46;M60; M54	AMPNLYKMQRMLLE KCDLQNYGDSA	M12;M55;M53;M17;M52;M 9;M23
856	KNLSDRVVFVLWAHG FELTSMKYFV	M46;M60; M54	LAFVVFLLVTLAILTA LRLCAYCCN	M54;M16;M60;M25;M17;M 46;M39
857	NLSDRVVFVLWAHGF ELTSMKYFVK	M46;M60; M54	AFVVFLLVTLAILTAL RLCAYCCNI	M54;M16;M60;M25;M17;M 46;M39
858	DTLKNLSDRVVFVLW AHGFELTSMK	M46;M60; M54	FVVFLLVTLAILTALR LCAYCCNIV	M54;M16;M60;M25;M17;M 46;M39
859	TLKNLSDRVVFVLWA HGFELTSMKY	M46;M60; M54	QHEETIYNLLKDCPA VAKHDFFKFR	M40;M30;M41;M42;M43;M 39;M11
860	PLMYKGLPWNVVRIKI VQMLSDTLK	M57;M9;M 20	KIITLKKRWQLALSK GVHFVCNLLL	M11;M74;M33;M27;M8;M4 2;M82
861	GLTGTGVLTESNKKFL PFQQFGRDI	M78;M24; M61	ATNYDLSVVNARLRA KHYVYIGDPA	M1;M25;M37;M57;M50;M1 8;M26
862	LTGTGVLTESNKKFLP FQQFGRDIA	M78;M24; M61	ISAKNRARTVAGVSIC STMTNRQFH	M64;M32;M60;M30;M2;M2 2;M23
863	TGTGVLTESNKKFLPF QQFGRDIAD	M78;M24; M61	TLKKRWQLALSKGV HFVCNLLLLFV	M11;M74;M33;M8;M42;M8 2;M23
864	RQRLTKYTMADLVYA LRHFDEGNCD	M10;M52; M17	KFKVNSTLEQYVFCT VNALPETTAD	M40;M29;M6;M18;M49;M3 5;M47
865	ISRQRLTKYTMADLVY ALRHFDEGN	M10;M52; M17	VNSTLEQYVFCTVNA LPETTADIVV	M40;M29;M6;M18;M49;M3 5;M47
866	SRQRLTKYTMADLVY ALRHFDEGNC	M10;M52; M17	FKVNSTLEQYVFCTV NALPETTADI	M40;M29;M6;M18;M49;M3 5;M47
867	NFNGLTGTGVLTESNK KFLPFQQFG	M24;M38; M61	STLEQYVFCTVNALP ETTADIVVFD	M40;M29;M6;M18;M49;M3 5;M47
868	NFNFNGLTGTGVLTES NKKFLPFQQ	M24;M38; M61	NSTLEQYVFCTVNAL PETTADIVVF	M40;M29;M6;M18;M49;M3 5;M47
869	FNFNGLTGTGVLTESN KKFLPFQQF	M24;M38; M61	KVNSTLEQYVFCTVN ALPETTADIV	M40;M29;M6;M18;M49;M3 5;M47
870	AIRHVRAWIGFDVEGC HATREAVGT	M57;M69; M20	TLEQYVFCTVNALPE TTADIVVFDE	M40;M29;M38;M6;M18;M4 9;M47
871	EAIRHVRAWIGFDVEG CHATREAVG	M57;M69; M20	VTQRNFYEPQIITTDN TFVSGNCDV	M64;M10;M7;M30;M79;M9; M23
872	RHVRAWIGFDVEGCH ATREAVGTNL	M57;M69; M20	MILSDDAVVCFNSTY ASQGLVASIK	M13;M21;M53;M48;M49;M 26;M22
873	IRHVRAWIGFDVEGCH ATREAVGTN	M57;M69; M20	MMILSDDAVVCFNST YASQGLVASI	M13;M21;M53;M48;M49;M 26;M22
874	GVYYHKNNKSWMES EFRVYSSANNC	M5;M41;M 70	ILSDDAVVCFNSTYAS QGLVASIKN	M13;M21;M53;M48;M49;M 26;M22

875	FTIYSLLLCRMNSRNYIAQVDVVNF	M10;M54;M24	SMMILSDDAVVCFNSTYASQGLVAS	M13;M21;M53;M48;M49;M26;M22
876	IYSLLLCRMNSRNYIAQVDVVNFNL	M10;M54;M24	LSLLSKGRLIIRENNRVVISSDVLV	M11;M21;M24;M10;M48;M41;M9
877	AFPFTIYSLLLCRMNSRNYIAQVDV	M10;M54;M24	LLSKGRLIIRENNRVVISSDVLVNN	M11;M21;M24;M10;M48;M41;M9
878	FPFTIYSLLLCRMNSRNYIAQVDVV	M10;M54;M24	MILSLLSKGRLIIRENNRVVISSDV	M11;M21;M24;M10;M48;M41;M9
879	PFTIYSLLLCRMNSRNYIAQVDVVN	M10;M54;M24	SLLSKGRLIIRENNRVVISSDVLVN	M11;M21;M24;M10;M48;M41;M9
880	FAFPFTIYSLLLCRMNSRNYIAQVD	M10;M54;M24	ILSLLSKGRLIIRENNRVVISSDVL	M11;M21;M24;M10;M48;M41;M9
881	TIYSLLLCRMNSRNYIAQVDVVNFN	M10;M54;M24	GLMWLSYFIASFRLFARTRSMWSFN	M64;M40;M16;M30;M15;M35;M26
882	VFAFPFTIYSLLLCRMNSRNYIAQV	M10;M54;M24	TRFASVYAWNRKRISNCVADYSVLY	M16;M55;M25;M53;M74;M67;M27
883	NVFAFPFTIYSLLLCRMNSRNYIAQ	M10;M54;M24	PQGLPNNTASWFTALTQHGKEDLKF	M40;M28;M70;M29;M38;M18;M15
884	VNRFNVAITRAKVGILCIMSDRDLY	M25;M68;M66	RRPQGLPNNTASWFTALTQHGKEDL	M40;M28;M70;M29;M38;M18;M15
885	VITHDVSSAINRPQIGVVREFLTRN	M49;M21;M70	RPQGLPNNTASWFTALTQHGKEDLK	M40;M28;M70;M29;M38;M18;M15
886	AFDKSAFVNLKQLPFFYYSDSPCES	M60;M41;M54	QRRPQGLPNNTASWFTALTQHGKED	M40;M28;M70;M29;M38;M18;M15
887	FDKSAFVNLKQLPFFYYSDSPCESH	M60;M41;M54	HFVCNLLLLFVTVYSHLLLVAAGLE	M21;M6;M37;M41;M43;M42;M22
888	HFPREGVFVSNGTHWFVTQRNFYEP	M50;M18;M24	VHFVCNLLLLFVTVYSHLLLVAAGL	M21;M6;M37;M41;M43;M42;M22
889	AHFPREGVFVSNGTHWFVTQRNFYE	M50;M18;M24	VNQNAQALNTLVKQLSSNFGAISSV	M58;M16;M53;M17;M15;M46;M22
890	SNVANYQKVGMQKYSTLQGPPGTGK	M21;M34;M41	NQNAQALNTLVKQLSSNFGAISSVL	M58;M16;M53;M17;M15;M46;M22
891	NGTKRFDNPVLPFNDGVYFASTEKS	M78;M65;M82	VDTDFVNEFYAYLRKHFSMMILSDD	M71;M16;M18;M35;M15;M52;M26
892	LGSLVVRCSFYEDFLEYHDVRVVLD	M21;M41;M70	DVDTDFVNEFYAYLRKHFSMMILSD	M71;M16;M18;M35;M15;M52;M26
893	GSLVVRCSFYEDFLEYHDVRVVLDF	M21;M41;M70	LLLQYGSFCTQLNRALTGIAVEQDK	M13;M28;M70;M41;M67;M43;M20
894	SLVVRCSFYEDFLEYHDVRVVLDFI	M21;M41;M70	HTFSNYQHEETIYNLLKDCPAVAKH	M40;M34;M30;M41;M27;M42;M11
895	VDFQVTIAEILLIIMRTFKVSIWNL	M5;M61;M37	VPVAIHADQLTPTWRVYSTGSNVFQ	M58;M24;M16;M5;M41;M17;M82
896	VLLPLVSSQCVNLTTRTQLPPAYTN	M43;M9;M24	LVYFLQSINFVRIIMRLWLCWKCRS	M4;M75;M24;M10;M25;M9;M23
897	LVLLPLVSSQCVNLTTRTQLPPAYT	M43;M9;M24	VLARKHTTCCSLSHRFYRLANECAQ	M81;M5;M60;M2;M79;M43;M42
898	PYNMRVIHFGAGSDKGVAPGTAVLR	M5;M13;M70	WFVTQRNFYEPQIITTDNTFVSGNC	M64;M10;M5;M7;M79;M9;M23
899	LAVPYNMRVIHFGAGSDKGVAPGTA	M5;M13;M70	LPAADLDDFSKQLQQSMSSADSTQA	M71;M32;M58;M31;M55;M53;M33

900	VPYNMRVIHFGAGSDKGVAPGTAVL	M5;M13;M70	PNQEYADVFHLYLQYIRKLHDELTG	M71;M32;M16;M61;M52;M9;M47
901	YNMRVIHFGAGSDKGVAPGTAVLRQ	M5;M13;M70	EDQDALFAYTKRNVIPTITQMNLKY	M71;M24;M55;M10;M35;M59;M23
902	AVPYNMRVIHFGAGSDKGVAPGTAV	M5;M13;M70	LWAKRNIKPVPEVKILNNLGVDIAA	M54;M66;M74;M57;M27;M49;M9
903	TLLALHRSYLTPGDSSSGWTAGAAA	M5;M75;M70	HAIHVSGTNGTKRFDNPVLPFNDGV	M64;M40;M22;M78;M65;M82;M23
904	AGSDKGVAPGTAVLRQWLPTGTLLV	M13;M26;M70	FHAIHVSGTNGTKRFDNPVLPFNDG	M64;M40;M22;M78;M65;M82;M23
905	TITQMNLKYAISAKNRARTVAGVSI	M35;M82;M18	IDSYFVVKRHTFSNYQHEETIYNLL	M71;M58;M18;M15;M52;M47;M20
906	PTITQMNLKYAISAKNRARTVAGVS	M35;M82;M18	VSNGTHWFVTQRNFYEPQIITTDNT	M24;M31;M5;M79;M50;M18;M35
907	ITQMNLKYAISAKNRARTVAGVSIC	M35;M82;M18	SNGTHWFVTQRNFYEPQIITTDNTF	M24;M31;M5;M79;M50;M18;M35
908	FNVAITRAKVGILCIMSDRDLYDKL	M32;M68;M66	FVSNGTHWFVTQRNFYEPQIITTDN	M24;M31;M5;M79;M50;M18;M35
909	VAITRAKVGILCIMSDRDLYDKLQF	M32;M68;M66	LPGCDGGSLYVNKHAFHTPAFDKSA	M56;M73;M58;M24;M50;M11;M47
910	RFNVAITRAKVGILCIMSDRDLYDK	M32;M68;M66	GCDGGSLYVNKHAFHTPAFDKSAFV	M56;M73;M58;M24;M50;M11;M47
911	NVAITRAKVGILCIMSDRDLYDKLQ	M32;M68;M66	LNLPGCDGGSLYVNKHAFHTPAFDK	M56;M73;M58;M24;M50;M11;M47
912	LYLQYIRKLHDELTGHMLDMYSVML	M52;M32;M38	NLNLPGCDGGSLYVNKHAFHTPAFD	M56;M73;M58;M24;M50;M11;M47
913	DYYRYNLPTMCDIRQLLFVVEVVDK	M70;M74;M20	PGCDGGSLYVNKHAFHTPAFDKSAF	M56;M73;M58;M24;M50;M11;M47
914	YYRYNLPTMCDIRQLLFVVEVVDKY	M70;M74;M20	NLPGCDGGSLYVNKHAFHTPAFDKS	M56;M73;M58;M24;M50;M11;M47
915	INFVRIIMRLWLCWKCRSKNPLLYD	M75;M76;M9	GTHWFVTQRNFYEPQIITTDNTFVS	M24;M31;M5;M79;M50;M18;M9
916	NFVRIIMRLWLCWKCRSKNPLLYDA	M75;M76;M9	SPFELEDFIPMDSTVKNYFITDAQT	M4;M19;M1;M25;M3;M61;M18;M43
917	KRHTFSNYQHEETIYNLLKDCPAVA	M34;M27;M20	RFKESPFELEDFIPMDSTVKNYFIT	M4;M19;M1;M25;M3;M61;M18;M43
918	VKRHTFSNYQHEETIYNLLKDCPAV	M34;M27;M20	FKESPFELEDFIPMDSTVKNYFITD	M4;M19;M1;M25;M3;M61;M18;M43
919	VVKRHTFSNYQHEETIYNLLKDCPA	M34;M27;M20	ESPFELEDFIPMDSTVKNYFITDAQ	M4;M19;M1;M25;M3;M61;M18;M43
920	ECVRGTTVLLKEPCSSGTYEGNSPF	M27;M58;M20	KESPFELEDFIPMDSTVKNYFITDA	M4;M19;M1;M25;M3;M61;M18;M43
921	CVRGTTVLLKEPCSSGTYEGNSPFH	M27;M58;M20	GLAKRFKESPFELEDFIPMDSTVKN	M4;M19;M1;M25;M3;M18;M43;M20
922	NGYPNMFITREEAIRHVRAWIGFDV	M64;M69;M32	NLCPFGEVFNATRFASVYAWNRKRI	M4;M19;M58;M25;M3;M2;M17;M20
923	ISTIGVCSMTDIAKKPTETICAPLT	M9;M59;M70	TNLCPFGEVFNATRFASVYAWNRKR	M4;M19;M58;M25;M3;M2;M17;M20
924	HISTIGVCSMTDIAKKPTETICAPL	M9;M59;M70	LCPFGEVFNATRFASVYAWNRKRIS	M4;M19;M58;M25;M3;M2;M17;M20

925	TIGVCSMTDIAKKPTETICAPLTVF	M9;M59;M70	FTRLQSLENVAFNVVNKGHFDGQQG	M4;M54;M16;M24;M1;M3;M27;M15
926	STIGVCSMTDIAKKPTETICAPLTV	M9;M59;M70	TSIKWADNNCYLATALLTLQQIELK	M4;M51;M3;M23;M4;M51;M3;M23
927	IAGLIAIVMVTIMLCCMTSCCSCLK	M60;M69;M42	LTSIKWADNNCYLATALLTLQQIEL	M4;M51;M3;M23;M4;M51;M3;M23
928	VMVTIMLCCMTSCCSCLKGCCSCGS	M60;M42;M37	GLTSIKWADNNCYLATALLTLQQIE	M4;M51;M3;M23;M4;M51;M3;M23
929	IVMVTIMLCCMTSCCSCLKGCCSCG	M60;M42;M37	LKSEDAQGMDNLACEDLKPVSEEVV	M4;M1;M3;M37;M4;M1;M3;M37
930	AIVMVTIMLCCMTSCCSCLKGCCSC	M60;M42;M37	YLYALVYFLQSINFVRIIMRLWLCW	M4;M54;M24;M19;M60;M25;M3;M9
931	GLIAIVMVTIMLCCMTSCCSCLKGC	M60;M42;M37	GCFVDDIVKTDGTLMIERFVSLAID	M9;M10;M7;M5;M3;M6;M8;M11
932	IAIVMVTIMLCCMTSCCSCLKGCCS	M60;M42;M37	RAAEIRASANLAATKMSECVLGQSK	M4;M64;M40;M3;M48;M27;M22;M23
933	MVTIMLCCMTSCCSCLKGCCSCGSC	M60;M42;M37	IRAAEIRASANLAATKMSECVLGQS	M4;M64;M40;M3;M48;M27;M22;M23
934	GFIAGLIAIVMVTIMLCCMTSCCSC	M60;M69;M42	FDNPVLPFNDGVYFASTEKSNIIRG	M64;M12;M14;M28;M24;M6;M45;M22
935	AGLIAIVMVTIMLCCMTSCCSCLKG	M60;M42;M37	TRGVYYPDKVFRSSVLHSTQDLFLP	M4;M12;M14;M1;M29;M6;M67;M72
936	LIAIVMVTIMLCCMTSCCSCLKGCC	M60;M42;M37	YYPDKVFRSSVLHSTQDLFLPFFSN	M4;M12;M14;M1;M29;M6;M67;M72
937	FIAGLIAIVMVTIMLCCMTSCCSCL	M60;M69;M42	RGVYYPDKVFRSSVLHSTQDLFLPF	M4;M12;M14;M1;M29;M6;M67;M72
938	DHVISTSHKLVLSVNPYVCNAPGCD	M64;M10;M23	GVYYPDKVFRSSVLHSTQDLFLPFF	M4;M12;M14;M1;M29;M6;M67;M72
939	LDDRCILHCANFNVLFSTVFPPTSF	M4;M1;M3;M48	VYYPDKVFRSSVLHSTQDLFLPFFS	M4;M12;M14;M1;M29;M6;M67;M72
940	QTVDSSQGSEYDYVIFTQTTETAHS	M4;M22;M3;M51	YPDKVFRSSVLHSTQDLFLPFFSNV	M4;M12;M14;M1;M29;M6;M67;M72
941	KTDGTLMIERFVSLAIDAYPLTKHP	M1;M5;M2;M3	NYLKRRVVFNGVSFSTFEEAALCTF	M4;M3;M6;M49;M4;M3;M6;M49
942	TDGTLMIERFVSLAIDAYPLTKHPN	M1;M5;M2;M3	SNYLKRRVVFNGVSFSTFEEAALCT	M4;M3;M6;M49;M4;M3;M6;M49
943	IKVCEFQFCNDPFLGVYYHKNNKSW	M4;M1;M3;M37	LKRRVVFNGVSFSTFEEAALCTFLL	M4;M3;M6;M49;M4;M3;M6;M49
944	LIGLAKRFKESPFELEDFIPMDSTV	M4;M1;M3;M20	YLKRRVVFNGVSFSTFEEAALCTFL	M4;M3;M6;M49;M4;M3;M6;M49
945	KVCEFQFCNDPFLGVYYHKNNKSWM	M4;M1;M3;M37	GVVQLTSQWLTNIFGTVYEKLKPVL	M4;M45;M3;M59;M4;M45;M3;M59
946	HLLIGLAKRFKESPFELEDFIPMDS	M4;M1;M3;M20	YALVYFLQSINFVRIIMRLWLCWKC	M4;M54;M24;M60;M25;M3;M9;M23
947	VIKVCEFQFCNDPFLGVYYHKNNKS	M4;M1;M3;M37	KELLVYAADPAMHAASGNLLLDKRT	M12;M24;M48;M33;M36;M8;M46;M39
948	IGLAKRFKESPFELEDFIPMDSTVK	M4;M1;M3;M20	PSKLIEYTDFATSACVLAAECTIFK	M29;M3;M14;M62;M29;M3;M14;M62
949	LLIGLAKRFKESPFELEDFIPMDST	M4;M1;M3;M20	YFVLTSHTVMPLSAPTLVPQEHYVR	M28;M54;M60;M29;M45;M51;M46;M39

950	GTYEGNSPFHPLADNK FALTCFSTQ	M1;M3;M4 4;M70	FVLTSHTVMPLSAPTL VPQEHYVRI	M28;M54;M60;M29;M45;M 51;M46;M39
951	GNSPFHPLADNKFALT CFSTQFAFA	M1;M22;M 3;M14	GDAALALLLLDRLNQ LESKMSGKGQ	M56;M58;M10;M53;M51;M 36;M17;M11
952	EGNSPFHPLADNKFAL TCFSTQFAF	M1;M3;M1 4;M70	ALCEKALKYLPIDKCS RIIPARARV	M71;M13;M28;M14;M29;M 51;M18;M22
953	SPFHPLADNKFALTCF STQFAFACP	M4;M22;M 3;M14	DALCEKALKYLPIDK CSRIIPARAR	M71;M13;M28;M14;M29;M 51;M18;M22
954	NITNLCPFGEVFNATR FASVYAWNR	M4;M3;M1 7;M58	AKSASVYYSQLMCQP ILLLDQALVS	M51;M7;M60;M36;M51;M7; M60;M36
955	HTPAFDKSAFVNLKQL PFFYYSDSP	M4;M60;M 54;M3	SASVYYSQLMCQPILL LDQALVSDV	M51;M7;M60;M36;M51;M7; M60;M36
956	VNKHAFHTPAFDKSAF VNLKQLPFF	M4;M60;M 54;M3	ASVYYSQLMCQPILL LDQALVSDVG	M51;M7;M60;M36;M51;M7; M60;M36
957	FHTPAFDKSAFVNLKQ LPFFYYSDS	M4;M60;M 54;M3	KSASVYYSQLMCQPI LLLDQALVSD	M51;M7;M60;M36;M51;M7; M60;M36
958	KHAFHTPAFDKSAFVN LKQLPFFYY	M4;M60;M 54;M3	KALKYLPIDKCSRIIPA RARVECFD	M13;M28;M14;M29;M51;M 33;M26;M22
959	NKHAFHTPAFDKSAFV NLKQLPFFY	M4;M60;M 54;M3	VVTTVMFLARGIVFM CVEYCPIFFI	M12;M3;M22;M20;M12;M3; M22;M20
960	TPAFDKSAFVNLKQLP FFYYSDSPC	M4;M60;M 54;M3	GVVTTVMFLARGIVF MCVEYCPIFF	M12;M3;M22;M20;M12;M3; M22;M20
961	HAFHTPAFDKSAFVNL KQLPFFYYS	M4;M60;M 54;M3	TVMFLARGIVFMCVE YCPIFFITGN	M12;M3;M22;M20;M12;M3; M22;M20
962	AFHTPAFDKSAFVNLK QLPFFYYSD	M4;M60;M 54;M3	VMFLARGIVFMCVEY CPIFFITGNT	M12;M3;M22;M20;M12;M3; M22;M20
963	ADYSVLYNSASFSTFK CYGVSPTKL	M15;M41; M3;M44	VTTVMFLARGIVFMC VEYCPIFFIT	M12;M3;M22;M20;M12;M3; M22;M20
964	VADYSVLYNSASFSTF KCYGVSPTK	M15;M41; M3;M44	TTVMFLARGIVFMCV EYCPIFFITG	M12;M3;M22;M20;M12;M3; M22;M20
965	VVIGTSKFYGGWHNM LKTVYSDVEN	M18;M72; M3;M6	TEEVGHTDLMAAYV DNSSLTIKKPN	M51;M63;M44;M70;M51;M 63;M44;M70
966	GTLIVNSVLLFLAFVV FLLVTLAIL	M50;M73; M3;M44	EVGHTDLMAAYVDN SSLTIKKPNEL	M51;M63;M44;M70;M51;M 63;M44;M70
967	TGTLIVNSVLLFLAFV VFLLVTLAI	M50;M73; M3;M44	EEVGHTDLMAAYVD NSSLTIKKPNE	M51;M63;M44;M70;M51;M 63;M44;M70
968	PAQLPAPRTLLTKGTL EPEYFNSVC	M29;M3;M 6;M58	VGHTDLMAAYVDNS SLTIKKPNELS	M51;M63;M44;M70;M51;M 63;M44;M70
969	GTSKFYGGWHNMLKT VYSDVENPHL	M6;M18;M 3;M59	IMQLFFSYFAVHFISN SWLMWLIIN	M9;M3;M45;M23;M9;M3;M 45;M23
970	IGTSKFYGGWHNMLK TVYSDVENPH	M6;M18;M 3;M59	VEEVTTTLEETKFLTE NLLLYIDIN	M50;M3;M6;M20;M50;M3; M6;M20
971	TSPDVDLGDISGINASV VNIQKEID	M14;M80; M28;M45	RGIVFMCVEYCPIFFIT GNTLQCIM	M40;M39;M11;M3;M40;M3 9;M11;M3
972	HTSPDVDLGDISGINAS VVNIQKEI	M14;M80; M28;M45	GIVFMCVEYCPIFFITG NTLQCIML	M40;M39;M11;M3;M40;M3 9;M11;M3
973	CLPFTINCQEPKLGSLV VRCSFYED	M50;M29; M51;M14	FLARGIVFMCVEYCPI FFITGNTLQ	M39;M22;M3;M20;M39;M2 2;M3;M20
974	SCLPFTINCQEPKLGSL VVRCSFYE	M50;M29; M51;M14	LARGIVFMCVEYCPIF FITGNTLQC	M39;M22;M3;M20;M39;M2 2;M3;M20

975	SHTVMPLSAPTLVPQE HYVRITGLY	M51;M69; M39;M28	KRAKVTSAMQTMLF TMLRKLDNDAL	M17;M52;M3;M16;M17;M5 2;M3;M16
976	SEYDYVIFTQTTETAH SCNVNRFNV	M51;M22; M6;M59	KGIYQTSNFRVQPTES IVRFPNITN	M31;M34;M30;M48;M50;M 51;M41;M39
977	YDYVIFTQTTETAHSC NVNRFNVAI	M51;M22; M6;M59	IYQTSNFRVQPTESIV RFPNITNLC	M31;M34;M30;M48;M50;M 51;M41;M39
978	EYDYVIFTQTTETAHS CNVNRFNVA	M51;M22; M6;M59	YQTSNFRVQPTESIVR FPNITNLCP	M31;M34;M30;M48;M50;M 51;M41;M39
979	TACSHAAVDALCEKA LKYLPIDKCS	M51;M1;M 60;M49	GIYQTSNFRVQPTESI VRFPNITNL	M31;M34;M30;M48;M50;M 51;M41;M39
980	FRKSNLKPFERDISTEI YQAGSTPC	M36;M53; M17;M44	VTALRANSAVKLQNN ELSPVALRQM	M51;M11;M73;M44;M51;M 11;M73;M44
981	LFRKSNLKPFERDISTE IYQAGSTP	M36;M53; M17;M44	AVHFISNSWLMWLIIN LVQMAPISA	M50;M11;M73;M3;M50;M1 1;M73;M3
982	RLFRKSNLKPFERDIST EIYQAGST	M36;M53; M17;M44	TFYLTNDVSFLAHIQ WMVMFTPLVP	M60;M54;M3;M58;M60;M5 4;M3;M58
983	YRLFRKSNLKPFERDIS TEIYQAGS	M36;M53; M17;M44	DPSRILGAGCFVDDIV KTDGTLMIE	M12;M10;M6;M57;M63;M8; M9;M20
984	RKSNLKPFERDISTEIY QAGSTPCN	M36;M53; M17;M44	EPEYFNSVCRLMKTIG PDMFLGTCR	M12;M14;M16;M5;M6;M17; M15;M59
985	DLATNNLVVMAYITG GVVQLTSQWL	M51;M12; M51;M12	LEPEYFNSVCRLMKTI GPDMFLGTC	M13;M12;M16;M14;M5;M6; M17;M15
986	NSFTRGVYYPDKVFRS SVLHSTQDL	M4;M1;M2 9;M12	SEDKRAKVTSAMQT MLFTMLRKLDN	M38;M52;M3;M62;M38;M5 2;M3;M62
987	FEKGDYGDAVVYRGT TTYKLNVGDY	M9;M12;M 8;M44	GTCRRCPAEIVDTVSA LVYDNKLKA	M12;M7;M29;M6;M38;M8; M59;M23
988	EKGDYGDAVVYRGTT TYKLNVGDYF	M9;M12;M 8;M44	LGTCRRCPAEIVDTVS ALVYDNKLK	M12;M7;M29;M6;M38;M8; M59;M23
989	WTIEYPIIGDELKINAA CRKVQHMV	M73;M19; M17;M44	TCRRCPAEIVDTVSAL VYDNKLKAH	M12;M7;M29;M6;M38;M8; M59;M23
990	YPIIGDELKINAACRKV QHMVVKAA	M73;M19; M17;M44	CRRCPAEIVDTVSALV YDNKLKAHK	M12;M7;M29;M6;M38;M8; M59;M23
991	IEYPIIGDELKINAACR KVQHMVVK	M73;M19; M17;M44	YDYCIPYNSVTSSIVIT SGDGTTSP	M12;M14;M29;M38;M45;M 43;M62;M42
992	EYPIIGDELKINAACRK VQHMVVKA	M73;M19; M17;M44	NCYDYCIPYNSVTSSI VITSGDGTT	M12;M14;M29;M38;M45;M 43;M62;M42
993	TIEYPIIGDELKINAAC RKVQHMVV	M73;M19; M17;M44	CYDYCIPYNSVTSSIVI TSGDGTTS	M12;M14;M29;M38;M45;M 43;M62;M42
994	PIIGDELKINAACRKVQ HMVVKAAL	M73;M19; M17;M44	DYCIPYNSVTSSIVITS GDGTTSPI	M12;M14;M29;M38;M45;M 43;M62;M42
995	TLVKQLSSNFGAISSVL NDILSRLD	M34;M48; M6;M45	TNCYDYCIPYNSVTSS IVITSGDGT	M12;M14;M29;M38;M45;M 43;M62;M42
996	NTLVKQLSSNFGAISS VLNDILSRL	M34;M48; M6;M45	YCIPYNSVTSSIVITSG DGTTSPIS	M12;M14;M29;M38;M45;M 43;M62;M42
997	AVASKILGLPTQTVDS SQGSEYDYV	M51;M21; M11;M54	IQKEIDRLNEVAKNLN ESLIDLQEL	M11;M78;M65;M2;M79;M5 1;M67;M82
998	NAVASKILGLPTQTVD SSQGSEYDY	M51;M21; M11;M54	QKEIDRLNEVAKNLN ESLIDLQELG	M11;M78;M65;M2;M79;M5 1;M67;M82
999	VDALCEKALKYLPIDK CSRIIPARA	M51;M18; M22;M71	NIQKEIDRLNEVAKNL NESLIDLQE	M11;M78;M65;M2;M79;M5 1;M67;M82

1000	AQCFKMFYKGVITHD VSSAINRPQI	M36;M11; M45;M70	KDATPSDFVRATATIP IQASLPFGW	M9;M14;M34;M29;M45;M3 3;M8;M11
1001	IWDYKRDAPAHISTIG VCSMTDIAK	M36;M11; M6;M70	IKDATPSDFVRATATI PIQASLPFG	M9;M14;M34;M29;M45;M3 3;M8;M11
1002	NQVIVNNLDKSAGFPF NKWGKARLY	M33;M51; M58;M17	DATPSDFVRATATIPI QASLPFGWL	M9;M14;M34;M29;M45;M3 3;M8;M11
1003	ESSAKSASVYYSQLMC QPILLLDQA	M57;M51; M57;M51	DPAMHAASGNLLLD KRTTCFSVAAL	M12;M7;M57;M50;M33;M8; M39;M9
1004	KCEESSAKSASVYYSQ LMCQPILLL	M57;M51; M57;M51	AADPAMHAASGNLL LDKRTTCFSVA	M12;M7;M57;M50;M33;M8; M39;M9
1005	KSKCEESSAKSASVYY SQLMCQPIL	M57;M51; M57;M51	ADPAMHAASGNLLL DKRTTCFSVAA	M12;M7;M57;M50;M33;M8; M39;M9
1006	CEESSAKSASVYYSQL MCQPILLLD	M57;M51; M57;M51	ADQLTPTWRVYSTGS NVFQTRAGCL	M75;M14;M16;M5;M6;M41; M8;M82
1007	GKSKCEESSAKSASVY YSQLMCQPI	M57;M51; M57;M51	DQLTPTWRVYSTGSN VFQTRAGCLI	M75;M14;M16;M5;M6;M41; M8;M82
1008	SKCEESSAKSASVYYS QLMCQPILL	M57;M51; M57;M51	MSKFPLKLRGTAVMS LKEGQINDMI	M54;M14;M60;M6;M67;M8; M49;M59
1009	EESSAKSASVYYSQLM CQPILLLDQ	M57;M51; M57;M51	FDMSKFPLKLRGTAV MSLKEGQIND	M54;M14;M60;M6;M67;M8; M49;M59
1010	KSAQCFKMFYKGVIT HDVSSAINRP	M52;M36; M45;M70	DMSKFPLKLRGTAVM SLKEGQINDM	M54;M14;M60;M6;M67;M8; M49;M59
1011	CYDGGCINANQVIVN NLDKSAGFPF	M50;M73; M17;M51	SKFPLKLRGTAVMSL KEGQINDMIL	M54;M14;M60;M6;M67;M8; M49;M59
1012	HTPINLVRDLPQGFSA LEPLVDLPI	M64;M40; M45;M36	VSEETGTLIVNSVLLF LAFVVFLLV	M56;M73;M14;M7;M50;M1 8;M11;M44
1013	KHTPINLVRDLPQGFS ALEPLVDLP	M64;M40; M45;M36	FVSEETGTLIVNSVLL FLAFVVFLL	M56;M73;M14;M7;M50;M1 8;M11;M44
1014	YKGVITHDVSSAINRP QIGVVREFL	M36;M21; M45;M70	SFVSEETGTLIVNSVL LFLAFVVFL	M56;M73;M14;M7;M50;M1 8;M11;M44
1015	DNINLHTQVVDMSMT YGQQFGPTYL	M51;M67; M51;M67	TDLTKGPHEFCSQHT MLVKQGDDYV	M14;M29;M30;M6;M18;M4 3;M42;M39
1016	VDNINLHTQVVDMSM TYGQQFGPTY	M51;M67; M51;M67	TKGPHEFCSQHTMLV KQGDDYVYLP	M14;M29;M30;M6;M18;M4 3;M42;M39
1017	QRKYKGIKIQEGVVDY GARFYFYTS	M51;M67; M51;M67	DLTKGPHEFCSQHTM LVKQGDDYVY	M14;M29;M30;M6;M18;M4 3;M42;M39
1018	KYKGIKIQEGVVDYG ARFYFYTSKT	M51;M67; M51;M67	ETDLTKGPHEFCSQH TMLVKQGDDY	M14;M29;M30;M6;M18;M4 3;M42;M39
1019	TIKVFTTVDNINLHTQ VVDMSMTYG	M51;M67; M51;M67	LTKGPHEFCSQHTML VKQGDDYVYL	M14;M29;M30;M6;M18;M4 3;M42;M39
1020	RKYKGIKIQEGVVDYG ARFYFYTSK	M51;M67; M51;M67	LWVYKQFDTYNLWN TFTRLQSLENV	M71;M58;M16;M14;M19;M 25;M17;M15
1021	NSQNAVASKILGLPTQ TVDSSQGSE	M51;M60; M21;M54	YVTQQLIRAAEIRASA NLAATKMSE	M64;M40;M21;M12;M14;M 48;M22;M23
1022	PYNSQNAVASKILGLP TQTVDSSQG	M51;M60; M21;M54	LQTYVTQQLIRAAEIR ASANLAATK	M64;M40;M21;M12;M14;M 48;M22;M23
1023	YNSQNAVASKILGLPT QTVDSSQGS	M51;M60; M21;M54	TYVTQQLIRAAEIRAS ANLAATKMS	M64;M40;M21;M12;M14;M 48;M22;M23
1024	SQNAVASKILGLPTQT VDSSQGSEY	M51;M60; M21;M54	QTYVTQQLIRAAEIRA SANLAATKM	M64;M40;M21;M12;M14;M 48;M22;M23

1025	VNLHSSRLSFKELLVY AADPAMHAA	M57;M36; M48;M20	AGLPYGANKDGIIWV ATEGALNTPK	M64;M40;M14;M30;M6;M5 7;M49;M22
1026	CTMYICGDSTECSNLL LQYGSFCTQ	M48;M39; M45;M41	YSLRLIDAMMFTSDL ATNNLVVMAY	M57;M36;M50;M44;M57;M 36;M50;M44
1027	LLKSIAATRGATVVIG TSKFYGGWH	M17;M72; M2;M14	QYSLRLIDAMMFTSD LATNNLVVMA	M57;M36;M50;M44;M57;M 36;M50;M44
1028	LKSIAATRGATVVIGT SKFYGGWHN	M17;M72; M2;M14	LLVYAADPAMHAAS GNLLLDKRTTC	M12;M24;M57;M50;M33;M 8;M46;M39
1029	TFEYVSQPFLMDLEGK QGNFKNLRE	M1;M36;M 46;M20	LVYAADPAMHAASG NLLLDKRTTCF	M12;M24;M57;M50;M33;M 8;M46;M39
1030	FEYVSQPFLMDLEGKQ GNFKNLREF	M1;M36;M 46;M20	DTVSALVYDNKLKA HKDKSAQCFKM	M13;M21;M28;M16;M7;M5 0;M63;M17
1031	GDQELIRQGTDYKHW PQIAQFAPSA	M64;M69; M82;M51	VHVVDGCNSSTCMM CYKRNRATRVE	M55;M39;M8;M44;M55;M3 9;M8;M44
1032	ETGTLIVNSVLLFLAFV VFLLVTLA	M50;M73; M14;M44	LATNNLVVMAYITGG VVQLTSQWLT	M51;M42;M9;M12;M51;M4 2;M9;M12
1033	ETTADIVVFDEISMAT NYDLSVVNA	M33;M7;M 48;M55	TRLQSLENVAFNVVN KGHFDGQQGE	M4;M71;M54;M16;M24;M1; M27;M15
1034	RKRISNCVADYSVLYN SASFSTFKC	M15;M7;M 67;M44	YGIATVREVLSDREL HLSWEVGKPR	M28;M70;M5;M7;M6;M49; M11;M59
1035	MCDIRQLLFVVEVVD KYFDCYDGGC	M51;M70; M37;M20	GIATVREVLSDRELHL SWEVGKPRP	M28;M70;M5;M7;M6;M49; M11;M59
1036	CDIRQLLFVVEVVDKY FDCYDGGCI	M51;M70; M37;M20	IATVREVLSDRELHLS WEVGKPRPP	M28;M70;M5;M7;M6;M49; M11;M59
1037	TMCDIRQLLFVVEVVD KYFDCYDGG	M51;M70; M37;M20	LDDFVEIIKSQDLSVV SKVVKVTID	M4;M48;M18;M8;M43;M15; M35;M47
1038	PDPSKPSKRSFIEDLLF NKVTLADA	M73;M63; M67;M44	PANSTVLSFCAFAVD AAKAYKDYLA	M36;M32;M12;M28;M36;M 32;M12;M28
1039	LIIMRTFKVSIWNLDYI INLIIKNL	M1;M5;M4 4;M20	CTERLKLFAAETLKA TEETFKLSYG	M4;M64;M21;M40;M48;M6 3;M22;M23
1040	IIMRTFKVSIWNLDYII NLIIKNLS	M1;M5;M4 4;M20	TCTERLKLFAAETLK ATEETFKLSY	M4;M64;M21;M40;M48;M6 3;M22;M23
1041	LFIRQEEVQELYSPIFLI VAAIVFI	M4;M1;M1 1;M54	VGGNYNYLYRLFRKS NLKPFERDIS	M4;M71;M16;M1;M37;M18; M17;M15
1042	KLFIRQEEVQELYSPIF LIVAAIVF	M4;M1;M1 1;M54	SKVGGNYNYLYRLFR KSNLKPFERD	M4;M71;M16;M1;M37;M18; M17;M15
1043	EITVATSRTLSYYKLG ASQRVAGDS	M25;M63; M19;M70	DSKVGGNYNYLYRLF RKSNLKPFER	M4;M71;M16;M1;M37;M18; M17;M15
1044	ITVATSRTLSYYKLGA SQRVAGDSG	M25;M63; M19;M70	LDSKVGGNYNYLYRL FRKSNLKPFE	M4;M71;M16;M1;M37;M18; M17;M15
1045	VATSRTLSYYKLGASQ RVAGDSGFA	M25;M63; M19;M70	KVGGNYNYLYRLFR KSNLKPFERDI	M4;M71;M16;M1;M37;M18; M17;M15
1046	TVATSRTLSYYKLGAS QRVAGDSGF	M25;M63; M19;M70	NLDSKVGGNYNYLY RLFRKSNLKPF	M4;M71;M16;M1;M37;M18; M17;M15
1047	DTWFSQRGGSYTNDK ACPLIAAVIT	M36;M6;M 36;M6	PLYAFASEAARVVRSI FSRTLETAQ	M4;M14;M6;M59;M4;M14; M6;M59
1048	FSQRGGSYTNDKACPL IAAVITREV	M36;M6;M 36;M6	LGSLAATVRLQAGNA TEVPANSTVL	M55;M51;M17;M10;M55;M 51;M17;M10
1049	WFSQRGGSYTNDKAC PLIAAVITRE	M36;M6;M 36;M6	IQRKYKGIKIQEGVVD YGARFYFYT	M51;M5;M67;M40;M51;M5; M67;M40

1050	TWFSQRGGSYTNDKACPLIAAVITR	M36;M6;M36;M6	KSVYYTSNPTTFHLDGEVITFDNLK	M50;M7;M48;M45;M50;M7;M48;M45
1051	FDTWFSQRGGSYTNDKACPLIAAVI	M36;M6;M36;M6	VRTIKVFTTVDNINLHTQVVDMSMT	M51;M43;M26;M67;M51;M43;M26;M67
1052	IFLWLLWPVTLACFVLAAVYRINWI	M33;M63;M14;M70	DQVILLNKHIDAYKTFPPTEPKKDK	M73;M14;M53;M44;M41;M35;M52;M47
1053	KLIFLWLLWPVTLACFVLAAVYRIN	M33;M63;M14;M70	NALLSTDGNKIADKYVRNLQHRLYE	M54;M10;M60;M57;M27;M8;M44;M20
1054	LIFLWLLWPVTLACFVLAAVYRINW	M33;M63;M14;M70	ARDGCVPLNIIPLTTAAKLMVVIPD	M24;M22;M19;M14;M24;M22;M19;M14
1055	QGNFKNLREFVFKNIDGYFKIYSKH	M6;M19;M54;M59	PLTTAAKLMVVIPDYNTYKNTCDGT	M57;M51;M82;M23;M57;M51;M82;M23
1056	VRITGLYPTLNISDEFSSNVANYQK	M34;M73;M6;M44	TFLKKDAPYIVGDVVQEGVLTAVVI	M7;M30;M11;M14;M7;M30;M11;M14
1057	SLQTYVTQQLIRAAEIRASANLAAT	M64;M21;M12;M14	ITFLKKDAPYIVGDVVQEGVLTAVV	M7;M30;M11;M14;M7;M30;M11;M14
1058	DLFMRIFTIGTVTLKQGEIKDATPS	M5;M72;M2;M6	LKKDAPYIVGDVVQEGVLTAVVIPT	M7;M30;M67;M14;M7;M30;M67;M14
1059	MDLFMRIFTIGTVTLKQGEIKDATP	M5;M72;M2;M6	KKDAPYIVGDVVQEGVLTAVVIPTK	M7;M30;M67;M14;M7;M30;M67;M14
1060	LYSPIFLIVAAIVFITLCFTLKRKT	M25;M12;M14;M37	LTENLLLYIDINGNLHPDSATLVSD	M7;M36;M11;M70;M7;M36;M11;M70
1061	YSPIFLIVAAIVFITLCFTLKRKTE	M25;M12;M14;M37	FLTENLLLYIDINGNLHPDSATLVS	M7;M36;M11;M70;M7;M36;M11;M70
1062	YPTLNISDEFSSNVANYQKVGMQKY	M18;M73;M6;M44	GKPVPYCYDTNVLEGSVAYESLRPD	M46;M29;M12;M14;M46;M29;M12;M14
1063	LNISDEFSSNVANYQKVGMQKYSTL	M18;M73;M6;M44	LNSIIKTIQPRVEKKKLDGFMGRIR	M29;M72;M6;M28;M29;M72;M6;M28
1064	ITGLYPTLNISDEFSSNVANYQKVG	M18;M73;M6;M44	LGRCDIKDLPKEITVATSRTLSYYK	M64;M6;M48;M33;M49;M46;M22;M23
1065	ISDEFSSNVANYQKVGMQKYSTLQG	M18;M73;M6;M44	KRGDKSVYYTSNPTTFHLDGEVITF	M50;M22;M45;M44;M50;M22;M45;M44
1066	TLNISDEFSSNVANYQKVGMQKYST	M18;M73;M6;M44	LKRGDKSVYYTSNPTTFHLDGEVIT	M50;M22;M45;M44;M50;M22;M45;M44
1067	LYPTLNISDEFSSNVANYQKVGMQK	M18;M73;M6;M44	GSFCTQLNRALTGIAVEQDKNTQEV	M28;M14;M70;M41;M67;M27;M43;M20
1068	PTLNISDEFSSNVANYQKVGMQKYS	M18;M73;M6;M44	QYGSFCTQLNRALTGIAVEQDKNTQ	M28;M14;M70;M41;M67;M27;M43;M20
1069	TGLYPTLNISDEFSSNVANYQKVGM	M18;M73;M6;M44	YGSFCTQLNRALTGIAVEQDKNTQE	M28;M14;M70;M41;M67;M27;M43;M20
1070	GLYPTLNISDEFSSNVANYQKVGMQ	M18;M73;M6;M44	TYNLWNTFTRLQSLENVAFNVVNKG	M54;M16;M14;M25;M34;M60;M42;M39
1071	NISDEFSSNVANYQKVGMQKYSTLQ	M18;M73;M6;M44	VTSNYSGVVTTVMFLARGIVFMCVE	M38;M29;M12;M14;M38;M29;M12;M14
1072	FIRQEEVQELYSPIFLIVAAIVFIT	M4;M1;M54;M25	ANKDGIIWVATEGALNTPKDHIGTR	M64;M40;M34;M30;M6;M72;M49;M22
1073	RQEEVQELYSPIFLIVAAIVFITLC	M4;M1;M54;M25	HFSMMILSDDAVVCFNSTYASQGLV	M13;M21;M7;M53;M48;M49;M26;M22
1074	IRQEEVQELYSPIFLIVAAIVFITL	M4;M1;M54;M25	FSMMILSDDAVVCFNSTYASQGLVA	M13;M21;M7;M53;M48;M49;M26;M22

1075	QEEVQELYSPIFLIVAAIVFITLCF	M4;M1;M54;M25	TREEAIRHVRAWIGFDVEGCHATRE	M64;M32;M14;M48;M57;M69;M46;M20
1076	RFPNITNLCPFGEVFNATRFASVYA	M45;M17;M28;M66	QTSNFRVQPTESIVRFPNITNLCPF	M21;M31;M34;M30;M48;M50;M41;M39
1077	VCEFQFCNDPFLGVYYHKNNKSWME	M4;M1;M22;M37	TAAKLMVVIPDYNTYKNTCDGTTFT	M51;M41;M82;M23;M51;M41;M82;M23
1078	CEFQFCNDPFLGVYYHKNNKSWMES	M4;M1;M22;M37	RVCTNYMPYFFTLLLQLCTFTRSTN	M4;M25;M29;M19;M4;M25;M29;M19
1079	IPLMYKGLPWNVVRIKIVQMLSDTL	M57;M1;M12;M20	NRVCTNYMPYFFTLLLQLCTFTRST	M4;M25;M29;M19;M4;M25;M29;M19
1080	IEDLLFNKVTLADAGFIKQYGDCLG	M48;M73;M47;M44	VCTNYMPYFFTLLLQLCTFTRSTNS	M4;M25;M29;M19;M4;M25;M29;M19
1081	EPMLQSADAQSFLNRVCGVSAARLT	M15;M47;M12;M45	SNYSGVVTTVMFLARGIVFMCVEYC	M29;M12;M14;M20;M29;M12;M14;M20
1082	CSCDQLREPMLQSADAQSFLNGFAV	M81;M33;M12;M45	NYSGVVTTVMFLARGIVFMCVEYCP	M29;M12;M14;M20;M29;M12;M14;M20
1083	YGCSCDQLREPMLQSADAQSFLNGF	M81;M33;M12;M45	LGSLIYSTAALGVLMSNLGMPSYCT	M29;M73;M6;M44;M29;M73;M6;M44
1084	GCSCDQLREPMLQSADAQSFLNGFA	M81;M33;M12;M45	VCLGSLIYSTAALGVLMSNLGMPSY	M29;M73;M6;M44;M29;M73;M6;M44
1085	PIGALDISASIVAGGIVAIVVTCLA	M12;M14;M12;M14	CLGSLIYSTAALGVLMSNLGMPSYC	M29;M73;M6;M44;M29;M73;M6;M44
1086	QPIGALDISASIVAGGIVAIVVTCL	M12;M14;M12;M14	QEKNFTTAPAICHDGKAHFPREGVF	M56;M24;M7;M45;M79;M33;M35;M82
1087	IGALDISASIVAGGIVAIVVTCLAY	M12;M14;M12;M14	AQEKNFTTAPAICHDGKAHFPREGV	M56;M24;M7;M45;M79;M33;M35;M82
1088	GALDISASIVAGGIVAIVVTCLAYY	M12;M14;M12;M14	GAIKLDDKDPNFKDQVILLNKHIDA	M73;M10;M7;M53;M44;M35;M52;M47
1089	ALDPLSETKCTLKSFTVEKGIYQTS	M75;M21;M63;M14	VESCGNFKVTKGKAKKGAWNIGEQK	M25;M41;M19;M8;M25;M41;M19;M8
1090	DYVYLPYPDPSRILGAGCFVDDIVK	M57;M63;M12;M20	QIVESCGNFKVTKGKAKKGAWNIGE	M25;M41;M19;M8;M25;M41;M19;M8
1091	YLPYPDPSRILGAGCFVDDIVKTDG	M57;M63;M12;M20	IVESCGNFKVTKGKAKKGAWNIGEQ	M25;M41;M19;M8;M25;M41;M19;M8
1092	VYLPYPDPSRILGAGCFVDDIVKTD	M57;M63;M12;M20	PTDQSSYIVDSVTVKNGSIHLYFDK	M50;M18;M12;M36;M50;M18;M12;M36
1093	LPYPDPSRILGAGCFVDDIVKTDGT	M57;M63;M12;M20	EMLAKALRKVPTDNYITTYPGQGLN	M48;M29;M14;M49;M48;M29;M14;M49
1094	YVYLPYPDPSRILGAGCFVDDIVKT	M57;M63;M12;M20	TLADAGFIKQYGDCLGDIAARDLIC	M21;M70;M48;M57;M50;M63;M41;M27
1095	PYPDPSRILGAGCFVDDIVKTDGTL	M57;M63;M12;M20	LADAGFIKQYGDCLGDIAARDLICA	M21;M70;M48;M57;M50;M63;M41;M27
1096	MLKTVYSDVENPHLMGWDYPKCDRA	M45;M43;M6;M59	ADAGFIKQYGDCLGDIAARDLICAQ	M21;M70;M48;M57;M50;M63;M41;M27
1097	NMLKTVYSDVENPHLMGWDYPKCDR	M45;M43;M6;M59	TYVPAQEKNFTTAPAICHDGKAHFP	M78;M65;M7;M29;M2;M79;M33;M82
1098	LKTVYSDVENPHLMGWDYPKCDRAM	M45;M43;M6;M59	VTYVPAQEKNFTTAPAICHDGKAHF	M78;M65;M7;M29;M2;M79;M33;M82
1099	KRTTCFSVAALTNNVAFQTVKPGNF	M1;M22;M6;M73	HVTYVPAQEKNFTTAPAICHDGKAH	M78;M65;M7;M29;M2;M79;M33;M82

1100	LYENQKLIANQFNSAIGKIQDSLSS	M4;M1;M33;M37	SRELKVTFFPDLNGDVVAIDYKHYT	M60;M21;M63;M36;M60;M21;M63;M36
1101	ENQKLIANQFNSAIGKIQDSLSSTA	M4;M1;M33;M37	ASRELKVTFFPDLNGDVVAIDYKHY	M60;M21;M63;M36;M60;M21;M63;M36
1102	TQNVLYENQKLIANQFNSAIGKIQD	M4;M1;M33;M37	NAQALNTLVKQLSSNFGAISSVLND	M58;M16;M53;M45;M17;M15;M46;M22
1103	YENQKLIANQFNSAIGKIQDSLSST	M4;M1;M33;M37	QNAQALNTLVKQLSSNFGAISSVLN	M58;M16;M53;M45;M17;M15;M46;M22
1104	QNVLYENQKLIANQFNSAIGKIQDS	M4;M1;M33;M37	NPTDQSSYIVDSVTVKNGSIHLYFD	M50;M18;M63;M36;M50;M18;M63;M36
1105	NVLYENQKLIANQFNSAIGKIQDSL	M4;M1;M33;M37	INPTDQSSYIVDSVTVKNGSIHLYF	M50;M18;M63;M36;M50;M18;M63;M36
1106	VLYENQKLIANQFNSAIGKIQDSLS	M4;M1;M33;M37	PINPTDQSSYIVDSVTVKNGSIHLY	M50;M18;M63;M36;M50;M18;M63;M36
1107	TEETFKLSYGIATVREVLSDRELHL	M33;M12;M6;M59	KRPINPTDQSSYIVDSVTVKNGSIH	M50;M18;M63;M36;M50;M18;M63;M36
1108	SSNFGAISSVLNDILSRLDKVEAEV	M50;M48;M6;M17	RPINPTDQSSYIVDSVTVKNGSIHL	M50;M18;M63;M36;M50;M18;M63;M36
1109	HLGRCDIKDLPKEITVATSRTLSYY	M33;M6;M48;M49	AALGVLMSNLGMPSYCTGYREGYLN	M18;M73;M45;M44;M18;M73;M45;M44
1110	WYFYYLGTGPEAGLPYGANKDGIIW	M32;M12;M6;M31	LGVLMSNLGMPSYCTGYREGYLNST	M18;M73;M45;M44;M18;M73;M45;M44
1111	PRWYFYYLGTGPEAGLPYGANKDGI	M32;M12;M6;M31	ALGVLMSNLGMPSYCTGYREGYLNS	M18;M73;M45;M44;M18;M73;M45;M44
1112	RWYFYYLGTGPEAGLPYGANKDGII	M32;M12;M6;M31	IRKSNHNFLVQAGNVQLRVIGHSMQ	M58;M12;M14;M70;M58;M12;M14;M70
1113	ISFMLWCKDGHVETFYPKLQSSQAW	M71;M36;M67;M47	YTTTIKPVTYKLDGVVCTEIDPKLD	M36;M6;M59;M20;M36;M6;M59;M20
1114	EISFMLWCKDGHVETFYPKLQSSQA	M71;M36;M67;M47	SYTTTIKPVTYKLDGVVCTEIDPKL	M36;M6;M59;M20;M36;M6;M59;M20
1115	DKVFRSSVLHSTQDLFLPFFSNVTW	M72;M29;M67;M6	TTTIKPVTYKLDGVVCTEIDPKLDN	M36;M6;M59;M20;M36;M6;M59;M20
1116	VRIKIVQMLSDTLKNLSDRVVFVLW	M57;M46;M61;M36	TFSSTFNVPMEKLKTLVATAEAELA	M29;M22;M6;M28;M29;M22;M6;M28
1117	VTQNVLYENQKLIANQFNSAIGKIQ	M4;M1;M53;M37	GVSFSTFEEAALCTFLLNKEMYLKL	M13;M6;M44;M49;M13;M6;M44;M49
1118	GVTQNVLYENQKLIANQFNSAIGKI	M4;M1;M53;M37	YQCAMRPNFTIKGSFLNGSCGSVGF	M52;M47;M12;M14;M52;M47;M12;M14
1119	IGVTQNVLYENQKLIANQFNSAIGK	M4;M1;M53;M37	VYQCAMRPNFTIKGSFLNGSCGSVG	M52;M47;M12;M14;M52;M47;M12;M14
1120	REVLSDRELHLSWEVGKPRPPLNRN	M5;M12;M28;M70	CAMRPNFTIKGSFLNGSCGSVGFNI	M52;M47;M12;M14;M52;M47;M12;M14
1121	EVLSDRELHLSWEVGKPRPPLNRNY	M5;M12;M28;M70	AMRPNFTIKGSFLNGSCGSVGFNID	M52;M47;M12;M14;M52;M47;M12;M14
1122	VLSDRELHLSWEVGKPRPPLNRNYV	M5;M12;M28;M70	QCAMRPNFTIKGSFLNGSCGSVGFN	M52;M47;M12;M14;M52;M47;M12;M14
1123	CVPQADVEWKFYDAQPCSDKAYKIE	M41;M6;M59;M8	MRPNFTIKGSFLNGSCGSVGFNIDY	M52;M47;M12;M14;M52;M47;M12;M14
1124	VPQADVEWKFYDAQPCSDKAYKIEE	M41;M6;M59;M8	GPTYLDGADVTKIKPHNSHEGKTFY	M55;M53;M12;M48;M55;M53;M12;M48

1125	DGYFKIYSKHTPINLV RDLPQGFSA	M64;M36; M40;M71	DASGKPVPYCYDTNV LEGSVAYESL	M35;M30;M29;M36;M35;M 30;M29;M36
1126	QYVFCTVNALPETTAD IVVFDEISM	M38;M6;M 28;M49	FKDASGKPVPYCYDT NVLEGSVAYE	M35;M30;M29;M36;M35;M 30;M29;M36
1127	KEITVATSRTLSYYKL GASQRVAGD	M49;M63; M48;M70	IFKDASGKPVPYCYD TNVLEGSVAY	M35;M30;M29;M36;M35;M 30;M29;M36
1128	TERLKLFAAETLKATE ETFKLSYGI	M4;M63;M 40;M64	KDASGKPVPYCYDTN VLEGSVAYES	M35;M30;M29;M36;M35;M 30;M29;M36
1129	SPRRARSVASQSIIAYT MSLGAENS	M5;M48;M 6;M59	LQKEKVNINIVGDFKL NEEIAIILA	M7;M27;M44;M35;M7;M27; M44;M35
1130	NSPRRARSVASQSIIAY TMSLGAEN	M5;M48;M 6;M59	ILQKEKVNINIVGDFK LNEEIAIIL	M7;M27;M44;M35;M7;M27; M44;M35
1131	FSLWVYKQFDTYNLW NTFTRLQSLE	M71;M25; M41;M19	DTSLSGFKLKDCVMY ASAVVLLILM	M15;M75;M12;M14;M15;M 75;M12;M14
1132	SFMLWCKDGHVETFY PKLQSSQAWQ	M15;M36; M67;M47	VDTSLSGFKLKDCVM YASAVVLLIL	M15;M75;M12;M14;M15;M 75;M12;M14
1133	TQTNSPRRARSVASQS IIAYTMSLG	M6;M5;M2; M59	NTFSSTFNVPMEKLK TLVATAEAEL	M29;M22;M28;M8;M29;M2 2;M28;M8
1134	QTQTNSPRRARSVASQ SIIAYTMSL	M6;M5;M2; M59	LLSAGIFGADPIHSLR VCVDTVRTN	M68;M36;M28;M31;M68;M 36;M28;M31
1135	QTNSPRRARSVASQSII AYTMSLGA	M6;M5;M2; M59	LSAGIFGADPIHSLRV CVDTVRTNV	M68;M36;M28;M31;M68;M 36;M28;M31
1136	CCNIVNVSLVKPSFYV YSRVKNLNS	M33;M12; M16;M71	AGIFGADPIHSLRVCV DTVRTNVYL	M68;M36;M28;M31;M68;M 36;M28;M31
1137	NIVNVSLVKPSFYVYS RVKNLNSSR	M33;M12; M16;M71	SAGIFGADPIHSLRVC VDTVRTNVY	M68;M36;M28;M31;M68;M 36;M28;M31
1138	CNIVNVSLVKPSFYVY SRVKNLNSS	M33;M12; M16;M71	DISASIVAGGIVAIVVT CLAYYFMR	M21;M12;M6;M22;M21;M1 2;M6;M22
1139	RRNVATLQAENVTGL FKDCSKVITG	M36;M29; M38;M47	APLLSAGIFGADPIHS LRVCVDTVR	M36;M31;M28;M20;M36;M 31;M28;M20
1140	RNVATLQAENVTGLF KDCSKVITGL	M36;M29; M38;M47	PLLSAGIFGADPIHSLR VCVDTVRT	M36;M31;M28;M20;M36;M 31;M28;M20
1141	DRYPANSIVCRFDTRV LSNLNLPGC	M5;M9;M2; M48	DFGDFIQTTPGSGVPV VDSYYSLLM	M40;M9;M58;M16;M34;M8; M15;M11
1142	RYPANSIVCRFDTRVL SNLNLPGCD	M5;M9;M2; M48	YDFGDFIQTTPGSGVP VVDSYYSLL	M40;M9;M58;M16;M34;M8; M15;M11
1143	NYGDSATLPKGIMMN VAKYTQLCQY	M73;M11; M58;M44	NWYDFGDFIQTTPGS GVPVVDSYYS	M40;M9;M58;M16;M34;M8; M15;M11
1144	YGDSATLPKGIMMNV AKYTQLCQYL	M73;M11; M58;M44	GNWYDFGDFIQTTPG SGVPVVDSYY	M40;M9;M58;M16;M34;M8; M15;M11
1145	GDSATLPKGIMMNVA KYTQLCQYLN	M73;M11; M58;M44	WYDFGDFIQTTPGSG VPVVDSYYSL	M40;M9;M58;M16;M34;M8; M15;M11
1146	CYMHHMELPTGVHAG TDLEGNFYGP	M6;M28;M 6;M28	KEKVNINIVGDFKLNE EIAIILASF	M7;M73;M44;M35;M7;M73; M44;M35
1147	MHHMELPTGVHAGTD LEGNFYGPFV	M6;M28;M 6;M28	KVNINIVGDFKLNEEI AIILASFSA	M7;M73;M44;M35;M7;M73; M44;M35
1148	YMHHMELPTGVHAGT DLEGNFYGPF	M6;M28;M 6;M28	EKVNINIVGDFKLNEE IAIILASFS	M7;M73;M44;M35;M7;M73; M44;M35
1149	FCYMHHMELPTGVHA GTDLEGNFYG	M6;M28;M 6;M28	KHTTCCSLSHRFYRL ANECAQVLSE	M5;M60;M30;M2;M79;M43; M42;M39

1150	SFCYMHHMELPTGVH AGTDLEGNFY	M6;M28;M 6;M28	DGVVQQLPETYFTQS RNLQEFKPRS	M71;M32;M16;M31;M45;M 33;M35;M47
1151	HHMELPTGVHAGTDL EGNFYGPFVD	M6;M28;M 6;M28	IDITFLKKDAPYIVGD VVQEGVLTA	M57;M30;M11;M14;M57;M 30;M11;M14
1152	APGTAVLRQWLPTGT LLVDSDLNDF	M33;M30; M8;M70	DIDITFLKKDAPYIVG DVVQEGVLT	M57;M30;M11;M14;M57;M 30;M11;M14
1153	VAPGTAVLRQWLPTG TLLVDSDLND	M33;M30; M8;M70	SKIITLKKRWQLALSK GVHFVCNLL	M11;M55;M74;M33;M27;M 8;M42;M82
1154	GVAPGTAVLRQWLPT GTLLVDSDLN	M33;M30; M8;M70	DDFTGCVIAWNSNNL DSKVGGNYNY	M56;M32;M12;M48;M50;M 68;M49;M26
1155	GTAVLRQWLPTGTLL VDSDLNDFVS	M33;M30; M8;M70	DFTGCVIAWNSNNLD SKVGGNYNYL	M56;M32;M12;M48;M50;M 68;M49;M26
1156	PGTAVLRQWLPTGTLL VDSDLNDFV	M33;M30; M8;M70	LSVCLGSLIYSTAALG VLMSNLGMP	M29;M73;M6;M8;M29;M73; M6;M8
1157	ALVYDNKLKAHKDKS AQCFKMFYKG	M13;M21; M63;M28	LLLSVCLGSLIYSTAA LGVLMSNLG	M29;M73;M6;M8;M29;M73; M6;M8
1158	VSALVYDNKLKAHKD KSAQCFKMFY	M13;M21; M63;M28	LLSVCLGSLIYSTAAL GVLMSNLGM	M29;M73;M6;M8;M29;M73; M6;M8
1159	SALVYDNKLKAHKDK SAQCFKMFYK	M13;M21; M63;M28	SVCLGSLIYSTAALGV LMSNLGMPS	M29;M73;M6;M8;M29;M73; M6;M8
1160	LVYDNKLKAHKDKSA QCFKMFYKGV	M13;M21; M63;M28	FLLLSVCLGSLIYSTA ALGVLMSNL	M29;M73;M6;M8;M29;M73; M6;M8
1161	GNFKNLREFVFKNIDG YFKIYSKHT	M71;M19; M54;M59	WFLLLSVCLGSLIYST AALGVLMSN	M29;M73;M6;M8;M29;M73; M6;M8
1162	ECIKDLLARAGKASCT LSEQLDFID	M12;M28; M12;M28	GMPSYCTGYREGYLN STNVTIATYC	M18;M49;M45;M8;M18;M4 9;M45;M8
1163	PLECIKDLLARAGKAS CTLSEQLDF	M12;M28; M12;M28	VAIHADQLTPTWRVY STGSNVFQTR	M58;M24;M16;M5;M6;M41; M17;M82
1164	LECIKDLLARAGKASC TLSEQLDFI	M12;M28; M12;M28	AIHADQLTPTWRVYS TGSNVFQTRA	M58;M24;M16;M5;M6;M41; M17;M82
1165	YPLECIKDLLARAGKA SCTLSEQLD	M12;M28; M12;M28	PVAIHADQLTPTWRV YSTGSNVFQT	M58;M24;M16;M5;M6;M41; M17;M82
1166	IKDLLARAGKASCTLS EQLDFIDTK	M12;M28; M12;M28	QGMDNLACEDLKPVS EEVVENPTIQ	M1;M49;M45;M37;M1;M49; M45;M37
1167	GYPLECIKDLLARAGK ASCTLSEQL	M12;M28; M12;M28	AYVNTFSSTFNVPME KLKTLVATAE	M22;M28;M8;M70;M22;M2 8;M8;M70
1168	CIKDLLARAGKASCTL SEQLDFIDT	M12;M28; M12;M28	YVNTFSSTFNVPMEK LKTLVATAEA	M22;M28;M8;M70;M22;M2 8;M8;M70
1169	VTGLFKDCSKVITGLH PTQAPTHLS	M46;M34; M47;M36	STSGRWVLNNDYYRS LPGVFCGVDA	M33;M34;M39;M44;M33;M 34;M39;M44
1170	KRSFIEDLLFNKVTLA DAGFIKQYG	M11;M73; M47;M44	DAAMQRKLEKMADQ AMTQMYKQARS	M57;M63;M82;M2;M57;M6 3;M82;M2
1171	SKRSFIEDLLFNKVTLA DAGFIKQY	M11;M73; M47;M44	EFDRDAAMQRKLEK MADQAMTQMYK	M57;M63;M82;M2;M57;M6 3;M82;M2
1172	SFIEDLLFNKVTLADA GFIKQYGDC	M11;M73; M47;M44	FDRDAAMQRKLEKM ADQAMTQMYKQ	M57;M63;M82;M2;M57;M6 3;M82;M2
1173	RSFIEDLLFNKVTLAD AGFIKQYGD	M11;M73; M47;M44	DRDAAMQRKLEKMA DQAMTQMYKQA	M57;M63;M82;M2;M57;M6 3;M82;M2
1174	SNLKPFERDISTEIYQA GSTPCNGV	M46;M53; M17;M44	RDAAMQRKLEKMAD QAMTQMYKQAR	M57;M63;M82;M2;M57;M6 3;M82;M2

1175	ISFPLCANGQVFGLYK NTCVGSDNV	M41;M73; M28;M48	TVKNGSIHLYFDKAG QKTYERHSLS	M7;M21;M48;M49;M7;M21; M48;M49
1176	CANGQVFGLYKNTCV GSDNVTDFNA	M41;M73; M28;M48	VKNGSIHLYFDKAGQ KTYERHSLSH	M7;M21;M48;M49;M7;M21; M48;M49
1177	SFPLCANGQVFGLYKN TCVGSDNVT	M41;M73; M28;M48	KNGSIHLYFDKAGQK TYERHSLSHF	M7;M21;M48;M49;M7;M21; M48;M49
1178	FPLCANGQVFGLYKN TCVGSDNVTD	M41;M73; M28;M48	SVTVKNGSIHLYFDK AGQKTYERHS	M7;M21;M48;M49;M7;M21; M48;M49
1179	PLCANGQVFGLYKNT CVGSDNVTDF	M41;M73; M28;M48	VTVKNGSIHLYFDKA GQKTYERHSL	M7;M21;M48;M49;M7;M21; M48;M49
1180	LCANGQVFGLYKNTC VGSDNVTDFN	M41;M73; M28;M48	IVDSVTVKNGSIHLYF DKAGQKTYE	M21;M12;M48;M49;M21;M 12;M48;M49
1181	FLGIITTVAAFHQECSL QSCTQHQP	M30;M29; M6;M59	VDSVTVKNGSIHLYF DKAGQKTYER	M21;M12;M48;M49;M21;M 12;M48;M49
1182	VFLGIITTVAAFHQECS LQSCTQHQ	M30;M29; M6;M59	SYIVDSVTVKNGSIHL YFDKAGQKT	M21;M12;M48;M49;M21;M 12;M48;M49
1183	YIATNGPLKVGGSCVL SGHNLAKHC	M80;M14; M80;M14	YIVDSVTVKNGSIHLY FDKAGQKTY	M21;M12;M48;M49;M21;M 12;M48;M49
1184	ATNGPLKVGGSCVLS GHNLAKHCLH	M80;M14; M80;M14	TLEETKFLTENLLLYI DINGNLHPD	M50;M36;M11;M70;M50;M 36;M11;M70
1185	IATNGPLKVGGSCVLS GHNLAKHCL	M80;M14; M80;M14	LEETKFLTENLLLYIDI NGNLHPDS	M50;M36;M11;M70;M50;M 36;M11;M70
1186	TNGPLKVGGSCVLSG HNLAKHCLHV	M80;M14; M80;M14	ALCTFLLNKEMYLKL RSDVLLPLTQ	M42;M39;M43;M44;M42;M 39;M43;M44
1187	DYIATNGPLKVGGSCV LSGHNLAKH	M80;M14; M80;M14	LCTFLLNKEMYLKLR SDVLLPLTQY	M42;M39;M43;M44;M42;M 39;M43;M44
1188	NGPLKVGGSCVLSGH NLAKHCLHVV	M80;M14; M80;M14	CTFLLNKEMYLKLRS DVLLPLTQYN	M42;M39;M43;M44;M42;M 39;M43;M44
1189	LESELVIGAVILRGHLR IAGHHLGR	M55;M53; M58;M14	ATNNAMQVESDDYIA TNGPLKVGGS	M10;M29;M11;M44;M10;M 29;M11;M44
1190	PGNFNKDFYDFAVSK GFFKEGSSVE	M33;M25; M19;M70	YGTEDDYQGKPLEFG ATSAALQPEE	M1;M22;M28;M37;M1;M22; M28;M37
1191	KPGNFNKDFYDFAVS KGFFKEGSSV	M33;M25; M19;M70	GTEDDYQGKPLEFGA TSAALQPEEE	M1;M22;M28;M37;M1;M22; M28;M37
1192	NKDFYDFAVSKGFFKE GSSVELKHF	M33;M25; M19;M31	LDGISQYSLRLIDAM MFTSDLATNN	M57;M60;M54;M36;M57;M 60;M54;M36
1193	FNKDFYDFAVSKGFFK EGSSVELKH	M33;M25; M19;M31	DGISQYSLRLIDAMM FTSDLATNNL	M57;M60;M54;M36;M57;M 60;M54;M36
1194	NFNKDFYDFAVSKGFF KEGSSVELK	M33;M25; M19;M31	VVFNGVSFSTFEEAAL CTFLLNKEM	M4;M13;M6;M49;M4;M13; M6;M49
1195	INCQEPKLGSLVVRCS FYEDFLEYH	M29;M82; M14;M70	RVVFNGVSFSTFEEA ALCTFLLNKE	M4;M13;M6;M49;M4;M13; M6;M49
1196	NCQEPKLGSLVVRCSF YEDFLEYHD	M29;M82; M14;M70	VFNGVSFSTFEEAALC TFLLNKEMY	M4;M13;M6;M49;M4;M13; M6;M49
1197	ANGQVFGLYKNTCVG SDNVTDFNAI	M48;M73; M28;M59	FNGVSFSTFEEAALCT FLLNKEMYL	M4;M13;M6;M49;M4;M13; M6;M49
1198	LPFTINCQEPKLGSLVV RCSFYEDF	M50;M29; M82;M14	KRRVVFNGVSFSTFEE AALCTFLLN	M4;M13;M6;M49;M4;M13; M6;M49
1199	LACFVLAAVYRINWIT GGIAIAMAC	M50;M33; M58;M44	RRVVFNGVSFSTFEEA ALCTFLLNK	M4;M13;M6;M49;M4;M13; M6;M49

1200	TLACFVLAAVYRINWI TGGIAIAMA	M50;M33; M58;M44	VENPDILRVYANLGE RVRQALLKTV	M64;M11;M21;M32;M48;M 41;M49;M22
1201	QKRTATKAYNVTQAF GRRGPEQTQG	M78;M25; M19;M70	AYTVELGTEVNEFAC VVADAVIKTL	M14;M34;M39;M66;M14;M 34;M39;M66
1202	RTATKAYNVTQAFGR RGPEQTQGNF	M78;M25; M19;M70	AVKMFDAYVNTFSST FNVPMEKLKT	M41;M28;M8;M70;M41;M2 8;M8;M70
1203	RQKRTATKAYNVTQA FGRRGPEQTQ	M78;M25; M19;M70	TRFQTLLALHRSYLTP GDSSSGWTA	M21;M24;M70;M55;M5;M4 8;M9;M23
1204	KRTATKAYNVTQAFG RRGPEQTQGN	M78;M25; M19;M70	VFLLVTLAILTALRLC AYCCNIVNV	M54;M16;M60;M25;M41;M 17;M46;M39
1205	TEKWESGVKDCVVLH SYFTSDYYQL	M46;M67; M14;M20	VVFLLVTLAILTALRL CAYCCNIVN	M54;M16;M60;M25;M41;M 17;M46;M39
1206	YTEKWESGVKDCVVL HSYFTSDYYQ	M46;M67; M14;M20	FLLVTLAILTALRLCA YCCNIVNVS	M54;M16;M60;M25;M41;M 17;M46;M39
1207	NDKVAGFAKFLKTNC CRFQEKDEDD	M79;M55; M73;M8	LLVTLAILTALRLCAY CCNIVNVSL	M54;M16;M60;M25;M41;M 17;M46;M39
1208	GVEHVTFFIYNKIVDE PEEHVQIHT	M50;M44; M47;M49	AFGGCVFSYVGCHNK CAYWVPRASA	M40;M75;M19;M55;M40;M 75;M19;M55
1209	TDTGVEHVTFFIYNKI VDEPEEHVQ	M50;M44; M47;M49	VVNVVTTKIALKGGK IVNNWLKQLI	M57;M29;M11;M12;M57;M 29;M11;M12
1210	TGVEHVTFFIYNKIVD EPEEHVQIH	M50;M44; M47;M49	QVVNVVTTKIALKGG KIVNNWLKQL	M57;M29;M11;M12;M57;M 29;M11;M12
1211	DTGVEHVTFFIYNKIV DEPEEHVQI	M50;M44; M47;M49	IGLALYYPSARIVYTA CSHAAVDAL	M64;M21;M28;M5;M29;M3 8;M17;M22
1212	VEHVTFFIYNKIVDEPE EHVQIHTI	M50;M44; M47;M49	YMLTYNKVENMTPR DLGACIDCSAR	M14;M11;M67;M74;M14;M 11;M67;M74
1213	TSRYWEPEFYEAMYT PHTVLQAVGA	M75;M30; M39;M16	LKWARFPKSDGTGTI YTELEPPCRF	M38;M6;M59;M28;M38;M6; M59;M28
1214	DNTSRYWEPEFYEAM YTPHTVLQAV	M75;M30; M39;M16	FPKSDGTGTIYTELEP PCRFVTDTP	M38;M6;M59;M28;M38;M6; M59;M28
1215	NTSRYWEPEFYEAMY TPHTVLQAVG	M75;M30; M39;M16	WARFPKSDGTGTIYT ELEPPCRFVT	M38;M6;M59;M28;M38;M6; M59;M28
1216	SRYWEPEFYEAMYTP HTVLQAVGAC	M75;M30; M39;M16	DLKWARFPKSDGTGT IYTELEPPCR	M38;M6;M59;M28;M38;M6; M59;M28
1217	YWEPEFYEAMYTPHT VLQAVGACVL	M75;M30; M39;M16	RFPKSDGTGTIYTELE PPCRFVTDT	M38;M6;M59;M28;M38;M6; M59;M28
1218	RYWEPEFYEAMYTPH TVLQAVGACV	M75;M30; M39;M16	KWARFPKSDGTGTIY TELEPPCRFV	M38;M6;M59;M28;M38;M6; M59;M28
1219	VYRGTTTYKLNVGDY FVLTSHTVMP	M42;M34; M43;M44	QDLKWARFPKSDGTG TIYTELEPPC	M38;M6;M59;M28;M38;M6; M59;M28
1220	TGKIADYNYKLPDDFT GCVIAWNSN	M13;M29; M67;M12	ARFPKSDGTGTIYTEL EPPCRFVTD	M38;M6;M59;M28;M38;M6; M59;M28
1221	KFLVFLGIITTVAAFHQ ECSLQSCT	M29;M22; M6;M59	WYDFVENPDILRVYA NLGERVRQAL	M64;M21;M32;M48;M41;M 49;M46;M22
1222	HEVLLAPLLSAGIFGA DPIHSLRVC	M36;M20; M36;M20	DWYDFVENPDILRVY ANLGERVRQA	M64;M21;M32;M48;M41;M 49;M46;M22
1223	FNQHEVLLAPLLSAGI FGADPIHSL	M36;M20; M36;M20	ISVTSNYSGVVTTVM FLARGIVFMC	M29;M11;M38;M14;M29;M 11;M38;M14
1224	LAPLLSAGIFGADPIHS LRVCVDTV	M36;M20; M36;M20	IISVTSNYSGVVTTVM FLARGIVFM	M29;M11;M38;M14;M29;M 11;M38;M14

1225	EVLLAPLLSAGIFGADPIHSLRVCV	M36;M20;M36;M20	LIISVTSNYSGVVTTVMFLARGIVF	M29;M11;M38;M14;M29;M11;M38;M14
1226	NQHEVLLAPLLSAGIFGADPIHSLR	M36;M20;M36;M20	SAYTVELGTEVNEFACVVADAVIKT	M43;M34;M39;M14;M43;M34;M39;M14
1227	ENSYTTTIKPVTYKLDGVVCTEIDP	M36;M20;M36;M20	CSAYTVELGTEVNEFACVVADAVIK	M43;M34;M39;M14;M43;M34;M39;M14
1228	VLLAPLLSAGIFGADPIHSLRVCVD	M36;M20;M36;M20	AFASEAARVVRSIFSRTLETAQNSV	M4;M42;M48;M59;M4;M42;M48;M59
1229	LLAPLLSAGIFGADPIHSLRVCVDT	M36;M20;M36;M20	SNYQHEETIYNLLKDCPAVAKHDFF	M40;M30;M41;M42;M27;M43;M39;M11
1230	QHEVLLAPLLSAGIFGADPIHSLRV	M36;M20;M36;M20	YQHEETIYNLLKDCPAVAKHDFFKF	M40;M30;M41;M42;M27;M43;M39;M11
1231	CYKRNRATRVECTTIVNGVRRSFYV	M29;M14;M29;M14	NYQHEETIYNLLKDCPAVAKHDFFK	M40;M30;M41;M42;M27;M43;M39;M11
1232	FRVYSSANNCTFEYVSQPFLMDLEG	M57;M1;M82;M20	KIKACVEEVTTTLEETKFLTENLLL	M32;M6;M28;M20;M32;M6;M28;M20
1233	KTTLPVNVAFELWAKRNIKPVPEVK	M55;M28;M66;M74	KDWYDFVENPDILRVYANLGERVRQ	M64;M21;M32;M48;M43;M49;M46;M22
1234	TTLPVNVAFELWAKRNIKPVPEVKI	M55;M28;M66;M74	ITLKKRWQLALSKGVHFVCNLLLLF	M11;M74;M33;M27;M8;M42;M82;M23
1235	IPARARVECFDKFKVNSTLEQYVFC	M50;M18;M44;M10	IITLKKRWQLALSKGVHFVCNLLLL	M11;M74;M33;M27;M8;M42;M82;M23
1236	SIKNFKSVLYYQNNVFMSEAKCWTE	M41;M22;M48;M49	FVTQRNFYEPQIITTDNTFVSGNCD	M64;M10;M5;M7;M30;M79;M9;M23
1237	FKSVLYYQNNVFMSEAKCWTETDLT	M41;M22;M48;M49	GGKGFCKLHNWNCVNCDTFCAGSTF	M42;M39;M45;M41;M42;M39;M45;M41
1238	ASIKNFKSVLYYQNNVFMSEAKCWT	M41;M22;M48;M49	NGGKGFCKLHNWNCVNCDTFCAGST	M42;M39;M45;M41;M42;M39;M45;M41
1239	KNFKSVLYYQNNVFMSEAKCWTETD	M41;M22;M48;M49	GLDSLDTYPSLETIQITISSFKWDL	M55;M29;M48;M41;M55;M29;M48;M41
1240	NFKSVLYYQNNVFMSEAKCWTETDL	M41;M22;M48;M49	KAIVSTIQRKYKGIKIQEGVVDYGA	M40;M5;M67;M14;M40;M5;M67;M14
1241	IKNFKSVLYYQNNVFMSEAKCWTET	M41;M22;M48;M49	AIVSTIQRKYKGIKIQEGVVDYGAR	M40;M5;M67;M14;M40;M5;M67;M14
1242	VASIKNFKSVLYYQNNVFMSEAKCW	M41;M22;M48;M49	VSTIQRKYKGIKIQEGVVDYGARFY	M40;M5;M67;M14;M40;M5;M67;M14
1243	YEDFQENWNTKHSSGVTRELMRELN	M74;M44;M74;M44	IVSTIQRKYKGIKIQEGVVDYGARF	M40;M5;M67;M14;M40;M5;M67;M14
1244	EDFQENWNTKHSSGVTRELMRELNG	M74;M44;M74;M44	TKAIVSTIQRKYKGIKIQEGVVDYG	M40;M5;M67;M14;M40;M5;M67;M14
1245	PYEDFQENWNTKHSSGVTRELMREL	M74;M44;M74;M44	LPKGIMMNVAKYTQLCQYLNTLTLA	M73;M58;M78;M34;M48;M41;M49;M11
1246	LSVVNARLRAKHYVYIGDPAQLPAP	M57;M1;M31;M37	DLQDLKWARFPKSDGTGTIYTELEP	M4;M38;M28;M59;M4;M38;M28;M59
1247	DTYACWHHSIGFDYVYNPFMIDVQQ	M57;M1;M43;M20	NSIIKTIQPRVEKKKLDGFMGRIRS	M26;M29;M72;M28;M26;M29;M72;M28
1248	TYACWHHSIGFDYVYNPFMIDVQQW	M57;M1;M43;M20	NSTYASQGLVASIKNFKSVLYYQNN	M64;M21;M54;M48;M68;M49;M22;M23
1249	LTNNVAFQTVKPGNFNKDFYDFAVS	M25;M29;M6;M59	TDFVNEFYAYLRKHFSMMILSDDAV	M71;M16;M57;M18;M35;M15;M52;M26

1250	ALTNNVAFQTVKPGN FNKDFYDFAV	M25;M29; M6;M59	DTDFVNEFYAYLRKH FSMMILSDDA	M71;M16;M57;M18;M35;M 15;M52;M26
1251	VFCTVNALPETTADIV VFDEISMAT	M38;M55; M28;M49	IKVTLVFLFVAAIFYLI TPVHVMSK	M1;M34;M39;M18;M1;M34; M39;M18
1252	IPTITQMNLKYAISAKN RARTVAGV	M35;M82; M18;M14	LKDCVMYASAVVLLI LMTARTVYDD	M75;M39;M12;M46;M75;M 39;M12;M46
1253	LQSADAQSFLNRVCG VSAARLTPCG	M15;M46; M47;M45	TPKYKFVRIQPGQTFS VLACYNGSP	M34;M29;M27;M14;M34;M 29;M27;M14
1254	MLQSADAQSFLNRVC GVSAARLTPC	M15;M46; M47;M45	YTDFATSACVLAAEC TIFKDASGKP	M70;M29;M14;M62;M70;M 29;M14;M62
1255	SADAQSFLNRVCGVS AARLTPCGTG	M15;M46; M47;M45	EYTDFATSACVLAAE CTIFKDASGK	M70;M29;M14;M62;M70;M 29;M14;M62
1256	QSADAQSFLNRVCGV SAARLTPCGT	M15;M46; M47;M45	SKLWAQCVQLHNDIL LAKDTTEAFE	M36;M32;M68;M58;M36;M 32;M68;M58
1257	PMLQSADAQSFLNRV CGVSAARLTP	M15;M46; M47;M45	GVHFVCNLLLLFVTV YSHLLLVAAG	M21;M6;M37;M50;M41;M4 3;M42;M22
1258	TNNVAFQTVKPGNFN KDFYDFAVSK	M29;M6;M 59;M70	KLKVDTANPKTPKYK FVRIQPGQTF	M77;M29;M34;M14;M77;M 29;M34;M14
1259	NNVAFQTVKPGNFNK DFYDFAVSKG	M29;M6;M 59;M70	KGLNNLNRGMVLGS LAATVRLQAGN	M55;M12;M17;M10;M55;M 12;M17;M10
1260	NVAFQTVKPGNFNKD FYDFAVSKGF	M29;M6;M 59;M70	PNASFDNFKFVCDNIK FADDLNQLT	M64;M25;M19;M23;M64;M 25;M19;M23
1261	RNVIPTITQMNLKYAIS AKNRARTV	M18;M35; M58;M14	VVFLHVTYVPAQEKN FTTAPAICHD	M28;M66;M70;M78;M79;M 33;M26;M82
1262	SASAFFGMSRIGMEVT PSGTWLTYT	M5;M28;M 16;M23	GVVFLHVTYVPAQEK NFTTAPAICH	M28;M66;M70;M78;M79;M 33;M26;M82
1263	DVEWKFYDAQPCSDK AYKIEELFYS	M29;M6;M 59;M41	VFLHVTYVPAQEKNF TTAPAICHDG	M28;M66;M70;M78;M79;M 33;M26;M82
1264	QADVEWKFYDAQPCS DKAYKIEELF	M29;M6;M 59;M41	HGVVFLHVTYVPAQE KNFTTAPAIC	M28;M66;M70;M78;M79;M 33;M26;M82
1265	VEWKFYDAQPCSDKA YKIEELFYSY	M29;M6;M 59;M41	DGADVTKIKPHNSHE GKTFYVLPND	M55;M21;M53;M48;M55;M 21;M53;M48
1266	ADVEWKFYDAQPCSD KAYKIEELFY	M29;M6;M 59;M41	PTYLDGADVTKIKPH NSHEGKTFYV	M55;M21;M53;M48;M55;M 21;M53;M48
1267	FRELGVVHNQDVNLH SSRLSFKELL	M21;M53; M38;M14	LDGADVTKIKPHNSH EGKTFYVLPN	M55;M21;M53;M48;M55;M 21;M53;M48
1268	RELGVVHNQDVNLHS SRLSFKELLV	M21;M53; M38;M14	YLDGADVTKIKPHNS HEGKTFYVLP	M55;M21;M53;M48;M55;M 21;M53;M48
1269	ELGVVHNQDVNLHSS RLSFKELLVY	M21;M53; M38;M14	TYLDGADVTKIKPHN SHEGKTFYVL	M55;M21;M53;M48;M55;M 21;M53;M48
1270	VVHNQDVNLHSSRLSF KELLVYAAD	M21;M53; M38;M14	CHIDHPNPKGFCDLK GKYVQIPTTC	M42;M39;M63;M43;M42;M 39;M63;M43
1271	LGVVHNQDVNLHSSR LSFKELLVYA	M21;M53; M38;M14	CRCHIDHPNPKGFCD LKGKYVQIPT	M42;M39;M63;M43;M42;M 39;M63;M43
1272	GVVHNQDVNLHSSRL SFKELLVYAA	M21;M53; M38;M14	RCHIDHPNPKGFCDL KGKYVQIPTT	M42;M39;M63;M43;M42;M 39;M63;M43
1273	STFEEAALCTFLLNKE MYLKLRSDV	M13;M44; M13;M44	YLALYNKYKYFSGA MDTTSYREAAC	M1;M67;M66;M31;M1;M67; M66;M31
1274	SFSTFEEAALCTFLLNK EMYLKLRS	M13;M44; M13;M44	SEVGPEHSLAEYHNE SGLKTILRKG	M13;M39;M68;M48;M13;M 39;M68;M48

1275	FSTFEEAALCTFLLNK EMYLKLRSD	M13;M44; M13;M44	HNSEVGPEHSLAEYH NESGLKTILR	M13;M39;M68;M48;M13;M 39;M68;M48
1276	TFEEAALCTFLLNKEM YLKLRSDVL	M13;M44; M13;M44	NSEVGPEHSLAEYHN ESGLKTILRK	M13;M39;M68;M48;M13;M 39;M68;M48
1277	FEEAALCTFLLNKEMY LKLRSDVLL	M13;M44; M13;M44	NASVVNIQKEIDRLNE VAKNLNESL	M70;M78;M65;M2;M61;M7 9;M82;M47
1278	AVTANVNALLSTDGN KIADKYVRNL	M57;M9;M 8;M10	ASVVNIQKEIDRLNEV AKNLNESLI	M70;M78;M65;M2;M61;M7 9;M82;M47
1279	QAVTANVNALLSTDG NKIADKYVRN	M57;M9;M 8;M10	PRVEKKKLDGFMGRI RSVYPVASPN	M26;M29;M6;M58;M26;M2 9;M6;M58
1280	SAFVNLKQLPFFYYSD SPCESHGKQ	M32;M41; M54;M45	RVEKKKLDGFMGRIR SVYPVASPNE	M26;M29;M6;M58;M26;M2 9;M6;M58
1281	TKRNVIPTITQMNLKY AISAKNRAR	M14;M35; M58;M59	PFEIKLAKKFDTFNGE CPNFVFPLN	M57;M27;M45;M20;M57;M 27;M45;M20
1282	YAAVINGDRWFLNRF TTTLNDFNLV	M14;M66; M14;M66	KLAKKFDTFNGECPN FVFPLNSIIK	M57;M27;M45;M20;M57;M 27;M45;M20
1283	AAVINGDRWFLNRFTT TLNDFNLVA	M14;M66; M14;M66	LAKKFDTFNGECPNF VFPLNSIIKT	M57;M27;M45;M20;M57;M 27;M45;M20
1284	AVINGDRWFLNRFTTT LNDFNLVAM	M14;M66; M14;M66	EIKLAKKFDTFNGECP NFVFPLNSI	M57;M27;M45;M20;M57;M 27;M45;M20
1285	WLYAAVINGDRWFLN RFTTTLNDFN	M14;M66; M14;M66	FEIKLAKKFDTFNGEC PNFVFPLNS	M57;M27;M45;M20;M57;M 27;M45;M20
1286	LYAAVINGDRWFLNR FTTTLNDFNL	M14;M66; M14;M66	IKLAKKFDTFNGECPN FVFPLNSII	M57;M27;M45;M20;M57;M 27;M45;M20
1287	ICQAVTANVNALLSTD GNKIADKYV	M10;M11; M9;M8	AMQRKLEKMADQA MTQMYKQARSED	M55;M82;M2;M74;M55;M8 2;M2;M74
1288	NICQAVTANVNALLST DGNKIADKY	M10;M11; M9;M8	FKEGVEFLRDGWEIV KFISTCACEI	M4;M22;M74;M49;M4;M22; M74;M49
1289	VFNICQAVTANVNALL STDGNKIAD	M10;M11; M9;M8	TDFATSACVLAAECTI FKDASGKPV	M33;M70;M14;M62;M33;M 70;M14;M62
1290	FNICQAVTANVNALLS TDGNKIADK	M10;M11; M9;M8	TTRQVVNVVTTKIAL KGGKIVNNWL	M64;M29;M22;M2;M64;M2 9;M22;M2
1291	YIINLIIKNLSKSLTENK YSQLDEE	M11;M73; M28;M17	MSFPQSAPHGVVFLH VTYVPAQEKN	M64;M21;M28;M66;M70;M 53;M26;M9
1292	IINLIIKNLSKSLTENKY SQLDEEQ	M11;M73; M28;M17	DVGDSAEVAVKMFD AYVNTFSSTFN	M26;M41;M14;M37;M26;M 41;M14;M37
1293	INLIIKNLSKSLTENKY SQLDEEQP	M11;M73; M28;M17	KDEDDNLIDSYFVVK RHTFSNYQHE	M71;M58;M16;M54;M18;M 15;M52;M47
1294	DYIINLIIKNLSKSLTEN KYSQLDE	M11;M73; M28;M17	EKDEDDNLIDSYFVV KRHTFSNYQH	M71;M58;M16;M54;M18;M 15;M52;M47
1295	DFQVTIAEILLIIMRTF KVSIWNLD	M1;M5;M6 1;M37	QEKDEDDNLIDSYFV VKRHTFSNYQ	M71;M58;M16;M54;M18;M 15;M52;M47
1296	YFNSVCRLMKTIGPD MFLGTCRRCP	M17;M5;M 6;M59	LWEIQQVVDADSKIV QLSEISMDNS	M64;M7;M22;M54;M64;M7; M22;M54
1297	EYFNSVCRLMKTIGPD MFLGTCRRC	M17;M5;M 6;M59	SMQGAVDINKLCEEM LDNRATLQAI	M60;M54;M45;M49;M60;M 54;M45;M49
1298	PEYFNSVCRLMKTIGP DMFLGTCRR	M17;M5;M 6;M59	LSMQGAVDINKLCEE MLDNRATLQA	M60;M54;M45;M49;M60;M 54;M45;M49
1299	FNSVCRLMKTIGPDMF LGTCRRCPA	M17;M5;M 6;M59	DDTLRVEAFEYYHTT DPSFLGRYMS	M29;M6;M59;M41;M29;M6; M59;M41

1300	PAMHAASGNLLLDKRTTCFSVAALT	M57;M7;M9;M50	LRVEAFEYYHTTDPSFLGRYMSALN	M29;M6;M59;M41;M29;M6;M59;M41
1301	SVYAWNRKRISNCVADYSVLYNSAS	M7;M67;M27;M74	DTLRVEAFEYYHTTDPSFLGRYMSA	M29;M6;M59;M41;M29;M6;M59;M41
1302	VYAWNRKRISNCVADYSVLYNSASF	M7;M67;M27;M74	NDDTLRVEAFEYYHTTDPSFLGRYM	M29;M6;M59;M41;M29;M6;M59;M41
1303	GTTLPKGFYAEGSRGGSQASSRSSS	M5;M42;M75;M45	TLRVEAFEYYHTTDPSFLGRYMSAL	M29;M6;M59;M41;M29;M6;M59;M41
1304	TTLPKGFYAEGSRGGSQASSRSSSR	M5;M42;M75;M45	RVEAFEYYHTTDPSFLGRYMSALNH	M29;M6;M59;M41;M29;M6;M59;M41
1305	SQPFLMDLEGKQGNFKNLREFVFKN	M6;M46;M54;M59	ADVFHLYLQYIRKLHDELTGHMLDM	M71;M32;M52;M16;M35;M46;M9;M47
1306	KYKYFSGAMDTTSYREAACCHLAKA	M1;M67;M1;M67	YFSGAMDTTSYREAACCHLAKALND	M78;M1;M79;M5;M78;M1;M79;M5
1307	FEPSTQYEYGTEDDYQGKPLEFGAT	M1;M67;M1;M67	FSGAMDTTSYREAACCHLAKALNDF	M78;M1;M79;M5;M78;M1;M79;M5
1308	LYNKYKYFSGAMDTTSYREAACCHL	M1;M67;M1;M67	GAMDTTSYREAACCHLAKALNDFSN	M78;M1;M79;M5;M78;M1;M79;M5
1309	EEFEPSTQYEYGTEDDYQGKPLEFG	M1;M67;M1;M67	SGAMDTTSYREAACCHLAKALNDFS	M78;M1;M79;M5;M78;M1;M79;M5
1310	YNKYKYFSGAMDTTSYREAACCHLA	M1;M67;M1;M67	EKFKEGVEFLRDGWEIVKFISTCAC	M57;M4;M27;M20;M57;M4;M27;M20
1311	EEEFEPSTQYEYGTEDDYQGKPLEF	M1;M67;M1;M67	LDGFMGRIRSVYPVASPNECNQMCL	M68;M29;M6;M58;M68;M29;M6;M58
1312	YKYFSGAMDTTSYREAACCHLAKAL	M1;M67;M1;M67	GFMGRIRSVYPVASPNECNQMCLST	M68;M29;M6;M58;M68;M29;M6;M58
1313	EEEEFEPSTQYEYGTEDDYQGKPLE	M1;M67;M1;M67	DGFMGRIRSVYPVASPNECNQMCLS	M68;M29;M6;M58;M68;M29;M6;M58
1314	ALYNKYKYFSGAMDTTSYREAACCH	M1;M67;M1;M67	FMGRIRSVYPVASPNECNQMCLSTL	M68;M29;M6;M58;M68;M29;M6;M58
1315	EFEPSTQYEYGTEDDYQGKPLEFGA	M1;M67;M1;M67	KLDGFMGRIRSVYPVASPNECNQMC	M68;M29;M6;M58;M68;M29;M6;M58
1316	NKYKYFSGAMDTTSYREAACCHLAK	M1;M67;M1;M67	VEVQPQLEMELTPVVQTIEVNSFSG	M56;M29;M60;M6;M56;M29;M60;M6
1317	GNYNYLYRLFRKSNLKPFERDISTE	M1;M53;M17;M37	EVQPQLEMELTPVVQTIEVNSFSGY	M56;M29;M60;M6;M56;M29;M60;M6
1318	KKRWQLALSKGVHFVCNLLLLFVTV	M50;M49;M8;M23	VQPQLEMELTPVVQTIEVNSFSGYL	M56;M29;M60;M6;M56;M29;M60;M6
1319	TRQVVNVVTTKIALKGGKIVNNWLK	M29;M12;M29;M12	KTLVATAEAELAKNVSLDNVLSTFI	M38;M29;M73;M6;M38;M29;M73;M6
1320	LVDFQVTIAEILLIIMRTFKVSIWN	M5;M8;M61;M37	TACTDDNALAYYNTTKGGRFVLALL	M21;M22;M27;M6;M21;M22;M27;M6
1321	AASGNLLLDKRTTCFSVAALTNNVA	M50;M7;M29;M9	ACTDDNALAYYNTTKGGRFVLALLS	M21;M22;M27;M6;M21;M22;M27;M6
1322	ASGNLLLDKRTTCFSVAALTNNVAF	M50;M7;M29;M9	TQTACTDDNALAYYNTTKGGRFVLA	M21;M22;M27;M6;M21;M22;M27;M6
1323	VYYHKNNKSWMESEFRVYSSANNCT	M5;M41;M48;M70	QTACTDDNALAYYNTTKGGRFVLAL	M21;M22;M27;M6;M21;M22;M27;M6
1324	FLGVYYHKNNKSWMESEFRVYSSAN	M41;M22;M28;M70	TTQTACTDDNALAYYNTTKGGRFVL	M21;M22;M27;M6;M21;M22;M27;M6

1325	YKRDAPAHISTIGVCS MTDIAKKPT	M59;M6;M 66;M70	CTDDNALAYYNTTK GGRFVLALLSD	M21;M22;M27;M6;M21;M2 2;M27;M6
1326	DYKRDAPAHISTIGVC SMTDIAKKP	M59;M6;M 66;M70	GTTQTACTDDNALAY YNTTKGGRFV	M21;M22;M27;M6;M21;M2 2;M27;M6
1327	TQTTETAHSCNVNRFN VAITRAKVG	M33;M25; M6;M59	IAWYTERSEKSYELQ TPFEIKLAKK	M25;M30;M39;M34;M25;M 30;M39;M34
1328	TTETAHSCNVNRFNV AITRAKVGIL	M33;M25; M6;M59	EIAWYTERSEKSYEL QTPFEIKLAK	M25;M30;M39;M34;M25;M 30;M39;M34
1329	QTTETAHSCNVNRFN VAITRAKVGI	M33;M25; M6;M59	SNLGMPSYCTGYREG YLNSTNVTIA	M50;M18;M45;M49;M50;M 18;M45;M49
1330	KPNELSRVLGLKTLAT HGLAAVNSV	M22;M6;M 22;M6	LMSNLGMPSYCTGYR EGYLNSTNVT	M50;M18;M45;M49;M50;M 18;M45;M49
1331	IKKPNELSRVLGLKTL ATHGLAAVN	M22;M6;M 22;M6	NLGMPSYCTGYREGY LNSTNVTIAT	M50;M18;M45;M49;M50;M 18;M45;M49
1332	LTIKKPNELSRVLGLK TLATHGLAA	M22;M6;M 22;M6	VLMSNLGMPSYCTGY REGYLNSTNV	M50;M18;M45;M49;M50;M 18;M45;M49
1333	TIKKPNELSRVLGLKT LATHGLAAV	M22;M6;M 22;M6	MSNLGMPSYCTGYRE GYLNSTNVTI	M50;M18;M45;M49;M50;M 18;M45;M49
1334	NELSRVLGLKTLATHG LAAVNSVPW	M22;M6;M 22;M6	LGMPSYCTGYREGYL NSTNVTIATY	M50;M18;M45;M49;M50;M 18;M45;M49
1335	PNELSRVLGLKTLATH GLAAVNSVP	M22;M6;M 22;M6	ALVYFLQSINFVRIIM RLWLCWKCR	M4;M75;M24;M10;M60;M2 5;M9;M23
1336	SLTIKKPNELSRVLGL KTLATHGLA	M22;M6;M 22;M6	DDNALAYYNTTKGG RFVLALLSDLQ	M21;M22;M6;M20;M21;M2 2;M6;M20
1337	KKPNELSRVLGLKTLA THGLAAVNS	M22;M6;M 22;M6	FDVLKSEDAQGMDN LACEDLKPVSE	M64;M22;M6;M37;M64;M2 2;M6;M37
1338	ELSRVLGLKTLATHGL AAVNSVPWD	M22;M6;M 22;M6	SKPSVEQRKQDDKKI KACVEEVTTT	M65;M67;M28;M74;M65;M 67;M28;M74
1339	LAYILFTRFFYVLGLA AIMQLFFSY	M5;M45;M 5;M45	KPSVEQRKQDDKKIK ACVEEVTTTL	M65;M67;M28;M74;M65;M 67;M28;M74
1340	ILFTRFFYVLGLAAIM QLFFSYFAV	M5;M45;M 5;M45	QEYADVFHLYLQYIR KLHDELTGHM	M71;M32;M16;M61;M35;M 52;M9;M47
1341	AYILFTRFFYVLGLAAI MQLFFSYF	M5;M45;M 5;M45	EYADVFHLYLQYIRK LHDELTGHML	M71;M32;M16;M61;M35;M 52;M9;M47
1342	YILFTRFFYVLGLAAI MQLFFSYFA	M5;M45;M 5;M45	NQEYADVFHLYLQYI RKLHDELTGH	M71;M32;M16;M61;M35;M 52;M9;M47
1343	WFLAYILFTRFFYVLG LAAIMQLFF	M5;M45;M 5;M45	TRCLNRVCTNYMPYF FTLLLQLCTF	M69;M29;M6;M20;M69;M2 9;M6;M20
1344	FLAYILFTRFFYVLGLA AIMQLFFS	M5;M45;M 5;M45	MNVLTLVYKVYYGN ALDQAISMWAL	M1;M41;M24;M37;M1;M41; M24;M37
1345	EWFLAYILFTRFFYVL GLAAIMQLF	M5;M45;M 5;M45	RVWTLMNVLTLVYK VYYGNALDQAI	M1;M41;M24;M37;M1;M41; M24;M37
1346	AEWFLAYILFTRFFYV LGLAAIMQL	M5;M45;M 5;M45	LMNVLTLVYKVYYG NALDQAISMWA	M1;M41;M24;M37;M1;M41; M24;M37
1347	VAEWFLAYILFTRFFY VLGLAAIMQ	M5;M45;M 5;M45	RRVWTLMNVLTLVY KVYYGNALDQA	M1;M41;M24;M37;M1;M41; M24;M37
1348	DPFLGVYYHKNNKSW MESEFRVYSS	M21;M22; M28;M70	WTLMNVLTLVYKVY YGNALDQAISM	M1;M41;M24;M37;M1;M41; M24;M37
1349	QLTGYKKPASRELKVT FFPDLNGDV	M57;M63; M57;M63	TLMNVLTLVYKVYY GNALDQAISMW	M1;M41;M24;M37;M1;M41; M24;M37

1350	NQLTGYKKPASRELK VTFFPDLNGD	M57;M63; M57;M63	NVLTLVYKVYYGNA LDQAISMWALI	M1;M41;M24;M37;M1;M41; M24;M37
1351	DGKMKDLSPRWYFYY LGTGPEAGLP	M52;M32; M6;M31	VWTLMNVLTLVYKV YYGNALDQAIS	M1;M41;M24;M37;M1;M41; M24;M37
1352	YICGDSTECSNLLLQY GSFCTQLNR	M13;M41; M46;M48	TARTVYDDGARRVW TLMNVLTLVYK	M5;M11;M2;M20;M5;M11; M2;M20
1353	LFNKVTLADAGFIKQY GDCLGDIAA	M21;M41; M48;M70	AANFCALILAYCNKT VGELGDVRET	M79;M41;M48;M49;M79;M 41;M48;M49
1354	LLFNKVTLADAGFIKQ YGDCLGDIA	M21;M41; M48;M70	EAANFCALILAYCNK TVGELGDVRE	M79;M41;M48;M49;M79;M 41;M48;M49
1355	ALVSDVGDSAEVAVK MFDAYVNTFS	M14;M37; M14;M37	ANFCALILAYCNKTV GELGDVRETM	M79;M41;M48;M49;M79;M 41;M48;M49
1356	LVSDVGDSAEVAVKM FDAYVNTFSS	M14;M37; M14;M37	DEFTPFDVVRQCSGV TFQSAVKRTI	M4;M46;M60;M54;M4;M46; M60;M54
1357	VVFVLWAHGFELTSM KYFVKIGPER	M46;M27; M28;M66	TSEDMLNPNYEDLLIR KSNHNFLVQ	M29;M9;M28;M24;M29;M9; M28;M24
1358	ILLIIMRTFKVSIWNLD YIINLIIK	M1;M5;M3 7;M20	SVRVVTTFDSEYCRH GTCERSEAGV	M43;M22;M48;M20;M43;M 22;M48;M20
1359	AEILLIIMRTFKVSIWN LDYIINLI	M1;M5;M3 7;M20	GLFCLLNRYFRLTLG VYDYLVSTQE	M18;M56;M14;M37;M18;M 56;M14;M37
1360	LLIIMRTFKVSIWNLD YIINLIIKN	M1;M5;M3 7;M20	LIDSYFVVKRHTFSNY QHEETIYNL	M71;M58;M16;M18;M15;M 52;M47;M20
1361	EILLIIMRTFKVSIWNL DYIINLII	M1;M5;M3 7;M20	NLIDSYFVVKRHTFSN YQHEETIYN	M71;M58;M16;M18;M15;M 52;M47;M20
1362	KCTLKSFTVEKGIYQT SNFRVQPTE	M75;M25; M8;M23	DNLIDSYFVVKRHTFS NYQHEETIY	M71;M58;M16;M18;M15;M 52;M47;M20
1363	DKSVYYTSNPTTFHLD GEVITFDNL	M50;M45; M50;M45	EDDNLIDSYFVVKRH TFSNYQHEET	M71;M58;M16;M18;M15;M 52;M47;M20
1364	IKGLNNLNRGMVLGS LAATVRLQAG	M12;M17; M12;M17	DDNLIDSYFVVKRHT FSNYQHEETI	M71;M58;M16;M18;M15;M 52;M47;M20
1365	STDVVYRAFDIYNDK VAGFAKFLKT	M78;M79; M7;M41	QQVVDADSKIVQLSEI SMDNSPNLA	M7;M60;M54;M49;M7;M60; M54;M49
1366	SLENVAFNVVNKGHF DGQQGEVPVS	M15;M24; M16;M71	VVDADSKIVQLSEISM DNSPNLAWP	M7;M60;M54;M49;M7;M60; M54;M49
1367	LENVAFNVVNKGHFD GQQGEVPVSI	M15;M24; M16;M71	QVVDADSKIVQLSEIS MDNSPNLAW	M7;M60;M54;M49;M7;M60; M54;M49
1368	SKKPRQKRTATKAYN VTQAFGRRGP	M78;M5;M 2;M70	SDIDITFLKKDAPYIV GDVVQEGVL	M57;M30;M11;M58;M57;M 30;M11;M58
1369	ASKKPRQKRTATKAY NVTQAFGRRG	M78;M5;M 2;M70	VHVMSKHTDFSSEIIG YKAIDGGVT	M26;M53;M48;M41;M26;M 53;M48;M41
1370	LYFIKGLNNLNRGMV LGSLAATVRL	M12;M24; M12;M24	DSMSYEDQDALFAYT KRNVIPTITQ	M71;M24;M55;M10;M53;M 35;M9;M23
1371	YLYFIKGLNNLNRGM VLGSLAATVR	M12;M24; M12;M24	SYEDQDALFAYTKRN VIPTITQMNL	M71;M24;M55;M10;M53;M 35;M9;M23
1372	DMILSLLSKGRLIIREN NRVVISSD	M21;M41; M9;M48	MSYEDQDALFAYTKR NVIPTITQMN	M71;M24;M55;M10;M53;M 35;M9;M23
1373	PSGTWLTYTGAIKLDD KDPNFKDQV	M10;M7;M 41;M35	SMSYEDQDALFAYTK RNVIPTITQM	M71;M24;M55;M10;M53;M 35;M9;M23
1374	SRVLGLKTLATHGLA AVNSVPWDTI	M54;M6;M 54;M6	SSEIIGYKAIDGGVTR DIASTDTCF	M43;M26;M41;M48;M43;M 26;M41;M48

1375	RVLGLKTLATHGLAA VNSVPWDTIA	M54;M6;M 54;M6	ISNEKQEILGTVSWNL REMLAHAEE	M75;M24;M9;M8;M75;M24; M9;M8
1376	VLGLKTLATHGLAAV NSVPWDTIAN	M54;M6;M 54;M6	SIISNEKQEILGTVSW NLREMLAHA	M75;M24;M9;M8;M75;M24; M9;M8
1377	VICTSEDMLNPNYEDL LIRKSNHNF	M29;M28; M29;M28	IISNEKQEILGTVSWN LREMLAHAE	M75;M24;M9;M8;M75;M24; M9;M8
1378	CTSEDMLNPNYEDLLI RKSNHNFLV	M29;M28; M29;M28	AEVAVKMFDAYVNT FSSTFNVPMEK	M70;M41;M8;M37;M70;M4 1;M8;M37
1379	ICTSEDMLNPNYEDLLI RKSNHNFL	M29;M28; M29;M28	LAYYNTTKGGRFVLA LLSDLQDLKW	M33;M70;M6;M20;M33;M7 0;M6;M20
1380	YDNKLKAHKDKSAQC FKMFYKGVIT	M13;M21; M63;M52	ALAYYNTTKGGRFVL ALLSDLQDLK	M33;M70;M6;M20;M33;M7 0;M6;M20
1381	NLLLLFVTVYSHLLLV AAGLEAPFL	M42;M6;M 43;M37	VYSVIYLYLTFYLTND VSFLAHIQW	M50;M60;M54;M48;M50;M 60;M54;M48
1382	VRNLQHRLYECLYRN RDVDTDFVNE	M52;M2;M 47;M35	ANNTKGSLPINVIVFD GKSKCEESS	M7;M56;M26;M52;M7;M56; M26;M52
1383	ECSNLLLQYGSFCTQL NRALTGIAV	M13;M41; M43;M48	NNTKGSLPINVIVFDG KSKCEESSA	M7;M56;M26;M52;M7;M56; M26;M52
1384	VFKNIDGYFKIYSKHT PINLVRDLP	M15;M52; M16;M71	VTCGTTTLNGLWLDD VVYCPRHVIC	M79;M7;M9;M24;M79;M7; M9;M24
1385	REFVFKNIDGYFKIYS KHTPINLVR	M15;M52; M16;M71	EGNFYGPFVDRQTAQ AAGTDTTITV	M15;M46;M2;M58;M15;M4 6;M2;M58
1386	FVFKNIDGYFKIYSKH TPINLVRDL	M15;M52; M16;M71	YGPFVDRQTAQAAGT DTTITVNVLA	M15;M46;M2;M58;M15;M4 6;M2;M58
1387	FKNIDGYFKIYSKHTPI NLVRDLPQ	M15;M52; M16;M71	NFYGPFVDRQTAQAA GTDTTITVNV	M15;M46;M2;M58;M15;M4 6;M2;M58
1388	EFVFKNIDGYFKIYSK HTPINLVRD	M15;M52; M16;M71	GNFYGPFVDRQTAQA AGTDTTITVN	M15;M46;M2;M58;M15;M4 6;M2;M58
1389	LREFVFKNIDGYFKIYS KHTPINLV	M15;M52; M16;M71	FYGPFVDRQTAQAAG TDTTITVNVL	M15;M46;M2;M58;M15;M4 6;M2;M58
1390	TPSFKKGAKLLHKPIV WHVNNATNK	M1;M27;M 1;M27	LEGNFYGPFVDRQTA QAAGTDTTIT	M15;M46;M2;M58;M15;M4 6;M2;M58
1391	PSFKKGAKLLHKPIVW HVNNATNKA	M1;M27;M 1;M27	LNLEEAARYMRSLKV PATVSVSSPD	M5;M72;M16;M35;M5;M72; M16;M35
1392	PNMLRIMASLVLARK HTTCCSLSHR	M5;M69;M 2;M35	HGLNLEEAARYMRSL KVPATVSVSS	M5;M72;M16;M35;M5;M72; M16;M35
1393	RLRAKHYVYIGDPAQ LPAPRTLLTK	M57;M30; M40;M31	NLEEAARYMRSLKVP ATVSVSSPDA	M5;M72;M16;M35;M5;M72; M16;M35
1394	ARLRAKHYVYIGDPA QLPAPRTLLT	M57;M30; M40;M31	GLNLEEAARYMRSLK VPATVSVSSP	M5;M72;M16;M35;M5;M72; M16;M35
1395	LRAKHYVYIGDPAQLP APRTLLTKG	M57;M30; M40;M31	LEEAARYMRSLKVPA TVSVSSPDAV	M5;M72;M16;M35;M5;M72; M16;M35
1396	APLIELCVDEAGSKSPI QYIDIGNY	M64;M7;M 21;M23	THGLNLEEAARYMRS LKVPATVSVS	M5;M72;M16;M35;M5;M72; M16;M35
1397	LNRYFRLTLGVYDYL VSTQEFRYMN	M6;M31;M 6;M31	KDNSYFTEQPIDLVPN QPYPNASFD	M64;M55;M39;M60;M64;M 55;M39;M60
1398	NRYFRLTLGVYDYLV STQEFRYMNS	M6;M31;M 6;M31	DNSYFTEQPIDLVPNQ PYPNASFDN	M64;M55;M39;M60;M64;M 55;M39;M60
1399	TSDLATNNLVVMAYIT GGVVQLTSQ	M50;M12; M50;M12	SLPINVIVFDGKSKCE ESSAKSASV	M50;M7;M56;M52;M50;M7; M56;M52

1400	SNHNFLVQAGNVQLR VIGHSMQNCV	M12;M58; M12;M58	LPINVIVFDGKSKCEE SSAKSASVY	M50;M7;M56;M52;M50;M7; M56;M52
1401	NHNFLVQAGNVQLRV IGHSMQNCVL	M12;M58; M12;M58	LKGGKIVNNWLKQLI KVTLVFLFVA	M57;M55;M56;M11;M57;M 55;M56;M11
1402	HNFLVQAGNVQLRVI GHSMQNCVLK	M12;M58; M12;M58	TTIVNGVRRSFYVYA NGGKGFCKLH	M5;M39;M11;M41;M5;M39; M11;M41
1403	YRARAGEAANFCALIL AYCNKTVGE	M41;M48; M41;M48	GVRRSFYVYANGGK GFCKLHNWNCV	M5;M39;M11;M41;M5;M39; M11;M41
1404	RARAGEAANFCALILA YCNKTVGEL	M41;M48; M41;M48	IVNGVRRSFYVYANG GKGFCKLHNW	M5;M39;M11;M41;M5;M39; M11;M41
1405	ARAGEAANFCALILAY CNKTVGELG	M41;M48; M41;M48	NGVRRSFYVYANGG KGFCKLHNWNC	M5;M39;M11;M41;M5;M39; M11;M41
1406	SCVLSGHNLAKHCLH VVGPNVNKGE	M1;M37;M 1;M37	VNGVRRSFYVYANG GKGFCKLHNWN	M5;M39;M11;M41;M5;M39; M11;M41
1407	CVLSGHNLAKHCLHV VGPNVNKGED	M1;M37;M 1;M37	TIVNGVRRSFYVYAN GGKGFCKLHN	M5;M39;M11;M41;M5;M39; M11;M41
1408	TQYEYGTEDDYQGKP LEFGATSAAL	M1;M37;M 1;M37	ARAGKASCTLSEQLD FIDTKRGVYC	M64;M83;M22;M28;M64;M 83;M22;M28
1409	GSCVLSGHNLAKHCL HVVGPNVNKG	M1;M37;M 1;M37	RAGKASCTLSEQLDFI DTKRGVYCC	M64;M83;M22;M28;M64;M 83;M22;M28
1410	FGPTYLDGADVTKIKP HNSHEGKTF	M53;M12; M53;M12	LARAGKASCTLSEQL DFIDTKRGVY	M64;M83;M22;M28;M64;M 83;M22;M28
1411	AHISTIGVCSMTDIAK KPTETICAP	M63;M9;M 59;M70	TKKAGGTTEMLAKA LRKVPTDNYIT	M78;M1;M18;M37;M78;M1; M18;M37
1412	PAHISTIGVCSMTDIAK KPTETICA	M63;M9;M 59;M70	KAGGTTEMLAKALR KVPTDNYITTY	M78;M1;M18;M37;M78;M1; M18;M37
1413	SQRGGSYTNDKACPLI AAVITREVG	M32;M6;M 32;M6	VIPTKKAGGTTEMLA KALRKVPTDN	M78;M1;M18;M37;M78;M1; M18;M37
1414	RDVLVRGFGDSVEEV LSEARQHLKD	M63;M70; M63;M70	IPTKKAGGTTEMLAK ALRKVPTDNY	M78;M1;M18;M37;M78;M1; M18;M37
1415	QPELDSFKEELDKYFK NHTSPDVDL	M75;M63; M59;M70	KKAGGTTEMLAKAL RKVPTDNYITT	M78;M1;M18;M37;M78;M1; M18;M37
1416	VRDVLVRGFGDSVEE VLSEARQHLK	M63;M70; M63;M70	AGGTTEMLAKALRK VPTDNYITTYP	M78;M1;M18;M37;M78;M1; M18;M37
1417	LQPELDSFKEELDKYF KNHTSPDVD	M75;M63; M59;M70	PTKKAGGTTEMLAKA LRKVPTDNYI	M78;M1;M18;M37;M78;M1; M18;M37
1418	RNARNGVLITEGSVKG LQPSVGPKQ	M13;M30; M22;M46	LLTLQQIELKFNPPAL QDAYYRARA	M48;M73;M58;M74;M48;M 73;M58;M74
1419	ARNGVLITEGSVKGLQ PSVGPKQAS	M13;M30; M22;M46	QKIAEIPKEEVKPFITE SKPSVEQR	M10;M26;M28;M24;M10;M 26;M28;M24
1420	NARNGVLITEGSVKGL QPSVGPKQA	M13;M30; M22;M46	YFYTSKTTVASLINTL NDLNETLVT	M57;M29;M72;M68;M57;M 29;M72;M68
1421	KLDGVVCTEIDPKLDN YYKKDNSYF	M6;M59;M 6;M59	GDIILKPANNSLKITEE VGHTDLMA	M26;M34;M28;M58;M26;M 34;M28;M58
1422	PTGVHAGTDLEGNFY GPFVDRQTAQ	M6;M37;M 6;M37	SGKPVPYCYDTNVLE GSVAYESLRP	M46;M30;M29;M35;M46;M 30;M29;M35
1423	TGVHAGTDLEGNFYG PFVDRQTAQA	M6;M37;M 6;M37	VNSFSGYLKLTDNVY IKNADIVEEA	M47;M9;M8;M23;M47;M9; M8;M23
1424	TIKPVTYKLDGVVCTE IDPKLDNYY	M6;M59;M 6;M59	NSFSGYLKLTDNVYI KNADIVEEAK	M47;M9;M8;M23;M47;M9; M8;M23

1425	YKLDGVVCTEIDPKLDNYYKKDNSY	M6;M59;M6;M59	SVVLLSVLQQLRVESSSKLWAQCVQ	M34;M30;M11;M54;M34;M30;M11;M54
1426	VTYKLDGVVCTEIDPKLDNYYKKDN	M6;M59;M6;M59	PPQTSITSAVLQSGFRKMAFPSGKV	M1;M38;M81;M62;M1;M38;M81;M62
1427	GVHAGTDLEGNFYGPFVDRQTAQAA	M6;M37;M6;M37	GLVEVEKGVLPQLEQPYVFIKRSDA	M13;M28;M66;M74;M13;M28;M66;M74
1428	IKPVTYKLDGVVCTEIDPKLDNYYK	M6;M59;M6;M59	CGLVEVEKGVLPQLEQPYVFIKRSD	M13;M28;M66;M74;M13;M28;M66;M74
1429	PVTYKLDGVVCTEIDPKLDNYYKKD	M6;M59;M6;M59	LVEVEKGVLPQLEQPYVFIKRSDAR	M13;M28;M66;M74;M13;M28;M66;M74
1430	KPVTYKLDGVVCTEIDPKLDNYYKK	M6;M59;M6;M59	TCGLVEVEKGVLPQLEQPYVFIKRS	M13;M28;M66;M74;M13;M28;M66;M74
1431	LDGVVCTEIDPKLDNYYKKDNSYFT	M6;M59;M6;M59	SLPVLQVRDVLVRGFGDSVEEVLSE	M43;M63;M68;M70;M43;M63;M68;M70
1432	SDGTGTIYTELEPPCRFVTDTPKGP	M6;M59;M6;M59	LPVLQVRDVLVRGFGDSVEEVLSEA	M43;M63;M68;M70;M43;M63;M68;M70
1433	TYKLDGVVCTEIDPKLDNYYKKDNS	M6;M59;M6;M59	RSFYVYANGGKGFCKLHNWNCVNCD	M42;M39;M11;M41;M42;M39;M11;M41
1434	DNALAYYNTTKGGRFVLALLSDLQD	M6;M20;M6;M20	VTRCLNRVCTNYMPYFFTLLLQLCT	M64;M69;M6;M20;M64;M69;M6;M20
1435	KSDGTGTIYTELEPPCRFVTDTPKG	M6;M59;M6;M59	QQIELKFNPPALQDAYYRARAGEAA	M75;M48;M73;M74;M75;M48;M73;M74
1436	TVTLLPAADLDDFSKQLQQSMSSAD	M55;M53;M58;M71	LQQIELKFNPPALQDAYYRARAGEA	M75;M48;M73;M74;M75;M48;M73;M74
1437	HDFFKFRIDGDMVPHISRQRLTKYT	M55;M26;M10;M71	LSVLQQLRVESSSKLWAQCVQLHND	M11;M34;M30;M82;M11;M34;M30;M82
1438	IDGDMVPHISRQRLTKYTMADLVYA	M55;M26;M10;M71	LLSVLQQLRVESSSKLWAQCVQLHN	M11;M34;M30;M82;M11;M34;M30;M82
1439	FAFACPDGVKHVYQLRARSVSPKLF	M46;M39;M60;M54	KKSLNVAKSEFDRDAAMQRKLEKMA	M50;M7;M32;M68;M50;M7;M32;M68
1440	FACPDGVKHVYQLRARSVSPKLFIR	M46;M39;M60;M54	KSLNVAKSEFDRDAAMQRKLEKMAD	M50;M7;M32;M68;M50;M7;M32;M68
1441	ACPDGVKHVYQLRARSVSPKLFIRQ	M46;M39;M60;M54	KHSSGVTRELMRELNGGAYTRYVDN	M60;M30;M22;M54;M60;M30;M22;M54
1442	QFAFACPDGVKHVYQLRARSVSPKL	M46;M39;M60;M54	NTKHSSGVTRELMRELNGGAYTRYV	M60;M30;M22;M54;M60;M30;M22;M54
1443	AFACPDGVKHVYQLRARSVSPKLFI	M46;M39;M60;M54	TKHSSGVTRELMRELNGGAYTRYVD	M60;M30;M22;M54;M60;M30;M22;M54
1444	CPDGVKHVYQLRARSVSPKLFIRQE	M46;M39;M60;M54	TERSEKSYELQTPFEIKLAKKFDTF	M25;M34;M39;M24;M25;M34;M39;M24
1445	LDNLRANNTKGSLPINVIVFDGKSK	M7;M53;M7;M53	EAARVVRSIFSRTLETAQNSVRVLQ	M42;M34;M2;M59;M42;M34;M2;M59
1446	FISPYNSQNAVASKILGLPTQTVDS	M21;M39;M26;M54	EILGTVSWNLREMLAHAEETRKLMP	M75;M9;M28;M24;M75;M9;M28;M24
1447	RKAVFISPYNSQNAVASKILGLPTQ	M21;M39;M26;M49	KQEILGTVSWNLREMLAHAEETRKL	M75;M9;M28;M24;M75;M9;M28;M24
1448	LTRNPAWRKAVFISPYNSQNAVASK	M21;M39;M26;M49	QEILGTVSWNLREMLAHAEETRKLM	M75;M9;M28;M24;M75;M9;M28;M24
1449	AEIPKEEVKPFITESKPSVEQRKQD	M26;M28;M26;M28	ILGTVSWNLREMLAHAEETRKLMPV	M75;M9;M28;M24;M75;M9;M28;M24

1450	PKEEVKPFITESKPSVEQRKQDDKK	M26;M28;M26;M28	EKQEILGTVSWNLREMLAHAEETRK	M75;M9;M28;M24;M75;M9;M28;M24
1451	EIPKEEVKPFITESKPSVEQRKQDD	M26;M28;M26;M28	GARFYFYTSKTTVASLINTLNDLNE	M15;M29;M72;M41;M15;M29;M72;M41
1452	KIAEIPKEEVKPFITESKPSVEQRK	M26;M28;M26;M28	KKLKKSLNVAKSEFDRDAAMQRKLE	M33;M68;M32;M28;M33;M68;M32;M28
1453	KEEVKPFITESKPSVEQRKQDDKKI	M26;M28;M26;M28	LKKLKKSLNVAKSEFDRDAAMQRKL	M33;M68;M32;M28;M33;M68;M32;M28
1454	IPKEEVKPFITESKPSVEQRKQDDK	M26;M28;M26;M28	DVFHLYLQYIRKLHDELTGHMLDMY	M71;M32;M52;M38;M35;M46;M9;M47
1455	IAEIPKEEVKPFITESKPSVEQRKQ	M26;M28;M26;M28	VTFFPDLNGDVVAIDYKHYTPSFKK	M7;M69;M60;M37;M7;M69;M60;M37
1456	EEVKPFITESKPSVEQRKQDDKKIK	M26;M28;M26;M28	HEIAWYTERSEKSYELQTPFEIKLA	M25;M34;M30;M49;M25;M34;M30;M49
1457	LRANNTKGSLPINVIVFDGKSKCEE	M7;M56;M7;M56	TEVNEFACVVADAVIKTLQPVSELL	M78;M25;M34;M39;M78;M25;M34;M39
1458	RANNTKGSLPINVIVFDGKSKCEES	M7;M56;M7;M56	LLNKEMYLKLRSDVLLPLTQYNRYL	M42;M39;M43;M61;M42;M39;M43;M61
1459	VVLSFELLHAPATVCGPKKSTNLVK	M46;M34;M39;M27	TFLLNKEMYLKLRSDVLLPLTQYNR	M42;M39;M43;M61;M42;M39;M43;M61
1460	QNAVVKIYCPACHNSEVGPEHSLAE	M35;M28;M35;M28	FLLNKEMYLKLRSDVLLPLTQYNRY	M42;M39;M43;M61;M42;M39;M43;M61
1461	YLPQNAVVKIYCPACHNSEVGPEHS	M35;M28;M35;M28	PNPKGFCDLKGKYVQIPTTCANDPV	M42;M39;M43;M31;M42;M39;M43;M31
1462	PQNAVVKIYCPACHNSEVGPEHSLA	M35;M28;M35;M28	TYYLFDESGEFKLASHMYCSFYPPD	M15;M52;M16;M23;M15;M52;M16;M23
1463	LPQNAVVKIYCPACHNSEVGPEHSL	M35;M28;M35;M28	GVDAVNLLTNMFTPLIQPIGALDIS	M15;M52;M16;M62;M15;M52;M16;M62
1464	ESKPSVEQRKQDDKKIKACVEEVTT	M28;M74;M28;M74	CGVDAVNLLTNMFTPLIQPIGALDI	M15;M52;M16;M62;M15;M52;M16;M62
1465	TESKPSVEQRKQDDKKIKACVEEVT	M28;M74;M28;M74	FCGVDAVNLLTNMFTPLIQPIGALD	M15;M52;M16;M62;M15;M52;M16;M62
1466	RRSFYVYANGGKGFCKLHNWNCVNC	M39;M11;M39;M11	DAVNLLTNMFTPLIQPIGALDISAS	M15;M52;M16;M62;M15;M52;M16;M62
1467	ITGRLQSLQTYVTQQLIRAAEIRAS	M46;M29;M22;M49	VDAVNLLTNMFTPLIQPIGALDISA	M15;M52;M16;M62;M15;M52;M16;M62
1468	GDEVRQIAPGQTGKIADYNYKLPDD	M80;M67;M38;M62	GAKLKALNLGETFVTHSKGLYRKCV	M55;M18;M27;M24;M55;M18;M27;M24
1469	DEVRQIAPGQTGKIADYNYKLPDDF	M80;M67;M38;M62	GGAKLKALNLGETFVTHSKGLYRKC	M55;M18;M27;M24;M55;M18;M27;M24
1470	CVSFCYMHHMELPTGVHAGTDLEGN	M43;M28;M43;M28	IELKFNPPALQDAYYRARAGEAANF	M75;M39;M73;M74;M75;M39;M73;M74
1471	VGLMWLSYFIASFRLFARTRSMWSF	M15;M35;M26;M16	QIELKFNPPALQDAYYRARAGEAAN	M75;M39;M73;M74;M75;M39;M73;M74
1472	LVGLMWLSYFIASFRLFARTRSMWS	M15;M35;M26;M16	SCNNYMLTYNKVENMTPRDLGACID	M15;M52;M11;M74;M15;M52;M11;M74
1473	LVIGAVILRGHLRIAGHHLGRCDIK	M55;M53;M58;M17	AFEKMVSLLSVLLSMQGAVDINKLC	M69;M67;M22;M61;M69;M67;M22;M61
1474	ELVIGAVILRGHLRIAGHHLGRCDI	M55;M53;M58;M17	EAFEKMVSLLSVLLSMQGAVDINKL	M69;M67;M22;M61;M69;M67;M22;M61

1475	VIGAVILRGHLRIAGH HLGRCDIKD	M55;M53; M58;M17	FEKMVSLLSVLLSMQ GAVDINKLCE	M69;M67;M22;M61;M69;M 67;M22;M61
1476	IGAVILRGHLRIAGHH LGRCDIKDL	M55;M53; M58;M17	QEGVVDYGARFYFYT SKTTVASLIN	M15;M29;M40;M41;M15;M 29;M40;M41
1477	CPACHNSEVGPEHSLA EYHNESGLK	M68;M28; M68;M28	DTIANYAKPFLNKVV STTTNIVTRC	M78;M55;M15;M23;M78;M 55;M15;M23
1478	YCPACHNSEVGPEHSL AEYHNESGL	M68;M28; M68;M28	WDTIANYAKPFLNKV VSTTTNIVTR	M78;M55;M15;M23;M78;M 55;M15;M23
1479	AVVKIYCPACHNSEVG PEHSLAEYH	M68;M28; M68;M28	GTGQAITVTPEANMD QESFGGASCC	M78;M34;M29;M24;M78;M 34;M29;M24
1480	IYCPACHNSEVGPEHS LAEYHNESG	M68;M28; M68;M28	AQEAYEQAVANGDS EVVLKKLKKSL	M33;M13;M59;M55;M33;M 13;M59;M55
1481	VVKIYCPACHNSEVGP EHSLAEYHN	M68;M28; M68;M28	RYMSALNHTKKWKY PQVNGLTSIKW	M5;M24;M54;M74;M5;M24; M54;M74
1482	VKIYCPACHNSEVGPE HSLAEYHNE	M68;M28; M68;M28	VLECNVKTTEVVGDII LKPANNSLK	M26;M29;M58;M53;M26;M 29;M58;M53
1483	KIYCPACHNSEVGPEH SLAEYHNES	M68;M28; M68;M28	LECNVKTTEVVGDIIL KPANNSLKI	M26;M29;M58;M53;M26;M 29;M58;M53
1484	EAEVQIDRLITGRLQSL QTYVTQQL	M46;M29; M22;M38	GRYMSALNHTKKWK YPQVNGLTSIK	M5;M24;M25;M74;M5;M24; M25;M74
1485	AEVQIDRLITGRLQSL QTYVTQQLI	M46;M29; M22;M38	SEDMLNPNYEDLLIR KSNHNFLVQA	M21;M29;M9;M24;M21;M2 9;M9;M24
1486	VEAEVQIDRLITGRLQ SLQTYVTQQ	M46;M29; M22;M38	GDVVAIDYKHYTPSF KKGAKLLHKP	M69;M82;M16;M37;M69;M 82;M16;M37
1487	KDLLARAGKASCTLSE QLDFIDTKR	M83;M28; M83;M28	CVNCDTFCAGSTFISD EVARDLSLQ	M57;M35;M70;M20;M57;M 35;M70;M20
1488	TTTIQTIVEVQPQLEME LTPVVQTI	M28;M59; M28;M59	YGARFYFYTSKTTVA SLINTLNDLN	M15;M29;M47;M41;M15;M 29;M47;M41
1489	EDNQTTTIQTIVEVQP QLEMELTPV	M28;M59; M28;M59	SSFLEMKSEKQVEQKI AEIPKEEVK	M25;M34;M24;M74;M25;M 34;M24;M74
1490	DNQTTTIQTIVEVQPQ LEMELTPVV	M28;M59; M28;M59	VTCAKEIKESVQTFFK LVNKFLALC	M43;M53;M24;M17;M43;M 53;M24;M17
1491	DLLARAGKASCTLSEQ LDFIDTKRG	M83;M28; M83;M28	TCAKEIKESVQTFFKL VNKFLALCA	M43;M53;M24;M17;M43;M 53;M24;M17
1492	SEARQHLKDGTCGLV EVEKGVLPQL	M13;M28; M13;M28	EAYEQAVANGDSEV VLKKLKKSLNV	M55;M13;M53;M59;M55;M 13;M53;M59
1493	QTTTIQTIVEVQPQLE MELTPVVQT	M28;M59; M28;M59	YEQAVANGDSEVVL KKLKKSLNVAK	M55;M13;M53;M59;M55;M 13;M53;M59
1494	LLARAGKASCTLSEQL DFIDTKRGV	M83;M28; M83;M28	AYEQAVANGDSEVV LKKLKKSLNVA	M55;M13;M53;M59;M55;M 13;M53;M59
1495	NQTTTIQTIVEVQPQLE MELTPVVQ	M28;M59; M28;M59	QYELKHGTFTCASEY TGNYQCGHYK	M33;M65;M38;M66;M33;M 65;M38;M66
1496	TSDYYQLYSTQLSTDT GVEHVTFFI	M42;M41; M39;M20	ELKHGTFTCASEYTG NYQCGHYKHI	M33;M65;M38;M66;M33;M 65;M38;M66
1497	KKVDGVVQQLPETYF TQSRNLQEFK	M33;M71; M54;M31	YELKHGTFTCASEYT GNYQCGHYKH	M33;M65;M38;M66;M33;M 65;M38;M66
1498	KVDGVVQQLPETYFT QSRNLQEFKP	M33;M71; M54;M31	LKHGTFTCASEYTGN YQCGHYKHIT	M33;M65;M38;M66;M33;M 65;M38;M66
1499	ADIVVFDEISMATNYD LSVVNARLR	M50;M18; M33;M55	INAQVAKSHNIALIW NVKDFMSLSE	M32;M72;M68;M37;M32;M 72;M68;M37

1500	DSLSSTASALGKLQDV VNQNAQALN	M79;M29; M22;M47	AQNSVRVLQKAAITIL DGISQYSLR	M5;M9;M54;M24;M5;M9;M 54;M24
1501	QDSLSSTASALGKLQD VVNQNAQAL	M79;M29; M22;M47	QMAPISAMVRMYIFF ASFYYVWKSY	M23;M55;M9;M20;M23;M5 5;M9;M20
1502	TGVLTESNKKFLPFQQ FGRDIADTT	M78;M41; M61;M71	MAPISAMVRMYIFFA SFYYVWKSYV	M23;M55;M9;M20;M23;M5 5;M9;M20
1503	LTESNKKFLPFQQFGR DIADTTDAV	M78;M41; M61;M71	LIINLVQMAPISAMVR MYIFFASFY	M23;M55;M9;M20;M23;M5 5;M9;M20
1504	TESNKKFLPFQQFGRD IADTTDAVR	M78;M41; M61;M71	VQMAPISAMVRMYIF FASFYYVWKS	M23;M55;M9;M20;M23;M5 5;M9;M20
1505	VLTESNKKFLPFQQFG RDIADTTDA	M78;M41; M61;M71	NLVQMAPISAMVRM YIFFASFYYVW	M23;M55;M9;M20;M23;M5 5;M9;M20
1506	ESNKKFLPFQQFGRDI ADTTDAVRD	M78;M41; M61;M71	INLVQMAPISAMVRM YIFFASFYYV	M23;M55;M9;M20;M23;M5 5;M9;M20
1507	GVLTESNKKFLPFQQF GRDIADTTD	M78;M41; M61;M71	IINLVQMAPISAMVR MYIFFASFYY	M23;M55;M9;M20;M23;M5 5;M9;M20
1508	QITISSFKWDLTAFGLV AEWFLAYI	M30;M82; M30;M82	WLIINLVQMAPISAM VRMYIFFASF	M23;M55;M9;M20;M23;M5 5;M9;M20
1509	ETIQITISSFKWDLTAF GLVAEWFL	M30;M82; M30;M82	LVQMAPISAMVRMYI FFASFYYVWK	M23;M55;M9;M20;M23;M5 5;M9;M20
1510	LETIQITISSFKWDLTA FGLVAEWF	M30;M82; M30;M82	TGDLQPLEQPTSEAVE APLVGTPVC	M60;M54;M58;M17;M60;M 54;M58;M17
1511	IQITISSFKWDLTAFGL VAEWFLAY	M30;M82; M30;M82	LLEDEFTPFDVVRQCS GVTFQSAVK	M46;M60;M54;M41;M46;M 60;M54;M41
1512	SLETIQITISSFKWDLT AFGLVAEW	M30;M82; M30;M82	ALLEDEFTPFDVVRQ CSGVTFQSAV	M46;M60;M54;M41;M46;M 60;M54;M41
1513	TIQITISSFKWDLTAFG LVAEWFLA	M30;M82; M30;M82	LEDEFTPFDVVRQCS GVTFQSAVKR	M46;M60;M54;M41;M46;M 60;M54;M41
1514	ALLLLDRLNQLESKMS GKGQQQQGQ	M15;M53; M11;M58	SALLEDEFTPFDVVRQ CSGVTFQSA	M46;M60;M54;M41;M46;M 60;M54;M41
1515	LALLLLDRLNQLESKM SGKGQQQQG	M15;M53; M11;M58	SCKRVLNVVCKTCGQ QQTTLKGVEA	M15;M5;M52;M58;M15;M5; M52;M58
1516	LGKLQDVVNQNAQAL NTLVKQLSSN	M79;M53; M22;M15	LNHTKKWKYPQVNG LTSIKWADNNC	M5;M60;M54;M74;M5;M60; M54;M74
1517	PPALQDAYYRARAGE AANFCALILA	M75;M39; M75;M39	NHTKKWKYPQVNGL TSIKWADNNCY	M5;M60;M54;M74;M5;M60; M54;M74
1518	LKFNPPALQDAYYRA RAGEAANFCA	M75;M39; M75;M39	ALNHTKKWKYPQVN GLTSIKWADNN	M5;M60;M54;M74;M5;M60; M54;M74
1519	NPPALQDAYYRARAG EAANFCALIL	M75;M39; M75;M39	ASWVMRIMTWLDMV DTSLSGFKLKD	M64;M83;M22;M70;M64;M 83;M22;M70
1520	FNPPALQDAYYRARA GEAANFCALI	M75;M39; M75;M39	PASWVMRIMTWLDM VDTSLSGFKLK	M64;M83;M22;M70;M64;M 83;M22;M70
1521	KFNPPALQDAYYRAR AGEAANFCAL	M75;M39; M75;M39	QVEQKIAEIPKEEVKP FITESKPSV	M10;M26;M24;M74;M10;M 26;M24;M74
1522	PALQDAYYRARAGEA ANFCALILAY	M75;M39; M75;M39	VEQKIAEIPKEEVKPFI TESKPSVE	M10;M26;M24;M74;M10;M 26;M24;M74
1523	DKNTQEVFAQVKQIY KTPPIKDFGG	M55;M18; M32;M56	KQVEQKIAEIPKEEVK PFITESKPS	M10;M26;M24;M74;M10;M 26;M24;M74
1524	VGMQKYSTLQGPPGT GKSHFAIGLA	M42;M34; M29;M41	DWLEEKFKEGVEFLR DGWEIVKFIS	M57;M9;M27;M20;M57;M9; M27;M20

1525	GMQKYSTLQGPPGTG KSHFAIGLAL	M42;M34; M29;M41	PVLDWLEEKFKEGVE FLRDGWEIVK	M57;M9;M27;M20;M57;M9; M27;M20
1526	AYYVGYLQPRTFLLK YNENGTITDA	M15;M11; M58;M47	KPVLDWLEEKFKEGV EFLRDGWEIV	M57;M9;M27;M20;M57;M9; M27;M20
1527	DGQVDLFRNARNGVL ITEGSVKGLQ	M33;M42; M22;M43	LDWLEEKFKEGVEFL RDGWEIVKFI	M57;M9;M27;M20;M57;M9; M27;M20
1528	LMYKGLPWNVVRIKI VQMLSDTLKN	M57;M46; M9;M20	VLDWLEEKFKEGVEF LRDGWEIVKF	M57;M9;M27;M20;M57;M9; M27;M20
1529	MYKGLPWNVVRIKIV QMLSDTLKNL	M57;M46; M9;M20	EHFIETISLAGSYKDW SYSGQSTQL	M64;M32;M29;M68;M64;M 32;M29;M68
1530	HYTPSFKKGAKLLHKP IVWHVNNAT	M27;M16; M27;M16	HFIETISLAGSYKDWS YSGQSTQLG	M64;M32;M29;M68;M64;M 32;M29;M68
1531	YKHYTPSFKKGAKLL HKPIVWHVNN	M27;M16; M27;M16	EEHFIETISLAGSYKD WSYSGQSTQ	M64;M32;M29;M68;M64;M 32;M29;M68
1532	KHYTPSFKKGAKLLH KPIVWHVNNA	M27;M16; M27;M16	ADIVEEAKKVKPTVV VNAANVYLKH	M18;M11;M73;M23;M18;M 11;M73;M23
1533	KVGGSCVLSGHNLAK HCLHVVGPNV	M80;M37; M80;M37	ECNVKTTEVVGDIILK PANNSLKIT	M26;M34;M58;M53;M26;M 34;M58;M53
1534	PLKVGGSCVLSGHNL AKHCLHVVGP	M80;M37; M80;M37	NVKTTEVVGDIILKPA NNSLKITEE	M26;M34;M58;M53;M26;M 34;M58;M53
1535	LKVGGSCVLSGHNLA KHCLHVVGPN	M80;M37; M80;M37	CNVKTTEVVGDIILKP ANNSLKITE	M26;M34;M58;M53;M26;M 34;M58;M53
1536	HPNQEYADVFHLYLQ YIRKLHDELT	M71;M32; M9;M61	IDTKRGVYCCREHEH EIAWYTERSE	M75;M27;M66;M74;M75;M 27;M66;M74
1537	KHPNQEYADVFHLYL QYIRKLHDEL	M71;M32; M9;M61	FIDTKRGVYCCREHE HEIAWYTERS	M75;M27;M66;M74;M75;M 27;M66;M74
1538	HDELTGHMLDMYSV MLTNDNTSRYW	M34;M22; M38;M31	LDFIDTKRGVYCCRE HEHEIAWYTE	M75;M27;M66;M74;M75;M 27;M66;M74
1539	KYTMADLVYALRHFD EGNCDTLKEI	M10;M52; M17;M49	DFIDTKRGVYCCREH EHEIAWYTER	M75;M27;M66;M74;M75;M 27;M66;M74
1540	TKYTMADLVYALRHF DEGNCDTLKE	M10;M52; M17;M49	QLDFIDTKRGVYCCR EHEHEIAWYT	M75;M27;M66;M74;M75;M 27;M66;M74
1541	LTKYTMADLVYALRH FDEGNCDTLK	M10;M52; M17;M49	RIMTWLDMVDTSLSG FKLKDCVMYA	M64;M75;M83;M22;M64;M 75;M83;M22
1542	YTMADLVYALRHFDE GNCDTLKEIL	M10;M52; M17;M49	IMTWLDMVDTSLSGF KLKDCVMYAS	M64;M75;M83;M22;M64;M 75;M83;M22
1543	QRLTKYTMADLVYAL RHFDEGNCDT	M10;M52; M17;M49	MRIMTWLDMVDTSL SGFKLKDCVMY	M64;M75;M83;M22;M64;M 75;M83;M22
1544	MADLVYALRHFDEGN CDTLKEILVT	M10;M52; M17;M49	YRKCVKSREETGLLM PLKAPKEIIF	M60;M54;M38;M31;M60;M 54;M38;M31
1545	TMADLVYALRHFDEG NCDTLKEILV	M10;M52; M17;M49	KCVKSREETGLLMPL KAPKEIIFLE	M60;M54;M38;M31;M60;M 54;M38;M31
1546	RLTKYTMADLVYALR HFDEGNCDTL	M10;M52; M17;M49	GLYRKCVKSREETGL LMPLKAPKEI	M60;M54;M38;M31;M60;M 54;M38;M31
1547	YHYQECVRGTTVLLK EPCSSGTYEG	M57;M27; M58;M20	CVKSREETGLLMPLK APKEIIFLEG	M60;M54;M38;M31;M60;M 54;M38;M31
1548	YQECVRGTTVLLKEPC SSGTYEGNS	M57;M27; M58;M20	RKCVKSREETGLLMP LKAPKEIIFL	M60;M54;M38;M31;M60;M 54;M38;M31
1549	QECVRGTTVLLKEPCS SGTYEGNSP	M57;M27; M58;M20	LYRKCVKSREETGLL MPLKAPKEII	M60;M54;M38;M31;M60;M 54;M38;M31

1550	HYQECVRGTTVLLKEP CSSGTYEGN	M57;M27; M58;M20	DYKAFKQIVESCGNF KVTKGKAKKG	M42;M41;M25;M23;M42;M 41;M25;M23
1551	LYHYQECVRGTTVLL KEPCSSGTYE	M57;M27; M58;M20	YKAFKQIVESCGNFK VTKGKAKKGA	M42;M41;M25;M23;M42;M 41;M25;M23
1552	VSGTNGTKRFDNPVLP FNDGVYFAS	M78;M65; M82;M66	KAFKQIVESCGNFKV TKGKAKKGAW	M42;M41;M25;M23;M42;M 41;M25;M23
1553	IHVSGTNGTKRFDNPV LPFNDGVYF	M78;M65; M82;M66	FCAGSTFISDEVARDL SLQFKRPIN	M35;M31;M70;M20;M35;M 31;M70;M20
1554	AIHVSGTNGTKRFDNP VLPFNDGVY	M78;M65; M82;M66	DTFCAGSTFISDEVAR DLSLQFKRP	M35;M31;M70;M20;M35;M 31;M70;M20
1555	GTNGTKRFDNPVLPFN DGVYFASTE	M78;M65; M82;M66	TFCAGSTFISDEVARD LSLQFKRPI	M35;M31;M70;M20;M35;M 31;M70;M20
1556	TNGTKRFDNPVLPFND GVYFASTEK	M78;M65; M82;M66	INGLMLLEIKDTEKYC ALAPNMMVT	M78;M9;M82;M61;M78;M9; M82;M61
1557	HVSGTNGTKRFDNPV LPFNDGVYFA	M78;M65; M82;M66	NGLMLLEIKDTEKYC ALAPNMMVTN	M78;M34;M9;M82;M78;M3 4;M9;M82
1558	SGTNGTKRFDNPVLPF NDGVYFAST	M78;M65; M82;M66	LNDNLLEILQKEKVNI NIVGDFKLN	M10;M9;M27;M24;M10;M9; M27;M24
1559	HNQDVNLHSSRLSFKE LLVYAADPA	M57;M53; M38;M20	NLLEILQKEKVNINIV GDFKLNEEI	M10;M9;M27;M24;M10;M9; M27;M24
1560	GTGVLTESNKKFLPFQ QFGRDIADT	M78;M24; M61;M41	NDNLLEILQKEKVNIN IVGDFKLNE	M10;M9;M27;M24;M10;M9; M27;M24
1561	YSLLLCRMNSRNYIAQ VDVVNFNLT	M10;M34; M54;M24	GLNDNLLEILQKEKV NINIVGDFKL	M10;M9;M27;M24;M10;M9; M27;M24
1562	HNWNCVNCDTFCAGS TFISDEVARD	M57;M70; M57;M70	DNLLEILQKEKVNINI VGDFKLNEE	M10;M9;M27;M24;M10;M9; M27;M24
1563	NCVNCDTFCAGSTFIS DEVARDLSL	M57;M70; M57;M70	GPLSAQTGIAVLDMC ASLKELLQNG	M10;M32;M24;M59;M10;M 32;M24;M59
1564	WNCVNCDTFCAGSTFI SDEVARDLS	M57;M70; M57;M70	PLSAQTGIAVLDMCA SLKELLQNGM	M10;M32;M24;M59;M10;M 32;M24;M59
1565	NWNCVNCDTFCAGST FISDEVARDL	M57;M70; M57;M70	GADVTKIKPHNSHEG KTFYVLPNDD	M42;M21;M53;M37;M42;M 21;M53;M37
1566	GYLTSSSKTPEEHFIETI SLAGSYK	M40;M29; M40;M29	TIANYAKPFLNKVVS TTTNIVTRCL	M78;M9;M15;M23;M78;M9; M15;M23
1567	QTLLALHRSYLTPGDS SSGWTAGAA	M23;M5;M 24;M70	DMCASLKELLQNGM NGRTILGSALL	M50;M18;M56;M60;M50;M 18;M56;M60
1568	VLQQLRVESSSKLWA QCVQLHNDIL	M11;M82; M11;M82	ATAQEAYEQAVANG DSEVVLKKLKK	M33;M13;M47;M59;M33;M 13;M47;M59
1569	LQQLRVESSSKLWAQ CVQLHNDILL	M11;M82; M11;M82	FATAQEAYEQAVAN GDSEVVLKKLK	M33;M13;M47;M59;M33;M 13;M47;M59
1570	QQLRVESSSKLWAQC VQLHNDILLA	M11;M82; M11;M82	YFCTCYFGLFCLLNR YFRLTLGVYD	M60;M56;M18;M37;M60;M 56;M18;M37
1571	WLIVGVALLAVFQSAS KIITLKKRW	M60;M26; M61;M35	GYFCTCYFGLFCLLN RYFRLTLGVY	M60;M56;M18;M37;M60;M 56;M18;M37
1572	LIVGVALLAVFQSASK IITLKKRWQ	M60;M26; M61;M35	TLLTKGTLEPEYFNSV CRLMKTIGP	M4;M13;M12;M16;M19;M1; M3;M6;M15
1573	IVGVALLAVFQSASKII TLKKRWQL	M60;M26; M61;M35	EPLVDLPIGINITRFQT LLALHRSY	M4;M21;M5;M1;M3;M2;M2 6;M22;M20
1574	GDCEEEEFEPSTQYEY GTEDDYQGK	M33;M67; M33;M67	PLVDLPIGINITRFQTL LALHRSYL	M4;M21;M5;M1;M3;M2;M2 6;M22;M20

1575	NGLTGTGVLTESNKKF LPFQQFGRD	M78;M24; M38;M61	NLWNTFTRLQSLENV AFNVVNKGHF	M4;M54;M14;M1;M34;M25; M60;M3;M39
1576	FNGLTGTGVLTESNKK FLPFQQFGR	M78;M24; M38;M61	LAKRFKESPFELEDFIP MDSTVKNY	M4;M19;M1;M25;M3;M61; M18;M43;M20
1577	DIVVFDEISMATNYDL SVVNARLRA	M50;M18; M25;M33	KRFKESPFELEDFIPM DSTVKNYFI	M4;M19;M1;M25;M3;M61; M18;M43;M20
1578	HLYLQYIRKLHDELTG HMLDMYSVM	M46;M32; M52;M38	AKRFKESPFELEDFIP MDSTVKNYF	M4;M19;M1;M25;M3;M61; M18;M43;M20
1579	IQEGVVDYGARFYFYT SKTTVASLI	M29;M41; M29;M41	CFVDDIVKTDGTLMIE RFVSLAIDA	M9;M10;M1;M5;M7;M3;M6 ;M8;M11
1580	NRATRVECTTIVNGVR RSFYVYANG	M29;M41; M29;M41	LWNTFTRLQSLENVA FNVVNKGHFD	M4;M54;M24;M1;M34;M25; M60;M3;M39
1581	IKQYGDCLGDIAARDL ICAQKFNGL	M78;M79; M50;M65	TFTRLQSLENVAFNV VNKGHFDGQQ	M4;M54;M16;M24;M1;M60; M3;M27;M15
1582	FIKQYGDCLGDIAARD LICAQKFNG	M78;M65; M79;M50	FKELLVYAADPAMH AASGNLLLDKR	M64;M12;M30;M48;M33;M 36;M8;M39;M44
1583	FPREGVFVSNGTHWF VTQRNFYEPQ	M50;M18; M24;M31	LYALVYFLQSINFVRII MRLWLCWK	M4;M54;M24;M19;M60;M2 5;M3;M9;M23
1584	REGVFVSNGTHWFVT QRNFYEPQII	M50;M18; M24;M31	VLPFNDGVYFASTEK SNIIRGWIFG	M64;M12;M28;M14;M10;M 24;M6;M45;M22
1585	PREGVFVSNGTHWFV TQRNFYEPQI	M50;M18; M24;M31	PVLPFNDGVYFASTE KSNIIRGWIF	M64;M12;M28;M14;M10;M 24;M6;M45;M22
1586	YKGIKIQEGVVDYGAR FYFYTSKTT	M41;M67; M41;M67	LPFNDGVYFASTEKS NIIRGWIFGT	M64;M12;M28;M14;M10;M 24;M6;M45;M22
1587	KGIKIQEGVVDYGARF YFYTSKTTV	M41;M67; M41;M67	NPVLPFNDGVYFAST EKSNIIRGWI	M64;M12;M28;M14;M10;M 24;M6;M45;M22
1588	AGFIKQYGDCLGDIAA RDLICAQKF	M50;M65; M27;M70	DNPVLPFNDGVYFAS TEKSNIIRGW	M64;M12;M28;M14;M10;M 24;M6;M45;M22
1589	GFIKQYGDCLGDIAAR DLICAQKFN	M78;M65; M50;M70	RDVDTDFVNEFYAYL RKHFSMMILS	M4;M71;M16;M3;M18;M35; M15;M52;M26
1590	IEFLKRGDKSVYYTSN PTTFHLDGE	M50;M22; M50;M22	SFPQSAPHGVVFLHV TYVPAQEKNF	M64;M21;M28;M66;M70;M 53;M3;M26;M9
1591	PKYKFVRIQPGQTFSV LACYNGSPS	M29;M27; M29;M27	LCEKALKYLPIDKCSR IIPARARVE	M71;M13;M28;M14;M29;M 51;M33;M18;M22
1592	VKMLCTHTGTGQAIT VTPEANMDQE	M78;M29; M78;M29	CEKALKYLPIDKCSRII PARARVEC	M71;M13;M28;M14;M29;M 51;M33;M18;M22
1593	CVKMLCTHTGTGQAI TVTPEANMDQ	M78;M29; M78;M29	AGDYILANTCTERLK LFAAETLKAT	M56;M73;M19;M31;M6;M4 4;M18;M63;M47
1594	NVANYQKVGMQKYS TLQGPPGTGKS	M42;M21; M34;M41	ELLVYAADPAMHAA SGNLLLDKRTT	M12;M24;M57;M50;M33;M 36;M8;M46;M39
1595	GTAVMSLKEGQINDMI LSLLSKGRL	M60;M54; M59;M49	KLQFTSLEIPRRNVAT LQAENVTGL	M28;M54;M29;M2;M6;M45; M27;M59;M20
1596	DKSAFVNLKQLPFFYY SDSPCESHG	M60;M32; M41;M54	TLEPEYFNSVCRLMK TIGPDMFLGT	M13;M12;M16;M14;M5;M6; M18;M17;M15
1597	NKKDWYDFVENPDIL RVYANLGERV	M43;M21; M32;M49	KEIDRLNEVAKNLNE SLIDLQELGK	M11;M70;M78;M65;M2;M7 9;M51;M67;M82
1598	TLVATAEAELAKNVSL DNVLSTFIS	M29;M73; M29;M73	AIATCDWTNAGDYIL ANTCTERLKL	M56;M73;M19;M31;M6;M4 4;M18;M52;M47
1599	GGDGKMKDLSPRWYF YYLGTGPEAG	M52;M32; M60;M31	IATCDWTNAGDYILA NTCTERLKLF	M56;M73;M19;M31;M6;M4 4;M18;M52;M47

1600	MVSLLSVLLSMQGAV DINKLCEEML	M69;M67; M69;M67	ATCDWTNAGDYILAN TCTERLKLFA	M56;M73;M19;M31;M6;M4 4;M18;M52;M47
1601	EKMVSLLSVLLSMQG AVDINKLCEE	M69;M67; M69;M67	NAIATCDWTNAGDYI LANTCTERLK	M56;M73;M19;M31;M6;M4 4;M18;M52;M47
1602	KMVSLLSVLLSMQGA VDINKLCEEM	M69;M67; M69;M67	YNLWNTFTRLQSLEN VAFNVVNKGH	M4;M54;M14;M1;M34;M25; M60;M42;M39
1603	IIGGAKLKALNLGETF VTHSKGLYR	M27;M24; M27;M24	SLWVYKQFDTYNLW NTFTRLQSLEN	M71;M58;M16;M14;M19;M 25;M41;M17;M15
1604	IIIGGAKLKALNLGETF VTHSKGLY	M27;M24; M27;M24	GLPYGANKDGIIWVA TEGALNTPKD	M64;M40;M14;M34;M30;M 6;M57;M49;M22
1605	SYLFQHANLDSCKRVL NVVCKTCGQ	M5;M27;M 5;M27	IDRLNEVAKNLNESLI DLQELGKYE	M11;M70;M78;M65;M61;M 79;M51;M67;M82
1606	MSYLFQHANLDSCKR VLNVVCKTCG	M5;M27;M 5;M27	VDTVSALVYDNKLK AHKDKSAQCFK	M21;M28;M16;M7;M38;M5 0;M63;M17;M35
1607	KSPNFSKLINIIIWFLLL SVCLGSL	M74;M31; M74;M31	PAEIVDTVSALVYDN KLKAHKDKSA	M12;M28;M16;M7;M38;M5 0;M17;M35;M59
1608	LKSPNFSKLINIIIWFLL LSVCLGS	M74;M31; M74;M31	VYAADPAMHAASGN LLLDKRTTCFS	M12;M24;M57;M50;M33;M 8;M46;M39;M9
1609	PVCVETKAIVSTIQRK YKGIKIQEG	M5;M60;M 5;M60	YAADPAMHAASGNL LLDKRTTCFSV	M12;M24;M57;M50;M33;M 8;M46;M39;M9
1610	VCVETKAIVSTIQRKY KGIKIQEGV	M5;M60;M 5;M60	LHSSRLSFKELLVYAA DPAMHAASG	M64;M48;M57;M36;M41;M 49;M26;M22;M20
1611	CVETKAIVSTIQRKYK GIKIQEGVV	M5;M60;M 5;M60	HSSRLSFKELLVYAA DPAMHAASGN	M64;M48;M57;M36;M41;M 49;M26;M22;M20
1612	MPVCVETKAIVSTIQR KYKGIKIQE	M5;M60;M 5;M60	EVFNATRFASVYAWN RKRISNCVAD	M19;M16;M55;M25;M53;M 2;M74;M27;M20
1613	KEMYLKLRSDVLLPLT QYNRYLALY	M53;M61; M53;M61	FNATRFASVYAWNR KRISNCVADYS	M19;M16;M55;M25;M53;M 2;M74;M27;M20
1614	DKAGQKTYERHSLSH FVNLDNLRAN	M31;M70; M31;M70	VFNATRFASVYAWN RKRISNCVADY	M19;M16;M55;M25;M53;M 2;M74;M27;M20
1615	DTTSYREAACCHLAK ALNDFSNSGS	M78;M79; M78;M79	NATRFASVYAWNRK RISNCVADYSV	M19;M16;M55;M25;M53;M 2;M74;M27;M20
1616	SYREAACCHLAKALN DFSNSGSDVL	M78;M79; M78;M79	LNGNWYDFGDFIQTT PGSGVPVVDS	M4;M40;M9;M58;M16;M34; M8;M15;M11
1617	TTSYREAACCHLAKA LNDFSNSGSD	M78;M79; M78;M79	DLNGNWYDFGDFIQT TPGSGVPVVD	M4;M40;M9;M58;M16;M34; M8;M15;M11
1618	YREAACCHLAKALND FSNSGSDVLY	M78;M79; M78;M79	NGNWYDFGDFIQTTP GSGVPVVDSY	M4;M40;M9;M58;M16;M34; M8;M15;M11
1619	AGALNKATNNAMQV ESDDYIATNGP	M78;M79; M78;M79	TCCSLSHRFYRLANE CAQVLSEMVM	M28;M5;M30;M2;M79;M42; M43;M46;M39
1620	REAACCHLAKALNDF SNSGSDVLYQ	M78;M79; M78;M79	CSLSHRFYRLANECA QVLSEMVMCG	M28;M5;M30;M2;M79;M42; M43;M46;M39
1621	AACCHLAKALNDFSN SGSDVLYQPP	M78;M79; M78;M79	CCSLSHRFYRLANEC AQVLSEMVMC	M28;M5;M30;M2;M79;M42; M43;M46;M39
1622	TSYREAACCHLAKAL NDFSNSGSDV	M78;M79; M78;M79	PPPGDQFKHLIPLMYK GLPWNVVRI	M56;M19;M12;M25;M60;M 18;M15;M39;M47
1623	EAACCHLAKALNDFS NSGSDVLYQP	M78;M79; M78;M79	DNQDLNGNWYDFGD FIQTTPGSGVP	M4;M40;M9;M58;M16;M70; M34;M8;M11
1624	SNLLLQYGSFCTQLNR ALTGIAVEQ	M13;M41; M43;M20	SNFRVQPTESIVRFPNI TNLCPFGE	M21;M28;M31;M34;M30;M 48;M41;M26;M22

1625	NLLLQYGSFCTQLNRALTGIAVEQD	M13;M41;M43;M20	HTTCCSLSHRFYRLANECAQVLSEM	M28;M5;M60;M30;M2;M79;M43;M42;M39
1626	DVLVRGFGDSVEEVLSEARQHLKDG	M10;M70;M10;M70	TTCCSLSHRFYRLANECAQVLSEMV	M28;M5;M60;M30;M2;M79;M43;M42;M39
1627	VLVRGFGDSVEEVLSEARQHLKDGT	M10;M70;M10;M70	LPYGANKDGIIWVATEGALNTPKDH	M64;M40;M34;M30;M6;M57;M72;M49;M22
1628	WVPRASANIGCNHTGVVGEGSEGLN	M9;M38;M9;M38	PYGANKDGIIWVATEGALNTPKDHI	M64;M40;M34;M30;M6;M57;M72;M49;M22
1629	YWVPRASANIGCNHTGVVGEGSEGL	M9;M38;M9;M38	YGANKDGIIWVATEGALNTPKDHIG	M64;M40;M34;M30;M6;M57;M72;M49;M22
1630	AYWVPRASANIGCNHTGVVGEGSEG	M9;M38;M9;M38	GANKDGIIWVATEGALNTPKDHIGT	M64;M40;M34;M30;M6;M57;M72;M49;M22
1631	VPRASANIGCNHTGVVGEGSEGLND	M9;M38;M9;M38	RGTTTYKLNVGDYFVLTSHTVMPLS	M16;M34;M18;M41;M43;M15;M42;M39;M44
1632	ETLPTEVLTEEVVLKTGDLQPLEQP	M38;M62;M38;M62	GTTTYKLNVGDYFVLTSHTVMPLSA	M16;M34;M18;M41;M43;M15;M42;M39;M44
1633	ARSEDKRAKVTSAMQTMLFTMLRKL	M38;M62;M38;M62	LVTLAILTALRLCAYCCNIVNVSLV	M54;M16;M60;M25;M63;M41;M17;M46;M39
1634	KQARSEDKRAKVTSAMQTMLFTMLR	M38;M62;M38;M62	VTLAILTALRLCAYCCNIVNVSLVK	M54;M16;M60;M25;M63;M41;M17;M46;M39
1635	GETLPTEVLTEEVVLKTGDLQPLEQ	M38;M62;M38;M62	LLQYGSFCTQLNRALTGIAVEQDKN	M13;M28;M14;M70;M41;M67;M27;M43;M20
1636	NSGSDVLYQPPQTSITSAVLQSGFR	M38;M62;M38;M62	LQYGSFCTQLNRALTGIAVEQDKNT	M13;M28;M14;M70;M41;M67;M27;M43;M20
1637	QARSEDKRAKVTSAMQTMLFTMLRK	M38;M62;M38;M62	DYPKCDRAMPNMLRIMASLVLARKH	M21;M12;M30;M69;M41;M46;M39;M22;M23
1638	RSEDKRAKVTSAMQTMLFTMLRKLD	M38;M62;M38;M62	ILANTCTERLKLFAAETLKATEETF	M64;M40;M21;M48;M63;M49;M26;M22;M23
1639	TLPTEVLTEEVVLKTGDLQPLEQPT	M38;M62;M38;M62	SGINASVVNIQKEIDRLNEVAKNLN	M28;M14;M70;M78;M61;M79;M35;M82;M47
1640	NKCAYWVPRASANIGCNHTGVVGEG	M75;M38;M75;M38	FKVSIWNLDYIINLIIKNLSKSLTE	M56;M73;M58;M16;M50;M18;M17;M11;M44
1641	HNKCAYWVPRASANIGCNHTGVVGE	M75;M38;M75;M38	VDGVVQQLPETYFTQSRNLQEFKPR	M71;M32;M54;M16;M31;M45;M33;M35;M47
1642	KHCLHVVGPNVNKGEDIQLLKSAYE	M60;M77;M60;M77	FLHVTYVPAQEKNFTTAPAICHDGK	M28;M66;M78;M65;M2;M79;M33;M26;M82
1643	GEFKLASHMYCSFYPPDEDEEEGDC	M23;M20;M23;M20	DSNGTITVEELKKLLEQWNLVIGFL	M4;M58;M16;M55;M53;M59;M17;M52;M47
1644	SGEFKLASHMYCSFYPPDEDEEEGD	M23;M20;M23;M20	ATRFASVYAWNRKRISNCVADYSVL	M16;M55;M25;M53;M2;M74;M67;M27;M20
1645	SGHNLAKHCLHVVGPNVNKGEDIQL	M77;M37;M77;M37	KLDDKDPNFKDQVILLNKHIDAYKT	M56;M73;M53;M44;M17;M35;M52;M11;M47
1646	HNLAKHCLHVVGPNVNKGEDIQLLK	M77;M37;M77;M37	DDKDPNFKDQVILLNKHIDAYKTFP	M56;M73;M53;M44;M17;M35;M52;M11;M47
1647	GHNLAKHCLHVVGPNVNKGEDIQLL	M77;M37;M77;M37	LDDKDPNFKDQVILLNKHIDAYKTF	M56;M73;M53;M44;M17;M35;M52;M11;M47
1648	IVKTDGTLMIERFVSLAIDAYPLTK	M4;M1;M5;M2;M3	DKDPNFKDQVILLNKHIDAYKTFPP	M56;M73;M53;M44;M17;M35;M52;M11;M47
1649	VKTDGTLMIERFVSLAIDAYPLTKH	M4;M1;M5;M2;M3	IKLDDKDPNFKDQVILLNKHIDAYK	M56;M73;M53;M44;M17;M35;M52;M11;M47

1650	DIVKTDGTLMIERFVS LAIDAYPLT	M4;M1;M5; M2;M3	VVQQLPETYFTQSRN LQEFKPRSQM	M71;M75;M32;M16;M31;M 45;M33;M35;M47
1651	NSPFHPLADNKFALTC FSTQFAFAC	M4;M14;M 1;M3;M22	GVVQQLPETYFTQSR NLQEFKPRSQ	M71;M75;M32;M16;M31;M 45;M33;M35;M47
1652	YSSANNCTFEYVSQPF LMDLEGKQG	M4;M1;M3; M57;M20	QQLPETYFTQSRNLQ EFKPRSQMEI	M71;M75;M32;M16;M31;M 45;M33;M35;M47
1653	VYSSANNCTFEYVSQP FLMDLEGKQ	M4;M1;M3; M57;M20	VQQLPETYFTQSRNL QEFKPRSQME	M71;M75;M32;M16;M31;M 45;M33;M35;M47
1654	HSIGFDYVVYNPFMIDV QQWGFTGNL	M4;M1;M3; M57;M20	QLPETYFTQSRNLQEF KPRSQMEID	M71;M75;M32;M16;M31;M 45;M33;M35;M47
1655	SGDATTAYANSVFNIC QAVTANVNA	M4;M1;M2 9;M3;M39	LPETYFTQSRNLQEFK PRSQMEIDF	M71;M75;M32;M16;M31;M 45;M33;M35;M47
1656	SSGDATTAYANSVFNI CQAVTANVN	M4;M1;M2 9;M3;M39	SNVTWFHAIHVSGTN GTKRFDNPVL	M64;M40;M29;M45;M49;M 15;M26;M22;M23
1657	TVDSSQGSEYDYVIFT QTTETAHSC	M4;M3;M5 1;M22;M23	FSNVTWFHAIHVSGT NGTKRFDNPV	M64;M40;M29;M45;M49;M 15;M26;M22;M23
1658	PFHPLADNKFALTCFS TQFAFACPD	M4;M21;M 14;M3;M22	PFFSNVTWFHAIHVSG TNGTKRFDN	M64;M40;M29;M45;M49;M 15;M26;M22;M23
1659	HPLADNKFALTCFSTQ FAFACPDGV	M4;M21;M 3;M6;M22	FFSNVTWFHAIHVSG TNGTKRFDNP	M64;M40;M29;M45;M49;M 15;M26;M22;M23
1660	LYRNRDVDTDFVNEF YAYLRKHFSM	M4;M6;M3; M26;M59	INASVVNIQKEIDRLN EVAKNLNES	M28;M70;M78;M65;M2;M6 1;M79;M82;M47
1661	CLYRNRDVDTDFVNE FYAYLRKHFS	M4;M6;M3; M26;M59	GINASVVNIQKEIDRL NEVAKNLNE	M28;M70;M78;M65;M2;M6 1;M79;M82;M47
1662	GWHNMLKTVYSDVE NPHLMGWDYPK	M6;M45;M 3;M43;M59	IHADQLTPTWRVYST GSNVFQTRAG	M75;M58;M24;M16;M5;M6; M41;M17;M82
1663	HNMLKTVYSDVENPH LMGWDYPKCD	M6;M45;M 3;M43;M59	FVENPDILRVYANLG ERVRQALLKT	M64;M11;M21;M32;M48;M 41;M49;M46;M22
1664	WHNMLKTVYSDVENP HLMGWDYPKC	M6;M45;M 3;M43;M59	DFVENPDILRVYANL GERVRQALLK	M64;M11;M21;M32;M48;M 41;M49;M46;M22
1665	ADNKFALTCFSTQFAF ACPDGVKHV	M21;M3;M 6;M33;M22	YDFVENPDILRVYAN LGERVRQALL	M64;M11;M21;M32;M48;M 41;M49;M46;M22
1666	LADNKFALTCFSTQFA FACPDGVKH	M21;M3;M 6;M33;M22	QAWQPGVAMPNLYK MQRMLLEKCDL	M12;M24;M55;M10;M53;M 17;M52;M9;M23
1667	DNKFALTCFSTQFAFA CPDGVKHVY	M21;M3;M 6;M33;M22	SQAWQPGVAMPNLY KMQRMLLEKCD	M12;M24;M55;M10;M53;M 17;M52;M9;M23
1668	PNCVNCLDDRCILHCA NFNVLFSTV	M64;M24; M3;M48;M 23	LHVTYVPAQEKNFTT APAICHDGKA	M66;M78;M65;M29;M2;M7 9;M33;M26;M82
1669	IAARDLICAQKFNGLT VLPPLLTDE	M58;M78; M3;M79;M 39	TFSNYQHEETIYNLLK DCPAVAKHD	M40;M34;M30;M41;M42;M 27;M43;M39;M11
1670	DCVVLHSYFTSDYYQ LYSTQLSTDT	M3;M41;M 43;M42;M3 9	FSNYQHEETIYNLLKD CPAVAKHDF	M40;M34;M30;M41;M42;M 27;M43;M39;M11
1671	KDCVVLHSYFTSDYY QLYSTQLSTD	M3;M41;M 43;M42;M3 9	VAMPNLYKMQRMLL EKCDLQNYGDS	M12;M55;M53;M17;M35;M 52;M9;M47;M23
1672	AVDALCEKALKYLPID KCSRIIPAR	M71;M1;M 51;M18;M2 2	GVAMPNLYKMQRML LEKCDLQNYGD	M12;M55;M53;M17;M35;M 52;M9;M47;M23

1673	PPTSFGPLVRKIFVDGV PFVVSTGY	M71;M7;M 1;M36;M11	TTTYKLNVGDYFVLT SHTVMPLSAP	M16;M25;M34;M18;M41;M 43;M15;M42;M39
1674	ACSHAAVDALCEKAL KYLPIDKCSR	M1;M60;M 51;M49;M2 2	YADVFHLYLQYIRKL HDELTGHMLD	M71;M32;M52;M16;M61;M 35;M46;M9;M47
1675	HAAVDALCEKALKYL PIDKCSRIIP	M1;M60;M 51;M49;M2 2	DEDDNLIDSYFVVKR HTFSNYQHEE	M71;M58;M16;M54;M18;M 15;M52;M47;M20
1676	SHAAVDALCEKALKY LPIDKCSRII	M1;M60;M 51;M49;M2 2	VGVALLAVFQSASKII TLKKRWQLA	M58;M24;M55;M60;M61;M 17;M35;M26;M9
1677	CSHAAVDALCEKALK YLPIDKCSRI	M1;M60;M 51;M49;M2 2	GVALLAVFQSASKIIT LKKRWQLAL	M58;M24;M55;M60;M61;M 17;M35;M26;M9
1678	AAVDALCEKALKYLPI DKCSRIIPA	M1;M60;M 51;M49;M2 2	YEDQDALFAYTKRNV IPTITQMNLK	M71;M24;M55;M10;M53;M 35;M9;M59;M23
1679	YTACSHAAVDALCEK ALKYLPIDKC	M1;M60;M 51;M67;M4 9	VDDIVKTDGTLMIERF VSLAIDAYP	M4;M9;M10;M1;M5;M2;M3 ;M6;M8;M11
1680	VYTACSHAAVDALCE KALKYLPIDK	M1;M60;M 51;M67;M4 9	LVDLPIGINITRFQTLL ALHRSYLT	M4;M21;M24;M5;M1;M3;M 2;M26;M22;M20
1681	QGSEYDYVIFTQTTET AHSCNVNRF	M64;M6;M 51;M22;M2 3	KQIYKTPPIKDFGGFN FSQILPDPS	M4;M32;M28;M14;M31;M1; M3;M33;M27;M35
1682	GSEYDYVIFTQTTETA HSCNVNRFN	M64;M6;M 51;M22;M5 9	CPFGEVFNATRFASV YAWNRKRISN	M4;M19;M58;M55;M25;M5 3;M3;M2;M17;M20
1683	SQGSEYDYVIFTQTTE TAHSCNVNR	M4;M64;M 51;M22;M2 3	WNTFTRLQSLENVAF NVVNKGHFDG	M4;M54;M24;M1;M34;M25; M60;M3;M27;M39
1684	KSNLKPFERDISTEIYQ AGSTPCNG	M53;M36; M17;M46; M44	NTFTRLQSLENVAFN VVNKGHFDGQ	M4;M54;M24;M1;M34;M25; M60;M3;M27;M39
1685	TLKATEETFKLSYGIA TVREVLSDR	M12;M6;M 44;M33;M5 9	KSEDAQGMDNLACE DLKPVSEEVVE	M4;M1;M3;M45;M37;M4;M 1;M3;M45;M37
1686	ATEETFKLSYGIATVR EVLSDRELH	M12;M6;M 44;M33;M5 9	NNCYLATALLTLQQI ELKFNPPALQ	M4;M58;M3;M48;M51;M4; M58;M3;M48;M51
1687	KATEETFKLSYGIATV REVLSDREL	M12;M6;M 44;M33;M5 9	VVQLTSQWLTNIFGT VYEKLKPVLD	M4;M31;M3;M45;M59;M4; M31;M3;M45;M59
1688	LKATEETFKLSYGIAT VREVLSDRE	M12;M6;M 44;M33;M5 9	GGVVQLTSQWLTNIF GTVYEKLKPV	M4;M3;M45;M42;M59;M4; M3;M45;M42;M59
1689	EETGTLIVNSVLLFLAF VVFLLVTL	M73;M14; M7;M50;M 44	YSGVVTTVMFLARGI VFMCVEYCPI	M12;M14;M29;M3;M20;M1 2;M14;M29;M3;M20

1690	LNTLVKQLSSNFGAISSVLNDILSR	M34;M6;M48;M45;M22	ITEEVGHTDLMAAYVDNSSLTIKKP	M14;M70;M51;M63;M44;M14;M70;M51;M63;M44
1691	ALNTLVKQLSSNFGAISSVLNDILS	M34;M6;M48;M45;M22	KITEEVGHTDLMAAYVDNSSLTIKK	M14;M70;M51;M63;M44;M14;M70;M51;M63;M44
1692	FSQILPDPSKPSKRSFIEDLLFNKV	M30;M36;M63;M67;M22	GTLSYEQFKKGVQIPCTCGKQATKY	M16;M1;M3;M37;M52;M16;M1;M3;M37;M52
1693	NFSQILPDPSKPSKRSFIEDLLFNK	M30;M36;M63;M67;M22	GGDAALALLLLDRLNQLESKMSGKG	M56;M58;M16;M55;M10;M53;M51;M36;M17;M11
1694	SQILPDPSKPSKRSFIEDLLFNKVT	M30;M36;M63;M67;M22	LAAIMQLFFSYFAVHFISNSWLMWL	M3;M48;M45;M9;M23;M3;M48;M45;M9;M23
1695	QLSSNFGAISSVLNDILSRLDKVEA	M34;M6;M48;M45;M50	AIMQLFFSYFAVHFISNSWLMWLII	M3;M48;M45;M9;M23;M3;M48;M45;M9;M23
1696	LVKQLSSNFGAISSVLNDILSRLDK	M34;M6;M48;M45;M50	GLAAIMQLFFSYFAVHFISNSWLMW	M3;M48;M45;M9;M23;M3;M48;M45;M9;M23
1697	KQLSSNFGAISSVLNDILSRLDKVE	M34;M6;M48;M45;M50	AAIMQLFFSYFAVHFISNSWLMWLI	M3;M48;M45;M9;M23;M3;M48;M45;M9;M23
1698	VKQLSSNFGAISSVLNDILSRLDKV	M34;M6;M48;M45;M50	ACVEEVTTTLEETKFLTENLLLYID	M28;M3;M6;M50;M20;M28;M3;M6;M50;M20
1699	GPHEFCSQHTMLVKQGDDYVYLPYP	M14;M29;M6;M18;M39	CVEEVTTTLEETKFLTENLLLYIDI	M28;M3;M6;M50;M20;M28;M3;M6;M50;M20
1700	KGPHEFCSQHTMLVKQGDDYVYLPY	M14;M29;M6;M18;M39	LLSDLQDLKWARFPKSDGTGTIYTE	M4;M77;M54;M60;M3;M4;M77;M54;M60;M3
1701	SAQCFKMFYKGVITHDVSSAINRPQ	M70;M45;M36;M52;M11	ALLSDLQDLKWARFPKSDGTGTIYT	M4;M77;M54;M60;M3;M4;M77;M54;M60;M3
1702	QNAVASKILGLPTQTVDSSQGSEYD	M21;M54;M60;M51;M11	LALLSDLQDLKWARFPKSDGTGTIY	M4;M77;M54;M60;M3;M4;M77;M54;M60;M3
1703	NEVAKNLNESLIDLQELGKYEQYIK	M70;M61;M51;M67;M17	IKACVEEVTTTLEETKFLTENLLLY	M32;M28;M3;M6;M20;M32;M28;M3;M6;M20
1704	RLNEVAKNLNESLIDLQELGKYEQY	M70;M61;M51;M67;M17	KACVEEVTTTLEETKFLTENLLLYI	M32;M28;M3;M6;M20;M32;M28;M3;M6;M20
1705	LNEVAKNLNESLIDLQELGKYEQYI	M70;M61;M51;M67;M17	GDYILANTCTERLKLFAAETLKATE	M56;M73;M19;M31;M6;M48;M44;M18;M63;M47
1706	AKNLNESLIDLQELGKYEQYIKWPW	M70;M61;M51;M67;M17	APHGVVFLHVTYVPAQEKNFTTAPA	M64;M21;M28;M66;M70;M53;M3;M33;M26;M9

1707	KNLNESLIDLQELGKY EQYIKWPWY	M70;M61; M51;M67; M17	QSAPHGVVFLHVTYV PAQEKNFTTA	M64;M21;M28;M66;M70;M 53;M3;M33;M26;M9
1708	VAKNLNESLIDLQELG KYEQYIKWP	M70;M61; M51;M67; M17	SAPHGVVFLHVTYVP AQEKNFTTAP	M64;M21;M28;M66;M70;M 53;M3;M33;M26;M9
1709	EVAKNLNESLIDLQEL GKYEQYIKW	M70;M61; M51;M67; M17	FPQSAPHGVVFLHVT YVPAQEKNFT	M64;M21;M28;M66;M70;M 53;M3;M33;M26;M9
1710	KMFYKGVITHDVSSAI NRPQIGVVR	M21;M70; M45;M36; M11	PQSAPHGVVFLHVTY VPAQEKNFTT	M64;M21;M28;M66;M70;M 53;M3;M33;M26;M9
1711	FYKGVITHDVSSAINR PQIGVVREF	M21;M70; M45;M36; M11	TGYKKPASRELKVTF FPDLNGDVVA	M21;M70;M3;M57;M63;M2 1;M70;M3;M57;M63
1712	FKMFYKGVITHDVSSA INRPQIGVV	M21;M70; M45;M36; M11	GYKKPASRELKVTFF PDLNGDVVAI	M21;M70;M3;M57;M63;M2 1;M70;M3;M57;M63
1713	CFKMFYKGVITHDVSS AINRPQIGV	M21;M70; M45;M36; M11	IVTALRANSAVKLQN NELSPVALRQ	M73;M51;M39;M11;M44;M 73;M51;M39;M11;M44
1714	QCFKMFYKGVITHDV SSAINRPQIG	M21;M70; M45;M36; M11	LIVTALRANSAVKLQ NNELSPVALR	M73;M51;M39;M11;M44;M 73;M51;M39;M11;M44
1715	MFYKGVITHDVSSAIN RPQIGVVRE	M21;M70; M45;M36; M11	PRVFSAVGNICYTPSK LIEYTDFAT	M49;M3;M43;M8;M42;M49; M3;M43;M8;M42
1716	DRLNEVAKNLNESLID LQELGKYEQ	M70;M61; M79;M51; M67	GDYFVLTSHTVMPLS APTLVPQEHY	M54;M55;M60;M34;M29;M 45;M51;M42;M46;M39
1717	PARMAGNGGDAALAL LLLDRLNQLE	M13;M58; M53;M51; M11	IPRRNVATLQAENVT GLFKDCSKVI	M28;M54;M29;M6;M45;M3 8;M36;M27;M59;M20
1718	TPSDFVRATATIPIQAS LPFGWLIV	M14;M34; M29;M45; M33	GKTFYVLPNDDTLRV EAFEYYHTTD	M3;M74;M43;M39;M22;M3; M74;M43;M39;M22
1719	CTFEYVSQPFLMDLEG KQGNFKNLR	M1;M57;M 36;M46;M2 0	YCFLGYFCTCYFGLF CLLNRYFRLT	M56;M60;M3;M6;M18;M56; M60;M3;M6;M18
1720	ANQVIVNNLDKSAGFP FNKWGKARL	M58;M50; M33;M51; M17	CFLGYFCTCYFGLFCL LNRYFRLTL	M56;M60;M3;M6;M18;M56; M60;M3;M6;M18
1721	INANQVIVNNLDKSAG FPFNKWGKA	M58;M50; M33;M51; M17	RRCPAEIVDTVSALV YDNKLKAHKD	M12;M16;M7;M29;M6;M38; M8;M17;M59;M23
1722	GCINANQVIVNNLDKS AGFPFNKWG	M58;M50; M33;M51; M17	WTNAGDYILANTCTE RLKLFAAETL	M56;M73;M19;M31;M6;M4 4;M18;M8;M52;M47
1723	GGCINANQVIVNNLDK SAGFPFNKW	M58;M50; M33;M51; M17	TCDWTNAGDYILANT CTERLKLFAA	M56;M73;M19;M31;M6;M4 4;M18;M8;M52;M47

1724	NANQVIVNNLDKSAG FPFNKWGKAR	M58;M50; M33;M51; M17	DWTNAGDYILANTCT ERLKLFAAET	M56;M73;M19;M31;M6;M4 4;M18;M8;M52;M47
1725	CINANQVIVNNLDKSA GFPFNKWGK	M58;M50; M33;M51; M17	CDWTNAGDYILANTC TERLKLFAAE	M56;M73;M19;M31;M6;M4 4;M18;M8;M52;M47
1726	PRRNVATLQAENVTG LFKDCSKVIT	M29;M38; M45;M36; M59	VEKGIYQTSNFRVQPT ESIVRFPNI	M31;M34;M30;M37;M50;M 51;M41;M8;M39;M23
1727	WDYKRDAPAHISTIGV CSMTDIAKK	M70;M6;M 36;M11;M5 9	FYLTNDVSFLAHIQW MVMFTPLVPF	M54;M58;M60;M30;M3;M5 4;M58;M60;M30;M3
1728	MEVTPSGTWLTYTGAI KLDDKDPNF	M19;M41; M8;M35;M 11	LTNDVSFLAHIQWMV MFTPLVPFWI	M54;M58;M60;M30;M3;M5 4;M58;M60;M30;M3
1729	DMYSVMLTNDNTSRY WEPEFYEAMY	M64;M7;M 34;M36;M2 2	TNDVSFLAHIQWMV MFTPLVPFWIT	M54;M58;M60;M30;M3;M5 4;M58;M60;M30;M3
1730	LDMYSVMLTNDNTSR YWEPEFYEAM	M64;M7;M 34;M36;M2 2	YLTNDVSFLAHIQWM VMFTPLVPFW	M54;M58;M60;M30;M3;M5 4;M58;M60;M30;M3
1731	IGMEVTPSGTWLTYTG AIKLDDKDP	M19;M41; M8;M11;M 23	TGYRVTKNSKVQIGE YTFEKGDYGD	M40;M14;M31;M24;M41;M 8;M43;M42;M39;M44
1732	DKSAQCFKMFYKGVI THDVSSAINR	M13;M70; M45;M36; M52	AEIVDTVSALVYDNK LKAHKDKSAQ	M12;M28;M16;M7;M38;M5 0;M63;M17;M35;M59
1733	PETTADIVVFDEISMAT NYDLSVVN	M55;M7;M 48;M33;M4 9	IVDTVSALVYDNKLK AHKDKSAQCF	M12;M28;M16;M7;M38;M5 0;M63;M17;M35;M59
1734	DVNLHSSRLSFKELLV YAADPAMHA	M38;M48; M57;M36; M20	EIVDTVSALVYDNKL KAHKDKSAQC	M12;M28;M16;M7;M38;M5 0;M63;M17;M35;M59
1735	MPILTLTRALTAESHV DTDLTKPYI	M12;M16; M58;M17; M8	DKLQFTSLEIPRRNVA TLQAENVTG	M28;M54;M29;M2;M6;M45; M38;M27;M59;M20
1736	VSQPFLMDLEGKQGN FKNLREFVFK	M54;M6;M 36;M46;M5 9	LQFTSLEIPRRNVATL QAENVTGLF	M28;M54;M60;M29;M2;M6; M45;M27;M59;M20
1737	KRISNCVADYSVLYNS ASFSTFKCY	M73;M7;M 15;M11;M4 4	YFAVHFISNSWLMWL IINLVQMAPI	M9;M73;M3;M11;M23;M9; M73;M3;M11;M23
1738	RISNCVADYSVLYNSA SFSTFKCYG	M73;M7;M 15;M11;M4 4	SYFAVHFISNSWLMW LIINLVQMAP	M9;M73;M3;M11;M23;M9; M73;M3;M11;M23
1739	FIEDLLFNKVTLADAG FIKQYGDCL	M73;M48; M44;M11; M47	EIDRLNEVAKNLNESL IDLQELGKY	M11;M70;M78;M65;M2;M6 1;M79;M51;M67;M82
1740	QGEIKDATPSDFVRAT ATIPIQASL	M34;M45; M33;M8;M 11	YLTFYLTNDVSFLAHI QWMVMFTPL	M54;M58;M60;M3;M50;M5 4;M58;M60;M3;M50

1741	TETAHSCNVNRFNVAITRAKVGILC	M19;M25;M6;M33;M59	YLYLTFYLTNDVSFLAHIQWMVMFT	M54;M58;M60;M3;M50;M54;M58;M60;M3;M50
1742	ECFDKFKVNSTLEQYVFCTVNALPE	M40;M6;M50;M18;M44	LTFYLTNDVSFLAHIQWMVMFTPLV	M54;M58;M60;M3;M50;M54;M58;M60;M3;M50
1743	QSLQTYVTQQLIRAAEIRASANLAA	M64;M21;M12;M14;M49	IYLYLTFYLTNDVSFLAHIQWMVMF	M54;M58;M60;M3;M50;M54;M58;M60;M3;M50
1744	LNRALTGIAVEQDKNTQEVFAQVKQ	M28;M14;M70;M67;M20	VIYLYLTFYLTNDVSFLAHIQWMVM	M54;M58;M60;M3;M50;M54;M58;M60;M3;M50
1745	QLNRALTGIAVEQDKNTQEVFAQVK	M28;M14;M70;M67;M20	LYLTFYLTNDVSFLAHIQWMVMFTP	M54;M58;M60;M3;M50;M54;M58;M60;M3;M50
1746	PVTLACFVLAAVYRINWITGGIAIA	M58;M70;M33;M63;M44	GRFVLALLSDLQDLKWARFPKSDGT	M77;M54;M70;M60;M3;M77;M54;M70;M60;M3
1747	FLWLLWPVTLACFVLAAVYRINWIT	M58;M14;M70;M33;M63	SSTCMMCYKRNRATRVECTTIVNGV	M14;M8;M39;M11;M44;M14;M8;M39;M11;M44
1748	EDLLFNKVTLADAGFIKQYGDCLGD	M73;M70;M48;M41;M44	NSSTCMMCYKRNRATRVECTTIVNG	M14;M8;M39;M11;M44;M14;M8;M39;M11;M44
1749	PRQKRTATKAYNVTQAFGRRGPEQT	M19;M70;M78;M25;M2	NVSLVKPSFYVYSRVKNLNSSRVPD	M40;M71;M54;M12;M16;M60;M33;M8;M46;M39
1750	KPRQKRTATKAYNVTQAFGRRGPEQ	M19;M70;M78;M25;M2	VSLVKPSFYVYSRVKNLNSSRVPDL	M40;M71;M54;M12;M16;M60;M33;M8;M46;M39
1751	AFDIYNDKVAGFAKFLKTNCCRFQE	M4;M55;M7;M78;M79	CMMCYKRNRATRVECTTIVNGVRRS	M14;M29;M8;M39;M44;M14;M29;M8;M39;M44
1752	PLSETKCTLKSFTVEKGIYQTSNFR	M75;M21;M14;M25;M63	STCMMCYKRNRATRVECTTIVNGVR	M14;M29;M8;M39;M44;M14;M29;M8;M39;M44
1753	DPLSETKCTLKSFTVEKGIYQTSNF	M75;M21;M14;M25;M63	MMCYKRNRATRVECTTIVNGVRRSF	M14;M29;M8;M39;M44;M14;M29;M8;M39;M44
1754	LSETKCTLKSFTVEKGIYQTSNFRV	M75;M21;M14;M25;M63	MCYKRNRATRVECTTIVNGVRRSFY	M14;M29;M8;M39;M44;M14;M29;M8;M39;M44
1755	LDPLSETKCTLKSFTVEKGIYQTSN	M75;M21;M14;M25;M63	TCMMCYKRNRATRVECTTIVNGVRR	M14;M29;M8;M39;M44;M14;M29;M8;M39;M44
1756	FPNITNLCPFGEVFNATRFASVYAW	M28;M66;M58;M45;M17	EVPANSTVLSFCAFAVDAAKAYKDY	M28;M48;M36;M8;M49;M28;M48;M36;M8;M49
1757	KNLREFVFKNIDGYFKIYSKHTPIN	M71;M19;M16;M15;M52	ADYNYKLPDDFTGCVIAWNSNNLDS	M13;M12;M14;M29;M38;M48;M67;M68;M49;M26

1758	NLREFVFKNIDGYFKIYSKHTPINL	M71;M19;M16;M15;M52	RMAGNGGDAALALLLLDRLNQLESK	M13;M56;M58;M16;M55;M10;M53;M51;M17;M11
1759	FQFCNDPFLGVYYHKNNKSWMESEF	M4;M21;M1;M37;M22	TIQRKYKGIKIQEGVVDYGARFYFY	M40;M14;M5;M51;M67;M40;M14;M5;M51;M67
1760	EFQFCNDPFLGVYYHKNNKSWMESE	M4;M21;M1;M37;M22	STIQRKYKGIKIQEGVVDYGARFYF	M40;M14;M5;M51;M67;M40;M14;M5;M51;M67
1761	PQADVEWKFYDAQPCSDKAYKIEEL	M29;M6;M41;M8;M59	VVDGCNSSTCMMCYKRNRATRVECT	M71;M55;M8;M39;M44;M71;M55;M8;M39;M44
1762	CTVNALPETTADIVVFDEISMATNY	M28;M55;M38;M48;M49	HVVDGCNSSTCMMCYKRNRATRVEC	M71;M55;M8;M39;M44;M71;M55;M8;M39;M44
1763	TVNALPETTADIVVFDEISMATNYD	M28;M55;M38;M48;M49	TSKETLYCIDGALLTKSSEYKGPIT	M10;M36;M35;M39;M44;M10;M36;M35;M39;M44
1764	FCTVNALPETTADIVVFDEISMATN	M28;M55;M38;M48;M49	VPAQEKNFTTAPAICHDGKAHFPRE	M24;M78;M65;M7;M29;M2;M45;M79;M33;M82
1765	GPEAGLPYGANKDGIIWVATEGALN	M64;M14;M30;M57;M22	YVPAQEKNFTTAPAICHDGKAHFPR	M24;M78;M65;M7;M29;M2;M45;M79;M33;M82
1766	EAGLPYGANKDGIIWVATEGALNTP	M64;M14;M30;M57;M22	GCNSSTCMMCYKRNRATRVECTTIV	M71;M8;M39;M11;M44;M71;M8;M39;M11;M44
1767	PEAGLPYGANKDGIIWVATEGALNT	M64;M14;M30;M57;M22	LLPSLATVAYFNMVYMPASWVMRIM	M28;M6;M63;M46;M39;M28;M6;M63;M46;M39
1768	FLGTCRRCPAEIVDTVSALVYDNKL	M29;M38;M6;M8;M23	LFLLPSLATVAYFNMVYMPASWVMR	M28;M6;M63;M46;M39;M28;M6;M63;M46;M39
1769	MFLGTCRRCPAEIVDTVSALVYDNK	M29;M38;M6;M8;M23	FLLPSLATVAYFNMVYMPASWVMRI	M28;M6;M63;M46;M39;M28;M6;M63;M46;M39
1770	KIADKYVRNLQHRLYECLYRNRDVD	M54;M60;M2;M37;M44	YYKKDNSYFTEQPIDLVPNQPYPNA	M64;M55;M60;M51;M39;M64;M55;M60;M51;M39
1771	IADKYVRNLQHRLYECLYRNRDVDT	M54;M60;M2;M37;M44	NYYKKDNSYFTEQPIDLVPNQPYPN	M64;M55;M60;M51;M39;M64;M55;M60;M51;M39
1772	ETQALPQRQKKQQTVTLLPAADLDD	M54;M14;M29;M26;M39	KKDNSYFTEQPIDLVPNQPYPNASF	M64;M55;M60;M51;M39;M64;M55;M60;M51;M39
1773	TQALPQRQKKQQTVTLLPAADLDDF	M54;M14;M29;M26;M39	YKKDNSYFTEQPIDLVPNQPYPNAS	M64;M55;M60;M51;M39;M64;M55;M60;M51;M39
1774	TKRFDNPVLPFNDGVYFASTEKSNI	M64;M12;M24;M28;M22	LANTCTERLKLFAAETLKATEETFK	M4;M64;M21;M40;M48;M63;M49;M26;M22;M23
1775	KRFDNPVLPFNDGVYFASTEKSNII	M64;M12;M24;M28;M22	ANTCTERLKLFAAETLKATEETFKL	M4;M64;M21;M40;M48;M63;M49;M26;M22;M23

1776	NKDGIIWVATEGALNTPKDHIGTRN	M64;M30;M6;M72;M22	NTCTERLKLFAAETLKATEETFKLS	M4;M64;M21;M40;M48;M63;M49;M26;M22;M23
1777	KDGIIWVATEGALNTPKDHIGTRNP	M64;M30;M6;M72;M22	CYLATALLTLQQIELKFNPPALQDA	M73;M58;M48;M74;M51;M73;M58;M48;M74;M51
1778	FTTAPAICHDGKAHFPREGVFVSNG	M56;M24;M7;M45;M35	ATALLTLQQIELKFNPPALQDAYYR	M73;M58;M48;M74;M51;M73;M58;M48;M74;M51
1779	TAPAICHDGKAHFPREGVFVSNGTH	M56;M24;M7;M45;M35	YLATALLTLQQIELKFNPPALQDAY	M73;M58;M48;M74;M51;M73;M58;M48;M74;M51
1780	NFTTAPAICHDGKAHFPREGVFVSN	M56;M24;M7;M45;M35	LATALLTLQQIELKFNPPALQDAYY	M73;M58;M48;M74;M51;M73;M58;M48;M74;M51
1781	KNFTTAPAICHDGKAHFPREGVFVS	M56;M24;M7;M45;M35	NCYLATALLTLQQIELKFNPPALQD	M73;M58;M48;M74;M51;M73;M58;M48;M74;M51
1782	TTAPAICHDGKAHFPREGVFVSNGT	M56;M24;M7;M45;M35	ALLTLQQIELKFNPPALQDAYYRAR	M73;M58;M48;M74;M51;M73;M58;M48;M74;M51
1783	EKNFTTAPAICHDGKAHFPREGVFV	M56;M24;M7;M45;M35	TALLTLQQIELKFNPPALQDAYYRA	M73;M58;M48;M74;M51;M73;M58;M48;M74;M51
1784	SPRWYFYYLGTGPEAGLPYGANKDG	M32;M12;M31;M6;M52	SSYIVDSVTVKNGSIHLYFDKAGQK	M21;M12;M48;M36;M49;M21;M12;M48;M36;M49
1785	KRDAPAHISTIGVCSMTDIAKKPTE	M66;M70;M6;M63;M59	HADQLTPTWRVYSTGSNVFQTRAGC	M75;M58;M14;M24;M16;M5;M6;M41;M17;M82
1786	RDAPAHISTIGVCSMTDIAKKPTET	M66;M70;M6;M63;M59	WNIGEQKSILSPLYAFASEAARVVR	M6;M48;M45;M49;M22;M6;M48;M45;M49;M22
1787	DAPAHISTIGVCSMTDIAKKPTETI	M66;M70;M6;M63;M59	DPNFKDQVILLNKHIDAYKTFPPTE	M56;M73;M14;M53;M44;M17;M35;M52;M11;M47
1788	APAHISTIGVCSMTDIAKKPTETIC	M66;M70;M6;M63;M59	KDPNFKDQVILLNKHIDAYKTFPPT	M56;M73;M14;M53;M44;M17;M35;M52;M11;M47
1789	GTKRFDNPVLPFNDGVYFASTEKSN	M64;M12;M28;M82;M22	QIRSAAKKNNLPFKLTCATTRQVVN	M19;M12;M78;M33;M8;M19;M12;M78;M33;M8
1790	RTTCFSVAALTNNVAFQTVKPGNFN	M73;M1;M6;M22;M59	KDQVILLNKHIDAYKTFPPTEPKKD	M56;M73;M14;M53;M44;M41;M35;M52;M11;M47
1791	LTVLPPLLTDEMIAQYTSALLAGTI	M7;M38;M48;M41;M49	NGVSFSTFEEAALCTFLLNKEMYLK	M4;M13;M6;M49;M44;M4;M13;M6;M49;M44
1792	LEAPFLYLYALVYFLQSINFVRIIM	M4;M54;M12;M60;M25	NQDLNGNWYDFGDFIQTTPGSGVPV	M4;M40;M9;M58;M16;M70;M34;M8;M15;M11

1793	GLEAPFLYLYALVYFLQSINFVRII	M4;M54;M12;M60;M25	QDLNGNWYDFGDFIQTTPGSGVPVV	M4;M40;M9;M58;M16;M70;M34;M8;M15;M11
1794	EAPFLYLYALVYFLQSINFVRIIMR	M4;M54;M12;M60;M25	ANSTVLSFCAFAVDAAKAYKDYLAS	M32;M12;M28;M36;M69;M32;M12;M28;M36;M69
1795	TVYDPLQPELDSFKEELDKYFKNHT	M70;M34;M6;M63;M59	AQGMDNLACEDLKPVSEEVVENPTI	M4;M1;M45;M37;M49;M4;M1;M45;M37;M49
1796	VVRIKIVQMLSDTLKNLSDRVVFVL	M61;M57;M36;M46;M20	SDDYIATNGPLKVGGSCVLSGHNLA	M14;M10;M29;M11;M44;M14;M10;M29;M11;M44
1797	LPWNVVRIKIVQMLSDTLKNLSDRV	M61;M57;M36;M46;M20	DITFLKKDAPYIVGDVVQEGVLTAV	M14;M7;M30;M57;M11;M14;M7;M30;M57;M11
1798	NVVRIKIVQMLSDTLKNLSDRVVFV	M61;M57;M36;M46;M20	TSNFRVQPTESIVRFPNITNLCPFG	M21;M31;M34;M30;M48;M50;M41;M26;M39;M22
1799	WNVVRIKIVQMLSDTLKNLSDRVVF	M61;M57;M36;M46;M20	SVYYTSNPTTFHLDGEVITFDNLKT	M7;M48;M45;M50;M49;M7;M48;M45;M50;M49
1800	PWNVVRIKIVQMLSDTLKNLSDRVV	M61;M57;M36;M46;M20	REVRTIKVFTTVDNINLHTQVVDMS	M29;M51;M43;M42;M26;M29;M51;M43;M42;M26
1801	TVREVLSDRELHLSWEVGKPRPPLN	M28;M70;M5;M6;M59	YTVELGTEVNEFACVVADAVIKTLQ	M14;M66;M34;M8;M39;M14;M66;M34;M8;M39
1802	ATVREVLSDRELHLSWEVGKPRPPL	M28;M70;M5;M6;M59	DSVTVKNGSIHLYFDKAGQKTYERH	M21;M12;M7;M48;M49;M21;M12;M7;M48;M49
1803	VREVLSDRELHLSWEVGKPRPPLNR	M28;M70;M5;M6;M59	LDYIINLIIKNLSKSLTENKYSQLD	M56;M73;M28;M58;M50;M18;M17;M15;M11;M44
1804	VYDPLQPELDSFKEELDKYFKNHTS	M75;M70;M6;M63;M59	NLDYIINLIIKNLSKSLTENKYSQL	M56;M73;M28;M58;M50;M18;M17;M15;M11;M44
1805	PLQPELDSFKEELDKYFKNHTSPDV	M75;M70;M6;M63;M59	YAFASEAARVVRSIFSRTLETAQNS	M4;M14;M48;M42;M59;M4;M14;M48;M42;M59
1806	DPLQPELDSFKEELDKYFKNHTSPD	M75;M70;M6;M63;M59	GTEVNEFACVVADAVIKTLQPVSEL	M14;M25;M34;M8;M39;M14;M25;M34;M8;M39
1807	YDPLQPELDSFKEELDKYFKNHTSP	M75;M70;M6;M63;M59	LLLQLCTFTRSTNSRIKASMPTTIA	M14;M33;M8;M42;M39;M14;M33;M8;M42;M39
1808	PSKRSFIEDLLFNKVTLADAGFIKQ	M73;M44;M67;M11;M47	LTTAAKLMVVIPDYNTYKNTCDGTT	M57;M51;M41;M82;M23;M57;M51;M41;M82;M23
1809	FLVFLGIITTVAAFHQECSLQSCTQ	M30;M29;M6;M22;M59	TTAAKLMVVIPDYNTYKNTCDGTTF	M57;M51;M41;M82;M23;M57;M51;M41;M82;M23

1810	LVFLGIITTVAAFHQECSLQSCTQH	M30;M29;M6;M22;M59	RDGCVPLNIIPLTTAAKLMVVIPDY	M19;M24;M14;M38;M22;M19;M24;M14;M38;M22
1811	PKEITVATSRTLSYYKLGASQRVAG	M70;M48;M63;M49;M23	DGCVPLNIIPLTTAAKLMVVIPDYN	M19;M24;M14;M38;M22;M19;M24;M14;M38;M22
1812	ESEFRVYSSANNCTFEYVSQPFLMD	M64;M5;M2;M48;M82	PVPYCYDTNVLEGSVAYESLRPDTR	M12;M14;M5;M29;M46;M12;M14;M5;M29;M46
1813	QPTESIVRFPNITNLCPFGEVFNAT	M21;M28;M66;M48;M41	KPVPYCYDTNVLEGSVAYESLRPDT	M12;M14;M5;M29;M46;M12;M14;M5;M29;M46
1814	DELTGHMLDMYSVMLTNDNTSRYWE	M64;M31;M34;M36;M22	NNDYYRSLPGVFCGVDAVNLLTNMF	M25;M45;M8;M43;M39;M25;M45;M8;M43;M39
1815	RNLQHRLYECLYRNRDVDTDFVNEF	M2;M6;M35;M52;M47	YRSLPGVFCGVDAVNLLTNMFTPLI	M25;M45;M8;M43;M39;M25;M45;M8;M43;M39
1816	LPFFYYSDSPCESHGKQVVSDIDYV	M71;M32;M55;M45;M41	YYRSLPGVFCGVDAVNLLTNMFTPL	M25;M45;M8;M43;M39;M25;M45;M8;M43;M39
1817	QLPFFYYSDSPCESHGKQVVSDIDY	M71;M32;M55;M45;M41	DYYRSLPGVFCGVDAVNLLTNMFTP	M25;M45;M8;M43;M39;M25;M45;M8;M43;M39
1818	KQLPFFYYSDSPCESHGKQVVSDID	M71;M32;M55;M45;M41	NDYYRSLPGVFCGVDAVNLLTNMFT	M25;M45;M8;M43;M39;M25;M45;M8;M43;M39
1819	SELVIGAVILRGHLRIAGHHLGRCD	M58;M14;M55;M53;M17	RSLPGVFCGVDAVNLLTNMFTPLIQ	M25;M45;M8;M43;M39;M25;M45;M8;M43;M39
1820	ESELVIGAVILRGHLRIAGHHLGRC	M58;M14;M55;M53;M17	PASRELKVTFFPDLNGDVVAIDYKH	M21;M70;M57;M36;M63;M21;M70;M57;M36;M63
1821	NQDVNLHSSRLSFKELLVYAADPAM	M53;M38;M57;M36;M20	PAQEKNFTTAPAICHDGKAHFPREG	M56;M24;M78;M65;M7;M45;M79;M33;M35;M82
1822	VDRYPANSIVCRFDTRVLSNLNLPG	M5;M2;M48;M50;M9	PLNSIIKTIQPRVEKKKLDGFMGRI	M28;M29;M6;M72;M59;M28;M29;M6;M72;M59
1823	PAWRKAVFISPYNSQNAVASKILGL	M21;M48;M49;M26;M39	FASEAARVVRSIFSRTLETAQNSVR	M4;M2;M48;M42;M59;M4;M2;M48;M42;M59
1824	AWRKAVFISPYNSQNAVASKILGLP	M21;M48;M49;M26;M39	ASEAARVVRSIFSRTLETAQNSVRV	M4;M2;M48;M42;M59;M4;M2;M48;M42;M59
1825	TRNPAWRKAVFISPYNSQNAVASKI	M21;M48;M49;M26;M39	TSNYSGVVTTVMFLARGIVFMCVEY	M12;M14;M29;M38;M20;M12;M14;M29;M38;M20
1826	RNPAWRKAVFISPYNSQNAVASKIL	M21;M48;M49;M26;M39	AKAYKDYLASGGQPITNCVKMLCTH	M12;M37;M33;M8;M39;M12;M37;M33;M8;M39
1827	NPAWRKAVFISPYNSQNAVASKILG	M21;M48;M49;M26;M39	KAYKDYLASGGQPITNCVKMLCTHT	M12;M37;M33;M8;M39;M12;M37;M33;M8;M39

1828	WRKAVFISPYNSQNAVASKILGLPT	M21;M48;M49;M26;M39	VNEFACVVADAVIKTLQPVSELLTP	M28;M78;M45;M49;M39;M28;M78;M45;M49;M39
1829	TFKVSIWNLDYIINLIIKNLSKSLT	M56;M50;M18;M11;M44	INITRFQTLLALHRSYLTPGDSSSG	M21;M24;M55;M5;M10;M2;M48;M20;M9;M23
1830	DSATLPKGIMMNVAKYTQLCQYLNT	M73;M58;M78;M11;M44	PYCYDTNVLEGSVAYESLRPDTRYV	M12;M14;M5;M34;M46;M12;M14;M5;M34;M46
1831	SATLPKGIMMNVAKYTQLCQYLNTL	M73;M58;M78;M11;M44	NLACEDLKPVSEEVVENPTIQKDVL	M73;M45;M50;M49;M44;M73;M45;M50;M49;M44
1832	DGNKIADKYVRNLQHRLYECLYRNR	M54;M60;M37;M57;M44	EDLKPVSEEVVENPTIQKDVLECNV	M73;M45;M50;M49;M44;M73;M45;M50;M49;M44
1833	EISMATNYDLSVVNARLRAKHYVYI	M19;M25;M50;M18;M26	LACEDLKPVSEEVVENPTIQKDVLE	M73;M45;M50;M49;M44;M73;M45;M50;M49;M44
1834	ISMATNYDLSVVNARLRAKHYVYIG	M19;M25;M50;M18;M26	CEDLKPVSEEVVENPTIQKDVLECN	M73;M45;M50;M49;M44;M73;M45;M50;M49;M44
1835	ASVYAWNRKRISNCVADYSVLYNSA	M55;M7;M74;M67;M27	ACEDLKPVSEEVVENPTIQKDVLEC	M73;M45;M50;M49;M44;M73;M45;M50;M49;M44
1836	AQALNTLVKQLSSNFGAISSVLNDI	M53;M45;M15;M46;M22	KQIVESCGNFKVTKGKAKKGAWNIG	M19;M25;M41;M8;M23;M19;M25;M41;M8;M23
1837	YNDKVAGFAKFLKTNCCRFQEKDED	M73;M78;M55;M79;M8	AFKQIVESCGNFKVTKGKAKKGAWN	M19;M25;M41;M8;M23;M19;M25;M41;M8;M23
1838	NYDLSVVNARLRAKHYVYIGDPAQL	M1;M25;M37;M57;M26	FKQIVESCGNFKVTKGKAKKGAWNI	M19;M25;M41;M8;M23;M19;M25;M41;M8;M23
1839	TNYDLSVVNARLRAKHYVYIGDPAQ	M1;M25;M37;M57;M26	GVLMSNLGMPSYCTGYREGYLNSTN	M73;M45;M18;M49;M44;M73;M45;M18;M49;M44
1840	YDLSVVNARLRAKHYVYIGDPAQLP	M1;M25;M37;M57;M26	ASGKPVPYCYDTNVLEGSVAYESLR	M30;M29;M36;M35;M46;M30;M29;M36;M35;M46
1841	GKIADYNYKLPDDFTGCVIAWNSNN	M13;M12;M29;M38;M67	EAELAKNVSLDNVLSTFISAARQGF	M14;M7;M29;M61;M27;M14;M7;M29;M61;M27
1842	KIADYNYKLPDDFTGCVIAWNSNNL	M13;M12;M29;M38;M67	AEAELAKNVSLDNVLSTFISAARQG	M14;M7;M29;M61;M27;M14;M7;M29;M61;M27
1843	VVYRAFDIYNDKVAGFAKFLKTNCC	M78;M7;M55;M79;M41	AELAKNVSLDNVLSTFISAARQGFV	M14;M7;M29;M61;M27;M14;M7;M29;M61;M27
1844	TDVVYRAFDIYNDKVAGFAKFLKTN	M78;M7;M55;M79;M41	YPNMFITREEAIRHVRAWIGFDVEG	M64;M32;M14;M34;M57;M46;M69;M42;M39;M20

1845	VYRAFDIYNDKVAGF AKFLKTNCCR	M78;M7;M 55;M79;M4 1	QGLVASIKNFKSVLY YQNNVFMSEA	M21;M54;M55;M60;M48;M 41;M49;M26;M22;M23
1846	DVVYRAFDIYNDKVA GFAKFLKTNC	M78;M7;M 55;M79;M4 1	VNTFSSTFNVPMEKL KTLVATAEAE	M28;M70;M29;M8;M22;M2 8;M70;M29;M8;M22
1847	MKFLVFLGIITTVAAF HQECSLQSC	M64;M29; M6;M22;M 59	LPFFSNVTWFHAIHVS GTNGTKRFD	M64;M40;M29;M45;M49;M 15;M46;M26;M22;M23
1848	SVVNARLRAKHYVYI GDPAQLPAPR	M40;M31; M1;M37;M 57	FLPFFSNVTWFHAIHV SGTNGTKRF	M64;M40;M29;M45;M49;M 15;M46;M26;M22;M23
1849	DLSVVNARLRAKHYV YIGDPAQLPA	M31;M1;M 37;M57;M2 6	LFLPFFSNVTWFHAIH VSGTNGTKR	M64;M40;M29;M45;M49;M 15;M46;M26;M22;M23
1850	RIVYTACSHAAVDALC EKALKYLPI	M28;M60; M29;M67; M49	FSSTFNVPMEKLKTL VATAEAELAK	M28;M81;M29;M6;M22;M2 8;M81;M29;M6;M22
1851	IVYTACSHAAVDALCE KALKYLPID	M28;M60; M29;M67; M49	FTPFDVVRQCSGVTF QSAVKRTIKG	M4;M54;M1;M60;M46;M4; M54;M1;M60;M46
1852	LVASIKNFKSVLYYQN NVFMSEAKC	M21;M48; M41;M49; M22	EFTPFDVVRQCSGVTF QSAVKRTIK	M4;M54;M1;M60;M46;M4; M54;M1;M60;M46
1853	GLVASIKNFKSVLYYQ NNVFMSEAK	M21;M48; M41;M49; M22	QKEKVNINIVGDFKL NEEIAIILAS	M73;M7;M27;M35;M44;M7 3;M7;M27;M35;M44
1854	DIYNDKVAGFAKFLKT NCCRFQEKD	M4;M73;M 55;M78;M7 9	ISASIVAGGIVAIVVTC LAYYFMRF	M21;M12;M60;M6;M22;M2 1;M12;M60;M6;M22
1855	MRTFKVSIWNLDYIIN LIIKNLSKS	M56;M50; M18;M44; M20	APYIVGDVVQEGVLT AVVIPTKKAG	M14;M30;M29;M38;M67;M 14;M30;M29;M38;M67
1856	RTFKVSIWNLDYIINLII KNLSKSL	M56;M50; M18;M44; M20	KDAPYIVGDVVQEGV LTAVVIPTKK	M14;M30;M29;M38;M67;M 14;M30;M29;M38;M67
1857	QKKQQTVTLLPAADL DDFSKQLQQS	M54;M55; M46;M26; M39	DAPYIVGDVVQEGVL TAVVIPTKKA	M14;M30;M29;M38;M67;M 14;M30;M29;M38;M67
1858	SRIIPARARVECFDKFK VNSTLEQY	M10;M50; M18;M9;M 44	VEAFEYYHTTDPSFL GRYMSALNHT	M1;M29;M6;M41;M59;M1; M29;M6;M41;M59
1859	IIPARARVECFDKFKV NSTLEQYVF	M10;M50; M18;M9;M 44	SVAYESLRPDTRYVL MDGSIIQFPN	M24;M7;M34;M48;M50;M2 4;M7;M34;M48;M50
1860	RIIPARARVECFDKFK VNSTLEQYV	M10;M50; M18;M9;M 44	GMDNLACEDLKPVSE EVVENPTIQK	M1;M45;M37;M50;M49;M1; M45;M37;M50;M49
1861	VIPTITQMNLKYAISAK NRARTVAG	M58;M14; M18;M35; M82	AAMQRKLEKMADQA MTQMYKQARSE	M2;M74;M57;M63;M82;M2; M74;M57;M63;M82

1862	NVIPTITQMNLKYAISAKNRARTVA	M58;M14;M18;M35;M82	CTFTRSTNSRIKASMPTTIAKNTVK	M14;M33;M42;M39;M11;M14;M33;M42;M39;M11
1863	CFNSTYASQGLVASIKNFKSVLYYQ	M64;M48;M49;M22;M23	LCTFTRSTNSRIKASMPTTIAKNTV	M14;M33;M42;M39;M11;M14;M33;M42;M39;M11
1864	FNSTYASQGLVASIKNFKSVLYYQN	M64;M48;M49;M22;M23	VLYQPPQTSITSAVLQSGFRKMAFP	M14;M81;M1;M38;M62;M14;M81;M1;M38;M62
1865	VAALTNNVAFQTVKPGNFNKDFYDF	M73;M25;M29;M6;M59	LYQPPQTSITSAVLQSGFRKMAFPS	M14;M81;M1;M38;M62;M14;M81;M1;M38;M62
1866	AALTNNVAFQTVKPGNFNKDFYDFA	M73;M25;M29;M6;M59	DVLYQPPQTSITSAVLQSGFRKMAF	M14;M81;M1;M38;M62;M14;M81;M1;M38;M62
1867	INLVRDLPQGFSALEPLVDLPIGIN	M31;M34;M45;M52;M47	YQPPQTSITSAVLQSGFRKMAFPSG	M14;M81;M1;M38;M62;M14;M81;M1;M38;M62
1868	DAQPCSDKAYKIEELFYSYATHSDK	M73;M70;M29;M6;M59	QPPQTSITSAVLQSGFRKMAFPSGK	M14;M81;M1;M38;M62;M14;M81;M1;M38;M62
1869	YAWNRKRISNCVADYSVLYNSASFS	M7;M74;M67;M27;M15	SDVLYQPPQTSITSAVLQSGFRKMA	M14;M81;M1;M38;M62;M14;M81;M1;M38;M62
1870	AWNRKRISNCVADYSVLYNSASFST	M7;M74;M67;M27;M15	ATYYLFDESGEFKLASHMYCSFYPP	M16;M36;M15;M52;M23;M16;M36;M15;M52;M23
1871	WNRKRISNCVADYSVLYNSASFSTF	M7;M74;M67;M27;M15	DKKIKACVEEVTTTLEETKFLTENL	M32;M28;M6;M67;M20;M32;M28;M6;M67;M20
1872	ANVNALLSTDGNKIADKYVRNLQHR	M10;M57;M27;M8;M20	KKIKACVEEVTTTLEETKFLTENLL	M32;M28;M6;M67;M20;M32;M28;M6;M67;M20
1873	NVNALLSTDGNKIADKYVRNLQHRL	M10;M57;M27;M8;M20	LNRVCTNYMPYFFTLLLQLCTFTRS	M4;M29;M6;M69;M20;M4;M29;M6;M69;M20
1874	TANVNALLSTDGNKIADKYVRNLQH	M10;M57;M27;M8;M20	CLNRVCTNYMPYFFTLLLQLCTFTR	M4;M29;M6;M69;M20;M4;M29;M6;M69;M20
1875	VNALLSTDGNKIADKYVRNLQHRLY	M10;M57;M27;M8;M20	RCLNRVCTNYMPYFFTLLLQLCTFT	M4;M29;M6;M69;M20;M4;M29;M6;M69;M20
1876	KSAFVNLKQLPFFYYSDSPCESHGK	M32;M54;M60;M45;M41	RLTLGVYDYLVSTQEFRYMNSQGLL	M31;M6;M43;M8;M42;M31;M6;M43;M8;M42
1877	KQRRPQGLPNNTASWFTALTQHGKE	M40;M28;M70;M29;M38	FRLTLGVYDYLVSTQEFRYMNSQGL	M31;M6;M43;M8;M42;M31;M6;M43;M8;M42
1878	KRNVIPTITQMNLKYAISAKNRART	M58;M14;M18;M35;M59	YFRLTLGVYDYLVSTQEFRYMNSQG	M31;M6;M43;M8;M42;M31;M6;M43;M8;M42

1879	DLPQGFSALEPLVDLPIGINITRFQ	M31;M60;M45;M52;M47	SSGVTRELMRELNGGAYTRYVDNNF	M54;M14;M60;M30;M22;M54;M14;M60;M30;M22
1880	LPQGFSALEPLVDLPIGINITRFQT	M31;M60;M45;M52;M47	HSSGVTRELMRELNGGAYTRYVDNN	M54;M14;M60;M30;M22;M54;M14;M60;M30;M22
1881	CGDSTECSNLLLQYGSFCTQLNRAL	M13;M48;M41;M49;M46	SGVTRELMRELNGGAYTRYVDNNFC	M54;M14;M60;M30;M22;M54;M14;M60;M30;M22
1882	ICGDSTECSNLLLQYGSFCTQLNRA	M13;M48;M41;M49;M46	FLNKVVSTTTNIVTRCLNRVCTNYM	M4;M78;M1;M37;M23;M4;M78;M1;M37;M23
1883	VTANVNALLSTDGNKIADKYVRNLQ	M10;M57;M8;M9;M20	LNKVVSTTTNIVTRCLNRVCTNYMP	M4;M78;M1;M37;M23;M4;M78;M1;M37;M23
1884	LPPLLTDEMIAQYTSALLAGTITSG	M38;M48;M41;M49;M26	VVRQCSGVTFQSAVKRTIKGTHHWL	M71;M19;M25;M33;M26;M71;M19;M25;M33;M26
1885	LLTDEMIAQYTSALLAGTITSGWTF	M38;M48;M41;M49;M26	PSARIVYTACSHAAVDALCEKALKY	M64;M21;M28;M5;M60;M29;M38;M67;M17;M49
1886	PLLTDEMIAQYTSALLAGTITSGWT	M38;M48;M41;M49;M26	ESDDYIATNGPLKVGGSCVLSGHNL	M10;M29;M18;M11;M44;M10;M29;M18;M11;M44
1887	PPLLTDEMIAQYTSALLAGTITSGW	M38;M48;M41;M49;M26	TTLEETKFLTENLLLYIDINGNLHP	M70;M50;M36;M11;M20;M70;M50;M36;M11;M20
1888	MWLSYFIASFRLFARTRSMWSFNPE	M64;M40;M16;M30;M15	TTTLEETKFLTENLLLYIDINGNLH	M70;M50;M36;M11;M20;M70;M50;M36;M11;M20
1889	YYHKNNKSWMESEFRVYSSANNCTF	M70;M5;M48;M41;M82	ALKGGKIVNNWLKQLIKVTLVFLFV	M56;M12;M55;M57;M11;M56;M12;M55;M57;M11
1890	IMMNVAKYTQLCQYLNTLTLAVPYN	M78;M34;M48;M41;M49	SNSFDVLKSEDAQGMDNLACEDLKP	M64;M6;M46;M39;M22;M64;M6;M46;M39;M22
1891	GIMMNVAKYTQLCQYLNTLTLAVPY	M78;M34;M48;M41;M49	NSFDVLKSEDAQGMDNLACEDLKPV	M64;M6;M46;M39;M22;M64;M6;M46;M39;M22
1892	MMNVAKYTQLCQYLNTLTLAVPYNM	M78;M34;M48;M41;M49	VVTTKIALKGGKIVNNWLKQLIKVT	M12;M55;M57;M11;M20;M12;M55;M57;M11;M20
1893	PHGVVFLHVTYVPAQEKNFTTAPAI	M28;M66;M70;M33;M26	VTTKIALKGGKIVNNWLKQLIKVTL	M12;M55;M57;M11;M20;M12;M55;M57;M11;M20
1894	VTIAEILLIIMRTFKVSIWNLDYII	M1;M5;M61;M37;M20	SMDNSPNLAWPLIVTALRANSAVKL	M73;M60;M18;M39;M44;M73;M60;M18;M39;M44
1895	TIAEILLIIMRTFKVSIWNLDYIIN	M1;M5;M61;M37;M20	ISMDNSPNLAWPLIVTALRANSAVK	M73;M60;M18;M39;M44;M73;M60;M18;M39;M44
1896	FQVTIAEILLIIMRTFKVSIWNLDY	M1;M5;M61;M37;M20	LMTARTVYDDGARRVWTLMNVLTLV	M5;M6;M72;M11;M20;M5;M6;M72;M11;M20

1897	IAEILLIIMRTFKVSIWNLDYIINL	M1;M5;M61;M37;M20	SFYVYANGGKGFCKLHNWNCVNCDT	M41;M42;M8;M43;M39;M41;M42;M8;M43;M39
1898	QVTIAEILLIIMRTFKVSIWNLDYI	M1;M5;M61;M37;M20	SEAARVVRSIFSRTLETAQNSVRVL	M34;M2;M48;M42;M59;M34;M2;M48;M42;M59
1899	WQLALSKGVHFVCNLLLLFVTVYSH	M50;M18;M8;M49;M23	SSPDAVTAYNGYLTSSSKTPEEHFI	M24;M55;M48;M41;M35;M24;M55;M48;M41;M35
1900	KRWQLALSKGVHFVCNLLLLFVTVY	M50;M18;M8;M49;M23	SPDAVTAYNGYLTSSSKTPEEHFIE	M24;M55;M48;M41;M35;M24;M55;M48;M41;M35
1901	RWQLALSKGVHFVCNLLLLFVTVYS	M50;M18;M8;M49;M23	KLKDCVMYASAVVLLILMTARTVYD	M75;M12;M33;M46;M39;M75;M12;M33;M46;M39
1902	QLALSKGVHFVCNLLLLFVTVYSHL	M50;M18;M8;M49;M23	LLILMTARTVYDDGARRVWTLMNVL	M32;M6;M72;M11;M59;M32;M6;M72;M11;M59
1903	ASFRLFARTRSMWSFNPETNILLNV	M64;M40;M16;M30;M42	GIVAIVVTCLAYYFMRFRRAFGEYS	M71;M16;M6;M62;M59;M71;M16;M6;M62;M59
1904	NSVCRLMKTIGPDMFLGTCRRCPAE	M5;M6;M37;M17;M59	IVAIVVTCLAYYFMRFRRAFGEYSH	M71;M16;M6;M62;M59;M71;M16;M6;M62;M59
1905	NGTITVEELKKLLEQWNLVIGFLFL	M4;M58;M53;M17;M47	GGIVAIVVTCLAYYFMRFRRAFGEY	M71;M16;M6;M62;M59;M71;M16;M6;M62;M59
1906	LKLRGTAVMSLKEGQINDMILSLLS	M54;M60;M6;M49;M59	LKVDTANPKTPKYKFVRIQPGQTFS	M40;M77;M14;M34;M29;M40;M77;M14;M34;M29
1907	KLRGTAVMSLKEGQINDMILSLLSK	M54;M60;M6;M49;M59	KTTEVVGDIILKPANNSLKITEEVG	M19;M58;M34;M53;M26;M19;M58;M34;M53;M26
1908	LRGTAVMSLKEGQINDMILSLLSKG	M54;M60;M6;M49;M59	VKTTEVVGDIILKPANNSLKITEEV	M19;M58;M34;M53;M26;M19;M58;M34;M53;M26
1909	RGTAVMSLKEGQINDMILSLLSKGR	M54;M60;M6;M49;M59	KVTLVFLFVAAIFYLITPVHVMSKH	M32;M1;M34;M18;M39;M32;M1;M34;M18;M39
1910	EEAIRHVRAWIGFDVEGCHATREAV	M32;M48;M57;M69;M20	TNVLEGSVAYESLRPDTRYVLMDGS	M19;M34;M50;M18;M46;M19;M34;M50;M18;M46
1911	TKCTLKSFTVEKGIYQTSNFRVQPT	M75;M21;M25;M8;M23	LLSMQGAVDINKLCEEMLDNRATLQ	M54;M60;M45;M67;M49;M54;M60;M45;M67;M49
1912	ETKCTLKSFTVEKGIYQTSNFRVQP	M75;M21;M25;M8;M23	SVLLSMQGAVDINKLCEEMLDNRAT	M54;M60;M45;M67;M49;M54;M60;M45;M67;M49
1913	VNIQKEIDRLNEVAKNLNESLIDLQ	M78;M65;M2;M79;M82	LSVLLSMQGAVDINKLCEEMLDNRA	M54;M60;M45;M67;M49;M54;M60;M45;M67;M49
1914	VVNIQKEIDRLNEVAKNLNESLIDL	M78;M65;M2;M79;M82	VLLSMQGAVDINKLCEEMLDNRATL	M54;M60;M45;M67;M49;M54;M60;M45;M67;M49

1915	KNIDGYFKIYSKHTPIN LVRDLPQG	M40;M71; M16;M15; M52	DCVMYASAVVLLILM TARTVYDDGA	M75;M32;M12;M46;M39;M 75;M32;M12;M46;M39
1916	TECSNLLLQYGSFCTQ LNRALTGIA	M13;M48; M41;M49; M43	KDCVMYASAVVLLIL MTARTVYDDG	M75;M32;M12;M46;M39;M 75;M32;M12;M46;M39
1917	LMDLEGKQGNFKNLR EFVFKNIDGY	M54;M6;M 43;M42;M5 9	HNDILLAKDTTEAFE KMVSLLSVLL	M32;M58;M53;M36;M68;M 32;M58;M53;M36;M68
1918	LEGKQGNFKNLREFVF KNIDGYFKI	M54;M6;M 43;M42;M5 9	NDILLAKDTTEAFEK MVSLLSVLLS	M32;M58;M53;M36;M68;M 32;M58;M53;M36;M68
1919	DLEGKQGNFKNLREF VFKNIDGYFK	M54;M6;M 43;M42;M5 9	IDHPNPKGFCDLKGK YVQIPTTCAN	M31;M63;M43;M42;M39;M 31;M63;M43;M42;M39
1920	EGKQGNFKNLREFVF KNIDGYFKIY	M54;M6;M 43;M42;M5 9	DHPNPKGFCDLKGKY VQIPTTCAND	M31;M63;M43;M42;M39;M 31;M63;M43;M42;M39
1921	FLMDLEGKQGNFKNL REFVFKNIDG	M54;M6;M 43;M42;M5 9	HPNPKGFCDLKGKYV QIPTTCANDP	M31;M63;M43;M42;M39;M 31;M63;M43;M42;M39
1922	MDLEGKQGNFKNLRE FVFKNIDGYF	M54;M6;M 43;M42;M5 9	HIDHPNPKGFCDLKG KYVQIPTTCA	M31;M63;M43;M42;M39;M 31;M63;M43;M42;M39
1923	DAGFIKQYGDCLGDIA ARDLICAQK	M21;M70; M48;M50; M27	DIEVTGDSCNNYMLT YNKVENMTPR	M8;M15;M52;M11;M47;M8; M15;M52;M11;M47
1924	MKDLSPRWYFYYLGT GPEAGLPYGA	M32;M31; M6;M68;M 52	VLSTFISAARQGFVDS DVETKDVVE	M16;M70;M33;M18;M63;M 16;M70;M33;M18;M63
1925	KDLSPRWYFYYLGTG PEAGLPYGAN	M32;M31; M6;M68;M 52	NVLSTFISAARQGFVD SDVETKDVV	M16;M70;M33;M18;M63;M 16;M70;M33;M18;M63
1926	KMKDLSPRWYFYYLG TGPEAGLPYG	M32;M31; M6;M68;M 52	AGGIVAIVVTCLAYY FMRFRRAFGE	M71;M6;M62;M22;M59;M7 1;M6;M62;M22;M59
1927	GKMKDLSPRWYFYYL GTGPEAGLPY	M32;M31; M6;M68;M 52	KLTCATTRQVVNVVT TKIALKGGKI	M64;M40;M29;M2;M22;M6 4;M40;M29;M2;M22
1928	DLSPRWYFYYLGTGPE AGLPYGANK	M32;M31; M6;M68;M 52	TCATTRQVVNVVTTK IALKGGKIVN	M64;M40;M29;M2;M22;M6 4;M40;M29;M2;M22
1929	SEFRVYSSANNCTFEY VSQPFLMDL	M64;M5;M 48;M82;M2 0	ATTRQVVNVVTTKIA LKGGKIVNNW	M64;M40;M29;M2;M22;M6 4;M40;M29;M2;M22
1930	QSLENVAFNVVNKGH FDGQQGEVPV	M71;M24; M16;M27; M15	FKLTCATTRQVVNVV TTKIALKGGK	M64;M40;M29;M2;M22;M6 4;M40;M29;M2;M22
1931	LQSLENVAFNVVNKG HFDGQQGEVP	M71;M24; M16;M27; M15	CATTRQVVNVVTTKI ALKGGKIVNN	M64;M40;M29;M2;M22;M6 4;M40;M29;M2;M22

1932	SHRFYRLANECAQVLSEMVMCGGSL	M28;M79;M42;M43;M46	LTCATTRQVVNVVTTKIALKGGKIV	M64;M40;M29;M2;M22;M64;M40;M29;M2;M22
1933	GCVIAWNSNNLDSKVGGNYNYLYRL	M32;M48;M50;M68;M26	VEKKKLDGFMGRIRSVYPVASPNEC	M58;M29;M6;M68;M26;M58;M29;M6;M68;M26
1934	HEETIYNLLKDCPAVAKHDFFKFRI	M40;M30;M41;M42;M11	EKKKLDGFMGRIRSVYPVASPNECN	M58;M29;M6;M68;M26;M58;M29;M6;M68;M26
1935	EETIYNLLKDCPAVAKHDFFKFRID	M40;M30;M41;M42;M11	KKLDGFMGRIRSVYPVASPNECNQM	M58;M29;M6;M68;M26;M58;M29;M6;M68;M26
1936	SLVLARKHTTCCSLSHRFYRLANEC	M81;M5;M60;M2;M79	KKKLDGFMGRIRSVYPVASPNECNQ	M58;M29;M6;M68;M26;M58;M29;M6;M68;M26
1937	LVLARKHTTCCSLSHRFYRLANECA	M81;M5;M60;M2;M79	AQVAKSHNIALIWNVKDFMSLSEQL	M32;M1;M37;M72;M68;M32;M1;M37;M72;M68
1938	FFKFRIDGDMVPHISRQRLTKYTMA	M71;M24;M55;M10;M26	NAQVAKSHNIALIWNVKDFMSLSEQ	M32;M1;M37;M72;M68;M32;M1;M37;M72;M68
1939	FKFRIDGDMVPHISRQRLTKYTMAD	M71;M24;M55;M10;M26	EYYHTTDPSFLGRYMSALNHTKKWK	M66;M1;M25;M37;M33;M66;M1;M25;M37;M33
1940	FRIDGDMVPHISRQRLTKYTMADLV	M71;M24;M55;M10;M26	DAVIKTLQPVSELLTPLGIDLDEWS	M78;M45;M79;M49;M82;M78;M45;M79;M49;M82
1941	RIDGDMVPHISRQRLTKYTMADLVY	M71;M24;M55;M10;M26	ADAVIKTLQPVSELLTPLGIDLDEW	M78;M45;M79;M49;M82;M78;M45;M79;M49;M82
1942	DFFKFRIDGDMVPHISRQRLTKYTM	M71;M24;M55;M10;M26	VADAVIKTLQPVSELLTPLGIDLDE	M78;M45;M79;M49;M82;M78;M45;M79;M49;M82
1943	KFRIDGDMVPHISRQRLTKYTMADL	M71;M24;M55;M10;M26	WEIQQVVDADSKIVQLSEISMDNSP	M64;M54;M7;M60;M22;M64;M54;M7;M60;M22
1944	RIMASLVLARKHTTCCSLSHRFYRL	M81;M5;M60;M2;M35	KFKEGVEFLRDGWEIVKFISTCACE	M4;M74;M49;M22;M20;M4;M74;M49;M22;M20
1945	IMASLVLARKHTTCCSLSHRFYRLA	M81;M5;M60;M2;M35	PSVEQRKQDDKKIKACVEEVTTTLE	M28;M65;M60;M74;M67;M28;M65;M60;M74;M67
1946	LRIMASLVLARKHTTCCSLSHRFYR	M81;M5;M60;M2;M35	HVMSKHTDFSSEIIGYKAIDGGVTR	M53;M48;M41;M43;M26;M53;M48;M41;M43;M26
1947	ASLVLARKHTTCCSLSHRFYRLANE	M81;M5;M60;M2;M35	MSKHTDFSSEIIGYKAIDGGVTRDI	M53;M48;M41;M43;M26;M53;M48;M41;M43;M26
1948	MASLVLARKHTTCCSLSHRFYRLAN	M81;M5;M60;M2;M35	DFSSEIIGYKAIDGGVTRDIASTDT	M53;M48;M41;M43;M26;M53;M48;M41;M43;M26
1949	YVRNLQHRLYECLYRNRDVDTDFVN	M2;M37;M35;M52;M47	TDFSSEIIGYKAIDGGVTRDIASTD	M53;M48;M41;M43;M26;M53;M48;M41;M43;M26
1950	KYVRNLQHRLYECLYRNRDVDTDFV	M2;M37;M35;M52;M47	SKHTDFSSEIIGYKAIDGGVTRDIA	M53;M48;M41;M43;M26;M53;M48;M41;M43;M26

1951	DKYVRNLQHRLYECL YRNRDVDTDF	M2;M37;M 35;M52;M4 7	VMSKHTDFSSEIIGYK AIDGGVTRD	M53;M48;M41;M43;M26;M 53;M48;M41;M43;M26
1952	CSNLLLQYGSFCTQLN RALTGIAVE	M13;M48; M41;M43; M20	FSSEIIGYKAIDGGVT RDIASTDTC	M53;M48;M41;M43;M26;M 53;M48;M41;M43;M26
1953	FLAFVVFLLVTLAILTA LRLCAYCC	M54;M60; M25;M46; M39	HTDFSSEIIGYKAIDG GVTRDIAST	M53;M48;M41;M43;M26;M 53;M48;M41;M43;M26
1954	LLFLAFVVFLLVTLAIL TALRLCAY	M54;M60; M25;M46; M39	KHTDFSSEIIGYKAID GGVTRDIAS	M53;M48;M41;M43;M26;M 53;M48;M41;M43;M26
1955	LFLAFVVFLLVTLAILT ALRLCAYC	M54;M60; M25;M46; M39	GSVAYESLRPDTRYV LMDGSIIQFP	M24;M7;M34;M50;M18;M2 4;M7;M34;M50;M18
1956	NARLRAKHYVYIGDP AQLPAPRTLL	M40;M31; M30;M37; M57	EGSVAYESLRPDTRY VLMDGSIIQF	M24;M7;M34;M50;M18;M2 4;M7;M34;M50;M18
1957	VIRGDEVRQIAPGQTG KIADYNYKL	M80;M38; M33;M67; M62	CYFGLFCLLNRYFRLT LGVYDYLVS	M56;M14;M60;M37;M18;M 56;M14;M60;M37;M18
1958	RGDEVRQIAPGQTGKI ADYNYKLPD	M80;M38; M33;M67; M62	FCTCYFGLFCLLNRYF RLTLGVYDY	M56;M14;M60;M37;M18;M 56;M14;M60;M37;M18
1959	FVIRGDEVRQIAPGQT GKIADYNYK	M80;M38; M33;M67; M62	YFGLFCLLNRYFRLTL GVYDYLVST	M56;M14;M60;M37;M18;M 56;M14;M60;M37;M18
1960	IRGDEVRQIAPGQTGKI ADYNYKLP	M80;M38; M33;M67; M62	FGLFCLLNRYFRLTLG VYDYLVSTQ	M56;M14;M60;M37;M18;M 56;M14;M60;M37;M18
1961	TLLPAADLDDFSKQLQ QSMSSADST	M71;M32; M58;M55; M53	TCYFGLFCLLNRYFRL TLGVYDYLV	M56;M14;M60;M37;M18;M 56;M14;M60;M37;M18
1962	LLPAADLDDFSKQLQQ SMSSADSTQ	M71;M32; M58;M55; M53	CTCYFGLFCLLNRYF RLTLGVYDYL	M56;M14;M60;M37;M18;M 56;M14;M60;M37;M18
1963	VTLLPAADLDDFSKQL QQSMSSADS	M71;M32; M58;M55; M53	ARRVWTLMNVLTLV YKVYYGNALDQ	M24;M1;M37;M41;M20;M2 4;M1;M37;M41;M20
1964	RLITGRLQSLQTYVTQ QLIRAAEIR	M34;M29; M49;M46; M22	SVIYLYLTFYLTNDVS FLAHIQWMV	M54;M58;M60;M48;M50;M 54;M58;M60;M48;M50
1965	LITGRLQSLQTYVTQQ LIRAAEIRA	M34;M29; M49;M46; M22	YSVIYLYLTFYLTNDV SFLAHIQWM	M54;M58;M60;M48;M50;M 54;M58;M60;M48;M50
1966	DRLITGRLQSLQTYVT QQLIRAAEI	M34;M29; M49;M46; M22	KGSLPINVIVFDGKSK CEESSAKSA	M56;M7;M50;M52;M26;M5 6;M7;M50;M52;M26
1967	DFVNEFYAYLRKHFS MMILSDDAVV	M71;M57; M18;M15; M35	GSLPINVIVFDGKSKC EESSAKSAS	M56;M7;M50;M52;M26;M5 6;M7;M50;M52;M26

1968	YDSMSYEDQDALFAYTKRNVIPTIT	M71;M55;M10;M53;M9	NTKGSLPINVIVFDGKSKCEESSAK	M56;M7;M50;M52;M26;M56;M7;M50;M52;M26
1969	NSAIGKIQDSLSSTASALGKLQDVV	M40;M64;M29;M79;M22	TKGSLPINVIVFDGKSKCEESSAKS	M56;M7;M50;M52;M26;M56;M7;M50;M52;M26
1970	FNSAIGKIQDSLSSTASALGKLQDV	M40;M64;M29;M79;M22	VAGGIVAIVVTCLAYYFMRFRRAFG	M60;M6;M62;M22;M59;M60;M6;M62;M22;M59
1971	QFNSAIGKIQDSLSSTASALGKLQD	M40;M64;M29;M79;M22	DVTKIKPHNSHEGKTFYVLPNDDTL	M1;M53;M74;M37;M42;M1;M53;M74;M37;M42
1972	NQFNSAIGKIQDSLSSTASALGKLQ	M40;M64;M29;M79;M22	ADVTKIKPHNSHEGKTFYVLPNDDT	M1;M53;M74;M37;M42;M1;M53;M74;M37;M42
1973	PVPEVKILNNLGVDIAANTVIWDYK	M11;M54;M57;M27;M9	VRSIFSRTLETAQNSVRVLQKAAIT	M54;M24;M34;M2;M9;M54;M24;M34;M2;M9
1974	NPDILRVYANLGERVRQALLKTVQF	M21;M32;M22;M49;M11	LFQHANLDSCKRVLNVVCKTCGQQQ	M58;M5;M2;M27;M15;M58;M5;M2;M27;M15
1975	KWYIRVGARKSAPLIELCVDEAGSK	M64;M40;M57;M22;M23	DCVSFCYMHHMELPTGVHAGTDLEG	M28;M18;M17;M43;M52;M28;M18;M17;M43;M52
1976	LQPRTFLLKYNENGTITDAVDCALD	M58;M24;M49;M15;M11	YDCVSFCYMHHMELPTGVHAGTDLE	M28;M18;M17;M43;M52;M28;M18;M17;M43;M52
1977	VSDIDYVPLKSATCITRCNLGGAVC	M34;M18;M43;M42;M39	NVYLAVFDKNLYDKLVSSFLEMKSE	M56;M55;M43;M42;M39;M56;M55;M43;M42;M39
1978	FAIGLALYYPSARIVYTACSHAAVD	M21;M5;M29;M38;M17	YIICISTKHFYWFFSNYLKRRVVFN	M24;M7;M50;M18;M23;M24;M7;M50;M18;M23
1979	AFELWAKRNIKPVPEVKILNNLGVD	M54;M66;M74;M49;M9	VEVEKGVLPQLEQPYVFIKRSDART	M13;M28;M66;M74;M15;M13;M28;M66;M74;M15
1980	FELWAKRNIKPVPEVKILNNLGVDI	M54;M66;M74;M49;M9	VLLSVLQQLRVESSSKLWAQCVQLH	M54;M34;M30;M82;M11;M54;M34;M30;M82;M11
1981	TLPKGIMMNVAKYTQLCQYLNTLTL	M73;M58;M78;M34;M11	VVLLSVLQQLRVESSSKLWAQCVQL	M54;M34;M30;M82;M11;M54;M34;M30;M82;M11
1982	DSYFVVKRHTFSNYQHEETIYNLLK	M71;M58;M34;M18;M20	VGDIILKPANNSLKITEEVGHTDLM	M28;M58;M34;M53;M26;M28;M58;M34;M53;M26
1983	VLNDILSRLDKVEAEVQIDRLITGR	M58;M53;M50;M17;M15	ARTVYDDGARRVWTLMNVLTLVYKV	M5;M2;M52;M47;M20;M5;M2;M52;M47;M20
1984	SVLNDILSRLDKVEAEVQIDRLITG	M58;M53;M50;M17;M15	TIEVNSFSGYLKLTDNVYIKNADIV	M38;M8;M9;M47;M23;M38;M8;M9;M47;M23

1985	ISSVLNDILSRLDKVEA EVQIDRLI	M58;M53; M50;M17; M15	EVNSFSGYLKLTDNV YIKNADIVEE	M38;M8;M9;M47;M23;M38; M8;M9;M47;M23
1986	SSVLNDILSRLDKVEA EVQIDRLIT	M58;M53; M50;M17; M15	IEVNSFSGYLKLTDNV YIKNADIVE	M38;M8;M9;M47;M23;M38; M8;M9;M47;M23
1987	AISSVLNDILSRLDKVE AEVQIDRL	M58;M53; M50;M17; M15	TLQQIELKFNPPALQD AYYRARAGE	M75;M73;M58;M48;M74;M 75;M73;M58;M48;M74
1988	IVVFDEISMATNYDLS VVNARLRAK	M25;M50; M18;M33; M26	LTLQQIELKFNPPALQ DAYYRARAG	M75;M73;M58;M48;M74;M 75;M73;M58;M48;M74
1989	VFDEISMATNYDLSVV NARLRAKHY	M25;M50; M18;M33; M26	GVLTAVVIPTKKAGG TTEMLAKALR	M58;M16;M53;M67;M17;M 58;M16;M53;M67;M17
1990	VVFDEISMATNYDLSV VNARLRAKH	M25;M50; M18;M33; M26	KDGTCGLVEVEKGVL PQLEQPYVFI	M13;M28;M66;M74;M9;M1 3;M28;M66;M74;M9
1991	CDGGSLYVNKHAFHT PAFDKSAFVN	M56;M73; M58;M50; M11	GTCGLVEVEKGVLPQ LEQPYVFIKR	M13;M28;M66;M74;M9;M1 3;M28;M66;M74;M9
1992	DGGSLYVNKHAFHTP AFDKSAFVNL	M56;M73; M58;M50; M11	DGTCGLVEVEKGVLP QLEQPYVFIK	M13;M28;M66;M74;M9;M1 3;M28;M66;M74;M9
1993	LSNLNLPGCDGGSLYV NKHAFHTPA	M56;M73; M58;M50; M11	ARQHLKDGTCGLVEV EKGVLPQLEQ	M13;M28;M24;M74;M9;M1 3;M28;M24;M74;M9
1994	SNLNLPGCDGGSLYV NKHAFHTPAF	M56;M73; M58;M50; M11	RQHLKDGTCGLVEVE KGVLPQLEQP	M13;M28;M24;M74;M9;M1 3;M28;M24;M74;M9
1995	EGVFVSNGTHWFVTQ RNFYEPQIIT	M24;M31; M50;M18; M35	EARQHLKDGTCGLVE VEKGVLPQLE	M13;M28;M24;M74;M9;M1 3;M28;M24;M74;M9
1996	YGDCLGDIAARDLICA QKFNGLTVL	M58;M78; M65;M79; M50	EVVLKKLKKSLNVAK SEFDRDAAMQ	M32;M28;M74;M33;M68;M 32;M28;M74;M33;M68
1997	QYGDCLGDIAARDLIC AQKFNGLTV	M58;M78; M65;M79; M50	VVLKKLKKSLNVAKS EFDRDAAMQR	M32;M28;M74;M33;M68;M 32;M28;M74;M33;M68
1998	KQYGDCLGDIAARDLI CAQKFNGLT	M58;M78; M65;M79; M50	SEVVLKKLKKSLNVA KSEFDRDAAM	M32;M28;M74;M33;M68;M 32;M28;M74;M33;M68
1999	ARKHTTCCSLSHRFYR LANECAQVL	M5;M60;M 79;M43;M4 2	VLKKLKKSLNVAKSE FDRDAAMQRK	M32;M28;M74;M33;M68;M 32;M28;M74;M33;M68
2000	FHLYLQYIRKLHDELT GHMLDMYSV	M32;M52; M38;M46; M9	KLKKSLNVAKSEFDR DAAMQRKLEK	M32;M28;M50;M33;M68;M 32;M28;M50;M33;M68
2001	VFHLYLQYIRKLHDEL TGHMLDMYS	M32;M52; M38;M46; M9	NIVTRCLNRVCTNYM PYFFTLLLQL	M64;M6;M37;M69;M20;M6 4;M6;M37;M69;M20

2002	FDGRVDGQVDLFRNARNGVLITEGS	M10;M33;M41;M43;M42	TTTNIVTRCLNRVCTNYMPYFFTLL	M64;M6;M37;M69;M20;M64;M6;M37;M69;M20
2003	VDGQVDLFRNARNGVLITEGSVKGL	M10;M33;M41;M43;M42	IVTRCLNRVCTNYMPYFFTLLLQLC	M64;M6;M37;M69;M20;M64;M6;M37;M69;M20
2004	RVDGQVDLFRNARNGVLITEGSVKG	M10;M33;M41;M43;M42	TNIVTRCLNRVCTNYMPYFFTLLLQ	M64;M6;M37;M69;M20;M64;M6;M37;M69;M20
2005	DGRVDGQVDLFRNARNGVLITEGSV	M10;M33;M41;M43;M42	TTNIVTRCLNRVCTNYMPYFFTLLL	M64;M6;M37;M69;M20;M64;M6;M37;M69;M20
2006	GRVDGQVDLFRNARNGVLITEGSVK	M10;M33;M41;M43;M42	KGTHHWLLLTILTSLLVLVQSTQWS	M52;M42;M43;M46;M39;M52;M42;M43;M46;M39
2007	SINFVRIIMRLWLCWKCRSKNPLLY	M75;M24;M76;M9;M23	GTHHWLLLTILTSLLVLVQSTQWSL	M52;M42;M43;M46;M39;M52;M42;M43;M46;M39
2008	QSINFVRIIMRLWLCWKCRSKNPLL	M75;M24;M76;M9;M23	TFFPDLNGDVVAIDYKHYTPSFKKG	M7;M60;M37;M69;M82;M7;M60;M37;M69;M82
2009	FNKKDWYDFVENPDILRVYANLGER	M21;M32;M43;M49;M42	PDLNGDVVAIDYKHYTPSFKKGAKL	M7;M60;M37;M69;M82;M7;M60;M37;M69;M82
2010	THWFVTQRNFYEPQIITTDNTFVSG	M64;M5;M79;M9;M23	FPDLNGDVVAIDYKHYTPSFKKGAK	M7;M60;M37;M69;M82;M7;M60;M37;M69;M82
2011	YDHVISTSHKLVLSVNPYVCNAPGC	M64;M24;M10;M9;M23	DLNGDVVAIDYKHYTPSFKKGAKLL	M7;M60;M37;M69;M82;M7;M60;M37;M69;M82
2012	CYDHVISTSHKLVLSVNPYVCNAPG	M64;M24;M10;M9;M23	FFPDLNGDVVAIDYKHYTPSFKKGA	M7;M60;M37;M69;M82;M7;M60;M37;M69;M82
2013	RRPFLCCKCCYDHVISTSHKLVLSV	M32;M24;M10;M9;M23	LNGDVVAIDYKHYTPSFKKGAKLLH	M7;M60;M37;M69;M82;M7;M60;M37;M69;M82
2014	IRRPFLCCKCCYDHVISTSHKLVLS	M32;M24;M10;M9;M23	VAYFNMVYMPASWVMRIMTWLDMVD	M52;M83;M15;M46;M39;M52;M83;M15;M46;M39
2015	YFLQSINFVRIIMRLWLCWKCRSKN	M75;M24;M10;M9;M23	AYFNMVYMPASWVMRIMTWLDMVDT	M52;M83;M15;M46;M39;M52;M83;M15;M46;M39
2016	DDIVKTDGTLMIERFVSLAIDAYPL	M4;M10;M1;M5;M2;M3	VSSFLEMKSEKQVEQKIAEIPKEEV	M31;M25;M34;M74;M39;M31;M25;M34;M74;M39
2017	SANNCTFEYVSQPFLMDLEGKQGNF	M4;M1;M3;M57;M36;M20	YNRYLALYNKYKYFSGAMDTTSYRE	M66;M31;M55;M67;M20;M66;M31;M55;M67;M20
2018	ANNCTFEYVSQPFLMDLEGKQGNFK	M4;M1;M3;M57;M36;M20	QYNRYLALYNKYKYFSGAMDTTSYR	M66;M31;M55;M67;M20;M66;M31;M55;M67;M20

2019	SSANNCTFEYVSQPFLMDLEGKQGN	M4;M1;M3;M57;M36;M20	GRWVLNNDYYRSLPGVFCGVDAVNL	M34;M33;M43;M42;M39;M34;M33;M43;M42;M39
2020	PRTLLTKGTLEPEYFNSVCRLMKTI	M4;M13;M16;M1;M3;M6	RWVLNNDYYRSLPGVFCGVDAVNLL	M34;M33;M43;M42;M39;M34;M33;M43;M42;M39
2021	AQLPAPRTLLTKGTLEPEYFNSVCR	M4;M58;M1;M29;M3;M6	KGEDIQLLKSAYENFNQHEVLLAPL	M32;M28;M60;M38;M68;M32;M28;M60;M38;M68
2022	QLPAPRTLLTKGTLEPEYFNSVCRL	M4;M58;M1;M29;M3;M6	NKGEDIQLLKSAYENFNQHEVLLAP	M32;M28;M60;M38;M68;M32;M28;M60;M38;M68
2023	WHHSIGFDYVYNPFMIDVQQWGFTG	M4;M1;M3;M57;M43;M20	VQSKMSDVKCTSVVLLSVLQQLRVE	M40;M56;M54;M29;M22;M40;M56;M54;M29;M22
2024	YACWHHSIGFDYVYNPFMIDVQQWG	M4;M1;M3;M57;M43;M20	SKMSDVKCTSVVLLSVLQQLRVESS	M40;M56;M54;M29;M22;M40;M56;M54;M29;M22
2025	CWHHSIGFDYVYNPFMIDVQQWGFT	M4;M1;M3;M57;M43;M20	QSKMSDVKCTSVVLLSVLQQLRVES	M40;M56;M54;M29;M22;M40;M56;M54;M29;M22
2026	HHSIGFDYVYNPFMIDVQQWGFTGN	M4;M1;M3;M57;M43;M20	KGFCDLKGKYVQIPTTCANDPVGFT	M40;M31;M30;M43;M42;M40;M31;M30;M43;M42
2027	ACWHHSIGFDYVYNPFMIDVQQWGF	M4;M1;M3;M57;M43;M20	GFCDLKGKYVQIPTTCANDPVGFTL	M40;M31;M30;M43;M42;M40;M31;M30;M43;M42
2028	VDSSQGSEYDYVIFTQTTETAHSCN	M4;M64;M3;M51;M22;M23	FCDLKGKYVQIPTTCANDPVGFTLK	M40;M31;M30;M43;M42;M40;M31;M30;M43;M42
2029	SSQGSEYDYVIFTQTTETAHSCNVN	M4;M64;M3;M51;M22;M23	PKGFCDLKGKYVQIPTTCANDPVGF	M40;M31;M30;M43;M42;M40;M31;M30;M43;M42
2030	DSSQGSEYDYVIFTQTTETAHSCNV	M4;M64;M3;M51;M22;M23	CDLKGKYVQIPTTCANDPVGFTLKN	M40;M31;M30;M43;M42;M40;M31;M30;M43;M42
2031	FHPLADNKFALTCFSTQFAFACPDG	M4;M21;M14;M3;M6;M22	SWLMWLIINLVQMAPISAMVRMYIF	M9;M73;M55;M50;M11;M9;M73;M55;M50;M11
2032	KWADNNCYLATALLTLQQIELKFNP	M4;M51;M3;M4;M51;M3	LTAVVIPTKKAGGTTEMLAKALRKV	M58;M16;M78;M53;M17;M58;M16;M78;M53;M17
2033	WADNNCYLATALLTLQQIELKFNPP	M4;M51;M3;M4;M51;M3	VLTAVVIPTKKAGGTTEMLAKALRK	M58;M16;M78;M53;M17;M58;M16;M78;M53;M17
2034	DNNCYLATALLTLQQIELKFNPPAL	M4;M51;M3;M4;M51;M3	HVVGPNVNKGEDIQLLKSAYENFNQ	M77;M32;M28;M60;M68;M77;M32;M28;M60;M68
2035	SIKWADNNCYLATALLTLQQIELKF	M4;M51;M3;M4;M51;M3	TQYNRYLALYNKYKYFSGAMDTTSY	M31;M55;M67;M27;M20;M31;M55;M67;M27;M20

2036	ADNNCYLATALLTLQQIELKFNPPA	M4;M51;M3;M4;M51;M3	LTQYNRYLALYNKYKYFSGAMDTTS	M55;M67;M27;M42;M20;M55;M67;M27;M42;M20
2037	IKWADNNCYLATALLTLQQIELKFN	M4;M51;M3;M4;M51;M3	YHNESGLKTILRKGGRTIAFGGCVF	M13;M58;M16;M53;M17;M13;M58;M16;M53;M17
2038	ITNLCPFGEVFNATRFASVYAWNRK	M4;M58;M3;M2;M17;M20	LAEYHNESGLKTILRKGGRTIAFGG	M13;M58;M16;M53;M17;M13;M58;M16;M53;M17
2039	PLADNKFALTCFSTQFAFACPDGVK	M4;M21;M3;M6;M33;M22	AEYHNESGLKTILRKGGRTIAFGGC	M13;M58;M16;M53;M17;M13;M58;M16;M53;M17
2040	YRNRDVDTDFVNEFYAYLRKHFSMM	M4;M71;M6;M3;M26;M59	EYHNESGLKTILRKGGRTIAFGGCV	M13;M58;M16;M53;M17;M13;M58;M16;M53;M17
2041	RNRDVDTDFVNEFYAYLRKHFSMMI	M4;M71;M6;M3;M26;M59	MWLIINLVQMAPISAMVRMYIFFAS	M9;M73;M55;M11;M23;M9;M73;M55;M11;M23
2042	ISNCVADYSVLYNSASFSTFKCYGV	M73;M7;M3;M15;M11;M44	QTMLFTMLRKLDNDALNNIINNARD	M16;M43;M15;M52;M9;M16;M43;M15;M52;M9
2043	FFSNYLKRRVVFNGVSFSTFEEAAL	M4;M3;M6;M4;M3;M6	MQTMLFTMLRKLDNDALNNIINNAR	M16;M43;M15;M52;M9;M16;M43;M15;M52;M9
2044	FSNYLKRRVVFNGVSFSTFEEAALC	M4;M3;M6;M4;M3;M6	PYIVGDVVQEGVLTAVVIPTKKAGG	M29;M38;M61;M67;M27;M29;M38;M61;M67;M27
2045	NCVADYSVLYNSASFSTFKCYGVSP	M73;M3;M41;M15;M11;M44	YIVGDVVQEGVLTAVVIPTKKAGGT	M29;M38;M61;M67;M27;M29;M38;M61;M67;M27
2046	SNCVADYSVLYNSASFSTFKCYGVS	M73;M3;M41;M15;M11;M44	TGTGQAITVTPEANMDQESFGGASC	M24;M78;M34;M29;M49;M24;M78;M34;M29;M49
2047	CVADYSVLYNSASFSTFKCYGVSPT	M73;M3;M41;M15;M11;M44	DSCNNYMLTYNKVENMTPRDLGACI	M53;M74;M15;M52;M11;M53;M74;M15;M52;M11
2048	VLKSEDAQGMDNLACEDLKPVSEEV	M1;M3;M37;M1;M3;M37	LFDESGEFKLASHMYCSFYPPDEDE	M16;M20;M15;M52;M23;M16;M20;M15;M52;M23
2049	LTGYKKPASRELKVTFFPDLNGDVV	M57;M63;M3;M57;M63;M3	FDESGEFKLASHMYCSFYPPDEDEE	M16;M20;M15;M52;M23;M16;M20;M15;M52;M23
2050	TSKFYGGWHNMLKTVYSDVENPHLM	M32;M6;M3;M18;M43;M59	YLFDESGEFKLASHMYCSFYPPDED	M16;M20;M15;M52;M23;M16;M20;M15;M52;M23
2051	YVLPNDDTLRVEAFEYYHTTDPSFL	M41;M3;M6;M41;M3;M6	YYLFDESGEFKLASHMYCSFYPPDE	M16;M20;M15;M52;M23;M16;M20;M15;M52;M23
2052	VLPNDDTLRVEAFEYYHTTDPSFLG	M41;M3;M6;M41;M3;M6	FLGRYMSALNHTKKWKYPQVNGLTS	M24;M5;M25;M74;M33;M24;M5;M25;M74;M33
2053	GHTDLMAAYVDNSSLTIKKPNELSR	M51;M63;M44;M51;M63;M44	LGRYMSALNHTKKWKYPQVNGLTSI	M24;M5;M25;M74;M33;M24;M5;M25;M74;M33

2054	DIAARDLICAQKFNGL TVLPPLLTD	M58;M78; M65;M10; M3;M79	VVDYGARFYFYTSKT TVASLINTLN	M40;M29;M41;M15;M47;M 40;M29;M41;M15;M47
2055	GDIAARDLICAQKFNG LTVLPPLLT	M58;M78; M65;M10; M3;M79	VDYGARFYFYTSKTT VASLINTLND	M40;M29;M41;M15;M47;M 40;M29;M41;M15;M47
2056	LGDIAARDLICAQKFN GLTVLPPLL	M58;M78; M65;M10; M3;M79	DYGARFYFYTSKTTV ASLINTLNDL	M40;M29;M41;M15;M47;M 40;M29;M41;M15;M47
2057	DKRAKVTSAMQTMLF TMLRKLDNDA	M52;M3;M 16;M52;M3 ;M16	EGVVDYGARFYFYTS KTTVASLINT	M40;M29;M41;M15;M47;M 40;M29;M41;M15;M47
2058	ATHGLAAVNSVPWDT IANYAKPFLN	M55;M54; M3;M55;M 54;M3	GVVDYGARFYFYTSK TTVASLINTL	M40;M29;M41;M15;M47;M 40;M29;M41;M15;M47
2059	NDVSFLAHIQWMVMF TPLVPFWITI	M30;M3;M 58;M30;M3 ;M58	QEAYEQAVANGDSE VVLKKLKKSLN	M13;M55;M53;M33;M59;M 13;M55;M53;M33;M59
2060	MFLARGIVFMCVEYCP IFFITGNTL	M22;M3;M 20;M22;M3 ;M20	KMLCTHTGTGQAITV TPEANMDQES	M24;M78;M34;M29;M9;M2 4;M78;M34;M29;M9
2061	PDVDLGDISGINASVV NIQKEIDRL	M28;M14; M70;M80; M45;M47	CDTFCAGSTFISDEVA RDLSLQFKR	M31;M70;M57;M35;M20;M 31;M70;M57;M35;M20
2062	VDLGDISGINASVVNI QKEIDRLNE	M28;M14; M70;M80; M45;M47	VNCDTFCAGSTFISDE VARDLSLQF	M31;M70;M57;M35;M20;M 31;M70;M57;M35;M20
2063	DVDLGDISGINASVVN IQKEIDRLN	M28;M14; M70;M80; M45;M47	NCDTFCAGSTFISDEV ARDLSLQFK	M31;M70;M57;M35;M20;M 31;M70;M57;M35;M20
2064	SPDVDLGDISGINASV VNIQKEIDR	M28;M14; M70;M80; M45;M47	MSALNHTKKWKYPQ VNGLTSIKWAD	M54;M24;M5;M60;M74;M5 4;M24;M5;M60;M74
2065	EDKRAKVTSAMQTML FTMLRKLDND	M52;M3;M 62;M52;M3 ;M62	YMSALNHTKKWKYP QVNGLTSIKWA	M54;M24;M5;M60;M74;M5 4;M24;M5;M60;M74
2066	EEVTTTLEETKFLTEN LLLYIDING	M50;M3;M 20;M50;M3 ;M20	SALNHTKKWKYPQV NGLTSIKWADN	M54;M24;M5;M60;M74;M5 4;M24;M5;M60;M74
2067	QLFFSYFAVHFISNSW LMWLIINLV	M9;M3;M2 3;M9;M3;M 23	DVVAIDYKHYTPSFK KGAKLLHKPI	M16;M37;M69;M27;M82;M 16;M37;M69;M27;M82
2068	LFFSYFAVHFISNSWL MWLIINLVQ	M9;M3;M2 3;M9;M3;M 23	VVAIDYKHYTPSFKK GAKLLHKPIV	M16;M37;M69;M27;M82;M 16;M37;M69;M27;M82
2069	FFSYFAVHFISNSWLM WLIINLVQM	M9;M3;M2 3;M9;M3;M 23	NGDVVAIDYKHYTPS FKKGAKLLHK	M16;M60;M37;M69;M82;M 16;M60;M37;M69;M82
2070	MQLFFSYFAVHFISNS WLMWLIINL	M9;M3;M2 3;M9;M3;M 23	ASFDNFKFVCDNIKFA DDLNQLTGY	M40;M64;M21;M22;M23;M 40;M64;M21;M22;M23

2071	FSYFAVHFISNSWLM WLIINLVQMA	M9;M3;M2 3;M9;M3;M 23	FDNFKFVCDNIKFAD DLNQLTGYKK	M40;M64;M21;M22;M23;M 40;M64;M21;M22;M23
2072	CIPYNSVTSSIVITSGD GTTSPISE	M12;M14; M29;M45; M62;M43	DNFKFVCDNIKFADD LNQLTGYKKP	M40;M64;M21;M22;M23;M 40;M64;M21;M22;M23
2073	PDKVFRSSVLHSTQDL FLPFFSNVT	M4;M1;M2 9;M6;M67; M72	SFDNFKFVCDNIKFAD DLNQLTGYK	M40;M64;M21;M22;M23;M 40;M64;M21;M22;M23
2074	NCTFEYVSQPFLMDLE GKQGNFKNL	M4;M1;M5 7;M36;M46 ;M20	PEEHFIETISLAGSYKD WSYSGQST	M64;M40;M32;M29;M68;M 64;M40;M32;M29;M68
2075	LTSHTVMPLSAPTLVP QEHYVRITG	M28;M54; M51;M69; M46;M39	LKPVLDWLEEKFKEG VEFLRDGWEI	M61;M57;M27;M9;M20;M6 1;M57;M27;M9;M20
2076	TSHTVMPLSAPTLVPQ EHYVRITGL	M28;M54; M51;M69; M46;M39	KLKPVLDWLEEKFKE GVEFLRDGWE	M61;M57;M27;M9;M20;M6 1;M57;M27;M9;M20
2077	LWLLWPVTLACFVLA AVYRINWITG	M58;M14; M70;M33; M63;M44	TAQNSVRVLQKAAITI LDGISQYSL	M56;M54;M24;M5;M9;M56; M54;M24;M5;M9
2078	WLLWPVTLACFVLAA VYRINWITGG	M58;M14; M70;M33; M63;M44	ETAQNSVRVLQKAAI TILDGISQYS	M56;M54;M24;M5;M9;M56; M54;M24;M5;M9
2079	WPVTLACFVLAAVYRI NWITGGIAI	M58;M14; M70;M33; M63;M44	GQPITNCVKMLCTHT GTGQAITVTP	M64;M21;M58;M22;M23;M 64;M21;M58;M22;M23
2080	LLWPVTLACFVLAAV YRINWITGGI	M58;M14; M70;M33; M63;M44	GKASCTLSEQLDFIDT KRGVYCCRE	M64;M74;M83;M27;M22;M 64;M74;M83;M27;M22
2081	LWPVTLACFVLAAVY RINWITGGIA	M58;M14; M70;M33; M63;M44	AKNTVKSVGKFCLEA SFNYLKSPNF	M24;M25;M43;M42;M9;M2 4;M25;M43;M42;M9
2082	VFTTVDNINLHTQVVD MSMTYGQQF	M51;M67; M6;M51;M 67;M6	IAKNTVKSVGKFCLE ASFNYLKSPN	M24;M25;M43;M42;M9;M2 4;M25;M43;M42;M9
2083	FTTVDNINLHTQVVD MSMTYGQQFG	M51;M67; M6;M51;M 67;M6	SAVKRTIKGTHHWLL LTILTSLLVL	M24;M42;M43;M52;M9;M2 4;M42;M43;M52;M9
2084	IKVFTTVDNINLHTQV VDMSMTYGQ	M51;M67; M6;M51;M 67;M6	DYDCVSFCYMHHME LPTGVHAGTDL	M18;M43;M17;M52;M9;M1 8;M43;M17;M52;M9
2085	TTVDNINLHTQVVDM SMTYGQQFGP	M51;M67; M6;M51;M 67;M6	SWVMRIMTWLDMVD TSLSGFKLKDC	M64;M75;M70;M83;M22;M 64;M75;M70;M83;M22
2086	TVDNINLHTQVVDMS MTYGQQFGPT	M51;M67; M6;M51;M 67;M6	VMRIMTWLDMVDTS LSGFKLKDCVM	M64;M75;M70;M83;M22;M 64;M75;M70;M83;M22
2087	KVFTTVDNINLHTQVV DMSMTYGQQ	M51;M67; M6;M51;M 67;M6	WVMRIMTWLDMVDT SLSGFKLKDCV	M64;M75;M70;M83;M22;M 64;M75;M70;M83;M22

2088	APFLYLYALVYFLQSINFVRIIMRL	M4;M19;M54;M12;M60;M25	IVEEAKKVKPTVVVNAANVYLKHGG	M56;M73;M18;M11;M23;M56;M73;M18;M11;M23
2089	LSSNFGAISSVLNDILSRLDKVEAE	M34;M6;M45;M48;M50;M17	DIVEEAKKVKPTVVVNAANVYLKHG	M56;M73;M18;M11;M23;M56;M73;M18;M11;M23
2090	VNALPETTADIVVFDEISMATNYDL	M28;M55;M7;M38;M48;M49	GLMLLEIKDTEKYCALAPNMMVTNN	M78;M65;M34;M82;M9;M78;M65;M34;M82;M9
2091	SETKCTLKSFTVEKGIYQTSNFRVQ	M75;M21;M14;M25;M63;M8	VKSREETGLLMPLKAPKEIIFLEGE	M54;M31;M60;M38;M27;M54;M31;M60;M38;M27
2092	QNCVLKLKVDTANPKTPKYKFVRIQ	M51;M7;M77;M51;M7;M77	SREETGLLMPLKAPKEIIFLEGETL	M54;M31;M60;M38;M27;M54;M31;M60;M38;M27
2093	GHSMQNCVLKLKVDTANPKTPKYKF	M51;M7;M77;M51;M7;M77	EETGLLMPLKAPKEIIFLEGETLPT	M54;M31;M60;M38;M27;M54;M31;M60;M38;M27
2094	MQNCVLKLKVDTANPKTPKYKFVRI	M51;M7;M77;M51;M7;M77	REETGLLMPLKAPKEIIFLEGETLP	M54;M31;M60;M38;M27;M54;M31;M60;M38;M27
2095	NCVLKLKVDTANPKTPKYKFVRIQP	M51;M7;M77;M51;M7;M77	KSREETGLLMPLKAPKEIIFLEGET	M54;M31;M60;M38;M27;M54;M31;M60;M38;M27
2096	SMQNCVLKLKVDTANPKTPKYKFVR	M51;M7;M77;M51;M7;M77	PTEVLTEEVVLKTGDLQPLEQPTSE	M58;M60;M38;M17;M62;M58;M60;M38;M17;M62
2097	HSMQNCVLKLKVDTANPKTPKYKFV	M51;M7;M77;M51;M7;M77	SEGLNDNLLEILQKEKVNINIVGDF	M24;M10;M61;M27;M9;M24;M10;M61;M27;M9
2098	IGHSMQNCVLKLKVDTANPKTPKYK	M51;M7;M77;M51;M7;M77	EGSEGLNDNLLEILQKEKVNINIVG	M24;M10;M61;M27;M9;M24;M10;M61;M27;M9
2099	TDQSSYIVDSVTVKNGSIHLYFDKA	M36;M12;M48;M36;M12;M48	VVGEGSEGLNDNLLEILQKEKVNIN	M24;M10;M61;M27;M9;M24;M10;M61;M27;M9
2100	DQSSYIVDSVTVKNGSIHLYFDKAG	M36;M12;M48;M36;M12;M48	EGLNDNLLEILQKEKVNINIVGDFK	M24;M10;M61;M27;M9;M24;M10;M61;M27;M9

Table 2Aii. Peptides and Alleles

	Set 1	**Set 1**
	Peptide	**Allele**
1	GEGSEGLNDNLLEILQKEKVNINIV	M24;M10;M61;M27;M9;M24;M10;M61;M27;M9
2	VGEGSEGLNDNLLEILQKEKVNINI	M24;M10;M61;M27;M9;M24;M10;M61;M27;M9
3	GSEGLNDNLLEILQKEKVNINIVGD	M24;M10;M61;M27;M9;M24;M10;M61;M27;M9
4	TGVVGEGSEGLNDNLLEILQKEKVN	M24;M10;M61;M27;M9;M24;M10;M61;M27;M9

5	GVVGEGSEGLNDNL LEILQKEKVNI	M24;M10;M61;M27;M9;M24;M10;M61;M27;M9
6	AVKRTIKGTHHWLL LTILTSLLVLV	M34;M42;M43;M52;M9;M34;M42;M43;M52;M9
7	KRTIKGTHHWLLLTI LTSLLVLVQS	M34;M42;M43;M52;M9;M34;M42;M43;M52;M9
8	VKRTIKGTHHWLLL TILTSLLVLVQ	M34;M42;M43;M52;M9;M34;M42;M43;M52;M9
9	VYMPASWVMRIMT WLDMVDTSLSGF	M32;M70;M83;M15;M52;M32;M70;M83;M15;M52
10	MVYMPASWVMRIM TWLDMVDTSLSG	M32;M70;M83;M15;M52;M32;M70;M83;M15;M52
11	NMVYMPASWVMRI MTWLDMVDTSLS	M32;M70;M83;M15;M52;M32;M70;M83;M15;M52
12	LDMCASLKELLQNG MNGRTILGSAL	M56;M24;M60;M50;M18;M56;M24;M60;M50;M18
13	GGRFVLALLSDLQD LKWARFPKSDG	M77;M32;M54;M70;M60;M77;M32;M54;M70;M60
14	PISAMVRMYIFFASF YYVWKSYVHV	M24;M20;M35;M9;M23;M24;M20;M35;M9;M23
15	ISAMVRMYIFFASFY YVWKSYVHVV	M24;M20;M35;M9;M23;M24;M20;M35;M9;M23
16	QTGIAVLDMCASLK ELLQNGMNGRT	M32;M24;M10;M60;M59;M32;M24;M10;M60;M59
17	TGIAVLDMCASLKE LLQNGMNGRTI	M32;M24;M10;M60;M59;M32;M24;M10;M60;M59
18	SAQTGIAVLDMCAS LKELLQNGMNG	M32;M24;M10;M60;M59;M32;M24;M10;M60;M59
19	AQTGIAVLDMCASL KELLQNGMNGR	M32;M24;M10;M60;M59;M32;M24;M10;M60;M59
20	LSAQTGIAVLDMCA SLKELLQNGMN	M32;M24;M10;M60;M59;M32;M24;M10;M60;M59
21	KGLDYKAFKQIVES CGNFKVTKGKA	M37;M42;M52;M47;M23;M37;M42;M52;M47;M23
22	VKGLDYKAFKQIVE SCGNFKVTKGK	M37;M42;M52;M47;M23;M37;M42;M52;M47;M23
23	LKLRSDVLLPLTQY NRYLALYNKYK	M53;M61;M69;M27;M20;M53;M61;M69;M27;M20
24	LRSDVLLPLTQYNR YLALYNKYKYF	M53;M61;M69;M27;M20;M53;M61;M69;M27;M20
25	KLRSDVLLPLTQYN RYLALYNKYKY	M53;M61;M69;M27;M20;M53;M61;M69;M27;M20
26	FVDDIVKTDGTLMI ERFVSLAIDAY	M4;M9;M10;M1;M5;M7;M2;M3;M6;M8;M11
27	LTKGTLEPEYFNSV CRLMKTIGPDM	M4;M13;M12;M14;M16;M19;M1;M3;M18;M17;M15
28	KGTLEPEYFNSVCR LMKTIGPDMFL	M4;M13;M12;M14;M16;M19;M3;M6;M18;M17;M15
29	QIYKTPPIKDFGGFN FSQILPDPSK	M4;M32;M28;M14;M31;M1;M29;M3;M33;M27;M35

30	IYKTPPIKDFGGFNF SQILPDPSKP	M4;M32;M28;M14;M31;M1;M29;M3;M33;M27;M35
31	GTLEPEYFNSVCRL MKTIGPDMFLG	M13;M12;M14;M16;M19;M5;M3;M6;M18;M17;M15
32	FTVEKGIYQTSNFRV QPTESIVRFP	M31;M1;M34;M30;M3;M37;M50;M41;M8;M39;M23
33	KSFTVEKGIYQTSNF RVQPTESIVR	M31;M1;M34;M30;M3;M37;M50;M41;M8;M39;M23
34	SFTVEKGIYQTSNFR VQPTESIVRF	M31;M1;M34;M30;M3;M37;M50;M41;M8;M39;M23
35	SFKELLVYAADPAM HAASGNLLLDK	M64;M12;M30;M48;M57;M33;M36;M8;M39;M44;M20
36	MAGNGGDAALALL LLDRLNQLESKM	M13;M56;M58;M16;M55;M10;M53;M51;M36;M17;M11
37	NGGDAALALLLLDR LNQLESKMSGK	M13;M56;M58;M16;M55;M10;M53;M51;M36;M17;M11
38	AGNGGDAALALLLL DRLNQLESKMS	M13;M56;M58;M16;M55;M10;M53;M51;M36;M17;M11
39	GNGGDAALALLLLD RLNQLESKMSG	M13;M56;M58;M16;M55;M10;M53;M51;M36;M17;M11
40	EKGIYQTSNFRVQPT ESIVRFPNIT	M31;M34;M30;M48;M37;M50;M51;M41;M8;M39;M23
41	RCPAEIVDTVSALV YDNKLKAHKDK	M12;M28;M16;M7;M29;M6;M38;M8;M17;M59;M23
42	TNAGDYILANTCTE RLKLFAAETLK	M56;M73;M19;M31;M6;M44;M18;M63;M8;M52;M47
43	NAGDYILANTCTER LKLFAAETLKA	M56;M73;M19;M31;M6;M44;M18;M63;M8;M52;M47
44	SSRLSFKELLVYAA DPAMHAASGNL	M64;M30;M48;M57;M36;M41;M49;M26;M22;M44;M20
45	PLNRNYVFTGYRVT KNSKVQIGEYT	M40;M14;M31;M24;M41;M8;M43;M42;M39;M9;M44
46	VFTGYRVTKNSKVQ IGEYTFEKGDY	M40;M14;M31;M24;M41;M8;M43;M42;M39;M9;M44
47	RNYVFTGYRVTKNS KVQIGEYTFEK	M40;M14;M31;M24;M41;M8;M43;M42;M39;M9;M44
48	NRNYVFTGYRVTK NSKVQIGEYTFE	M40;M14;M31;M24;M41;M8;M43;M42;M39;M9;M44
49	YVFTGYRVTKNSKV QIGEYTFEKGD	M40;M14;M31;M24;M41;M8;M43;M42;M39;M9;M44
50	LNRNYVFTGYRVTK NSKVQIGEYTF	M40;M14;M31;M24;M41;M8;M43;M42;M39;M9;M44
51	FTGYRVTKNSKVQI GEYTFEKGDYG	M40;M14;M31;M24;M41;M8;M43;M42;M39;M9;M44
52	NYVFTGYRVTKNSK VQIGEYTFEKG	M40;M14;M31;M24;M41;M8;M43;M42;M39;M9;M44
53	WVYKQFDTYNLWN TFTRLQSLENVA	M71;M58;M14;M16;M19;M25;M34;M53;M17;M15;M39
54	VYKQFDTYNLWNT FTRLQSLENVAF	M71;M58;M14;M16;M19;M25;M34;M53;M17;M15;M39

55	EIPRRNVATLQAEN VTGLFKDCSKV	M28;M54;M29;M6;M45;M38;M27;M46;M39;M59;M20
56	LVKPSFYVYSRVKN LNSSRVPDLLV	M40;M71;M12;M54;M16;M60;M38;M33;M8;M46;M39
57	SLVKPSFYVYSRVK NLNSSRVPDLL	M40;M71;M12;M54;M16;M60;M38;M33;M8;M46;M39
58	DYNYKLPDDFTGCV IAWNSNNLDSK	M13;M32;M12;M14;M29;M38;M48;M67;M68;M49;M26
59	IPKDMTYRRLISMM GFKMNYQVNGY	M40;M58;M16;M25;M30;M44;M46;M43;M42;M39;M47
60	IKPVPEVKILNNLGV DIAANTVIWD	M11;M9;M54;M60;M48;M57;M27;M43;M42;M22;M44
61	NIKPVPEVKILNNLG VDIAANTVIW	M11;M9;M54;M60;M48;M57;M27;M43;M42;M22;M44
62	KRNIKPVPEVKILNN LGVDIAANTV	M11;M9;M54;M60;M48;M57;M27;M43;M42;M22;M44
63	RNIKPVPEVKILNNL GVDIAANTVI	M11;M9;M54;M60;M48;M57;M27;M43;M42;M22;M44
64	NFKDQVILLNKHID AYKTFPPTEPK	M56;M73;M14;M53;M44;M41;M17;M35;M52;M11;M47
65	FKDQVILLNKHIDA YKTFPPTEPKK	M56;M73;M14;M53;M44;M41;M17;M35;M52;M11;M47
66	PNFKDQVILLNKHID AYKTFPPTEP	M56;M73;M14;M53;M44;M41;M17;M35;M52;M11;M47
67	GLALYYPSARIVYT ACSHAAVDALC	M64;M21;M28;M14;M5;M29;M38;M17;M49;M46;M22
68	KVSIWNLDYIINLIIK NLSKSLTEN	M56;M73;M28;M58;M16;M50;M18;M17;M15;M11;M44
69	WNLDYIINLIIKNLS KSLTENKYSQ	M56;M73;M28;M58;M16;M50;M18;M17;M15;M11;M44
70	IWNLDYIINLIIKNLS KSLTENKYS	M56;M73;M28;M58;M16;M50;M18;M17;M15;M11;M44
71	VSIWNLDYIINLIIKN LSKSLTENK	M56;M73;M28;M58;M16;M50;M18;M17;M15;M11;M44
72	SIWNLDYIINLIIKNL SKSLTENKY	M56;M73;M28;M58;M16;M50;M18;M17;M15;M11;M44
73	NMFITREEAIRHVRA WIGFDVEGCH	M64;M32;M14;M34;M48;M57;M46;M69;M42;M39;M20
74	PNMFITREEAIRHVR AWIGFDVEGC	M64;M32;M14;M34;M48;M57;M46;M69;M42;M39;M20
75	FITREEAIRHVRAWI GFDVEGCHAT	M64;M32;M14;M34;M48;M57;M46;M69;M42;M39;M20
76	ITREEAIRHVRAWIG FDVEGCHATR	M64;M32;M14;M34;M48;M57;M46;M69;M42;M39;M20
77	MFITREEAIRHVRA WIGFDVEGCHA	M64;M32;M14;M34;M48;M57;M46;M69;M42;M39;M20
78	AKRNIKPVPEVKILN NLGVDIAANT	M9;M54;M66;M60;M48;M57;M27;M43;M42;M22;M44
79	ADSNGTITVEELKK LLEQWNLVIGF	M4;M56;M58;M16;M55;M53;M6;M59;M17;M52;M47

80	PDDFTGCVIAWNSN NLDSKVGGNYN	M13;M32;M56;M12;M55;M48;M50;M67;M68;M49;M26
81	ITRFQTLLALHRSYL TPGDSSSGWT	M23;M21;M24;M70;M55;M5;M10;M2;M48;M9;M20
82	NITRFQTLLALHRSY LTPGDSSSGW	M23;M21;M24;M70;M55;M5;M10;M2;M48;M9;M20
83	KLNVGDYFVLTSHT VMPLSAPTLVP	M16;M55;M25;M34;M29;M18;M41;M43;M15;M42;M39
84	TTYKLNVGDYFVLT SHTVMPLSAPT	M16;M55;M25;M34;M29;M18;M41;M43;M15;M42;M39
85	YKLNVGDYFVLTSH TVMPLSAPTLV	M16;M55;M25;M34;M29;M18;M41;M43;M15;M42;M39
86	TYKLNVGDYFVLTS HTVMPLSAPTL	M16;M55;M25;M34;M29;M18;M41;M43;M15;M42;M39
87	SQGLVASIKNFKSVL YYQNNVFMSE	M21;M54;M55;M60;M48;M41;M68;M49;M26;M22;M23
88	ASQGLVASIKNFKS VLYYQNNVFMS	M21;M54;M55;M60;M48;M41;M68;M49;M26;M22;M23
89	STYASQGLVASIKNF KSVLYYQNNV	M64;M21;M54;M55;M60;M48;M68;M49;M26;M22;M23
90	YASQGLVASIKNFK SVLYYQNNVFM	M64;M21;M54;M55;M60;M48;M68;M49;M26;M22;M23
91	TYASQGLVASIKNF KSVLYYQNNVF	M64;M21;M54;M55;M60;M48;M68;M49;M26;M22;M23
92	WQPGVAMPNLYKM QRMLLEKCDLQN	M12;M24;M55;M10;M53;M17;M35;M52;M9;M47;M23
93	AWQPGVAMPNLYK MQRMLLEKCDLQ	M12;M24;M55;M10;M53;M17;M35;M52;M9;M47;M23
94	QPGVAMPNLYKMQ RMLLEKCDLQNY	M12;M24;M55;M10;M53;M17;M35;M52;M9;M47;M23
95	PGVAMPNLYKMQR MLLEKCDLQNYG	M12;M24;M55;M10;M53;M17;M35;M52;M9;M47;M23
96	TKGTLEPEYFNSVC RLMKTIGPDMF	M4;M13;M12;M14;M16;M19;M1;M3;M6;M18;M17;M15
97	LLTKGTLEPEYFNSV CRLMKTIGPD	M4;M13;M12;M14;M16;M19;M1;M3;M6;M18;M17;M15
98	YKTPPIKDFGGFNFS QILPDPSKPS	M4;M32;M28;M14;M31;M1;M34;M29;M3;M33;M27;M35
99	KTPPIKDFGGFNFSQ ILPDPSKPSK	M4;M32;M28;M14;M31;M1;M34;M29;M3;M33;M27;M35
100	TVEKGIYQTSNFRV QPTESIVRFPN	M31;M1;M34;M30;M3;M37;M50;M51;M41;M8;M39;M23
101	SKCVCSVIDLLLDDF VEIIKSQDLS	M4;M52;M14;M16;M3;M48;M18;M8;M43;M15;M35;M47
102	KCVCSVIDLLLDDF VEIIKSQDLSV	M4;M52;M14;M16;M3;M48;M18;M8;M43;M15;M35;M47
103	CVCSVIDLLLDDFVE IIKSQDLSVV	M4;M52;M14;M16;M3;M48;M18;M8;M43;M15;M35;M47
104	SEDAQGMDNLACE DLKPVSEEVVEN	M4;M1;M3;M45;M37;M49;M4;M1;M3;M45;M37;M49

105	EDAQGMDNLACED LKPVSEEVVENP	M4;M1;M3;M45;M37;M49;M4;M1;M3;M45;M37;M49
106	DAQGMDNLACEDL KPVSEEVVENPT	M4;M1;M3;M45;M37;M49;M4;M1;M3;M45;M37;M49
107	YMGTLSYEQFKKG VQIPCTCGKQAT	M4;M16;M1;M3;M37;M52;M4;M16;M1;M3;M37;M52
108	MYMGTLSYEQFKK GVQIPCTCGKQA	M4;M16;M1;M3;M37;M52;M4;M16;M1;M3;M37;M52
109	VMYMGTLSYEQFK KGVQIPCTCGKQ	M4;M16;M1;M3;M37;M52;M4;M16;M1;M3;M37;M52
110	MGTLSYEQFKKGV QIPCTCGKQATK	M4;M16;M1;M3;M37;M52;M4;M16;M1;M3;M37;M52
111	VQLTSQWLTNIFGT VYEKLKPVLDW	M4;M28;M31;M3;M45;M59;M4;M28;M31;M3;M45;M59
112	QLTSQWLTNIFGTV YEKLKPVLDWL	M4;M28;M31;M3;M45;M59;M4;M28;M31;M3;M45;M59
113	NICYTPSKLIEYTDF ATSACVLAAE	M4;M3;M48;M63;M41;M49;M4;M3;M48;M63;M41;M49
114	KKPASRELKVTFFP DLNGDVVAIDY	M21;M70;M3;M57;M36;M63;M21;M70;M3;M57;M36;M63
115	YKKPASRELKVTFF PDLNGDVVAID	M21;M70;M3;M57;M36;M63;M21;M70;M3;M57;M36;M63
116	KPASRELKVTFFPDL NGDVVAIDYK	M21;M70;M3;M57;M36;M63;M21;M70;M3;M57;M36;M63
117	SGVVTTVMFLARGI VFMCVEYCPIF	M12;M14;M29;M3;M22;M20;M12;M14;M29;M3;M22;M20
118	VLALLSDLQDLKW ARFPKSDGTGTI	M4;M77;M54;M70;M60;M3;M4;M77;M54;M70;M60;M3
119	RFVLALLSDLQDLK WARFPKSDGTG	M4;M77;M54;M70;M60;M3;M4;M77;M54;M70;M60;M3
120	FVLALLSDLQDLKW ARFPKSDGTGT	M4;M77;M54;M70;M60;M3;M4;M77;M54;M70;M60;M3
121	WPLIVTALRANSAV KLQNNELSPVA	M73;M60;M51;M39;M11;M44;M73;M60;M51;M39;M11;M44
122	PLIVTALRANSAVK LQNNELSPVAL	M73;M60;M51;M39;M11;M44;M73;M60;M51;M39;M11;M44
123	AWPLIVTALRANSA VKLQNNELSPV	M73;M60;M51;M39;M11;M44;M73;M60;M51;M39;M11;M44
124	CSVIDLLLDDFVEIIK SQDLSVVSK	M4;M52;M14;M16;M48;M18;M42;M8;M43;M15;M35;M47
125	TSLEIPRRNVATLQA ENVTGLFKDC	M28;M54;M60;M29;M2;M6;M45;M27;M46;M39;M59;M20
126	FTSLEIPRRNVATLQ AENVTGLFKD	M28;M54;M60;M29;M2;M6;M45;M27;M46;M39;M59;M20
127	QFTSLEIPRRNVATL QAENVTGLFK	M28;M54;M60;M29;M2;M6;M45;M27;M46;M39;M59;M20
128	SLEIPRRNVATLQAE NVTGLFKDCS	M28;M54;M60;M29;M2;M6;M45;M27;M46;M39;M59;M20
129	GGFNFSQILPDPSKP SKRSFIEDLL	M32;M14;M31;M7;M34;M29;M30;M33;M36;M27;M35;M22

130	FLGYFCTCYFGLFCL LNRYFRLTLG	M56;M60;M3;M6;M37;M18;M56;M60;M3;M6;M37;M18
131	LGYFCTCYFGLFCL LNRYFRLTLGV	M56;M60;M3;M6;M37;M18;M56;M60;M3;M6;M37;M18
132	IKDFGGFNFSQILPD PSKPSKRSFI	M32;M28;M14;M31;M34;M29;M30;M33;M36;M27;M35;M22
133	PIKDFGGFNFSQILP DPSKPSKRSF	M32;M28;M14;M31;M34;M29;M30;M33;M36;M27;M35;M22
134	SILSPLYAFASEAAR VVRSIFSRTL	M14;M6;M48;M45;M49;M22;M14;M6;M48;M45;M49;M22
135	CNSSTCMMCYKRN RATRVECTTIVN	M71;M14;M8;M39;M11;M44;M71;M14;M8;M39;M11;M44
136	YNYKLPDDFTGCVI AWNSNNLDSKV	M13;M32;M12;M14;M55;M29;M38;M48;M67;M68;M49;M26
137	SPLYAFASEAARVV RSIFSRTLETA	M14;M6;M48;M45;M49;M59;M14;M6;M48;M45;M49;M59
138	FAVHFISNSWLMWL IINLVQMAPIS	M11;M73;M3;M50;M9;M23;M11;M73;M3;M50;M9;M23
139	YYTSNPTTFHLDGE VITFDNLKTLL	M7;M48;M45;M50;M36;M49;M7;M48;M45;M50;M36;M49
140	VYYTSNPTTFHLDG EVITFDNLKTL	M7;M48;M45;M50;M36;M49;M7;M48;M45;M50;M36;M49
141	LPKEITVATSRTLSY YKLGASQRVA	M64;M56;M12;M70;M29;M6;M48;M33;M49;M46;M22;M23
142	DGCNSSTCMMCYK RNRATRVECTTI	M71;M55;M8;M39;M11;M44;M71;M55;M8;M39;M11;M44
143	VDGCNSSTCMMCY KRNRATRVECTT	M71;M55;M8;M39;M11;M44;M71;M55;M8;M39;M11;M44
144	LLLDDFVEIIKSQDL SVVSKVVKVT	M4;M52;M16;M48;M18;M42;M8;M43;M15;M35;M47;M23
145	LLDDFVEIIKSQDLS VVSKVVKVTI	M4;M52;M16;M48;M18;M42;M8;M43;M15;M35;M47;M23
146	DLLLDDFVEIIKSQD LSVVSKVVKV	M4;M52;M16;M48;M18;M42;M8;M43;M15;M35;M47;M23
147	KNNLPFKLTCATTR QVVNVVTTKIA	M21;M12;M19;M2;M33;M8;M21;M12;M19;M2;M33;M8
148	NNLPFKLTCATTRQ VVNVVTTKIAL	M21;M12;M19;M2;M33;M8;M21;M12;M19;M2;M33;M8
149	NSTVLSFCAFAVDA AKAYKDYLASG	M32;M12;M28;M48;M36;M69;M32;M12;M28;M48;M36;M69
150	LYAFASEAARVVRS IFSRTLETAQN	M4;M14;M6;M48;M42;M59;M4;M14;M6;M48;M42;M59
151	KPPPGDQFKHLIPLM YKGLPWNVVR	M56;M19;M12;M16;M54;M25;M34;M60;M18;M15;M39;M47
152	ALYYPSARIVYTAC SHAAVDALCEK	M64;M21;M28;M14;M5;M29;M38;M67;M17;M49;M46;M22
153	YYPSARIVYTACSH AAVDALCEKAL	M64;M21;M28;M14;M5;M29;M38;M67;M17;M49;M46;M22
154	LALYYPSARIVYTA CSHAAVDALCE	M64;M21;M28;M14;M5;M29;M38;M67;M17;M49;M46;M22

155	LYYPSARIVYTACS HAAVDALCEKA	M64;M21;M28;M14;M5;M29;M38;M67;M17;M49;M46;M22
156	FNGECPNFVFPLNSII KTIQPRVEK	M28;M19;M6;M61;M50;M72;M28;M19;M6;M61;M50;M72
157	TNNAMQVESDDYIA TNGPLKVGGSC	M19;M10;M29;M18;M11;M44;M19;M10;M29;M18;M11;M44
158	VLGSLAATVRLQAG NATEVPANSTV	M16;M55;M10;M53;M51;M17;M16;M55;M10;M53;M51;M17
159	MVLGSLAATVRLQ AGNATEVPANST	M16;M55;M10;M53;M51;M17;M16;M55;M10;M53;M51;M17
160	RSAAKKNNLPFKLT CATTRQVVNVV	M19;M12;M78;M25;M33;M8;M19;M12;M78;M25;M33;M8
161	IRSAAKKNNLPFKLT CATTRQVVNV	M19;M12;M78;M25;M33;M8;M19;M12;M78;M25;M33;M8
162	EQKSILSPLYAFASE AARVVRSIFS	M21;M6;M48;M45;M49;M22;M21;M6;M48;M45;M49;M22
163	NIGEQKSILSPLYAF ASEAARVVRS	M21;M6;M48;M45;M49;M22;M21;M6;M48;M45;M49;M22
164	IGEQKSILSPLYAFA SEAARVVRSI	M21;M6;M48;M45;M49;M22;M21;M6;M48;M45;M49;M22
165	GEQKSILSPLYAFAS EAARVVRSIF	M21;M6;M48;M45;M49;M22;M21;M6;M48;M45;M49;M22
166	NLKTLLSLREVRTIK VFTTVDNINL	M14;M29;M6;M72;M49;M26;M14;M29;M6;M72;M49;M26
167	LKTLLSLREVRTIKV FTTVDNINLH	M14;M29;M6;M72;M49;M26;M14;M29;M6;M72;M49;M26
168	REVGFVVPGLPGTIL RTTNGDFLHF	M64;M11;M12;M1;M6;M9;M64;M11;M12;M1;M6;M9
169	TREVGFVVPGLPGTI LRTTNGDFLH	M64;M11;M12;M1;M6;M9;M64;M11;M12;M1;M6;M9
170	EVRTIKVFTTVDNIN LHTQVVDMSM	M29;M51;M67;M43;M42;M26;M29;M51;M67;M43;M42;M26
171	PYFFTLLLQLCTFTR STNSRIKASM	M19;M25;M33;M8;M42;M39;M19;M25;M33;M8;M42;M39
172	YFFTLLLQLCTFTRS TNSRIKASMP	M19;M25;M33;M8;M42;M39;M19;M25;M33;M8;M42;M39
173	QLCTFTRSTNSRIKA SMPTTIAKNT	M14;M33;M8;M42;M39;M11;M14;M33;M8;M42;M39;M11
174	LQLCTFTRSTNSRIK ASMPTTIAKN	M14;M33;M8;M42;M39;M11;M14;M33;M8;M42;M39;M11
175	LLQLCTFTRSTNSRI KASMPTTIAK	M14;M33;M8;M42;M39;M11;M14;M33;M8;M42;M39;M11
176	RVSAKPPPGDQFKH LIPLMYKGLPW	M56;M19;M16;M54;M25;M34;M60;M18;M15;M52;M39;M47
177	AKPPPGDQFKHLIPL MYKGLPWNVV	M56;M19;M16;M54;M25;M34;M60;M18;M15;M52;M39;M47
178	VSAKPPPGDQFKHLI PLMYKGLPWN	M56;M19;M16;M54;M25;M34;M60;M18;M15;M52;M39;M47
179	SAKPPPGDQFKHLIP LMYKGLPWNV	M56;M19;M16;M54;M25;M34;M60;M18;M15;M52;M39;M47

180	KLVNKFLALCADSII IGGAKLKALN	M34;M45;M41;M67;M8;M39;M34;M45;M41;M67;M8;M39
181	LGTEVNEFACVVAD AVIKTLQPVSE	M14;M66;M25;M34;M8;M39;M14;M66;M25;M34;M8;M39
182	ELGTEVNEFACVVA DAVIKTLQPVS	M14;M66;M25;M34;M8;M39;M14;M66;M25;M34;M8;M39
183	TVELGTEVNEFACV VADAVIKTLQP	M14;M66;M25;M34;M8;M39;M14;M66;M25;M34;M8;M39
184	VELGTEVNEFACVV ADAVIKTLQPV	M14;M66;M25;M34;M8;M39;M14;M66;M25;M34;M8;M39
185	TLLLQLCTFTRSTNS RIKASMPTTI	M14;M25;M33;M8;M42;M39;M14;M25;M33;M8;M42;M39
186	MPNMLRIMASLVLA RKHTTCCSLSH	M56;M21;M12;M5;M30;M69;M41;M35;M46;M39;M22;M23
187	GLNGYTVEEAKTVL KKCKSAFYILP	M19;M78;M60;M45;M39;M9;M19;M78;M60;M45;M39;M9
188	VPYCYDTNVLEGSV AYESLRPDTRY	M12;M14;M5;M34;M29;M46;M12;M14;M5;M34;M29;M46
189	NYITTYPGQGLNGY TVEEAKTVLKK	M75;M70;M45;M63;M76;M39;M75;M70;M45;M63;M76;M39
190	FYVYANGGKGFCK LHNWNCVNCDTF	M45;M41;M42;M8;M43;M39;M45;M41;M42;M8;M43;M39
191	YANGGKGFCKLHN WNCVNCDTFCAG	M45;M41;M42;M8;M43;M39;M45;M41;M42;M8;M43;M39
192	ANGGKGFCKLHNW NCVNCDTFCAGS	M45;M41;M42;M8;M43;M39;M45;M41;M42;M8;M43;M39
193	VYANGGKGFCKLH NWNCVNCDTFCA	M45;M41;M42;M8;M43;M39;M45;M41;M42;M8;M43;M39
194	YVYANGGKGFCKL HNWNCVNCDTFC	M45;M41;M42;M8;M43;M39;M45;M41;M42;M8;M43;M39
195	DTANPKTPKYKFVR IQPGQTFSVLA	M40;M14;M34;M30;M29;M39;M40;M14;M34;M30;M29;M39
196	TANPKTPKYKFVRI QPGQTFSVLAC	M40;M14;M34;M30;M29;M39;M40;M14;M34;M30;M29;M39
197	ANPKTPKYKFVRIQ PGQTFSVLACY	M40;M14;M34;M30;M29;M39;M40;M14;M34;M30;M29;M39
198	NPKTPKYKFVRIQP GQTFSVLACYN	M40;M14;M34;M30;M29;M39;M40;M14;M34;M30;M29;M39
199	YYHTTDPSFLGRYM SALNHTKKWKY	M19;M66;M1;M25;M37;M33;M19;M66;M1;M25;M37;M33
200	YHTTDPSFLGRYMS ALNHTKKWKYP	M19;M66;M1;M25;M37;M33;M19;M66;M1;M25;M37;M33
201	LAKALRKVPTDNYI TTYPGQGLNGY	M14;M29;M48;M49;M15;M26;M14;M29;M48;M49;M15;M26
202	MLAKALRKVPTDN YITTYPGQGLNG	M14;M29;M48;M49;M15;M26;M14;M29;M48;M49;M15;M26
203	NFVFPLNSIIKTIQPR VEKKKLDGF	M28;M29;M6;M72;M62;M59;M28;M29;M6;M72;M62;M59
204	VFPLNSIIKTIQPRVE KKKLDGFMG	M28;M29;M6;M72;M62;M59;M28;M29;M6;M72;M62;M59

205	PNFVFPLNSIIKTIQP RVEKKKLDG	M28;M29;M6;M72;M62;M59;M28;M29;M6;M72;M62;M59
206	FVFPLNSIIKTIQPRV EKKKLDGFM	M28;M29;M6;M72;M62;M59;M28;M29;M6;M72;M62;M59
207	FPLNSIIKTIQPRVEK KKLDGFMGR	M28;M29;M6;M72;M62;M59;M28;M29;M6;M72;M62;M59
208	YCYDTNVLEGSVAY ESLRPDTRYVL	M12;M14;M5;M34;M18;M46;M12;M14;M5;M34;M18;M46
209	CYDTNVLEGSVAYE SLRPDTRYVLM	M12;M14;M5;M34;M18;M46;M12;M14;M5;M34;M18;M46
210	VKDFMSLSEQLRKQ IRSAAKKNNLP	M56;M19;M66;M25;M6;M18;M56;M19;M66;M25;M6;M18
211	DNLACEDLKPVSEE VVENPTIQKDV	M73;M45;M37;M50;M49;M44;M73;M45;M37;M50;M49;M44
212	MDNLACEDLKPVSE EVVENPTIQKD	M73;M45;M37;M50;M49;M44;M73;M45;M37;M50;M49;M44
213	DTNVLEGSVAYESL RPDTRYVLMDG	M12;M19;M34;M50;M18;M46;M12;M19;M34;M50;M18;M46
214	ASKIITLKKRWQLA LSKGVHFVCNL	M9;M58;M24;M55;M60;M74;M33;M27;M8;M17;M42;M82
215	SDVLLPLTQYNRYL ALYNKYKYFSG	M19;M14;M53;M69;M27;M20;M19;M14;M53;M69;M27;M20
216	VLEGSVAYESLRPD TRYVLMDGSII	M19;M24;M7;M34;M50;M18;M19;M24;M7;M34;M50;M18
217	LEGSVAYESLRPDT RYVLMDGSIIQ	M19;M24;M7;M34;M50;M18;M19;M24;M7;M34;M50;M18
218	EDLLIRKSNHNFLV QAGNVQLRVIG	M12;M24;M14;M70;M10;M9;M12;M24;M14;M70;M10;M9
219	NYEDLLIRKSNHNF LVQAGNVQLRV	M12;M24;M14;M70;M10;M9;M12;M24;M14;M70;M10;M9
220	YEDLLIRKSNHNFL VQAGNVQLRVI	M12;M24;M14;M70;M10;M9;M12;M24;M14;M70;M10;M9
221	IPGIPKDMTYRRLIS MMGFKMNYQV	M40;M58;M16;M31;M25;M34;M30;M43;M15;M42;M39;M47
222	VDIPGIPKDMTYRRL ISMMGFKMNY	M40;M58;M16;M31;M25;M34;M30;M43;M15;M42;M39;M47
223	DIPGIPKDMTYRRLI SMMGFKMNYQ	M40;M58;M16;M31;M25;M34;M30;M43;M15;M42;M39;M47
224	ADDLNQLTGYKKP ASRELKVTFFPD	M58;M19;M70;M53;M63;M15;M58;M19;M70;M53;M63;M15
225	AFEYYHTTDPSFLG RYMSALNHTKK	M1;M25;M29;M6;M37;M33;M1;M25;M29;M6;M37;M33
226	APNMMVTNNTFTL KGGAPTKVTFGD	M11;M12;M24;M10;M6;M9;M11;M12;M24;M10;M6;M9
227	PNLAWPLIVTALRA NSAVKLQNNEL	M73;M60;M46;M39;M11;M44;M73;M60;M46;M39;M11;M44
228	SPNLAWPLIVTALR ANSAVKLQNNE	M73;M60;M46;M39;M11;M44;M73;M60;M46;M39;M11;M44
229	NLAWPLIVTALRAN SAVKLQNNELS	M73;M60;M46;M39;M11;M44;M73;M60;M46;M39;M11;M44

230	EAFEYYHTTDPSFL GRYMSALNHTK	M1;M29;M6;M37;M33;M41;M1;M29;M6;M37;M33;M41
231	TTEVVGDIILKPANN SLKITEEVGH	M28;M58;M19;M34;M53;M26;M28;M58;M19;M34;M53;M26
232	EVVGDIILKPANNSL KITEEVGHTD	M28;M58;M19;M34;M53;M26;M28;M58;M19;M34;M53;M26
233	VVGDIILKPANNSLK ITEEVGHTDL	M28;M58;M19;M34;M53;M26;M28;M58;M19;M34;M53;M26
234	TEVVGDIILKPANNS LKITEEVGHT	M28;M58;M19;M34;M53;M26;M28;M58;M19;M34;M53;M26
235	KEGVEFLRDGWEIV KFISTCACEIV	M4;M21;M6;M74;M49;M22;M4;M21;M6;M74;M49;M22
236	WAKRNIKPVPEVKI LNNLGVDIAAN	M9;M54;M66;M60;M74;M48;M57;M27;M43;M49;M42;M22
237	MDNSPNLAWPLIVT ALRANSAVKLQ	M73;M60;M18;M39;M11;M44;M73;M60;M18;M39;M11;M44
238	KTPKYKFVRIQPGQ TFSVLACYNGS	M40;M14;M34;M29;M27;M39;M40;M14;M34;M29;M27;M39
239	PKTPKYKFVRIQPG QTFSVLACYNG	M40;M14;M34;M29;M27;M39;M40;M14;M34;M29;M27;M39
240	TSGRWVLNNDYYR SLPGVFCGVDAV	M34;M33;M43;M42;M39;M44;M34;M33;M43;M42;M39;M44
241	SGRWVLNNDYYRS LPGVFCGVDAVN	M34;M33;M43;M42;M39;M44;M34;M33;M43;M42;M39;M44
242	TSNSFDVLKSEDAQ GMDNLACEDLK	M64;M6;M41;M46;M39;M22;M64;M6;M41;M46;M39;M22
243	GLNNLNRGMVLGS LAATVRLQAGNA	M12;M16;M55;M10;M53;M17;M12;M16;M55;M10;M53;M17
244	VRQCSGVTFQSAVK RTIKGTHHWLL	M71;M19;M25;M33;M26;M9;M71;M19;M25;M33;M26;M9
245	PLTQYNRYLALYNK YKYFSGAMDTT	M19;M55;M67;M27;M42;M20;M19;M55;M67;M27;M42;M20
246	KLNEEIAIILASFSAS TSAFVETVK	M28;M38;M33;M43;M8;M42;M28;M38;M33;M43;M8;M42
247	ADQAMTQMYKQAR SEDKRAKVTSAM	M56;M19;M55;M25;M74;M18;M56;M19;M55;M25;M74;M18
248	MADQAMTQMYKQ ARSEDKRAKVTSA	M56;M19;M55;M25;M74;M18;M56;M19;M55;M25;M74;M18
249	KMADQAMTQMYK QARSEDKRAKVTS	M56;M19;M55;M25;M74;M18;M56;M19;M55;M25;M74;M18
250	LWSTKPVETSNSFD VLKSEDAQGMD	M64;M25;M6;M41;M39;M22;M64;M25;M6;M41;M39;M22
251	CVPLNIIPLTTAAKL MVVIPDYNTY	M14;M24;M38;M82;M57;M22;M14;M24;M38;M82;M57;M22
252	AVANGDSEVVLKK LKKSLNVAKSEF	M71;M13;M55;M1;M53;M17;M71;M13;M55;M1;M53;M17
253	VANGDSEVVLKKL KKSLNVAKSEFD	M71;M13;M55;M1;M53;M17;M71;M13;M55;M1;M53;M17
254	LNNDYYRSLPGVFC GVDAVNLLTNM	M25;M34;M45;M33;M43;M39;M25;M34;M45;M33;M43;M39

255	KIALKGGKIVNNWLKQLIKVTLVFL	M56;M12;M55;M57;M11;M20;M56;M12;M55;M57;M11;M20
256	TKIALKGGKIVNNWLKQLIKVTLVF	M56;M12;M55;M57;M11;M20;M56;M12;M55;M57;M11;M20
257	IALKGGKIVNNWLKQLIKVTLVFLF	M56;M12;M55;M57;M11;M20;M56;M12;M55;M57;M11;M20
258	TTKIALKGGKIVNNWLKQLIKVTLV	M56;M12;M55;M57;M11;M20;M56;M12;M55;M57;M11;M20
259	PCSVCLSGLDSLDTYPSLETIQITI	M21;M55;M34;M48;M41;M22;M21;M55;M34;M48;M41;M22
260	IPCSVCLSGLDSLDTYPSLETIQIT	M21;M55;M34;M48;M41;M22;M21;M55;M34;M48;M41;M22
261	CSVCLSGLDSLDTYPSLETIQITIS	M21;M55;M34;M48;M41;M22;M21;M55;M34;M48;M41;M22
262	SVCLSGLDSLDTYPSLETIQITISS	M21;M55;M34;M48;M41;M22;M21;M55;M34;M48;M41;M22
263	SIPCSVCLSGLDSLDTYPSLETIQI	M21;M55;M34;M48;M41;M22;M21;M55;M34;M48;M41;M22
264	GSIPCSVCLSGLDSLDTYPSLETIQ	M21;M55;M34;M48;M41;M22;M21;M55;M34;M48;M41;M22
265	VCLSGLDSLDTYPSLETIQITISSF	M21;M55;M34;M48;M41;M22;M21;M55;M34;M48;M41;M22
266	WVLNNDYYRSLPGVFCGVDAVNLLT	M34;M45;M33;M43;M42;M39;M34;M45;M33;M43;M42;M39
267	KLWAQCVQLHNDILLAKDTTEAFEK	M21;M32;M58;M36;M68;M22;M21;M32;M58;M36;M68;M22
268	LWAQCVQLHNDILLAKDTTEAFEKM	M21;M32;M58;M36;M68;M22;M21;M32;M58;M36;M68;M22
269	AQCVQLHNDILLAKDTTEAFEKMVS	M21;M32;M58;M36;M68;M22;M21;M32;M58;M36;M68;M22
270	WAQCVQLHNDILLAKDTTEAFEKMV	M21;M32;M58;M36;M68;M22;M21;M32;M58;M36;M68;M22
271	TVSVSSPDAVTAYNGYLTSSSKTPE	M55;M48;M41;M49;M35;M26;M55;M48;M41;M49;M35;M26
272	ALIISVTSNYSGVVTTVMFLARGIV	M56;M14;M29;M38;M68;M11;M56;M14;M29;M38;M68;M11
273	ILMTARTVYDDGARRVWTLMNVLTL	M5;M6;M72;M11;M59;M20;M5;M6;M72;M11;M59;M20
274	LKKSLNVAKSEFDRDAAMQRKLEKM	M32;M28;M7;M50;M33;M68;M32;M28;M7;M50;M33;M68
275	NFKFVCDNIKFADDLNQLTGYKKPA	M40;M64;M21;M19;M22;M23;M40;M64;M21;M19;M22;M23
276	FKFVCDNIKFADDLNQLTGYKKPAS	M40;M64;M21;M19;M22;M23;M40;M64;M21;M19;M22;M23
277	EQAVANGDSEVVLKKLKKSLNVAKS	M71;M13;M55;M1;M53;M59;M71;M13;M55;M1;M53;M59
278	VTLVFLFVAAIFYLITPVHVMSKHT	M56;M32;M1;M34;M18;M39;M56;M32;M1;M34;M18;M39
279	TLVFLFVAAIFYLITPVHVMSKHTD	M56;M32;M1;M34;M18;M39;M56;M32;M1;M34;M18;M39

280	QIVTCAKEIKESVQT FFKLVNKFLA	M24;M53;M33;M17;M8;M43;M24;M53;M33;M17;M8;M43
281	IVTCAKEIKESVQTF FKLVNKFLAL	M24;M53;M33;M17;M8;M43;M24;M53;M33;M17;M8;M43
282	TGDSCNNYMLTYN KVENMTPRDLGA	M53;M8;M15;M52;M11;M47;M53;M8;M15;M52;M11;M47
283	VTGDSCNNYMLTY NKVENMTPRDLG	M53;M8;M15;M52;M11;M47;M53;M8;M15;M52;M11;M47
284	EVTGDSCNNYMLT YNKVENMTPRDL	M53;M8;M15;M52;M11;M47;M53;M8;M15;M52;M11;M47
285	IEVTGDSCNNYMLT YNKVENMTPRD	M53;M8;M15;M52;M11;M47;M53;M8;M15;M52;M11;M47
286	GSVGFNIDYDCVSF CYMHHMELPTG	M14;M18;M17;M43;M52;M9;M14;M18;M17;M43;M52;M9
287	KYCALAPNMMVTN NTFTLKGGAPTK	M11;M24;M10;M6;M50;M9;M11;M24;M10;M6;M50;M9
288	EKYCALAPNMMVT NNTFTLKGGAPT	M11;M24;M10;M6;M50;M9;M11;M24;M10;M6;M50;M9
289	TEKYCALAPNMMV TNNTFTLKGGAP	M11;M24;M10;M6;M50;M9;M11;M24;M10;M6;M50;M9
290	YCALAPNMMVTNN TFTLKGGAPTKV	M11;M24;M10;M6;M50;M9;M11;M24;M10;M6;M50;M9
291	QRKLEKMADQAMT QMYKQARSEDKR	M56;M55;M2;M74;M18;M82;M56;M55;M2;M74;M18;M82
292	MQRKLEKMADQA MTQMYKQARSEDK	M56;M55;M2;M74;M18;M82;M56;M55;M2;M74;M18;M82
293	GQIVTCAKEIKESVQ TFFKLVNKFL	M65;M53;M79;M33;M8;M23;M65;M53;M79;M33;M8;M23
294	NPKGFCDLKGKYV QIPTTCANDPVG	M40;M31;M30;M43;M42;M39;M40;M31;M30;M43;M42;M39
295	DGSIIQFPNTYLEGS VRVVTTFDSE	M12;M43;M42;M26;M22;M20;M12;M43;M42;M26;M22;M20
296	QPQLEMELTPVVQT IEVNSFSGYLK	M56;M60;M29;M6;M50;M59;M56;M60;M29;M6;M50;M59
297	QLEMELTPVVQTIE VNSFSGYLKLT	M56;M60;M29;M6;M50;M59;M56;M60;M29;M6;M50;M59
298	LEMELTPVVQTIEV NSFSGYLKLTD	M56;M60;M29;M6;M50;M59;M56;M60;M29;M6;M50;M59
299	PQLEMELTPVVQTIE VNSFSGYLKL	M56;M60;M29;M6;M50;M59;M56;M60;M29;M6;M50;M59
300	DGARRVWTLMNVL TLVYKVYYGNAL	M24;M5;M2;M18;M22;M20;M24;M5;M2;M18;M22;M20
301	GPEHSLAEYHNESG LKTILRKGGRT	M13;M58;M16;M53;M17;M39;M13;M58;M16;M53;M17;M39
302	SLAEYHNESGLKTIL RKGGRTIAFG	M13;M58;M16;M53;M17;M39;M13;M58;M16;M53;M17;M39
303	PEHSLAEYHNESGL KTILRKGGRTI	M13;M58;M16;M53;M17;M39;M13;M58;M16;M53;M17;M39
304	EHSLAEYHNESGLK TILRKGGRTIA	M13;M58;M16;M53;M17;M39;M13;M58;M16;M53;M17;M39

305	HSLAEYHNESGLKTILRKGGRTIAF	M13;M58;M16;M53;M17;M39;M13;M58;M16;M53;M17;M39
306	RSDVLLPLTQYNRYLALYNKYKYFS	M14;M53;M61;M69;M27;M20;M14;M53;M61;M69;M27;M20
307	ASFYYVWKSYVHVVDGCNSSTCMMC	M24;M1;M34;M37;M35;M23;M24;M1;M34;M37;M35;M23
308	RSIFSRTLETAQNSVRVLQKAAITI	M54;M24;M5;M34;M2;M9;M54;M24;M5;M34;M2;M9
309	SIFSRTLETAQNSVRVLQKAAITIL	M54;M24;M5;M34;M2;M9;M54;M24;M5;M34;M2;M9
310	SIIQFPNTYLEGSVRVVTTFDSEYC	M64;M12;M27;M20;M22;M23;M64;M12;M27;M20;M22;M23
311	DSCKRVLNVVCKTCGQQQTTLKGVE	M58;M5;M2;M27;M15;M52;M58;M5;M2;M27;M15;M52
312	TEAFEKMVSLLSVLLSMQGAVDINK	M61;M74;M69;M67;M39;M22;M61;M74;M69;M67;M39;M22
313	PSIISNEKQEILGTVSWNLREMLAH	M75;M56;M24;M8;M9;M23;M75;M56;M24;M8;M9;M23
314	ETVKGLDYKAFKQIVESCGNFKVTK	M1;M37;M42;M52;M47;M23;M1;M37;M42;M52;M47;M23
315	TVKGLDYKAFKQIVESCGNFKVTKG	M1;M37;M42;M52;M47;M23;M1;M37;M42;M52;M47;M23
316	QHLKDGTCGLVEVEKGVLPQLEQPY	M13;M28;M24;M66;M74;M9;M13;M28;M24;M66;M74;M9
317	LKDGTCGLVEVEKGVLPQLEQPYVF	M13;M28;M24;M66;M74;M9;M13;M28;M24;M66;M74;M9
318	HLKDGTCGLVEVEKGVLPQLEQPYV	M13;M28;M24;M66;M74;M9;M13;M28;M24;M66;M74;M9
319	TVYEKLKPVLDWLEEKFKEGVEFLR	M32;M28;M61;M67;M9;M20;M32;M28;M61;M67;M9;M20
320	IANYAKPFLNKVVSTTTNIVTRCLN	M78;M10;M8;M15;M9;M23;M78;M10;M8;M15;M9;M23
321	KPFLNKVVSTTTNIVTRCLNRVCTN	M78;M10;M37;M8;M15;M23;M78;M10;M37;M8;M15;M23
322	GTVYEKLKPVLDWLEEKFKEGVEFL	M32;M28;M31;M67;M9;M20;M32;M28;M31;M67;M9;M20
323	NRATLQAIASEFSSLPSYAAFATAQ	M21;M41;M42;M43;M39;M22;M21;M41;M42;M43;M39;M22
324	AKLKALNLGETFVTHSKGLYRKCVK	M71;M24;M55;M50;M18;M27;M71;M24;M55;M50;M18;M27
325	TIKGTHHWLLLTILTSLLVLVQSTQ	M52;M34;M42;M43;M46;M39;M52;M34;M42;M43;M46;M39
326	IKGTHHWLLLTILTSLLVLVQSTQW	M52;M34;M42;M43;M46;M39;M52;M34;M42;M43;M46;M39
327	RTIKGTHHWLLLTILTSLLVLVQST	M52;M34;M42;M43;M46;M39;M52;M34;M42;M43;M46;M39
328	STTTNIVTRCLNRVCTNYMPYFFTL	M64;M78;M6;M37;M69;M20;M64;M78;M6;M37;M69;M20
329	YLAVFDKNLYDKLVSSFLEMKSEKQ	M70;M41;M42;M49;M43;M39;M70;M41;M42;M49;M43;M39

330	LAVFDKNLYDKLVS SFLEMKSEKQV	M70;M41;M42;M49;M43;M39;M70;M41;M42;M49;M43;M39
331	YFNMVYMPASWV MRIMTWLDMVDTS	M32;M52;M83;M15;M46;M39;M32;M52;M83;M15;M46;M39
332	NVNKGEDIQLLKSA YENFNQHEVLL	M32;M28;M31;M60;M38;M68;M32;M28;M31;M60;M38;M68
333	VNKGEDIQLLKSAY ENFNQHEVLLA	M32;M28;M31;M60;M38;M68;M32;M28;M31;M60;M38;M68
334	PNVNKGEDIQLLKS AYENFNQHEVL	M32;M28;M31;M60;M38;M68;M32;M28;M31;M60;M38;M68
335	GPNVNKGEDIQLLK SAYENFNQHEV	M32;M28;M31;M60;M38;M68;M32;M28;M31;M60;M38;M68
336	GETFVTHSKGLYRK CVKSREETGLL	M24;M55;M18;M35;M52;M47;M24;M55;M18;M35;M52;M47
337	KMSDVKCTSVVLLS VLQQLRVESSS	M40;M56;M54;M60;M29;M22;M40;M56;M54;M60;M29;M22
338	WLMWLIINLVQMA PISAMVRMYIFF	M11;M73;M55;M50;M9;M23;M11;M73;M55;M50;M9;M23
339	LMWLIINLVQMAPIS AMVRMYIFFA	M11;M73;M55;M50;M9;M23;M11;M73;M55;M50;M9;M23
340	AMQTMLFTMLRKL DNDALNNIINNA	M16;M43;M15;M52;M9;M47;M16;M43;M15;M52;M9;M47
341	SFLGRYMSALNHTK KWKYPQVNGLT	M24;M5;M25;M61;M74;M33;M24;M5;M25;M61;M74;M33
342	APISAMVRMYIFFAS FYYVWKSYVH	M24;M55;M20;M35;M9;M23;M24;M55;M20;M35;M9;M23
343	MLCTHTGTGQAITV TPEANMDQESF	M24;M78;M34;M29;M49;M9;M24;M78;M34;M29;M49;M9
344	THTGTGQAITVTPE ANMDQESFGGA	M24;M78;M34;M29;M49;M9;M24;M78;M34;M29;M49;M9
345	HTGTGQAITVTPEA NMDQESFGGAS	M24;M78;M34;M29;M49;M9;M24;M78;M34;M29;M49;M9
346	LCTHTGTGQAITVTP EANMDQESFG	M24;M78;M34;M29;M49;M9;M24;M78;M34;M29;M49;M9
347	CTHTGTGQAITVTPE ANMDQESFGG	M24;M78;M34;M29;M49;M9;M24;M78;M34;M29;M49;M9
348	SDVKCTSVVLLSVL QQLRVESSSKL	M40;M56;M54;M60;M34;M22;M40;M56;M54;M60;M34;M22
349	MPASWVMRIMTWL DMVDTSLSGFKL	M64;M70;M83;M15;M52;M22;M64;M70;M83;M15;M52;M22
350	EQLDFIDTKRGVYC CREHEHEIAWY	M64;M75;M66;M74;M27;M22;M64;M75;M66;M74;M27;M22
351	SEQLDFIDTKRGVY CCREHEHEIAW	M64;M75;M66;M74;M27;M22;M64;M75;M66;M74;M27;M22
352	VLKTGDLQPLEQPT SEAVEAPLVGT	M54;M58;M60;M38;M17;M15;M54;M58;M60;M38;M17;M15
353	KTGDLQPLEQPTSE AVEAPLVGTPV	M54;M58;M60;M38;M17;M15;M54;M58;M60;M38;M17;M15
354	EVVLKTGDLQPLEQ PTSEAVEAPLV	M54;M58;M60;M38;M17;M15;M54;M58;M60;M38;M17;M15

355	LKTGDLQPLEQPTSEAVEAPLVGTP	M54;M58;M60;M38;M17;M15;M54;M58;M60;M38;M17;M15
356	VVLKTGDLQPLEQPTSEAVEAPLVG	M54;M58;M60;M38;M17;M15;M54;M58;M60;M38;M17;M15
357	GGQPITNCVKMLCTHTGTGQAITVT	M64;M21;M58;M53;M22;M23;M64;M21;M58;M53;M22;M23
358	EDMLNPNYEDLLIRKSNHNFLVQAG	M21;M24;M10;M29;M9;M23;M21;M24;M10;M29;M9;M23
359	KNTVKSVGKFCLEASFNYLKSPNFS	M54;M60;M25;M41;M43;M42;M54;M60;M25;M41;M43;M42
360	TLETAQNSVRVLQKAAITILDGISQ	M56;M54;M24;M5;M60;M9;M56;M54;M24;M5;M60;M9
361	LETAQNSVRVLQKAAITILDGISQY	M56;M54;M24;M5;M60;M9;M56;M54;M24;M5;M60;M9
362	TEVLTEEVVLKTGDLQPLEQPTSEA	M54;M58;M60;M38;M17;M62;M54;M58;M60;M38;M17;M62
363	EVLTEEVVLKTGDLQPLEQPTSEAV	M54;M58;M60;M38;M17;M62;M54;M58;M60;M38;M17;M62
364	KASCTLSEQLDFIDTKRGVYCCREH	M64;M75;M74;M83;M27;M22;M64;M75;M74;M83;M27;M22
365	ASCTLSEQLDFIDTKRGVYCCREHE	M64;M75;M74;M83;M27;M22;M64;M75;M74;M83;M27;M22
366	EEAKKVKPTVVVNAANVYLKHGGGV	M56;M73;M50;M18;M11;M23;M56;M73;M50;M18;M11;M23
367	EAKKVKPTVVVNAANVYLKHGGGVA	M56;M73;M50;M18;M11;M23;M56;M73;M50;M18;M11;M23
368	VEEAKKVKPTVVVNAANVYLKHGGG	M56;M73;M50;M18;M11;M23;M56;M73;M50;M18;M11;M23
369	VYEKLKPVLDWLEEKFKEGVEFLRD	M32;M61;M67;M27;M9;M20;M32;M61;M67;M27;M9;M20
370	GNALDQAISMWALIISVTSNYSGVV	M64;M56;M32;M68;M22;M23;M64;M56;M32;M68;M22;M23
371	NALDQAISMWALIISVTSNYSGVVT	M64;M56;M32;M68;M22;M23;M64;M56;M32;M68;M22;M23
372	KPTVVVNAANVYLKHGGGVAGALNK	M56;M11;M73;M18;M9;M23;M56;M11;M73;M18;M9;M23
373	VLDMCASLKELLQNGMNGRTILGSA	M56;M24;M60;M50;M18;M59;M56;M24;M60;M50;M18;M59
374	AYYNTTKGGRFVLALLSDLQDLKWA	M32;M70;M31;M33;M68;M20;M32;M70;M31;M33;M68;M20
375	KGGRFVLALLSDLQDLKWARFPKSD	M77;M32;M54;M70;M60;M20;M77;M32;M54;M70;M60;M20
376	SAMVRMYIFFASFYYVWKSYVHVVD	M24;M37;M20;M35;M9;M23;M24;M37;M20;M35;M9;M23
377	IAVLDMCASLKELLQNGMNGRTILG	M56;M32;M24;M10;M60;M59;M56;M32;M24;M10;M60;M59
378	GIAVLDMCASLKELLQNGMNGRTIL	M56;M32;M24;M10;M60;M59;M56;M32;M24;M10;M60;M59
379	VQTIEVNSFSGYLKLTDNVYIKNAD	M56;M38;M50;M9;M47;M23;M56;M38;M50;M9;M47;M23

380	VDLPIGINITRFQTLL ALHRSYLTP	M4;M23;M21;M19;M24;M5;M1;M25;M3;M2;M26;M22;M20
381	LPIGINITRFQTLLAL HRSYLTPGD	M4;M23;M21;M19;M24;M55;M5;M25;M3;M2;M26;M22;M20
382	DLPIGINITRFQTLLA LHRSYLTPG	M4;M23;M21;M19;M24;M55;M5;M25;M3;M2;M26;M22;M20
383	VCSVIDLLLDDFVEII KSQDLSVVS	M4;M52;M14;M16;M3;M48;M18;M42;M8;M43;M15;M35;M47
384	LSFKELLVYAADPA MHAASGNLLLD	M64;M30;M48;M57;M33;M36;M41;M8;M49;M26;M22;M44;M20
385	SRLSFKELLVYAAD PAMHAASGNLL	M64;M30;M48;M57;M33;M36;M41;M8;M49;M26;M22;M44;M20
386	RLSFKELLVYAADP AMHAASGNLLL	M64;M30;M48;M57;M33;M36;M41;M8;M49;M26;M22;M44;M20
387	CPAEIVDTVSALVY DNKLKAHKDKS	M12;M28;M16;M7;M29;M6;M38;M50;M8;M17;M35;M59;M23
388	DFGGFNFSQILPDPS KPSKRSFIED	M32;M28;M14;M31;M7;M34;M29;M30;M33;M36;M27;M35;M22
389	KDFGGFNFSQILPDP SKPSKRSFIE	M32;M28;M14;M31;M7;M34;M29;M30;M33;M36;M27;M35;M22
390	FGGFNFSQILPDPSK PSKRSFIEDL	M32;M28;M14;M31;M7;M34;M29;M30;M33;M36;M27;M35;M22
391	LEIPRRNVATLQAE NVTGLFKDCSK	M28;M54;M60;M29;M2;M6;M45;M38;M27;M46;M39;M59;M20
392	IDLLLDDFVEIIKSQ DLSVVSKVVK	M4;M52;M14;M16;M48;M18;M42;M8;M43;M15;M35;M47;M23
393	SVIDLLLDDFVEIIKS QDLSVVSKV	M4;M52;M14;M16;M48;M18;M42;M8;M43;M15;M35;M47;M23
394	VIDLLLDDFVEIIKS QDLSVVSKVV	M4;M52;M14;M16;M48;M18;M42;M8;M43;M15;M35;M47;M23
395	YKQFDTYNLWNTFT RLQSLENVAFN	M71;M58;M14;M16;M54;M25;M34;M53;M60;M19;M17;M15;M39
396	DTYNLWNTFTRLQS LENVAFNVVNK	M71;M58;M14;M16;M54;M25;M34;M60;M19;M17;M15;M42;M39
397	DLPKEITVATSRTLS YYKLGASQRV	M64;M56;M12;M70;M55;M29;M6;M48;M33;M49;M46;M22;M23
398	MADSNGTITVEELK KLLEQWNLVIG	M4;M56;M28;M58;M16;M55;M80;M53;M6;M17;M52;M47;M59
399	IGINITRFQTLLALHR SYLTPGDSS	M23;M21;M9;M19;M24;M55;M5;M10;M25;M2;M48;M22;M20
400	GINITRFQTLLALHR SYLTPGDSSS	M23;M21;M9;M19;M24;M55;M5;M10;M25;M2;M48;M22;M20
401	YPSARIVYTACSHA AVDALCEKALK	M64;M21;M28;M14;M5;M60;M29;M38;M67;M17;M49;M46;M22
402	AMPNMLRIMASLVL ARKHTTCCSLS	M56;M21;M12;M25;M5;M30;M69;M41;M35;M46;M39;M22;M23
403	GIPKDMTYRRLISM MGFKMNYQVNG	M40;M58;M16;M31;M25;M34;M30;M46;M43;M15;M42;M39;M47
404	PGIPKDMTYRRLISM MGFKMNYQVN	M40;M58;M16;M31;M25;M34;M30;M46;M43;M15;M42;M39;M47

405	ALLAVFQSASKIITL KKRWQLALSK	M56;M9;M58;M24;M16;M55;M60;M53;M61;M17;M15;M52;M82
406	LLAVFQSASKIITLK KRWQLALSKG	M56;M9;M58;M24;M16;M55;M60;M53;M27;M17;M15;M52;M82
407	VALLAVFQSASKIIT LKKRWQLALS	M9;M58;M24;M55;M60;M53;M61;M17;M35;M15;M52;M26;M82
408	PPLNRNYVFTGYRV TKNSKVQIGEY	M4;M40;M24;M31;M1;M38;M3;M37;M41;M8;M43;M42;M39;M44
409	RPPLNRNYVFTGYR VTKNSKVQIGE	M4;M40;M24;M31;M1;M38;M3;M37;M41;M8;M43;M42;M39;M44
410	PIGINITRFQTLLALH RSYLTPGDS	M4;M23;M21;M9;M19;M24;M55;M5;M10;M25;M3;M2;M22;M20
411	AVMYMGTLSYEQF KKGVQIPCTCGK	M4;M16;M1;M3;M6;M37;M52;M4;M16;M1;M3;M6;M37;M52
412	KHGTFTCASEYTGN YQCGHYKHITS	M4;M66;M1;M65;M3;M38;M33;M4;M66;M1;M65;M3;M38;M33
413	HGTFTCASEYTGNY QCGHYKHITSK	M4;M1;M65;M3;M38;M33;M42;M4;M1;M65;M3;M38;M33;M42
414	ICYTPSKLIEYTDFA TSACVLAAEC	M4;M49;M3;M48;M63;M41;M62;M4;M49;M3;M48;M63;M41;M62
415	TPSKLIEYTDFATSA CVLAAECTIF	M14;M29;M3;M48;M63;M41;M62;M14;M29;M3;M48;M63;M41;M62
416	SAVGNICYTPSKLIE YTDFATSACV	M3;M48;M63;M41;M8;M43;M42;M3;M48;M63;M41;M8;M43;M42
417	PPIKDFGGFNFSQILP DPSKPSKRS	M4;M32;M28;M14;M31;M1;M34;M29;M30;M33;M36;M27;M35;M22
418	FSAVGNICYTPSKLI EYTDFATSAC	M3;M48;M41;M8;M49;M43;M42;M3;M48;M41;M8;M49;M43;M42
419	RVFSAVGNICYTPSK LIEYTDFATS	M3;M48;M41;M8;M49;M43;M42;M3;M48;M41;M8;M49;M43;M42
420	VFSAVGNICYTPSKL IEYTDFATSA	M3;M48;M41;M8;M49;M43;M42;M3;M48;M41;M8;M49;M43;M42
421	VGDYFVLTSHTVMP LSAPTLVPQEH	M54;M16;M55;M60;M34;M29;M45;M51;M18;M42;M43;M15;M46;M39
422	LAWPLIVTALRANS AVKLQNNELSP	M73;M60;M51;M46;M39;M11;M44;M73;M60;M51;M46;M39;M11;M44
423	VPANSTVLSFCAFA VDAAKAYKDYL	M32;M12;M28;M48;M36;M8;M49;M32;M12;M28;M48;M36;M8;M49
424	KSILSPLYAFASEAA RVVRSIFSRT	M21;M14;M6;M45;M48;M49;M22;M21;M14;M6;M45;M48;M49;M22
425	QKSILSPLYAFASEA ARVVRSIFSR	M21;M14;M6;M45;M48;M49;M22;M21;M14;M6;M45;M48;M49;M22
426	IPLTTAAKLMVVIPD YNTYKNTCDG	M28;M14;M24;M57;M51;M82;M23;M28;M14;M24;M57;M51;M82;M23
427	LSPLYAFASEAARV VRSIFSRTLET	M14;M6;M45;M48;M49;M22;M59;M14;M6;M45;M48;M49;M22;M59
428	ILSPLYAFASEAARV VRSIFSRTLE	M14;M6;M45;M48;M49;M22;M59;M14;M6;M45;M48;M49;M22;M59
429	KQFDTYNLWNTFTR LQSLENVAFNV	M71;M58;M14;M16;M54;M25;M34;M53;M60;M19;M17;M15;M42;M39

430	QFDTYNLWNTFTRL QSLENVAFNVV	M71;M58;M14;M16;M54;M25;M34;M53;M60;M19;M17;M15;M42; M39
431	FDTYNLWNTFTRLQ SLENVAFNVVN	M71;M58;M14;M16;M54;M25;M34;M53;M60;M19;M17;M15;M42; M39
432	LPDDFTGCVIAWNS NNLDSKVGGNY	M13;M32;M56;M12;M14;M55;M29;M38;M48;M50;M67;M68;M49; M26
433	NYKLPDDFTGCVIA WNSNNLDSKVG	M13;M32;M56;M12;M14;M55;M29;M38;M48;M50;M67;M68;M49; M26
434	KLPDDFTGCVIAWN SNNLDSKVGGN	M13;M32;M56;M12;M14;M55;M29;M38;M48;M50;M67;M68;M49; M26
435	YKLPDDFTGCVIAW NSNNLDSKVGG	M13;M32;M56;M12;M14;M55;M29;M38;M48;M50;M67;M68;M49; M26
436	GRCDIKDLPKEITVA TSRTLSYYKL	M64;M21;M12;M25;M6;M48;M33;M42;M43;M49;M46;M39;M22;M 23
437	RGMVLGSLAATVRL QAGNATEVPAN	M16;M14;M55;M10;M53;M51;M17;M16;M14;M55;M10;M53;M51; M17
438	GMVLGSLAATVRL QAGNATEVPANS	M16;M14;M55;M10;M53;M51;M17;M16;M14;M55;M10;M53;M51; M17
439	TSNPTTFHLDGEVIT FDNLKTLLSL	M21;M7;M48;M45;M50;M36;M49;M21;M7;M48;M45;M50;M36;M4 9
440	YTSNPTTFHLDGEVI TFDNLKTLLS	M21;M7;M48;M45;M50;M36;M49;M21;M7;M48;M45;M50;M36;M4 9
441	STVLSFCAFAVDAA KAYKDYLASGG	M32;M12;M28;M48;M57;M36;M69;M32;M12;M28;M48;M57;M36; M69
442	FTLLLQLCTFTRSTN SRIKASMPTT	M19;M14;M25;M33;M8;M42;M39;M19;M14;M25;M33;M8;M42;M3 9
443	FFTLLLQLCTFTRST NSRIKASMPT	M19;M14;M25;M33;M8;M42;M39;M19;M14;M25;M33;M8;M42;M3 9
444	YITTYPGQGLNGYT VEEAKTVLKKC	M75;M70;M45;M36;M63;M76;M39;M75;M70;M45;M36;M63;M76; M39
445	AKKNNLPFKLTCAT TRQVVNVVTTK	M21;M12;M19;M25;M2;M33;M8;M21;M12;M19;M25;M2;M33;M8
446	KKNNLPFKLTCATT RQVVNVVTTKI	M21;M12;M19;M25;M2;M33;M8;M21;M12;M19;M25;M2;M33;M8
447	NGECPNFVFPLNSII KTIQPRVEKK	M28;M19;M29;M6;M61;M50;M72;M28;M19;M29;M6;M61;M50;M7 2
448	LNVGDYFVLTSHTV MPLSAPTLVPQ	M54;M16;M55;M25;M34;M29;M45;M18;M41;M42;M43;M15;M46; M39
449	YDTNVLEGSVAYES LRPDTRYVLMD	M12;M14;M19;M34;M50;M18;M46;M12;M14;M19;M34;M50;M18; M46
450	NVGDYFVLTSHTV MPLSAPTLVPQE	M54;M16;M55;M60;M34;M29;M45;M18;M41;M42;M43;M15;M46; M39
451	TLLSLREVRTIKVFT TVDNINLHTQ	M21;M14;M29;M6;M72;M26;M22;M21;M14;M29;M6;M72;M26;M2 2
452	SAAKKNNLPFKLTC ATTRQVVNVVT	M21;M12;M19;M78;M25;M33;M8;M21;M12;M19;M78;M25;M33;M 8
453	AAKKNNLPFKLTCA TTRQVVNVVTT	M21;M12;M19;M78;M25;M33;M8;M21;M12;M19;M78;M25;M33;M 8
454	MPYFFTLLLQLCTFT RSTNSRIKAS	M19;M25;M29;M33;M8;M42;M39;M19;M25;M29;M33;M8;M42;M3 9

455	NYMPYFFTLLLQLC TFTRSTNSRIK	M19;M25;M29;M33;M8;M42;M39;M19;M25;M29;M33;M8;M42;M3 9
456	YMPYFFTLLLQLCT FTRSTNSRIKA	M19;M25;M29;M33;M8;M42;M39;M19;M25;M29;M33;M8;M42;M3 9
457	EEIAIILASFSASTSA FVETVKGLD	M28;M14;M38;M33;M8;M43;M42;M28;M14;M38;M33;M8;M43;M4 2
458	LNEEIAIILASFSAST SAFVETVKG	M28;M14;M38;M33;M8;M43;M42;M28;M14;M38;M33;M8;M43;M4 2
459	EIAIILASFSASTSAF VETVKGLDY	M28;M14;M38;M33;M8;M43;M42;M28;M14;M38;M33;M8;M43;M4 2
460	NEEIAIILASFSASTS AFVETVKGL	M28;M14;M38;M33;M8;M43;M42;M28;M14;M38;M33;M8;M43;M4 2
461	GCVPLNIIPLTTAAK LMVVIPDYNT	M19;M14;M24;M38;M82;M57;M22;M19;M14;M24;M38;M82;M57; M22
462	LPSYAAFATAQEAY EQAVANGDSEV	M12;M28;M31;M70;M6;M33;M68;M12;M28;M31;M70;M6;M33;M6 8
463	DNVLSTFISAARQGF VDSDVETKDV	M14;M70;M16;M29;M33;M18;M63;M14;M70;M16;M29;M33;M18; M63
464	AKALRKVPTDNYIT TYPGQGLNGYT	M16;M14;M29;M48;M49;M15;M26;M16;M14;M29;M48;M49;M15; M26
465	FKLVNKFLALCADSI IIGGAKLKAL	M34;M45;M41;M67;M8;M42;M39;M34;M45;M41;M67;M8;M42;M3 9
466	TFFKLVNKFLALCA DSIIIGGAKLK	M34;M45;M41;M67;M8;M42;M39;M34;M45;M41;M67;M8;M42;M3 9
467	FFKLVNKFLALCAD SIIIGGAKLKA	M34;M45;M41;M67;M8;M42;M39;M34;M45;M41;M67;M8;M42;M3 9
468	DVVRQCSGVTFQSA VKRTIKGTHHW	M71;M19;M1;M60;M25;M33;M26;M71;M19;M1;M60;M25;M33;M2 6
469	CVMYASAVVLLILM TARTVYDDGAR	M75;M32;M28;M6;M72;M46;M39;M75;M32;M28;M6;M72;M46;M3 9
470	AAKAYKDYLASGG QPITNCVKMLCT	M12;M37;M57;M33;M8;M42;M39;M12;M37;M57;M33;M8;M42;M3 9
471	VLLPLTQYNRYLAL YNKYKYFSGAM	M19;M14;M55;M53;M27;M42;M20;M19;M14;M55;M53;M27;M42; M20
472	DVLLPLTQYNRYLA LYNKYKYFSGA	M19;M14;M55;M53;M27;M42;M20;M19;M14;M55;M53;M27;M42; M20
473	LLPLTQYNRYLALY NKYKYFSGAMD	M19;M14;M55;M53;M27;M42;M20;M19;M14;M55;M53;M27;M42; M20
474	LPLTQYNRYLALYN KYKYFSGAMDT	M19;M14;M55;M53;M27;M42;M20;M19;M14;M55;M53;M27;M42; M20
475	DNLKTLLSLREVRTI KVFTTVDNIN	M32;M14;M31;M29;M6;M49;M26;M32;M14;M31;M29;M6;M49;M2 6
476	GDFLHFLPRVFSAV GNICYTPSKLI	M64;M12;M24;M53;M45;M46;M22;M64;M12;M24;M53;M45;M46; M22
477	CPNFVFPLNSIIKTIQ PRVEKKKLD	M28;M29;M6;M61;M72;M62;M59;M28;M29;M6;M61;M72;M62;M5 9
478	VDTANPKTPKYKFV RIQPGQTFSVL	M40;M77;M14;M34;M30;M29;M39;M40;M77;M14;M34;M30;M29; M39
479	KVDTANPKTPKYKF VRIQPGQTFSV	M40;M77;M14;M34;M30;M29;M39;M40;M77;M14;M34;M30;M29; M39

480	VEQRKQDDKKIKAC VEEVTTTLEET	M28;M14;M65;M60;M74;M67;M49;M28;M14;M65;M60;M74;M67; M49
481	SVEQRKQDDKKIKA CVEEVTTTLEE	M28;M14;M65;M60;M74;M67;M49;M28;M14;M65;M60;M74;M67; M49
482	NVLEGSVAYESLRP DTRYVLMDGSI	M19;M24;M7;M34;M50;M18;M46;M19;M24;M7;M34;M50;M18;M4 6
483	FEYYHTTDPSFLGR YMSALNHTKKW	M66;M1;M25;M29;M6;M37;M33;M66;M1;M25;M29;M6;M37;M33
484	ASTSAFVETVKGLD YKAFKQIVESC	M54;M16;M1;M60;M6;M37;M52;M54;M16;M1;M60;M6;M37;M52
485	CDNIKFADDLNQLT GYKKPASRELK	M64;M19;M70;M38;M63;M22;M23;M64;M19;M70;M38;M63;M22; M23
486	ELAKNVSLDNVLST FISAARQGFVD	M14;M7;M29;M61;M18;M27;M26;M14;M7;M29;M61;M18;M27;M2 6
487	LTSSSKTPEEHFIETI SLAGSYKDW	M64;M40;M16;M30;M29;M68;M8;M64;M40;M16;M30;M29;M68;M 8
488	CALAPNMMVTNNT FTLKGGAPTKVT	M11;M12;M24;M10;M6;M50;M9;M11;M12;M24;M10;M6;M50;M9
489	LAPNMMVTNNTFTL KGGAPTKVTFG	M11;M12;M24;M10;M6;M50;M9;M11;M12;M24;M10;M6;M50;M9
490	ALAPNMMVTNNTF TLKGGAPTKVTF	M11;M12;M24;M10;M6;M50;M9;M11;M12;M24;M10;M6;M50;M9
491	IKFADDLNQLTGYK KPASRELKVTF	M58;M19;M70;M53;M38;M63;M15;M58;M19;M70;M53;M38;M63; M15
492	FADDLNQLTGYKKP ASRELKVTFFP	M58;M19;M70;M53;M38;M63;M15;M58;M19;M70;M53;M38;M63; M15
493	NIKFADDLNQLTGY KKPASRELKVT	M58;M19;M70;M53;M38;M63;M15;M58;M19;M70;M53;M38;M63; M15
494	KFADDLNQLTGYK KPASRELKVTFF	M58;M19;M70;M53;M38;M63;M15;M58;M19;M70;M53;M38;M63; M15
495	PNYEDLLIRKSNHNF LVQAGNVQLR	M12;M24;M14;M70;M10;M9;M23;M12;M24;M14;M70;M10;M9;M2 3
496	NSPNLAWPLIVTAL RANSAVKLQNN	M73;M60;M18;M46;M39;M11;M44;M73;M60;M18;M46;M39;M11; M44
497	DNSPNLAWPLIVTA LRANSAVKLQN	M73;M60;M18;M46;M39;M11;M44;M73;M60;M18;M46;M39;M11; M44
498	QDDKKIKACVEEVT TTLEETKFLTE	M32;M28;M65;M6;M74;M67;M20;M32;M28;M65;M6;M74;M67;M2 0
499	DDKKIKACVEEVTT TLEETKFLTEN	M32;M28;M65;M6;M74;M67;M20;M32;M28;M65;M6;M74;M67;M2 0
500	SASIVAGGIVAIVVT CLAYYFMRFR	M21;M12;M60;M6;M62;M22;M59;M21;M12;M60;M6;M62;M22;M5 9
501	SIVAGGIVAIVVTCL AYYFMRFRRA	M21;M12;M60;M6;M62;M22;M59;M21;M12;M60;M6;M62;M22;M5 9
502	IVAGGIVAIVVTCLA YYFMRFRRAF	M21;M12;M60;M6;M62;M22;M59;M21;M12;M60;M6;M62;M22;M5 9
503	ASIVAGGIVAIVVTC LAYYFMRFRR	M21;M12;M60;M6;M62;M22;M59;M21;M12;M60;M6;M62;M22;M5 9
504	FACVVADAVIKTLQ PVSELLTPLGI	M28;M78;M45;M79;M49;M82;M47;M28;M78;M45;M79;M49;M82; M47

505	VVADAVIKTLQPVSELLTPLGIDLD	M28;M78;M45;M79;M49;M82;M47;M28;M78;M45;M79;M49;M82;M47
506	ACVVADAVIKTLQPVSELLTPLGID	M28;M78;M45;M79;M49;M82;M47;M28;M78;M45;M79;M49;M82;M47
507	EFACVVADAVIKTLQPVSELLTPLG	M28;M78;M45;M79;M49;M82;M47;M28;M78;M45;M79;M49;M82;M47
508	CVVADAVIKTLQPVSELLTPLGIDL	M28;M78;M45;M79;M49;M82;M47;M28;M78;M45;M79;M49;M82;M47
509	LSGLDSLDTYPSLETIQITISSFKW	M21;M55;M34;M29;M48;M41;M22;M21;M55;M34;M29;M48;M41;M22
510	SGLDSLDTYPSLETIQITISSFKWD	M21;M55;M34;M29;M48;M41;M22;M21;M55;M34;M29;M48;M41;M22
511	CLSGLDSLDTYPSLETIQITISSFK	M21;M55;M34;M29;M48;M41;M22;M21;M55;M34;M29;M48;M41;M22
512	KAPKEIIFLEGETLPTEVLTEEVVL	M54;M24;M48;M42;M27;M46;M39;M54;M24;M48;M42;M27;M46;M39
513	APKEIIFLEGETLPTEVLTEEVVLK	M54;M24;M48;M42;M27;M46;M39;M54;M24;M48;M42;M27;M46;M39
514	DPSFLGRYMSALNHTKKWKYPQVNG	M19;M66;M24;M25;M74;M61;M33;M19;M66;M24;M25;M74;M61;M33
515	ERSEKSYELQTPFEIKLAKKFDTFN	M12;M58;M24;M25;M34;M17;M39;M12;M58;M24;M25;M34;M17;M39
516	EKMADQAMTQMYKQARSEDKRAKVT	M56;M19;M55;M25;M74;M18;M82;M56;M19;M55;M25;M74;M18;M82
517	LEKMADQAMTQMYKQARSEDKRAKV	M56;M19;M55;M25;M74;M18;M82;M56;M19;M55;M25;M74;M18;M82
518	LAVFQSASKIITLKKRWQLALSKGV	M56;M9;M58;M24;M16;M55;M60;M53;M74;M27;M17;M15;M52;M82
519	VSSPDAVTAYNGYLTSSSKTPEEHF	M24;M55;M48;M41;M49;M35;M26;M24;M55;M48;M41;M49;M35;M26
520	SVSSPDAVTAYNGYLTSSSKTPEEH	M24;M55;M48;M41;M49;M35;M26;M24;M55;M48;M41;M49;M35;M26
521	VSVSSPDAVTAYNGYLTSSSKTPEE	M24;M55;M48;M41;M49;M35;M26;M24;M55;M48;M41;M49;M35;M26
522	VLNNDYYRSLPGVFCGVDAVNLLTN	M25;M34;M45;M33;M42;M43;M39;M25;M34;M45;M33;M42;M43;M39
523	VESDDYIATNGPLKVGGSCVLSGHN	M11;M73;M10;M29;M18;M9;M44;M11;M73;M10;M29;M18;M9;M44
524	QAVANGDSEVVLKKLKKSLNVAKSE	M71;M13;M55;M1;M53;M17;M59;M71;M13;M55;M1;M53;M17;M59
525	NASFDNFKFVCDNIKFADDLNQLTG	M40;M64;M21;M19;M25;M22;M23;M40;M64;M21;M19;M25;M22;M23
526	LHNDILLAKDTTEAFEKMVSLLSVL	M21;M32;M58;M53;M36;M68;M22;M21;M32;M58;M53;M36;M68;M22
527	CVQLHNDILLAKDTTEAFEKMVSLL	M21;M32;M58;M53;M36;M68;M22;M21;M32;M58;M53;M36;M68;M22
528	QLHNDILLAKDTTEAFEKMVSLLSV	M21;M32;M58;M53;M36;M68;M22;M21;M32;M58;M53;M36;M68;M22
529	VQLHNDILLAKDTTEAFEKMVSLLS	M21;M32;M58;M53;M36;M68;M22;M21;M32;M58;M53;M36;M68;M22

530	QCVQLHNDILLAKD TTEAFEKMVSL	M21;M32;M58;M53;M36;M68;M22;M21;M32;M58;M53;M36;M68; M22
531	GQQQTTLKGVEAV MYMGTLSYEQFK	M56;M54;M55;M60;M53;M6;M22;M56;M54;M55;M60;M53;M6;M2 2
532	VLLILMTARTVYDD GARRVWTLMNV	M75;M32;M6;M72;M46;M11;M59;M75;M32;M6;M72;M46;M11;M5 9
533	LILMTARTVYDDGA RRVWTLMNVLT	M32;M5;M6;M72;M11;M59;M20;M32;M5;M6;M72;M11;M59;M20
534	RATLQAIASEFSSLP SYAAFATAQE	M21;M28;M41;M42;M43;M39;M22;M21;M28;M41;M42;M43;M39; M22
535	FQHANLDSCKRVLN VVCKTCGQQQT	M58;M16;M5;M2;M27;M17;M15;M58;M16;M5;M2;M27;M17;M15
536	GDSCNNYMLTYNK VENMTPRDLGAC	M53;M74;M8;M15;M52;M11;M47;M53;M74;M8;M15;M52;M11;M4 7
537	LVFLFVAAIFYLITP VHVMSKHTDF	M56;M32;M1;M34;M18;M39;M47;M56;M32;M1;M34;M18;M39;M4 7
538	IDYDCVSFCYMHH MELPTGVHAGTD	M24;M14;M18;M17;M43;M52;M9;M24;M14;M18;M17;M43;M52;M 9
539	FNIDYDCVSFCYMH HMELPTGVHAG	M24;M14;M18;M17;M43;M52;M9;M24;M14;M18;M17;M43;M52;M 9
540	NIDYDCVSFCYMHH MELPTGVHAGT	M24;M14;M18;M17;M43;M52;M9;M24;M14;M18;M17;M43;M52;M 9
541	GFNIDYDCVSFCYM HHMELPTGVHA	M24;M14;M18;M17;M43;M52;M9;M24;M14;M18;M17;M43;M52;M 9
542	VGFNIDYDCVSFCY MHHMELPTGVH	M24;M14;M18;M17;M43;M52;M9;M24;M14;M18;M17;M43;M52;M 9
543	SVGFNIDYDCVSFC YMHHMELPTGV	M24;M14;M18;M17;M43;M52;M9;M24;M14;M18;M17;M43;M52;M 9
544	RYVLMDGSIIQFPNT YLEGSVRVVT	M48;M41;M43;M49;M42;M26;M22;M48;M41;M43;M49;M42;M26; M22
545	TRYVLMDGSIIQFPN TYLEGSVRVV	M48;M41;M43;M49;M42;M26;M22;M48;M41;M43;M49;M42;M26; M22
546	PDTRYVLMDGSIIQF PNTYLEGSVR	M48;M41;M43;M49;M42;M26;M22;M48;M41;M43;M49;M42;M26; M22
547	YVLMDGSIIQFPNTY LEGSVRVVTT	M48;M41;M43;M49;M42;M26;M22;M48;M41;M43;M49;M42;M26; M22
548	VLMDGSIIQFPNTYL EGSVRVVTTF	M48;M41;M43;M49;M42;M26;M22;M48;M41;M43;M49;M42;M26; M22
549	DTRYVLMDGSIIQFP NTYLEGSVRV	M48;M41;M43;M49;M42;M26;M22;M48;M41;M43;M49;M42;M26; M22
550	RKLEKMADQAMTQ MYKQARSEDKRA	M56;M55;M25;M2;M74;M18;M82;M56;M55;M25;M2;M74;M18;M8 2
551	DSEVVLKKLKKSLN VAKSEFDRDAA	M32;M28;M55;M53;M74;M33;M68;M32;M28;M55;M53;M74;M33; M68
552	TSVVLLSVLQQLRV ESSSKLWAQCV	M40;M56;M11;M54;M34;M30;M22;M40;M56;M11;M54;M34;M30; M22
553	IVGDVVQEGVLTAV VIPTKKAGGTT	M16;M29;M38;M61;M67;M27;M17;M16;M29;M38;M61;M67;M27; M17
554	IFSRTLETAQNSVRV LQKAAITILD	M54;M24;M5;M34;M60;M2;M9;M54;M24;M5;M34;M60;M2;M9

555	RTVYDDGARRVWT LMNVLTLVYKVY	M5;M2;M18;M52;M22;M47;M20;M5;M2;M18;M52;M22;M47;M20
556	TVYDDGARRVWTL MNVLTLVYKVYY	M5;M2;M18;M52;M22;M47;M20;M5;M2;M18;M52;M22;M47;M20
557	EGVLTAVVIPTKKA GGTTEMLAKAL	M58;M16;M29;M53;M38;M67;M17;M58;M16;M29;M53;M38;M67; M17
558	EGSVRVVTTFDSEY CRHGTCERSEA	M64;M48;M27;M20;M43;M22;M23;M64;M48;M27;M20;M43;M22; M23
559	GSVRVVTTFDSEYC RHGTCERSEAG	M64;M48;M27;M20;M43;M22;M23;M64;M48;M27;M20;M43;M22; M23
560	GSIIQFPNTYLEGSV RVVTTFDSEY	M64;M12;M20;M43;M42;M22;M23;M64;M12;M20;M43;M42;M22; M23
561	VRMYIFFASFYYVW KSYVHVVDGCN	M21;M24;M1;M37;M35;M9;M23;M21;M24;M1;M37;M35;M9;M23
562	RMYIFFASFYYVWK SYVHVVDGCNS	M21;M24;M1;M37;M35;M9;M23;M21;M24;M1;M37;M35;M9;M23
563	KALNLGETFVTHSK GLYRKCVKSRE	M71;M24;M55;M50;M18;M27;M26;M71;M24;M55;M50;M18;M27; M26
564	KLKALNLGETFVTH SKGLYRKCVKS	M71;M24;M55;M50;M18;M27;M26;M71;M24;M55;M50;M18;M27; M26
565	LNLGETFVTHSKGL YRKCVKSREET	M71;M24;M55;M50;M18;M27;M26;M71;M24;M55;M50;M18;M27; M26
566	ALNLGETFVTHSKG LYRKCVKSREE	M71;M24;M55;M50;M18;M27;M26;M71;M24;M55;M50;M18;M27; M26
567	LKALNLGETFVTHS KGLYRKCVKSR	M71;M24;M55;M50;M18;M27;M26;M71;M24;M55;M50;M18;M27; M26
568	LGETFVTHSKGLYR KCVKSREETGL	M71;M24;M55;M50;M18;M52;M47;M71;M24;M55;M50;M18;M52; M47
569	HEGKTFYVLPNDDT LRVEAFEYYHT	M34;M74;M41;M42;M43;M39;M22;M34;M74;M41;M42;M43;M39; M22
570	EGKTFYVLPNDDTL RVEAFEYYHTT	M34;M74;M41;M42;M43;M39;M22;M34;M74;M41;M42;M43;M39; M22
571	QTIEVNSFSGYLKLT DNVYIKNADI	M56;M38;M50;M8;M9;M47;M23;M56;M38;M50;M8;M9;M47;M23
572	AYIICISTKHFYWFF SNYLKRRVVF	M56;M32;M24;M10;M7;M50;M23;M56;M32;M24;M10;M7;M50;M2 3
573	NYAKPFLNKVVSTT TNIVTRCLNRV	M78;M10;M37;M8;M15;M9;M23;M78;M10;M37;M8;M15;M9;M23
574	ANYAKPFLNKVVST TTNIVTRCLNR	M78;M10;M37;M8;M15;M9;M23;M78;M10;M37;M8;M15;M9;M23
575	YAKPFLNKVVSTTT NIVTRCLNRVC	M78;M10;M37;M8;M15;M9;M23;M78;M10;M37;M8;M15;M9;M23
576	AKPFLNKVVSTTTNI VTRCLNRVCT	M78;M10;M37;M8;M15;M9;M23;M78;M10;M37;M8;M15;M9;M23
577	LVPFWITIAYIICIST KHFYWFFSN	M56;M32;M24;M10;M7;M60;M23;M56;M32;M24;M10;M7;M60;M2 3
578	PLVPFWITIAYIICIST KHFYWFFS	M56;M32;M24;M10;M7;M60;M23;M56;M32;M24;M10;M7;M60;M2 3
579	WITIAYIICISTKHFY WFFSNYLKR	M56;M32;M24;M10;M7;M60;M23;M56;M32;M24;M10;M7;M60;M2 3

580	TIAYIICISTKHFYWF FSNYLKRRV	M56;M32;M24;M10;M7;M60;M23;M56;M32;M24;M10;M7;M60;M2 3
581	ITIAYIICISTKHFYW FFSNYLKRR	M56;M32;M24;M10;M7;M60;M23;M56;M32;M24;M10;M7;M60;M2 3
582	FWITIAYIICISTKHF YWFFSNYLK	M56;M32;M24;M10;M7;M60;M23;M56;M32;M24;M10;M7;M60;M2 3
583	VPFWITIAYIICISTK HFYWFFSNY	M56;M32;M24;M10;M7;M60;M23;M56;M32;M24;M10;M7;M60;M2 3
584	PFWITIAYIICISTKH FYWFFSNYL	M56;M32;M24;M10;M7;M60;M23;M56;M32;M24;M10;M7;M60;M2 3
585	TPLVPFWITIAYIICIS TKHFYWFF	M56;M32;M24;M10;M7;M60;M23;M56;M32;M24;M10;M7;M60;M2 3
586	SHFVNLDNLRANNT KGSLPINVIVF	M64;M40;M31;M53;M43;M46;M39;M64;M40;M31;M53;M43;M46; M39
587	TTEAFEKMVSLLSV LLSMQGAVDIN	M61;M74;M69;M43;M42;M39;M22;M61;M74;M69;M43;M42;M39; M22
588	FNMVYMPASWVMR IMTWLDMVDTSL	M32;M52;M70;M83;M15;M46;M39;M32;M52;M70;M83;M15;M46; M39
589	LLEIKDTEKYCALAP NMMVTNNTFT	M78;M65;M25;M34;M18;M39;M82;M78;M65;M25;M34;M18;M39; M82
590	LEIKDTEKYCALAP NMMVTNNTFTL	M78;M65;M25;M34;M18;M39;M82;M78;M65;M25;M34;M18;M39; M82
591	DVKCTSVVLLSVLQ QLRVESSSKLW	M40;M56;M11;M54;M60;M34;M22;M40;M56;M11;M54;M60;M34; M22
592	KCTSVVLLSVLQQL RVESSSKLWAQ	M40;M56;M11;M54;M60;M34;M22;M40;M56;M11;M54;M60;M34; M22
593	VKCTSVVLLSVLQQ LRVESSSKLWA	M40;M56;M11;M54;M60;M34;M22;M40;M56;M11;M54;M60;M34; M22
594	CTSVVLLSVLQQLR VESSSKLWAQC	M40;M56;M11;M54;M60;M34;M22;M40;M56;M11;M54;M60;M34; M22
595	MSDVKCTSVVLLSV LQQLRVESSSK	M40;M56;M54;M60;M34;M29;M22;M40;M56;M54;M60;M34;M29; M22
596	PSFLGRYMSALNHT KKWKYPQVNGL	M66;M24;M5;M25;M74;M61;M33;M66;M24;M5;M25;M74;M61;M3 3
597	VGPNVNKGEDIQLL KSAYENFNQHE	M77;M32;M28;M31;M60;M38;M68;M77;M32;M28;M31;M60;M38; M68
598	VVGPNVNKGEDIQL LKSAYENFNQH	M77;M32;M28;M31;M60;M38;M68;M77;M32;M28;M31;M60;M38; M68
599	SAMQTMLFTMLRK LDNDALNNIINN	M16;M43;M35;M15;M52;M9;M47;M16;M43;M35;M15;M52;M9;M4 7
600	YTVEEAKTVLKKCK SAFYILPSIIS	M64;M54;M78;M65;M55;M60;M9;M64;M54;M78;M65;M55;M60;M 9
601	GYTVEEAKTVLKKC KSAFYILPSII	M64;M54;M78;M65;M55;M60;M9;M64;M54;M78;M65;M55;M60;M 9
602	YEKLKPVLDWLEEK FKEGVEFLRDG	M32;M61;M57;M67;M27;M9;M20;M32;M61;M57;M67;M27;M9;M2 0
603	EKLKPVLDWLEEKF KEGVEFLRDGW	M32;M61;M57;M67;M27;M9;M20;M32;M61;M57;M67;M27;M9;M2 0
604	LDQAISMWALIISVT SNYSGVVTTV	M64;M56;M32;M11;M68;M22;M23;M64;M56;M32;M11;M68;M22; M23

605	ALDQAISMWALIISV TSNYSGVVTT	M64;M56;M32;M11;M68;M22;M23;M64;M56;M32;M11;M68;M22; M23
606	YMPASWVMRIMTW LDMVDTSLSGFK	M64;M32;M70;M83;M15;M52;M22;M64;M32;M70;M83;M15;M52; M22
607	ITPVHVMSKHTDFSS EIIGYKAIDG	M56;M21;M53;M17;M52;M26;M47;M56;M21;M53;M17;M52;M26; M47
608	SCTLSEQLDFIDTKR GVYCCREHEH	M64;M75;M66;M74;M83;M27;M22;M64;M75;M66;M74;M83;M27; M22
609	TLSEQLDFIDTKRGV YCCREHEHEI	M64;M75;M66;M74;M83;M27;M22;M64;M75;M66;M74;M83;M27; M22
610	LSEQLDFIDTKRGV YCCREHEHEIA	M64;M75;M66;M74;M83;M27;M22;M64;M75;M66;M74;M83;M27; M22
611	CTLSEQLDFIDTKRG VYCCREHEHE	M64;M75;M66;M74;M83;M27;M22;M64;M75;M66;M74;M83;M27; M22
612	YLITPVHVMSKHTD FSSEIIGYKAI	M56;M21;M53;M17;M35;M52;M47;M56;M21;M53;M17;M35;M52; M47
613	IFYLITPVHVMSKHT DFSSEIIGYK	M56;M21;M53;M17;M35;M52;M47;M56;M21;M53;M17;M35;M52; M47
614	AIFYLITPVHVMSKH TDFSSEIIGY	M56;M21;M53;M17;M35;M52;M47;M56;M21;M53;M17;M35;M52; M47
615	FYLITPVHVMSKHT DFSSEIIGYKA	M56;M21;M53;M17;M35;M52;M47;M56;M21;M53;M17;M35;M52; M47
616	MLNPNYEDLLIRKS NHNFLVQAGNV	M21;M24;M70;M10;M29;M9;M23;M21;M24;M70;M10;M29;M9;M2 3
617	DMLNPNYEDLLIRK SNHNFLVQAGN	M21;M24;M70;M10;M29;M9;M23;M21;M24;M70;M10;M29;M9;M2 3
618	SRTLETAQNSVRVL QKAAITILDGI	M56;M54;M24;M5;M34;M60;M9;M56;M54;M24;M5;M34;M60;M9
619	FSRTLETAQNSVRV LQKAAITILDG	M56;M54;M24;M5;M34;M60;M9;M56;M54;M24;M5;M34;M60;M9
620	RTLETAQNSVRVLQ KAAITILDGIS	M56;M54;M24;M5;M34;M60;M9;M56;M54;M24;M5;M34;M60;M9
621	TEEVVLKTGDLQPL EQPTSEAVEAP	M58;M54;M60;M38;M17;M62;M15;M58;M54;M60;M38;M17;M62; M15
622	VLTEEVVLKTGDLQ PLEQPTSEAVE	M58;M54;M60;M38;M17;M62;M15;M58;M54;M60;M38;M17;M62; M15
623	LTEEVVLKTGDLQP LEQPTSEAVEA	M58;M54;M60;M38;M17;M62;M15;M58;M54;M60;M38;M17;M62; M15
624	EEVVLKTGDLQPLE QPTSEAVEAPL	M58;M54;M60;M38;M17;M62;M15;M58;M54;M60;M38;M17;M62; M15
625	KVKPTVVVNAANV YLKHGGGVAGAL	M56;M11;M73;M50;M18;M9;M23;M56;M11;M73;M50;M18;M9;M2 3
626	AKKVKPTVVVNAA NVYLKHGGGVAG	M56;M11;M73;M50;M18;M9;M23;M56;M11;M73;M50;M18;M9;M2 3
627	KKVKPTVVVNAAN VYLKHGGGVAGA	M56;M11;M73;M50;M18;M9;M23;M56;M11;M73;M50;M18;M9;M2 3
628	VKPTVVVNAANVY LKHGGGVAGALN	M56;M11;M73;M50;M18;M9;M23;M56;M11;M73;M50;M18;M9;M2 3
629	AMVRMYIFFASFYY VWKSYVHVVDG	M21;M24;M37;M20;M35;M9;M23;M21;M24;M37;M20;M35;M9;M2 3

630	AVLDMCASLKELLQNGMNGRTILGS	M56;M24;M10;M60;M50;M18;M59;M56;M24;M10;M60;M50;M18;M59
631	VVQTIEVNSFSGYLKLTDNVYIKNA	M56;M38;M50;M26;M9;M47;M23;M56;M38;M50;M26;M9;M47;M23
632	PVVQTIEVNSFSGYLKLTDNVYIKN	M56;M38;M50;M26;M9;M47;M23;M56;M38;M50;M26;M9;M47;M23
633	NTTKGGRFVLALLSDLQDLKWARFP	M77;M32;M70;M31;M33;M68;M20;M77;M32;M70;M31;M33;M68;M20
634	YNTTKGGRFVLALLSDLQDLKWARF	M77;M32;M70;M31;M33;M68;M20;M77;M32;M70;M31;M33;M68;M20
635	YYNTTKGGRFVLALLSDLQDLKWAR	M77;M32;M70;M31;M33;M68;M20;M77;M32;M70;M31;M33;M68;M20
636	TPPIKDFGGFNFSQILPDPSKPSKR	M4;M32;M28;M14;M31;M1;M34;M29;M30;M3;M33;M36;M27;M35;M22
637	SASKIITLKKRWQLALSKGVHFVCN	M9;M58;M24;M55;M60;M53;M74;M33;M42;M27;M8;M17;M15;M52;M82
638	QSASKIITLKKRWQLALSKGVHFVC	M9;M58;M24;M55;M60;M53;M74;M33;M42;M27;M8;M17;M15;M52;M82
639	EAVMYMGTLSYEQFKKGVQIPCTCG	M4;M40;M16;M1;M3;M6;M37;M52;M4;M40;M16;M1;M3;M6;M37;M52
640	VEAVMYMGTLSYEQFKKGVQIPCTC	M4;M40;M16;M1;M3;M6;M37;M52;M4;M40;M16;M1;M3;M6;M37;M52
641	TFTCASEYTGNYQCGHYKHITSKET	M4;M1;M38;M3;M41;M8;M43;M42;M4;M1;M38;M3;M41;M8;M43;M42
642	YTPSKLIEYTDFATSACVLAAECTI	M4;M14;M29;M3;M48;M63;M41;M62;M4;M14;M29;M3;M48;M63;M41;M62
643	VGNICYTPSKLIEYTDFATSACVLA	M4;M3;M48;M63;M41;M8;M49;M42;M4;M3;M48;M63;M41;M8;M49;M42
644	GNICYTPSKLIEYTDFATSACVLAA	M4;M3;M48;M63;M41;M8;M49;M42;M4;M3;M48;M63;M41;M8;M49;M42
645	GTFTCASEYTGNYQCGHYKHITSKE	M4;M1;M65;M3;M38;M33;M43;M42;M4;M1;M65;M3;M38;M33;M43;M42
646	FVETVKGLDYKAFKQIVESCGNFKV	M4;M54;M1;M3;M37;M42;M52;M47;M4;M54;M1;M3;M37;M42;M52;M47
647	AFVETVKGLDYKAFKQIVESCGNFK	M4;M54;M1;M3;M37;M42;M52;M47;M4;M54;M1;M3;M37;M42;M52;M47
648	VETVKGLDYKAFKQIVESCGNFKVT	M4;M54;M1;M3;M37;M42;M52;M47;M4;M54;M1;M3;M37;M42;M52;M47
649	LTSQWLTNIFGTVYEKLKPVLDWLE	M4;M28;M31;M34;M3;M45;M67;M59;M4;M28;M31;M34;M3;M45;M67;M59
650	AVGNICYTPSKLIEYTDFATSACVL	M3;M48;M63;M41;M8;M49;M43;M42;M3;M48;M63;M41;M8;M49;M43;M42
651	LNNLNRGMVLGSLAATVRLQAGNAT	M12;M16;M14;M55;M10;M53;M51;M17;M12;M16;M14;M55;M10;M53;M51;M17
652	LNRGMVLGSLAATVRLQAGNATEVP	M12;M16;M14;M55;M10;M53;M51;M17;M12;M16;M14;M55;M10;M53;M51;M17
653	NLNRGMVLGSLAATVRLQAGNATEV	M12;M16;M14;M55;M10;M53;M51;M17;M12;M16;M14;M55;M10;M53;M51;M17
654	NRGMVLGSLAATVRLQAGNATEVPA	M12;M16;M14;M55;M10;M53;M51;M17;M12;M16;M14;M55;M10;M53;M51;M17

655	NNLNRGMVLGSLA ATVRLQAGNATE	M12;M16;M14;M55;M10;M53;M51;M17;M12;M16;M14;M55;M10; M53;M51;M17
656	RCDIKDLPKEITVAT SRTLSYYKLG	M64;M56;M21;M12;M55;M25;M6;M48;M33;M42;M43;M49;M46;M 39;M22;M23
657	KLKTLVATAEAELA KNVSLDNVLST	M12;M81;M28;M29;M6;M45;M38;M49;M12;M81;M28;M29;M6;M4 5;M38;M49
658	EKLKTLVATAEAEL AKNVSLDNVLS	M12;M81;M28;M29;M6;M45;M38;M49;M12;M81;M28;M29;M6;M4 5;M38;M49
659	EFSSLPSYAAFATAQ EAYEQAVANG	M12;M14;M28;M70;M31;M6;M68;M52;M12;M14;M28;M70;M31;M 6;M68;M52
660	FSSLPSYAAFATAQE AYEQAVANGD	M12;M14;M28;M70;M31;M6;M68;M52;M12;M14;M28;M70;M31;M 6;M68;M52
661	NIIPLTTAAKLMVVI PDYNTYKNTC	M28;M14;M24;M38;M57;M51;M82;M23;M28;M14;M24;M38;M57; M51;M82;M23
662	LNIIPLTTAAKLMVV IPDYNTYKNT	M28;M14;M24;M38;M57;M51;M82;M23;M28;M14;M24;M38;M57; M51;M82;M23
663	IIPLTTAAKLMVVIP DYNTYKNTCD	M28;M14;M24;M38;M57;M51;M82;M23;M28;M14;M24;M38;M57; M51;M82;M23
664	PLNIIPLTTAAKLMV VIPDYNTYKN	M28;M14;M24;M38;M57;M51;M82;M23;M28;M14;M24;M38;M57; M51;M82;M23
665	NPTTFHLDGEVITFD NLKTLLSLRE	M21;M30;M45;M48;M50;M36;M49;M22;M21;M30;M45;M48;M50; M36;M49;M22
666	SNPTTFHLDGEVITF DNLKTLLSLR	M21;M30;M45;M48;M50;M36;M49;M22;M21;M30;M45;M48;M50; M36;M49;M22
667	ITTYPGQGLNGYTV EEAKTVLKKCK	M75;M70;M25;M45;M36;M63;M76;M39;M75;M70;M25;M45;M36; M63;M76;M39
668	TTYPGQGLNGYTVE EAKTVLKKCKS	M75;M70;M25;M45;M36;M63;M76;M39;M75;M70;M25;M45;M36; M63;M76;M39
669	LREVRTIKVFTTVD NINLHTQVVDM	M21;M29;M6;M51;M43;M42;M26;M22;M21;M29;M6;M51;M43;M4 2;M26;M22
670	FDVVRQCSGVTFQS AVKRTIKGTHH	M4;M71;M19;M1;M60;M25;M33;M26;M4;M71;M19;M1;M60;M25; M33;M26
671	PFDVVRQCSGVTFQ SAVKRTIKGTH	M4;M71;M19;M1;M60;M25;M33;M26;M4;M71;M19;M1;M60;M25; M33;M26
672	KQDDKKIKACVEEV TTTLEETKFLT	M32;M28;M14;M65;M6;M74;M67;M49;M32;M28;M14;M65;M6;M7 4;M67;M49
673	KHITSKETLYCIDGA LLTKSSEYKG	M10;M36;M43;M35;M46;M39;M9;M44;M10;M36;M43;M35;M46;M 39;M9;M44
674	HITSKETLYCIDGAL LTKSSEYKGP	M10;M36;M43;M35;M46;M39;M9;M44;M10;M36;M43;M35;M46;M 39;M9;M44
675	YKHITSKETLYCIDG ALLTKSSEYK	M10;M36;M43;M35;M46;M39;M9;M44;M10;M36;M43;M35;M46;M 39;M9;M44
676	ITSKETLYCIDGALL TKSSEYKGPI	M10;M36;M43;M35;M46;M39;M9;M44;M10;M36;M43;M35;M46;M 39;M9;M44
677	VYCPRHVICTSEDM LNPNYEDLLIR	M64;M28;M6;M45;M72;M49;M59;M20;M64;M28;M6;M45;M72;M4 9;M59;M20
678	CPRHVICTSEDMLN PNYEDLLIRKS	M64;M28;M6;M45;M72;M49;M59;M20;M64;M28;M6;M45;M72;M4 9;M59;M20
679	YCPRHVICTSEDML NPNYEDLLIRK	M64;M28;M6;M45;M72;M49;M59;M20;M64;M28;M6;M45;M72;M4 9;M59;M20

680	KTLLSLREVRTIKVF TTVDNINLHT	M21;M14;M29;M6;M72;M49;M26;M22;M21;M14;M29;M6;M72;M4 9;M26;M22
681	IWNVKDFMSLSEQL RKQIRSAAKKN	M56;M19;M66;M25;M6;M45;M18;M59;M56;M19;M66;M25;M6;M4 5;M18;M59
682	NVKDFMSLSEQLRK QIRSAAKKNNL	M56;M19;M66;M25;M6;M45;M18;M59;M56;M19;M66;M25;M6;M4 5;M18;M59
683	WNVKDFMSLSEQL RKQIRSAAKKNN	M56;M19;M66;M25;M6;M45;M18;M59;M56;M19;M66;M25;M6;M4 5;M18;M59
684	HFLPRVFSAVGNICY TPSKLIEYTD	M64;M12;M45;M42;M8;M43;M46;M22;M64;M12;M45;M42;M8;M4 3;M46;M22
685	FLHFLPRVFSAVGNI CYTPSKLIEY	M64;M12;M45;M42;M8;M43;M46;M22;M64;M12;M45;M42;M8;M4 3;M46;M22
686	LHFLPRVFSAVGNIC YTPSKLIEYT	M64;M12;M45;M42;M8;M43;M46;M22;M64;M12;M45;M42;M8;M4 3;M46;M22
687	LLSLREVRTIKVFTT VDNINLHTQV	M21;M14;M29;M6;M72;M42;M26;M22;M21;M14;M29;M6;M72;M4 2;M26;M22
688	FLPRVFSAVGNICYT PSKLIEYTDF	M64;M12;M45;M8;M49;M43;M42;M22;M64;M12;M45;M8;M49;M4 3;M42;M22
689	LPRVFSAVGNICYTP SKLIEYTDFA	M64;M12;M45;M8;M49;M43;M42;M22;M64;M12;M45;M8;M49;M4 3;M42;M22
690	QVESDDYIATNGPL KVGGSCVLSGH	M11;M73;M19;M10;M29;M18;M9;M44;M11;M73;M19;M10;M29;M 18;M9;M44
691	NAMQVESDDYIATN GPLKVGGSCVL	M11;M73;M19;M10;M29;M18;M9;M44;M11;M73;M19;M10;M29;M 18;M9;M44
692	NNAMQVESDDYIAT NGPLKVGGSCV	M11;M73;M19;M10;M29;M18;M9;M44;M11;M73;M19;M10;M29;M 18;M9;M44
693	AMQVESDDYIATNG PLKVGGSCVLS	M11;M73;M19;M10;M29;M18;M9;M44;M11;M73;M19;M10;M29;M 18;M9;M44
694	MQVESDDYIATNGP LKVGGSCVLSG	M11;M73;M19;M10;M29;M18;M9;M44;M11;M73;M19;M10;M29;M 18;M9;M44
695	QVAKSHNIALIWNV KDFMSLSEQLR	M32;M28;M66;M1;M6;M37;M72;M68;M32;M28;M66;M1;M6;M37; M72;M68
696	DILLAKDTTEAFEK MVSLLSVLLSM	M40;M16;M34;M30;M53;M36;M42;M39;M40;M16;M34;M30;M53; M36;M42;M39
697	SLPSYAAFATAQEA YEQAVANGDSE	M12;M28;M31;M70;M6;M33;M68;M52;M12;M28;M31;M70;M6;M3 3;M68;M52
698	CGHYKHITSKETLY CIDGALLTKSS	M21;M58;M36;M41;M8;M43;M39;M9;M21;M58;M36;M41;M8;M43 ;M39;M9
699	DNYITTYPGQGLNG YTVEEAKTVLK	M75;M70;M26;M29;M45;M63;M76;M39;M75;M70;M26;M29;M45; M63;M76;M39
700	RKVPTDNYITTYPG QGLNGYTVEEA	M16;M14;M29;M48;M41;M49;M15;M26;M16;M14;M29;M48;M41; M49;M15;M26
701	ALRKVPTDNYITTY PGQGLNGYTVE	M16;M14;M29;M48;M41;M49;M15;M26;M16;M14;M29;M48;M41; M49;M15;M26
702	LRKVPTDNYITTYP GQGLNGYTVEE	M16;M14;M29;M48;M41;M49;M15;M26;M16;M14;M29;M48;M41; M49;M15;M26
703	KALRKVPTDNYITT YPGQGLNGYTV	M16;M14;M29;M48;M41;M49;M15;M26;M16;M14;M29;M48;M41; M49;M15;M26
704	SLDNVLSTFISAARQ GFVDSDVETK	M14;M70;M16;M29;M61;M33;M18;M63;M14;M70;M16;M29;M61; M33;M18;M63

705	LDNVLSTFISAARQG FVDSDVETKD	M14;M70;M16;M29;M61;M33;M18;M63;M14;M70;M16;M29;M61; M33;M18;M63
706	TPEEHFIETISLAGSY KDWSYSGQS	M64;M40;M32;M14;M16;M29;M6;M68;M64;M40;M32;M14;M16;M 29;M6;M68
707	GQGLNGYTVEEAKT VLKKCKSAFYI	M75;M19;M60;M25;M45;M76;M39;M9;M75;M19;M60;M25;M45;M 76;M39;M9
708	QGLNGYTVEEAKTV LKKCKSAFYIL	M75;M19;M78;M60;M45;M76;M39;M9;M75;M19;M78;M60;M45;M 76;M39;M9
709	YASAVVLLILMTAR TVYDDGARRVW	M75;M32;M28;M6;M72;M46;M39;M59;M75;M32;M28;M6;M72;M4 6;M39;M59
710	VMYASAVVLLILMT ARTVYDDGARR	M75;M32;M28;M6;M72;M46;M39;M59;M75;M32;M28;M6;M72;M4 6;M39;M59
711	MYASAVVLLILMTA RTVYDDGARRV	M75;M32;M28;M6;M72;M46;M39;M59;M75;M32;M28;M6;M72;M4 6;M39;M59
712	VVSTTTNIVTRCLNR VCTNYMPYFF	M4;M64;M78;M1;M6;M37;M69;M20;M4;M64;M78;M1;M6;M37;M6 9;M20
713	KVVSTTTNIVTRCL NRVCTNYMPYF	M4;M64;M78;M1;M6;M37;M69;M20;M4;M64;M78;M1;M6;M37;M6 9;M20
714	VSTTTNIVTRCLNRV CTNYMPYFFT	M4;M64;M78;M1;M6;M37;M69;M20;M4;M64;M78;M1;M6;M37;M6 9;M20
715	TDPSFLGRYMSALN HTKKWKYPQVN	M19;M66;M24;M1;M25;M61;M37;M33;M19;M66;M24;M1;M25;M6 1;M37;M33
716	TTDPSFLGRYMSAL NHTKKWKYPQV	M19;M66;M24;M1;M25;M61;M37;M33;M19;M66;M24;M1;M25;M6 1;M37;M33
717	HTTDPSFLGRYMSA LNHTKKWKYPQ	M19;M66;M24;M1;M25;M61;M37;M33;M19;M66;M24;M1;M25;M6 1;M37;M33
718	AYKDYLASGGQPIT NCVKMLCTHTG	M56;M12;M24;M53;M37;M33;M8;M39;M56;M12;M24;M53;M37;M 33;M8;M39
719	LTLGVYDYLVSTQE FRYMNSQGLLP	M40;M31;M34;M30;M6;M8;M43;M42;M40;M31;M34;M30;M6;M8; M43;M42
720	KLEKMADQAMTQM YKQARSEDKRAK	M56;M19;M55;M25;M2;M74;M18;M82;M56;M19;M55;M25;M2;M7 4;M18;M82
721	ECPNFVFPLNSIIKTI QPRVEKKKL	M28;M29;M6;M61;M50;M72;M62;M59;M28;M29;M6;M61;M50;M7 2;M62;M59
722	NEFACVVADAVIKT LQPVSELLTPL	M28;M78;M45;M79;M49;M39;M82;M47;M28;M78;M45;M79;M49; M39;M82;M47
723	KFVCDNIKFADDLN QLTGYKKPASR	M40;M64;M21;M19;M70;M63;M22;M23;M40;M64;M21;M19;M70; M63;M22;M23
724	VCDNIKFADDLNQL TGYKKPASREL	M40;M64;M21;M19;M70;M63;M22;M23;M40;M64;M21;M19;M70; M63;M22;M23
725	FVCDNIKFADDLNQ LTGYKKPASRE	M40;M64;M21;M19;M70;M63;M22;M23;M40;M64;M21;M19;M70; M63;M22;M23
726	EQRKQDDKKIKACV EEVTTTLEETK	M32;M28;M14;M65;M60;M74;M67;M49;M32;M28;M14;M65;M60; M74;M67;M49
727	QRKQDDKKIKACVE EVTTTLEETKF	M32;M28;M14;M65;M60;M74;M67;M49;M32;M28;M14;M65;M60; M74;M67;M49
728	TDNYITTYPGQGLN GYTVEEAKTVL	M75;M70;M26;M29;M48;M63;M49;M76;M75;M70;M26;M29;M48; M63;M49;M76
729	MDGSIIQFPNTYLEG SVRVVTTFDS	M12;M48;M41;M43;M49;M42;M26;M22;M12;M48;M41;M43;M49; M42;M26;M22

730	LMDGSIIQFPNTYLE GSVRVVTTFD	M12;M48;M41;M43;M49;M42;M26;M22;M12;M48;M41;M43;M49; M42;M26;M22
731	DNIKFADDLNQLTG YKKPASRELKV	M64;M58;M19;M70;M53;M38;M63;M15;M64;M58;M19;M70;M53; M38;M63;M15
732	VVLLILMTARTVYD DGARRVWTLMN	M75;M32;M6;M72;M46;M39;M11;M59;M75;M32;M6;M72;M46;M3 9;M11;M59
733	LNGYTVEEAKTVLK KCKSAFYILPS	M54;M78;M65;M55;M60;M45;M39;M9;M54;M78;M65;M55;M60;M 45;M39;M9
734	GHYKHITSKETLYCI DGALLTKSSE	M21;M58;M10;M46;M36;M43;M39;M9;M21;M58;M10;M46;M36;M 43;M39;M9
735	KNVSLDNVLSTFISA ARQGFVDSDV	M14;M16;M29;M61;M33;M18;M27;M26;M14;M16;M29;M61;M33; M18;M27;M26
736	VSLDNVLSTFISAAR QGFVDSDVET	M14;M16;M29;M61;M33;M18;M27;M26;M14;M16;M29;M61;M33; M18;M27;M26
737	AKNVSLDNVLSTFIS AARQGFVDSD	M14;M16;M29;M61;M33;M18;M27;M26;M14;M16;M29;M61;M33; M18;M27;M26
738	NVSLDNVLSTFISAA RQGFVDSDVE	M14;M16;M29;M61;M33;M18;M27;M26;M14;M16;M29;M61;M33; M18;M27;M26
739	FTPLVPFWITIAYIICI STKHFYWF	M56;M32;M24;M10;M7;M60;M8;M23;M56;M32;M24;M10;M7;M60 ;M8;M23
740	MFTPLVPFWITIAYII CISTKHFYW	M56;M32;M24;M10;M7;M60;M8;M23;M56;M32;M24;M10;M7;M60 ;M8;M23
741	MPLKAPKEIIFLEGE TLPTEVLTEE	M54;M24;M60;M48;M42;M27;M46;M39;M54;M24;M60;M48;M42; M27;M46;M39
742	LMPLKAPKEIIFLEG ETLPTEVLTE	M54;M24;M60;M48;M42;M27;M46;M39;M54;M24;M60;M48;M42; M27;M46;M39
743	LKAPKEIIFLEGETLP TEVLTEEVV	M54;M24;M60;M48;M42;M27;M46;M39;M54;M24;M60;M48;M42; M27;M46;M39
744	PLKAPKEIIFLEGETL PTEVLTEEV	M54;M24;M60;M48;M42;M27;M46;M39;M54;M24;M60;M48;M42; M27;M46;M39
745	LLMPLKAPKEIIFLE GETLPTEVLT	M54;M24;M60;M48;M42;M27;M46;M39;M54;M24;M60;M48;M42; M27;M46;M39
746	NKVVSTTTNIVTRC LNRVCTNYMPY	M4;M64;M23;M78;M1;M37;M69;M20;M4;M64;M23;M78;M1;M37; M69;M20
747	SHEGKTFYVLPNDD TLRVEAFEYYH	M34;M74;M63;M41;M42;M43;M39;M22;M34;M74;M63;M41;M42; M43;M39;M22
748	NSHEGKTFYVLPND DTLRVEAFEYY	M34;M74;M63;M41;M42;M43;M39;M22;M34;M74;M63;M41;M42; M43;M39;M22
749	VAYESLRPDTRYVL MDGSIIQFPNT	M25;M34;M48;M50;M41;M43;M42;M39;M25;M34;M48;M50;M41; M43;M42;M39
750	ATLQAIASEFSSLPS YAAFATAQEA	M21;M28;M31;M41;M42;M43;M39;M22;M21;M28;M31;M41;M42; M43;M39;M22
751	NLDSCKRVLNVVCK TCGQQQTTLKG	M58;M16;M5;M2;M27;M17;M15;M52;M58;M16;M5;M2;M27;M17; M15;M52
752	QHANLDSCKRVLN VVCKTCGQQQTT	M58;M16;M5;M2;M27;M17;M15;M52;M58;M16;M5;M2;M27;M17; M15;M52
753	LDSCKRVLNVVCKT CGQQQTTLKGV	M58;M16;M5;M2;M27;M17;M15;M52;M58;M16;M5;M2;M27;M17; M15;M52
754	ANLDSCKRVLNVVC KTCGQQQTTLK	M58;M16;M5;M2;M27;M17;M15;M52;M58;M16;M5;M2;M27;M17; M15;M52

755	HANLDSCKRVLNV VCKTCGQQQTTL	M58;M16;M5;M2;M27;M17;M15;M52;M58;M16;M5;M2;M27;M17; M15;M52
756	LNPNYEDLLIRKSN HNFLVQAGNVQ	M21;M14;M70;M24;M10;M29;M9;M23;M21;M14;M70;M24;M10;M 29;M9;M23
757	CAKEIKESVQTFFKL VNKFLALCAD	M16;M24;M53;M17;M43;M42;M39;M47;M16;M24;M53;M17;M43; M42;M39;M47
758	DTEKYCALAPNMM VTNNTFTLKGGA	M11;M9;M24;M78;M10;M34;M6;M82;M11;M9;M24;M78;M10;M34 ;M6;M82
759	LTPVVQTIEVNSFSG YLKLTDNVYI	M56;M60;M29;M38;M6;M50;M26;M47;M56;M60;M29;M38;M6;M5 0;M26;M47
760	ELTPVVQTIEVNSFS GYLKLTDNVY	M56;M60;M29;M38;M6;M50;M26;M47;M56;M60;M29;M38;M6;M5 0;M26;M47
761	VYDDGARRVWTLM NVLTLVYKVYYG	M24;M5;M2;M18;M52;M22;M47;M20;M24;M5;M2;M18;M52;M22; M47;M20
762	YDDGARRVWTLMN VLTLVYKVYYGN	M24;M5;M2;M18;M52;M22;M47;M20;M24;M5;M2;M18;M52;M22; M47;M20
763	DDGARRVWTLMNV LTLVYKVYYGNA	M24;M5;M2;M18;M52;M22;M47;M20;M24;M5;M2;M18;M52;M22; M47;M20
764	PNTYLEGSVRVVTT FDSEYCRHGTC	M64;M40;M48;M27;M20;M43;M22;M23;M64;M40;M48;M27;M20; M43;M22;M23
765	TYLEGSVRVVTTFD SEYCRHGTCER	M64;M40;M48;M27;M20;M43;M22;M23;M64;M40;M48;M27;M20; M43;M22;M23
766	LEGSVRVVTTFDSE YCRHGTCERSE	M64;M40;M48;M27;M20;M43;M22;M23;M64;M40;M48;M27;M20; M43;M22;M23
767	NTYLEGSVRVVTTF DSEYCRHGTCE	M64;M40;M48;M27;M20;M43;M22;M23;M64;M40;M48;M27;M20; M43;M22;M23
768	YLEGSVRVVTTFDS EYCRHGTCERS	M64;M40;M48;M27;M20;M43;M22;M23;M64;M40;M48;M27;M20; M43;M22;M23
769	DYLASGGQPITNCV KMLCTHTGTGQ	M4;M64;M56;M24;M10;M53;M22;M23;M4;M64;M56;M24;M10;M5 3;M22;M23
770	VYLAVFDKNLYDK LVSSFLEMKSEK	M56;M70;M55;M41;M42;M49;M43;M39;M56;M70;M55;M41;M42; M49;M43;M39
771	IIQFPNTYLEGSVRV VTTFDSEYCR	M64;M40;M12;M27;M20;M43;M22;M23;M64;M40;M12;M27;M20; M43;M22;M23
772	QEGVLTAVVIPTKK AGGTTEMLAKA	M58;M16;M29;M53;M38;M61;M67;M17;M58;M16;M29;M53;M38; M61;M67;M17
773	VQEGVLTAVVIPTK KAGGTTEMLAK	M58;M16;M29;M53;M38;M61;M67;M17;M58;M16;M29;M53;M38; M61;M67;M17
774	VVQEGVLTAVVIPT KKAGGTTEMLA	M58;M16;M29;M53;M38;M61;M67;M17;M58;M16;M29;M53;M38; M61;M67;M17
775	SGGQPITNCVKMLC THTGTGQAITV	M4;M64;M21;M56;M58;M53;M22;M23;M4;M64;M21;M56;M58;M5 3;M22;M23
776	EMELTPVVQTIEVN SFSGYLKLTDN	M56;M60;M29;M6;M38;M50;M47;M59;M56;M60;M29;M6;M38;M5 0;M47;M59
777	NGYTVEEAKTVLKK CKSAFYILPSI	M64;M54;M78;M65;M55;M60;M39;M9;M64;M54;M78;M65;M55;M 60;M39;M9
778	FFASFYYVWKSYVH VVDGCNSSTCM	M21;M24;M1;M34;M37;M35;M9;M23;M21;M24;M1;M34;M37;M35 ;M9;M23
779	FASFYYVWKSYVH VVDGCNSSTCMM	M21;M24;M1;M34;M37;M35;M9;M23;M21;M24;M1;M34;M37;M35 ;M9;M23

780	MYIFFASFYYVWKS YVHVVDGCNSS	M21;M24;M1;M34;M37;M35;M9;M23;M21;M24;M1;M34;M37;M35 ;M9;M23
781	IFFASFYYVWKSYV HVVDGCNSSTC	M21;M24;M1;M34;M37;M35;M9;M23;M21;M24;M1;M34;M37;M35 ;M9;M23
782	YIFFASFYYVWKSY VHVVDGCNSST	M21;M24;M1;M34;M37;M35;M9;M23;M21;M24;M1;M34;M37;M35 ;M9;M23
783	TVEEAKTVLKKCKS AFYILPSIISN	M64;M54;M16;M78;M65;M55;M60;M9;M64;M54;M16;M78;M65;M 55;M60;M9
784	MVRMYIFFASFYYV WKSYVHVVDGC	M21;M24;M1;M37;M20;M35;M9;M23;M21;M24;M1;M37;M20;M35 ;M9;M23
785	IAYIICISTKHFYWFF SNYLKRRVV	M56;M32;M24;M10;M7;M60;M50;M23;M56;M32;M24;M10;M7;M6 0;M50;M23
786	DTTEAFEKMVSLLS VLLSMQGAVDI	M53;M61;M74;M69;M42;M43;M39;M22;M53;M61;M74;M69;M42; M43;M39;M22
787	TSAMQTMLFTMLR KLDNDALNNIIN	M16;M17;M35;M15;M52;M43;M9;M47;M16;M17;M35;M15;M52;M 43;M9;M47
788	KSVGKFCLEASFNY LKSPNFSKLIN	M54;M25;M60;M18;M41;M43;M42;M39;M54;M25;M60;M18;M41; M43;M42;M39
789	VKSVGKFCLEASFN YLKSPNFSKLI	M54;M25;M60;M18;M41;M43;M42;M39;M54;M25;M60;M18;M41; M43;M42;M39
790	TVKSVGKFCLEASF NYLKSPNFSKL	M54;M25;M60;M18;M41;M43;M42;M39;M54;M25;M60;M18;M41; M43;M42;M39
791	NTVKSVGKFCLEAS FNYLKSPNFSK	M54;M25;M60;M18;M41;M43;M42;M39;M54;M25;M60;M18;M41; M43;M42;M39
792	LMLLEIKDTEKYCA LAPNMMVTNNT	M9;M78;M65;M25;M34;M18;M39;M82;M9;M78;M65;M25;M34;M1 8;M39;M82
793	MLLEIKDTEKYCAL APNMMVTNNTF	M9;M78;M65;M25;M34;M18;M39;M82;M9;M78;M65;M25;M34;M1 8;M39;M82
794	LITPVHVMSKHTDF SSEIIGYKAID	M56;M21;M53;M17;M35;M52;M26;M47;M56;M21;M53;M17;M35; M52;M26;M47
795	DQAISMWALIISVTS NYSGVVTTVM	M64;M56;M32;M11;M38;M68;M22;M23;M64;M56;M32;M11;M38; M68;M22;M23
796	AISMWALIISVTSNY SGVVTTVMFL	M64;M56;M32;M11;M38;M68;M22;M23;M64;M56;M32;M11;M38; M68;M22;M23
797	SMWALIISVTSNYSG VVTTVMFLAR	M64;M56;M32;M11;M38;M68;M22;M23;M64;M56;M32;M11;M38; M68;M22;M23
798	ISMWALIISVTSNYS GVVTTVMFLA	M64;M56;M32;M11;M38;M68;M22;M23;M64;M56;M32;M11;M38; M68;M22;M23
799	QAISMWALIISVTSN YSGVVTTVMF	M64;M56;M32;M11;M38;M68;M22;M23;M64;M56;M32;M11;M38; M68;M22;M23
800	TPVHVMSKHTDFSS EIIGYKAIDGG	M56;M21;M53;M41;M17;M52;M26;M47;M56;M21;M53;M41;M17; M52;M26;M47
801	TKGGRFVLALLSDL QDLKWARFPKS	M77;M32;M70;M31;M60;M33;M68;M20;M77;M32;M70;M31;M60; M33;M68;M20
802	TTKGGRFVLALLSD LQDLKWARFPK	M77;M32;M70;M31;M60;M33;M68;M20;M77;M32;M70;M31;M60; M33;M68;M20
803	PKCDRAMPNMLRI MASLVLARKHTT	M56;M21;M12;M54;M25;M30;M48;M69;M41;M42;M8;M49;M43;M 46;M39;M22;M23
804	YPKCDRAMPNMLRI MASLVLARKHT	M56;M21;M12;M54;M25;M30;M48;M69;M41;M42;M8;M49;M43;M 46;M39;M22;M23

805	DIKDLPKEITVATSR TLSYYKLGAS	M64;M56;M21;M12;M55;M25;M29;M6;M48;M33;M42;M43;M49;M 46;M39;M22;M23
806	IKDLPKEITVATSRT LSYYKLGASQ	M64;M56;M21;M12;M55;M25;M29;M6;M48;M33;M42;M43;M49;M 46;M39;M22;M23
807	CDIKDLPKEITVATS RTLSYYKLGA	M64;M56;M21;M12;M55;M25;M29;M6;M48;M33;M42;M43;M49;M 46;M39;M22;M23
808	AVFQSASKIITLKKR WQLALSKGVH	M56;M9;M58;M24;M16;M55;M60;M53;M74;M33;M42;M27;M8;M1 7;M15;M52;M82
809	FQSASKIITLKKRWQ LALSKGVHFV	M56;M9;M58;M24;M16;M55;M60;M53;M74;M33;M42;M27;M8;M1 7;M15;M52;M82
810	VFQSASKIITLKKRW QLALSKGVHF	M56;M9;M58;M24;M16;M55;M60;M53;M74;M33;M42;M27;M8;M1 7;M15;M52;M82
811	CYTPSKLIEYTDFAT SACVLAAECT	M4;M49;M14;M29;M3;M48;M63;M41;M62;M4;M49;M14;M29;M3; M48;M63;M41;M62
812	SAFVETVKGLDYKA FKQIVESCGNF	M4;M54;M1;M3;M6;M37;M42;M52;M47;M4;M54;M1;M3;M6;M37; M42;M52;M47
813	RAMPNMLRIMASLV LARKHTTCCSL	M56;M21;M12;M54;M25;M30;M48;M69;M41;M42;M8;M49;M43;M 46;M39;M22;M35;M23
814	CDRAMPNMLRIMA SLVLARKHTTCC	M56;M21;M12;M54;M25;M30;M48;M69;M41;M42;M8;M49;M43;M 46;M39;M22;M35;M23
815	DRAMPNMLRIMASL VLARKHTTCCS	M56;M21;M12;M54;M25;M30;M48;M69;M41;M42;M8;M49;M43;M 46;M39;M22;M35;M23
816	KCDRAMPNMLRIM ASLVLARKHTTC	M56;M21;M12;M54;M25;M30;M48;M69;M41;M42;M8;M49;M43;M 46;M39;M22;M35;M23
817	YPGQGLNGYTVEEA KTVLKKCKSAF	M75;M19;M70;M25;M45;M36;M63;M76;M39;M75;M19;M70;M25; M45;M36;M63;M76;M39
818	TYPGQGLNGYTVEE AKTVLKKCKSA	M75;M19;M70;M25;M45;M36;M63;M76;M39;M75;M19;M70;M25; M45;M36;M63;M76;M39
819	KDLPKEITVATSRTL SYYKLGASQR	M64;M56;M21;M12;M70;M55;M25;M29;M6;M48;M33;M42;M43;M 49;M46;M39;M22;M23
820	EVGFVVPGLPGTILR TTNGDFLHFL	M64;M11;M12;M24;M1;M6;M45;M8;M9;M64;M11;M12;M24;M1;M 6;M45;M8;M9
821	WEIVKFISTCACEIV GGQIVTCAKE	M12;M29;M6;M45;M74;M72;M8;M22;M20;M12;M29;M6;M45;M74 ;M72;M8;M22;M20
822	TVLSFCAFAVDAAK AYKDYLASGGQ	M32;M12;M28;M70;M48;M57;M36;M69;M63;M32;M12;M28;M70; M48;M57;M36;M69;M63
823	SLREVRTIKVFTTVD NINLHTQVVD	M21;M14;M29;M6;M51;M43;M42;M26;M22;M21;M14;M29;M6;M5 1;M43;M42;M26;M22
824	STFNVPMEKLKTLV ATAEAELAKNV	M12;M81;M28;M29;M6;M45;M38;M49;M22;M12;M81;M28;M29;M 6;M45;M38;M49;M22
825	SSTFNVPMEKLKTL VATAEAELAKN	M12;M81;M28;M29;M6;M45;M38;M49;M22;M12;M81;M28;M29;M 6;M45;M38;M49;M22
826	SEFSSLPSYAAFATA QEAYEQAVAN	M12;M14;M28;M70;M31;M6;M68;M52;M22;M12;M14;M28;M70;M 31;M6;M68;M52;M22
827	ASEFSSLPSYAAFAT AQEAYEQAVA	M12;M14;M28;M70;M31;M6;M68;M52;M22;M12;M14;M28;M70;M 31;M6;M68;M52;M22
828	VPLNIIPLTTAAKLM VVIPDYNTYK	M28;M14;M22;M24;M38;M57;M51;M82;M23;M28;M14;M22;M24; M38;M57;M51;M82;M23
829	LKTLVATAEAELAK NVSLDNVLSTF	M73;M12;M81;M28;M29;M6;M45;M38;M49;M73;M12;M81;M28;M 29;M6;M45;M38;M49

830	PMEKLKTLVATAEA ELAKNVSLDNV	M12;M81;M28;M29;M6;M45;M38;M49;M59;M12;M81;M28;M29;M 6;M45;M38;M49;M59
831	NVPMEKLKTLVATA EAELAKNVSLD	M12;M81;M28;M29;M6;M45;M38;M49;M59;M12;M81;M28;M29;M 6;M45;M38;M49;M59
832	MEKLKTLVATAEAE LAKNVSLDNVL	M12;M81;M28;M29;M6;M45;M38;M49;M59;M12;M81;M28;M29;M 6;M45;M38;M49;M59
833	VPMEKLKTLVATAE AELAKNVSLDN	M12;M81;M28;M29;M6;M45;M38;M49;M59;M12;M81;M28;M29;M 6;M45;M38;M49;M59
834	RAKVTSAMQTMLF TMLRKLDNDALN	M16;M3;M17;M35;M15;M52;M43;M9;M47;M16;M3;M17;M35;M15 ;M52;M43;M9;M47
835	AKVTSAMQTMLFT MLRKLDNDALNN	M16;M3;M17;M35;M15;M52;M43;M9;M47;M16;M3;M17;M35;M15 ;M52;M43;M9;M47
836	KVTSAMQTMLFTM LRKLDNDALNNI	M16;M3;M17;M35;M15;M52;M43;M9;M47;M16;M3;M17;M35;M15 ;M52;M43;M9;M47
837	VTSAMQTMLFTML RKLDNDALNNII	M16;M3;M17;M35;M15;M52;M43;M9;M47;M16;M3;M17;M35;M15 ;M52;M43;M9;M47
838	SSLPSYAAFATAQE AYEQAVANGDS	M12;M14;M28;M70;M31;M6;M33;M68;M52;M12;M14;M28;M70;M 31;M6;M33;M68;M52
839	LIWNVKDFMSLSEQ LRKQIRSAAKK	M56;M28;M66;M19;M25;M6;M45;M18;M59;M56;M28;M66;M19;M 25;M6;M45;M18;M59
840	VGFVVPGLPGTILRT TNGDFLHFLP	M64;M11;M24;M1;M6;M45;M8;M9;M23;M64;M11;M24;M1;M6;M4 5;M8;M9;M23
841	TPFDVVRQCSGVTF QSAVKRTIKGT	M4;M71;M54;M19;M1;M60;M25;M46;M26;M4;M71;M54;M19;M1; M60;M25;M46;M26
842	GECPNFVFPLNSIIKT IQPRVEKKK	M28;M19;M29;M6;M61;M50;M72;M62;M59;M28;M19;M29;M6;M6 1;M50;M72;M62;M59
843	DAAKAYKDYLASG GQPITNCVKMLC	M12;M48;M37;M57;M33;M69;M8;M42;M39;M12;M48;M37;M57;M 33;M69;M8;M42;M39
844	VVYCPRHVICTSED MLNPNYEDLLI	M64;M28;M66;M6;M45;M72;M49;M59;M20;M64;M28;M66;M6;M4 5;M72;M49;M59;M20
845	DVVYCPRHVICTSE DMLNPNYEDLL	M64;M28;M66;M6;M45;M72;M49;M59;M20;M64;M28;M66;M6;M4 5;M72;M49;M59;M20
846	RKQDDKKIKACVEE VTTTLEETKFL	M32;M28;M14;M65;M60;M6;M74;M67;M49;M32;M28;M14;M65;M 60;M6;M74;M67;M49
847	DFLHFLPRVFSAVG NICYTPSKLIE	M64;M12;M53;M45;M42;M8;M43;M46;M22;M64;M12;M53;M45;M 42;M8;M43;M46;M22
848	LSLREVRTIKVFTTV DNINLHTQVV	M21;M14;M29;M6;M72;M43;M42;M26;M22;M21;M14;M29;M6;M7 2;M43;M42;M26;M22
849	QTFFKLVNKFLALC ADSIIIGGAKL	M24;M34;M45;M41;M67;M42;M8;M43;M39;M24;M34;M45;M41;M 67;M42;M8;M43;M39
850	RPDTRYVLMDGSIIQ FPNTYLEGSV	M7;M30;M48;M41;M43;M49;M42;M26;M22;M7;M30;M48;M41;M4 3;M49;M42;M26;M22
851	ASAVVLLILMTART VYDDGARRVWT	M75;M32;M28;M6;M72;M46;M39;M11;M59;M75;M32;M28;M6;M7 2;M46;M39;M11;M59
852	SAVVLLILMTARTV YDDGARRVWTL	M75;M32;M28;M6;M72;M46;M39;M11;M59;M75;M32;M28;M6;M7 2;M46;M39;M11;M59
853	AVVLLILMTARTVY DDGARRVWTLM	M75;M32;M28;M6;M72;M46;M39;M11;M59;M75;M32;M28;M6;M7 2;M46;M39;M11;M59
854	LAKNVSLDNVLSTFI SAARQGFVDS	M14;M16;M7;M29;M61;M33;M18;M27;M26;M14;M16;M7;M29;M6 1;M33;M18;M27;M26

855	FDNLKTLLSLREVR TIKVFTTVDNI	M32;M14;M66;M31;M65;M29;M6;M68;M49;M32;M14;M66;M31;M65;M29;M6;M68;M49
856	TFDNLKTLLSLREV RTIKVFTTVDN	M32;M14;M66;M31;M65;M29;M6;M68;M49;M32;M14;M66;M31;M65;M29;M6;M68;M49
857	NPNYEDLLIRKSNH NFLVQAGNVQL	M21;M12;M14;M70;M24;M10;M29;M9;M23;M21;M12;M14;M70;M24;M10;M29;M9;M23
858	GLPGTILRTTNGDFL HFLPRVFSAV	M64;M75;M11;M24;M53;M6;M45;M52;M9;M64;M75;M11;M24;M53;M6;M45;M52;M9
859	ETSNSFDVLKSEDA QGMDNLACEDL	M64;M34;M30;M6;M41;M42;M46;M39;M22;M64;M34;M30;M6;M41;M42;M46;M39;M22
860	GEVITFDNLKTLLSL REVRTIKVFT	M32;M66;M31;M65;M30;M29;M36;M68;M49;M32;M66;M31;M65;M30;M29;M36;M68;M49
861	PTDNYITTYPGQGL NGYTVEEAKTV	M75;M70;M26;M29;M48;M63;M49;M15;M76;M75;M70;M26;M29;M48;M63;M49;M15;M76
862	SVGKFCLEASFNYL KSPNFSKLINI	M54;M19;M25;M60;M18;M41;M43;M42;M39;M54;M19;M25;M60;M18;M41;M43;M42;M39
863	VGKFCLEASFNYLK SPNFSKLINII	M54;M19;M25;M60;M18;M41;M43;M42;M39;M54;M19;M25;M60;M18;M41;M43;M42;M39
864	IQFPNTYLEGSVRVV TTFDSEYCRH	M64;M40;M12;M48;M27;M20;M43;M22;M23;M64;M40;M12;M48;M27;M20;M43;M22;M23
865	QFPNTYLEGSVRVV TTFDSEYCRHG	M64;M40;M12;M48;M27;M20;M43;M22;M23;M64;M40;M12;M48;M27;M20;M43;M22;M23
866	FPNTYLEGSVRVVT TFDSEYCRHGT	M64;M40;M12;M48;M27;M20;M43;M22;M23;M64;M40;M12;M48;M27;M20;M43;M22;M23
867	TGLLMPLKAPKEIIF LEGETLPTEV	M54;M24;M31;M60;M48;M42;M27;M46;M39;M54;M24;M31;M60;M48;M42;M27;M46;M39
868	GLLMPLKAPKEIIFL EGETLPTEVL	M54;M24;M31;M60;M48;M42;M27;M46;M39;M54;M24;M31;M60;M48;M42;M27;M46;M39
869	EVITFDNLKTLLSLR EVRTIKVFTT	M32;M66;M31;M65;M29;M30;M6;M68;M49;M32;M66;M31;M65;M29;M30;M6;M68;M49
870	VITFDNLKTLLSLRE VRTIKVFTTV	M32;M66;M31;M65;M29;M30;M6;M68;M49;M32;M66;M31;M65;M29;M30;M6;M68;M49
871	ITFDNLKTLLSLREV RTIKVFTTVD	M32;M66;M31;M65;M29;M30;M6;M68;M49;M32;M66;M31;M65;M29;M30;M6;M68;M49
872	HNSHEGKTFYVLPN DDTLRVEAFEY	M31;M34;M74;M63;M41;M42;M43;M39;M22;M31;M34;M74;M63;M41;M42;M43;M39;M22
873	RSEKSYELQTPFEIK LAKKFDTFNG	M12;M58;M24;M10;M25;M34;M17;M39;M23;M12;M58;M24;M10;M25;M34;M17;M39;M23
874	GDSEVVLKKLKKSL NVAKSEFDRDA	M71;M32;M28;M55;M53;M74;M33;M68;M17;M71;M32;M28;M55;M53;M74;M33;M68;M17
875	LSHFVNLDNLRANN TKGSLPINVIV	M64;M40;M31;M30;M53;M43;M46;M39;M22;M64;M40;M31;M30;M53;M43;M46;M39;M22
876	EIKDTEKYCALAPN MMVTNNTFTLK	M78;M65;M25;M34;M6;M82;M18;M39;M9;M78;M65;M25;M34;M6;M82;M18;M39;M9
877	IKDTEKYCALAPNM MVTNNTFTLKG	M78;M65;M25;M34;M6;M82;M18;M39;M9;M78;M65;M25;M34;M6;M82;M18;M39;M9
878	GGQIVTCAKEIKESV QTFFKLVNKF	M56;M55;M65;M10;M53;M79;M33;M8;M23;M56;M55;M65;M10;M53;M79;M33;M8;M23
879	KAGQKTYERHSLSH FVNLDNLRANN	M64;M40;M70;M31;M30;M15;M43;M39;M22;M64;M40;M70;M31;M30;M15;M43;M39;M22

880	TLQAIASEFSSLPSY AAFATAQEAY	M21;M28;M31;M41;M42;M68;M43;M39;M22;M21;M28;M31;M41; M42;M68;M43;M39;M22
881	NIFGTVYEKLKPVL DWLEEKFKEGV	M32;M28;M31;M34;M67;M68;M39;M47;M20;M32;M28;M31;M34; M67;M68;M39;M47;M20
882	FGTVYEKLKPVLDW LEEKFKEGVEF	M32;M28;M31;M34;M67;M68;M39;M9;M20;M32;M28;M31;M34;M 67;M68;M39;M9;M20
883	KDTEKYCALAPNM MVTNNTFTLKGG	M11;M9;M24;M78;M65;M10;M34;M6;M82;M11;M9;M24;M78;M65 ;M10;M34;M6;M82
884	ELQTPFEIKLAKKFD TFNGECPNFV	M23;M12;M58;M24;M10;M57;M27;M17;M20;M23;M12;M58;M24; M10;M57;M27;M17;M20
885	SYELQTPFEIKLAKK FDTFNGECPN	M23;M12;M58;M24;M10;M57;M27;M17;M20;M23;M12;M58;M24; M10;M57;M27;M17;M20
886	YELQTPFEIKLAKKF DTFNGECPNF	M23;M12;M58;M24;M10;M57;M27;M17;M20;M23;M12;M58;M24; M10;M57;M27;M17;M20
887	LQTPFEIKLAKKFDT FNGECPNFVF	M23;M12;M58;M24;M10;M57;M27;M17;M20;M23;M12;M58;M24; M10;M57;M27;M17;M20
888	MELTPVVQTIEVNSF SGYLKLTDNV	M56;M60;M29;M6;M38;M50;M26;M47;M59;M56;M60;M29;M6;M3 8;M50;M26;M47;M59
889	VGDVVQEGVLTAV VIPTKKAGGTTE	M58;M16;M29;M53;M38;M61;M67;M27;M17;M58;M16;M29;M53; M38;M61;M67;M27;M17
890	DVVQEGVLTAVVIP TKKAGGTTEML	M58;M16;M29;M53;M38;M61;M67;M27;M17;M58;M16;M29;M53; M38;M61;M67;M27;M17
891	GDVVQEGVLTAVVI PTKKAGGTTEM	M58;M16;M29;M53;M38;M61;M67;M27;M17;M58;M16;M29;M53; M38;M61;M67;M27;M17
892	ASGGQPITNCVKML CTHTGTGQAIT	M4;M64;M21;M56;M58;M10;M53;M22;M23;M4;M64;M21;M56;M5 8;M10;M53;M22;M23
893	NLGETFVTHSKGLY RKCVKSREETG	M71;M24;M55;M50;M18;M27;M52;M26;M47;M71;M24;M55;M50; M18;M27;M52;M26;M47
894	AVFDKNLYDKLVSS FLEMKSEKQVE	M31;M70;M25;M34;M41;M42;M49;M43;M39;M31;M70;M25;M34; M41;M42;M49;M43;M39
895	ASFNYLKSPNFSKLI NIIIWFLLLS	M54;M25;M60;M74;M18;M41;M43;M42;M39;M54;M25;M60;M74; M18;M41;M43;M42;M39
896	VFLFVAAIFYLITPV HVMSKHTDFS	M56;M32;M34;M53;M18;M17;M52;M39;M47;M56;M32;M34;M53; M18;M17;M52;M39;M47
897	FLFVAAIFYLITPVH VMSKHTDFSS	M56;M32;M34;M53;M18;M17;M52;M39;M47;M56;M32;M34;M53; M18;M17;M52;M39;M47
898	FTCASEYTGNYQCG HYKHITSKETL	M4;M52;M1;M38;M3;M41;M42;M8;M43;M39;M4;M52;M1;M38;M3 ;M41;M42;M8;M43;M39
899	STSAFVETVKGLDY KAFKQIVESCG	M4;M54;M16;M1;M60;M3;M6;M37;M52;M47;M4;M54;M16;M1;M6 0;M3;M6;M37;M52;M47
900	TSAFVETVKGLDYK AFKQIVESCGN	M4;M54;M1;M60;M3;M6;M37;M42;M52;M47;M4;M54;M1;M60;M3 ;M6;M37;M42;M52;M47
901	TSQWLTNIFGTVYE KLKPVLDWLEE	M4;M28;M31;M34;M3;M45;M47;M67;M39;M59;M4;M28;M31;M34 ;M3;M45;M47;M67;M39;M59
902	GWEIVKFISTCACEI VGGQIVTCAK	M12;M29;M6;M45;M74;M72;M8;M49;M22;M20;M12;M29;M6;M45 ;M74;M72;M8;M49;M22;M20
903	TNIFGTVYEKLKPVL DWLEEKFKEG	M32;M28;M31;M34;M3;M67;M68;M39;M47;M20;M32;M28;M31;M 34;M3;M67;M68;M39;M47;M20
904	LSFCAFAVDAAKAY KDYLASGGQPI	M32;M21;M12;M28;M70;M48;M57;M36;M69;M63;M32;M21;M12; M28;M70;M48;M57;M36;M69;M63

905	VLSFCAFAVDAAKA YKDYLASGGQP	M32;M21;M12;M28;M70;M48;M57;M36;M69;M63;M32;M21;M12; M28;M70;M48;M57;M36;M69;M63
906	IVKFISTCACEIVGG QIVTCAKEIK	M28;M66;M12;M78;M65;M29;M6;M74;M45;M79;M28;M66;M12;M 78;M65;M29;M6;M74;M45;M79
907	FNVPMEKLKTLVAT AEAELAKNVSL	M12;M81;M28;M29;M6;M45;M38;M49;M22;M59;M12;M81;M28;M 29;M6;M45;M38;M49;M22;M59
908	TFNVPMEKLKTLVA TAEAELAKNVS	M12;M81;M28;M29;M6;M45;M38;M49;M22;M59;M12;M81;M28;M 29;M6;M45;M38;M49;M22;M59
909	PTTFHLDGEVITFDN LKTLLSLREV	M40;M21;M16;M7;M30;M48;M50;M36;M49;M22;M40;M21;M16;M 7;M30;M48;M50;M36;M49;M22
910	AIILASFSASTSAFVE TVKGLDYKA	M52;M28;M14;M16;M38;M6;M33;M8;M43;M42;M52;M28;M14;M1 6;M38;M6;M33;M8;M43;M42
911	IAIILASFSASTSAFV ETVKGLDYK	M52;M28;M14;M16;M38;M6;M33;M8;M43;M42;M52;M28;M14;M1 6;M38;M6;M33;M8;M43;M42
912	EIVKFISTCACEIVG GQIVTCAKEI	M12;M78;M65;M29;M6;M74;M45;M79;M8;M20;M12;M78;M65;M2 9;M6;M74;M45;M79;M8;M20
913	TSSSKTPEEHFIETIS LAGSYKDWS	M64;M40;M32;M14;M16;M30;M29;M6;M68;M8;M64;M40;M32;M1 4;M16;M30;M29;M6;M68;M8
914	KTPEEHFIETISLAGS YKDWSYSGQ	M64;M40;M32;M14;M16;M30;M29;M6;M68;M8;M64;M40;M32;M1 4;M16;M30;M29;M6;M68;M8
915	SSSKTPEEHFIETISL AGSYKDWSY	M64;M40;M32;M14;M16;M30;M29;M6;M68;M8;M64;M40;M32;M1 4;M16;M30;M29;M6;M68;M8
916	SKTPEEHFIETISLAG SYKDWSYSG	M64;M40;M32;M14;M16;M30;M29;M6;M68;M8;M64;M40;M32;M1 4;M16;M30;M29;M6;M68;M8
917	SSKTPEEHFIETISLA GSYKDWSYS	M64;M40;M32;M14;M16;M30;M29;M6;M68;M8;M64;M40;M32;M1 4;M16;M30;M29;M6;M68;M8
918	AYITGGVVQLTSQW LTNIFGTVYEK	M12;M54;M60;M48;M51;M42;M43;M49;M46;M9;M12;M54;M60;M 48;M51;M42;M43;M49;M46;M9
919	ATNNLVVMAYITGG VVQLTSQWLTN	M12;M54;M60;M48;M51;M42;M43;M49;M46;M9;M12;M54;M60;M 48;M51;M42;M43;M49;M46;M9
920	TNNLVVMAYITGGV VQLTSQWLTNI	M12;M54;M60;M48;M51;M42;M43;M49;M46;M9;M12;M54;M60;M 48;M51;M42;M43;M49;M46;M9
921	LVVMAYITGGVVQL TSQWLTNIFGT	M12;M54;M60;M48;M51;M42;M43;M49;M46;M9;M12;M54;M60;M 48;M51;M42;M43;M49;M46;M9
922	MAYITGGVVQLTSQ WLTNIFGTVYE	M12;M54;M60;M48;M51;M42;M43;M49;M46;M9;M12;M54;M60;M 48;M51;M42;M43;M49;M46;M9
923	YITGGVVQLTSQWL TNIFGTVYEKL	M12;M54;M60;M48;M51;M42;M43;M49;M46;M9;M12;M54;M60;M 48;M51;M42;M43;M49;M46;M9
924	VMAYITGGVVQLTS QWLTNIFGTVY	M12;M54;M60;M48;M51;M42;M43;M49;M46;M9;M12;M54;M60;M 48;M51;M42;M43;M49;M46;M9
925	VVMAYITGGVVQLT SQWLTNIFGTV	M12;M54;M60;M48;M51;M42;M43;M49;M46;M9;M12;M54;M60;M 48;M51;M42;M43;M49;M46;M9
926	NLVVMAYITGGVV QLTSQWLTNIFG	M12;M54;M60;M48;M51;M42;M43;M49;M46;M9;M12;M54;M60;M 48;M51;M42;M43;M49;M46;M9
927	NNLVVMAYITGGV VQLTSQWLTNIF	M12;M54;M60;M48;M51;M42;M43;M49;M46;M9;M12;M54;M60;M 48;M51;M42;M43;M49;M46;M9
928	VVPGLPGTILRTTNG DFLHFLPRVF	M64;M75;M11;M24;M1;M6;M45;M8;M9;M23;M64;M75;M11;M24; M1;M6;M45;M8;M9;M23
929	GFVVPGLPGTILRTT NGDFLHFLPR	M64;M75;M11;M24;M1;M6;M45;M8;M9;M23;M64;M75;M11;M24; M1;M6;M45;M8;M9;M23

930	FVVPGLPGTILRTTN GDFLHFLPRV	M64;M75;M11;M24;M1;M6;M45;M8;M9;M23;M64;M75;M11;M24; M1;M6;M45;M8;M9;M23
931	VDAAKAYKDYLAS GGQPITNCVKML	M12;M48;M37;M57;M33;M69;M41;M8;M42;M39;M12;M48;M37;M 57;M33;M69;M41;M8;M42;M39
932	SLRPDTRYVLMDGS IIQFPNTYLEG	M25;M34;M7;M30;M48;M41;M43;M42;M39;M22;M25;M34;M7;M3 0;M48;M41;M43;M42;M39;M22
933	HYKHITSKETLYCID GALLTKSSEY	M21;M58;M10;M36;M43;M35;M46;M39;M9;M44;M21;M58;M10;M 36;M43;M35;M46;M39;M9;M44
934	SVQTFFKLVNKFLA LCADSIIIGGA	M16;M24;M34;M45;M57;M41;M42;M8;M43;M39;M16;M24;M34;M 45;M57;M41;M42;M8;M43;M39
935	YESLRPDTRYVLMD GSIIQFPNTYL	M25;M34;M7;M30;M48;M50;M41;M43;M42;M39;M25;M34;M7;M3 0;M48;M50;M41;M43;M42;M39
936	AYESLRPDTRYVLM DGSIIQFPNTY	M25;M34;M7;M30;M48;M50;M41;M43;M42;M39;M25;M34;M7;M3 0;M48;M50;M41;M43;M42;M39
937	ESLRPDTRYVLMDG SIIQFPNTYLE	M25;M34;M7;M30;M48;M50;M41;M43;M42;M39;M25;M34;M7;M3 0;M48;M50;M41;M43;M42;M39
938	ILLAKDTTEAFEKM VSLLSVLLSMQ	M40;M16;M34;M30;M53;M36;M43;M42;M39;M22;M40;M16;M34; M30;M53;M36;M43;M42;M39;M22
939	VPGLPGTILRTTNGD FLHFLPRVFS	M64;M75;M11;M24;M6;M45;M8;M52;M9;M23;M64;M75;M11;M24 ;M6;M45;M8;M52;M9;M23
940	VQTFFKLVNKFLAL CADSIIIGGAK	M24;M34;M45;M57;M41;M67;M42;M8;M43;M39;M24;M34;M45;M 57;M41;M67;M42;M8;M43;M39
941	DGEVITFDNLKTLLS LREVRTIKVF	M32;M66;M31;M65;M30;M29;M48;M36;M68;M49;M32;M66;M31; M65;M30;M29;M48;M36;M68;M49
942	VAKSHNIALIWNVK DFMSLSEQLRK	M32;M28;M66;M1;M25;M6;M37;M72;M68;M59;M32;M28;M66;M1 ;M25;M6;M37;M72;M68;M59
943	KFCLEASFNYLKSP NFSKLINIIIW	M4;M54;M19;M25;M60;M18;M41;M43;M42;M39;M4;M54;M19;M2 5;M60;M18;M41;M43;M42;M39
944	FCLEASFNYLKSPNF SKLINIIIWF	M4;M54;M19;M25;M60;M18;M41;M43;M42;M39;M4;M54;M19;M2 5;M60;M18;M41;M43;M42;M39
945	GKFCLEASFNYLKS PNFSKLINIII	M4;M54;M19;M25;M60;M18;M41;M43;M42;M39;M4;M54;M19;M2 5;M60;M18;M41;M43;M42;M39
946	VKFISTCACEIVGGQ IVTCAKEIKE	M28;M66;M12;M78;M65;M80;M29;M79;M50;M23;M28;M66;M12; M78;M65;M80;M29;M79;M50;M23
947	TLGVYDYLVSTQEF RYMNSQGLLPP	M40;M31;M34;M30;M6;M33;M8;M43;M42;M47;M40;M31;M34;M3 0;M6;M33;M8;M43;M42;M47
948	VTKIKPHNSHEGKT FYVLPNDDTLR	M1;M34;M74;M37;M63;M41;M42;M43;M39;M22;M1;M34;M74;M3 7;M63;M41;M42;M43;M39;M22
949	YKDYLASGGQPITN CVKMLCTHTGT	M56;M12;M24;M10;M53;M37;M33;M8;M39;M23;M56;M12;M24;M 10;M53;M37;M33;M8;M39;M23
950	NGDSEVVLKKLKKS LNVAKSEFDRD	M71;M13;M32;M28;M55;M1;M53;M33;M68;M17;M71;M13;M32;M 28;M55;M1;M53;M33;M68;M17
951	ANGDSEVVLKKLK KSLNVAKSEFDR	M71;M13;M32;M28;M55;M1;M53;M33;M68;M17;M71;M13;M32;M 28;M55;M1;M53;M33;M68;M17
952	VETSNSFDVLKSED AQGMDNLACED	M64;M34;M30;M6;M41;M42;M43;M46;M39;M22;M64;M34;M30;M 6;M41;M42;M43;M46;M39;M22
953	QTPFEIKLAKKFDTF NGECPNFVFP	M23;M12;M58;M24;M10;M45;M57;M27;M17;M20;M23;M12;M58; M24;M10;M45;M57;M27;M17;M20
954	TPFEIKLAKKFDTFN GECPNFVFPL	M23;M12;M58;M24;M10;M45;M57;M27;M17;M20;M23;M12;M58; M24;M10;M45;M57;M27;M17;M20

955	PGLPGTILRTTNGDF LHFLPRVFSA	M64;M75;M11;M24;M53;M6;M45;M52;M9;M23;M64;M75;M11;M24;M53;M6;M45;M52;M9;M23
956	SASTSAFVETVKGL DYKAFKQIVES	M52;M54;M16;M1;M60;M6;M38;M37;M35;M47;M52;M54;M16;M1;M60;M6;M38;M37;M35;M47
957	AGQKTYERHSLSHF VNLDNLRANNT	M64;M40;M16;M70;M31;M30;M15;M43;M39;M22;M64;M40;M16;M70;M31;M30;M15;M43;M39;M22
958	LLAKDTTEAFEKMV SLLSVLLSMQG	M40;M16;M34;M30;M53;M69;M43;M42;M39;M22;M40;M16;M34;M30;M53;M69;M43;M42;M39;M22
959	ETGLLMPLKAPKEII FLEGETLPTE	M54;M24;M31;M60;M38;M48;M42;M27;M46;M39;M54;M24;M31;M60;M38;M48;M42;M27;M46;M39
960	VEEAKTVLKKCKSA FYILPSIISNE	M64;M21;M54;M16;M78;M65;M55;M60;M63;M9;M64;M21;M54;M16;M78;M65;M55;M60;M63;M9
961	WALIISVTSNYSGVV TTVMFLARGI	M64;M56;M32;M11;M14;M29;M38;M68;M22;M23;M64;M56;M32;M11;M14;M29;M38;M68;M22;M23
962	MWALIISVTSNYSG VVTTVMFLARG	M64;M56;M32;M11;M14;M29;M38;M68;M22;M23;M64;M56;M32;M11;M14;M29;M38;M68;M22;M23
963	SEKSYELQTPFEIKL AKKFDTFNGE	M12;M58;M24;M10;M25;M34;M27;M17;M39;M23;M12;M58;M24;M10;M25;M34;M27;M17;M39;M23
964	KPHNSHEGKTFYVL PNDDTLRVEAF	M31;M34;M74;M37;M63;M41;M42;M43;M39;M22;M31;M34;M74;M37;M63;M41;M42;M43;M39;M22
965	PHNSHEGKTFYVLP NDDTLRVEAFE	M31;M34;M74;M37;M63;M41;M42;M43;M39;M22;M31;M34;M74;M37;M63;M41;M42;M43;M39;M22
966	AFYILPSIISNEKQEI LGTVSWNLR	M56;M11;M24;M55;M10;M45;M50;M18;M9;M23;M56;M11;M24;M55;M10;M45;M50;M18;M9;M23
967	FYILPSIISNEKQEIL GTVSWNLRE	M56;M11;M24;M55;M10;M45;M50;M18;M9;M23;M56;M11;M24;M55;M10;M45;M50;M18;M9;M23
968	LEASFNYLKSPNFSK LINIIIWFLL	M4;M54;M25;M60;M74;M18;M41;M43;M42;M39;M4;M54;M25;M60;M74;M18;M41;M43;M42;M39
969	EASFNYLKSPNFSKL INIIIWFLLL	M4;M54;M25;M60;M74;M18;M41;M43;M42;M39;M4;M54;M25;M60;M74;M18;M41;M43;M42;M39
970	LQAIASEFSSLPSYA AFATAQEAYE	M21;M52;M28;M31;M41;M42;M68;M43;M39;M22;M21;M52;M28;M31;M41;M42;M68;M43;M39;M22
971	TCGTTTLNGLWLDD VVYCPRHVICT	M56;M75;M24;M55;M65;M7;M53;M79;M9;M23;M56;M75;M24;M55;M65;M7;M53;M79;M9;M23
972	KSYELQTPFEIKLAK KFDTFNGECP	M23;M12;M58;M24;M10;M25;M57;M27;M17;M20;M23;M12;M58;M24;M10;M25;M57;M27;M17;M20
973	EKSYELQTPFEIKLA KKFDTFNGEC	M23;M12;M58;M24;M10;M25;M57;M27;M17;M20;M23;M12;M58;M24;M10;M25;M57;M27;M17;M20
974	IFGTVYEKLKPVLD WLEEKFKEGVE	M32;M28;M31;M34;M67;M68;M39;M9;M47;M20;M32;M28;M31;M34;M67;M68;M39;M9;M47;M20
975	LASGGQPITNCVKM LCTHTGTGQAI	M4;M64;M21;M56;M58;M24;M10;M53;M22;M23;M4;M64;M21;M56;M58;M24;M10;M53;M22;M23
976	YLASGGQPITNCVK MLCTHTGTGQA	M4;M64;M21;M56;M58;M24;M10;M53;M22;M23;M4;M64;M21;M56;M58;M24;M10;M53;M22;M23
977	TPVVQTIEVNSFSGY LKLTDNVYIK	M56;M60;M29;M38;M6;M50;M26;M9;M47;M23;M56;M60;M29;M38;M6;M50;M26;M9;M47;M23
978	VAAIFYLITPVHVMS KHTDFSSEII	M56;M21;M34;M53;M18;M17;M35;M52;M39;M47;M56;M21;M34;M53;M18;M17;M35;M52;M39;M47
979	LFVAAIFYLITPVHV MSKHTDFSSE	M56;M21;M34;M53;M18;M17;M35;M52;M39;M47;M56;M21;M34;M53;M18;M17;M35;M52;M39;M47

980	AAIFYLITPVHVMSK HTDFSSEIIG	M56;M21;M34;M53;M18;M17;M35;M52;M39;M47;M56;M21;M34; M53;M18;M17;M35;M52;M39;M47
981	FVAAIFYLITPVHVM SKHTDFSSEI	M56;M21;M34;M53;M18;M17;M35;M52;M39;M47;M56;M21;M34; M53;M18;M17;M35;M52;M39;M47
982	TGGVVQLTSQWLT NIFGTVYEKLKP	M4;M3;M45;M48;M51;M42;M43;M49;M46;M9;M59;M4;M3;M45;M 48;M51;M42;M43;M49;M46;M9;M59
983	QWLTNIFGTVYEKL KPVLDWLEEKF	M4;M32;M28;M31;M34;M3;M45;M47;M67;M39;M59;M4;M32;M28 ;M31;M34;M3;M45;M47;M67;M39;M59
984	SQWLTNIFGTVYEK LKPVLDWLEEK	M4;M32;M28;M31;M34;M3;M45;M47;M67;M39;M59;M4;M32;M28 ;M31;M34;M3;M45;M47;M67;M39;M59
985	PGQGLNGYTVEEAK TVLKKCKSAFY	M75;M19;M70;M60;M25;M45;M36;M63;M76;M39;M9;M75;M19;M 70;M60;M25;M45;M36;M63;M76;M39;M9
986	ALIWNVKDFMSLSE QLRKQIRSAAK	M56;M28;M66;M19;M25;M6;M45;M37;M18;M72;M59;M56;M28;M 66;M19;M25;M6;M45;M37;M18;M72;M59
987	IILASFSASTSAFVET VKGLDYKAF	M52;M28;M14;M16;M54;M38;M6;M33;M8;M43;M42;M52;M28;M1 4;M16;M54;M38;M6;M33;M8;M43;M42
988	DGWEIVKFISTCACE IVGGQIVTCA	M23;M21;M29;M6;M45;M74;M72;M8;M49;M22;M20;M23;M21;M2 9;M6;M45;M74;M72;M8;M49;M22;M20
989	RDGWEIVKFISTCAC EIVGGQIVTC	M23;M21;M29;M6;M45;M74;M72;M8;M49;M22;M20;M23;M21;M2 9;M6;M45;M74;M72;M8;M49;M22;M20
990	VPTDNYITTYPGQG LNGYTVEEAKT	M75;M14;M70;M26;M29;M48;M63;M41;M49;M15;M76;M75;M14; M70;M26;M29;M48;M63;M41;M49;M15;M76
991	SFSASTSAFVETVKG LDYKAFKQIV	M52;M54;M14;M16;M1;M60;M6;M38;M37;M35;M47;M52;M54;M1 4;M16;M1;M60;M6;M38;M37;M35;M47
992	FSASTSAFVETVKGL DYKAFKQIVE	M52;M54;M14;M16;M1;M60;M6;M38;M37;M35;M47;M52;M54;M1 4;M16;M1;M60;M6;M38;M37;M35;M47
993	AIASEFSSLPSYAAF ATAQEAYEQA	M21;M12;M28;M70;M31;M6;M41;M42;M68;M52;M22;M21;M12;M 28;M70;M31;M6;M41;M42;M68;M52;M22
994	CLEASFNYLKSPNFS KLINIIIWFL	M4;M54;M19;M25;M60;M74;M18;M41;M43;M42;M39;M4;M54;M1 9;M25;M60;M74;M18;M41;M43;M42;M39
995	KDYLASGGQPITNC VKMLCTHTGTG	M4;M64;M56;M24;M10;M53;M37;M8;M39;M22;M23;M4;M64;M56 ;M24;M10;M53;M37;M8;M39;M22;M23
996	TKIKPHNSHEGKTF YVLPNDDTLRV	M31;M1;M34;M74;M37;M63;M41;M42;M43;M39;M22;M31;M1;M3 4;M74;M37;M63;M41;M42;M43;M39;M22
997	IKPHNSHEGKTFYV LPNDDTLRVEA	M31;M1;M34;M74;M37;M63;M41;M42;M43;M39;M22;M31;M1;M3 4;M74;M37;M63;M41;M42;M43;M39;M22
998	KIKPHNSHEGKTFY VLPNDDTLRVE	M31;M1;M34;M74;M37;M63;M41;M42;M43;M39;M22;M31;M1;M3 4;M74;M37;M63;M41;M42;M43;M39;M22
999	PVETSNSFDVLKSED AQGMDNLACE	M64;M25;M34;M30;M6;M41;M42;M43;M46;M39;M22;M64;M25;M 34;M30;M6;M41;M42;M43;M46;M39;M22
1000	KPVETSNSFDVLKSE DAQGMDNLAC	M64;M25;M34;M30;M6;M41;M42;M43;M46;M39;M22;M64;M25;M 34;M30;M6;M41;M42;M43;M46;M39;M22
1001	WSTKPVETSNSFDV LKSEDAQGMDN	M64;M25;M34;M30;M6;M41;M42;M43;M46;M39;M22;M64;M25;M 34;M30;M6;M41;M42;M43;M46;M39;M22
1002	STKPVETSNSFDVLK SEDAQGMDNL	M64;M25;M34;M30;M6;M41;M42;M43;M46;M39;M22;M64;M25;M 34;M30;M6;M41;M42;M43;M46;M39;M22
1003	TKPVETSNSFDVLKS EDAQGMDNLA	M64;M25;M34;M30;M6;M41;M42;M43;M46;M39;M22;M64;M25;M 34;M30;M6;M41;M42;M43;M46;M39;M22
1004	GQKTYERHSLSHFV NLDNLRANNTK	M64;M40;M16;M70;M31;M30;M42;M15;M43;M39;M22;M64;M40; M16;M70;M31;M30;M42;M15;M43;M39;M22

1005	AKDTTEAFEKMVSL LSVLLSMQGAV	M40;M16;M34;M30;M53;M74;M69;M43;M42;M39;M22;M40;M16; M34;M30;M53;M74;M69;M43;M42;M39;M22
1006	KDTTEAFEKMVSLL SVLLSMQGAVD	M40;M16;M34;M30;M53;M74;M69;M43;M42;M39;M22;M40;M16; M34;M30;M53;M74;M69;M43;M42;M39;M22
1007	LAKDTTEAFEKMVS LLSVLLSMQGA	M40;M16;M34;M30;M53;M74;M69;M43;M42;M39;M22;M40;M16; M34;M30;M53;M74;M69;M43;M42;M39;M22
1008	LVSSFLEMKSEKQV EQKIAEIPKEE	M40;M16;M31;M25;M34;M30;M74;M41;M43;M42;M39;M40;M16; M31;M25;M34;M30;M74;M41;M43;M42;M39
1009	TILRTTNGDFLHFLP RVFSAVGNIC	M75;M56;M58;M16;M24;M53;M45;M18;M17;M15;M52;M75;M56; M58;M16;M24;M53;M45;M18;M17;M15;M52
1010	YILPSIISNEKQEILG TVSWNLREM	M75;M56;M11;M24;M55;M10;M45;M50;M18;M9;M23;M75;M56;M 11;M24;M55;M10;M45;M50;M18;M9;M23
1011	KEIKESVQTFFKLVN KFLALCADSI	M58;M16;M24;M53;M17;M35;M15;M42;M43;M39;M47;M58;M16; M24;M53;M17;M35;M15;M42;M43;M39;M47
1012	AKEIKESVQTFFKLV NKFLALCADS	M58;M16;M24;M53;M17;M35;M15;M42;M43;M39;M47;M58;M16; M24;M53;M17;M35;M15;M42;M43;M39;M47
1013	VFDKNLYDKLVSSF LEMKSEKQVEQ	M40;M16;M31;M70;M25;M34;M41;M43;M49;M42;M39;M40;M16; M31;M70;M25;M34;M41;M43;M49;M42;M39
1014	KGVEAVMYMGTLS YEQFKKGVQIPC	M4;M56;M40;M54;M16;M55;M1;M53;M3;M6;M37;M22;M4;M56;M 40;M54;M16;M55;M1;M53;M3;M6;M37;M22
1015	TCASEYTGNYQCGH YKHITSKETLY	M4;M52;M31;M1;M38;M3;M41;M42;M8;M43;M39;M9;M4;M52;M3 1;M1;M38;M3;M41;M42;M8;M43;M39;M9
1016	LKGVEAVMYMGTL SYEQFKKGVQIP	M4;M56;M21;M40;M54;M55;M1;M53;M3;M6;M37;M22;M4;M56;M 21;M40;M54;M55;M1;M53;M3;M6;M37;M22
1017	ITGGVVQLTSQWLT NIFGTVYEKLK	M12;M54;M60;M3;M48;M45;M51;M42;M43;M49;M46;M9;M12;M5 4;M60;M3;M48;M45;M51;M42;M43;M49;M46;M9
1018	WLTNIFGTVYEKLK PVLDWLEEKFK	M4;M32;M28;M31;M34;M3;M45;M47;M67;M68;M39;M59;M4;M32 ;M28;M31;M34;M3;M45;M47;M67;M68;M39;M59
1019	LTNIFGTVYEKLKPV LDWLEEKFKE	M4;M32;M28;M31;M34;M3;M45;M47;M67;M68;M39;M59;M4;M32 ;M28;M31;M34;M3;M45;M47;M67;M68;M39;M59
1020	QTTLKGVEAVMYM GTLSYEQFKKGV	M4;M56;M21;M40;M54;M55;M60;M53;M3;M6;M37;M22;M4;M56; M21;M40;M54;M55;M60;M53;M3;M6;M37;M22
1021	QQTTLKGVEAVMY MGTLSYEQFKKG	M4;M56;M21;M40;M54;M55;M60;M53;M3;M6;M37;M22;M4;M56; M21;M40;M54;M55;M60;M53;M3;M6;M37;M22
1022	QQQTTLKGVEAVM YMGTLSYEQFKK	M4;M56;M21;M40;M54;M55;M60;M53;M3;M6;M37;M22;M4;M56; M21;M40;M54;M55;M60;M53;M3;M6;M37;M22
1023	SFCAFAVDAAKAYK DYLASGGQPIT	M32;M21;M12;M28;M70;M48;M57;M33;M69;M63;M36;M8;M32;M 21;M12;M28;M70;M48;M57;M33;M69;M63;M36;M8
1024	IALIWNVKDFMSLS EQLRKQIRSAA	M56;M28;M66;M19;M1;M25;M6;M45;M37;M18;M72;M59;M56;M2 8;M66;M19;M1;M25;M6;M45;M37;M18;M72;M59
1025	NIALIWNVKDFMSL SEQLRKQIRSA	M56;M28;M66;M19;M1;M25;M6;M45;M37;M18;M72;M59;M56;M2 8;M66;M19;M1;M25;M6;M45;M37;M18;M72;M59
1026	IASEFSSLPSYAAFA TAQEAYEQAV	M21;M12;M14;M28;M70;M31;M6;M41;M42;M68;M52;M22;M21;M 12;M14;M28;M70;M31;M6;M41;M42;M68;M52;M22
1027	AVDAAKAYKDYLA SGGQPITNCVKM	M12;M70;M48;M37;M57;M33;M69;M63;M41;M8;M42;M39;M12;M 70;M48;M37;M57;M33;M69;M63;M41;M8;M42;M39
1028	GVEFLRDGWEIVKFI STCACEIVGG	M4;M64;M21;M23;M29;M6;M45;M74;M48;M49;M22;M20;M4;M64 ;M21;M23;M29;M6;M45;M74;M48;M49;M22;M20
1029	EGVEFLRDGWEIVK FISTCACEIVG	M4;M64;M21;M23;M29;M6;M45;M74;M48;M49;M22;M20;M4;M64 ;M21;M23;M29;M6;M45;M74;M48;M49;M22;M20

1030	KVPTDNYITTYPGQ GLNGYTVEEAK	M75;M14;M70;M16;M26;M29;M48;M63;M41;M49;M15;M76;M75; M14;M70;M16;M26;M29;M48;M63;M41;M49;M15;M76
1031	NGDFLHFLPRVFSA VGNICYTPSKL	M64;M56;M12;M58;M16;M24;M1;M53;M45;M17;M46;M22;M64;M 56;M12;M58;M16;M24;M1;M53;M45;M17;M46;M22
1032	LRPDTRYVLMDGSII QFPNTYLEGS	M25;M34;M7;M30;M48;M41;M43;M49;M42;M26;M39;M22;M25;M 34;M7;M30;M48;M41;M43;M49;M42;M26;M39;M22
1033	QCGHYKHITSKETL YCIDGALLTKS	M40;M21;M52;M58;M31;M36;M41;M42;M8;M43;M39;M9;M40;M2 1;M52;M58;M31;M36;M41;M42;M8;M43;M39;M9
1034	YQCGHYKHITSKET LYCIDGALLTK	M40;M21;M52;M58;M31;M36;M41;M42;M8;M43;M39;M9;M40;M2 1;M52;M58;M31;M36;M41;M42;M8;M43;M39;M9
1035	NYQCGHYKHITSKE TLYCIDGALLT	M40;M21;M52;M58;M31;M36;M41;M42;M8;M43;M39;M9;M40;M2 1;M52;M58;M31;M36;M41;M42;M8;M43;M39;M9
1036	LPGTILRTTNGDFLH FLPRVFSAVG	M64;M75;M56;M11;M58;M16;M24;M53;M6;M45;M52;M9;M64;M7 5;M56;M11;M58;M16;M24;M53;M6;M45;M52;M9
1037	KFISTCACEIVGGQI VTCAKEIKES	M56;M28;M66;M12;M78;M65;M80;M55;M10;M79;M50;M23;M56; M28;M66;M12;M78;M65;M80;M55;M10;M79;M50;M23
1038	FISTCACEIVGGQIV TCAKEIKESV	M56;M28;M66;M12;M78;M65;M80;M55;M10;M79;M50;M23;M56; M28;M66;M12;M78;M65;M80;M55;M10;M79;M50;M23
1039	ILRTTNGDFLHFLPR VFSAVGNICY	M75;M56;M58;M16;M24;M1;M53;M45;M18;M17;M15;M52;M75;M 56;M58;M16;M24;M1;M53;M45;M18;M17;M15;M52
1040	LRTTNGDFLHFLPR VFSAVGNICYT	M75;M56;M58;M16;M24;M1;M53;M45;M18;M17;M15;M52;M75;M 56;M58;M16;M24;M1;M53;M45;M18;M17;M15;M52
1041	RTTNGDFLHFLPRV FSAVGNICYTP	M75;M56;M58;M16;M24;M1;M53;M45;M18;M17;M15;M52;M75;M 56;M58;M16;M24;M1;M53;M45;M18;M17;M15;M52
1042	LPSIISNEKQEILGTV SWNLREMLA	M75;M56;M11;M24;M55;M10;M45;M50;M18;M8;M9;M23;M75;M5 6;M11;M24;M55;M10;M45;M50;M18;M8;M9;M23
1043	ILPSIISNEKQEILGT VSWNLREML	M75;M56;M11;M24;M55;M10;M45;M50;M18;M8;M9;M23;M75;M5 6;M11;M24;M55;M10;M45;M50;M18;M8;M9;M23
1044	HSLSHFVNLDNLRA NNTKGSLPINV	M64;M40;M16;M31;M30;M53;M42;M43;M15;M46;M39;M22;M64; M40;M16;M31;M30;M53;M42;M43;M15;M46;M39;M22
1045	SLSHFVNLDNLRAN NTKGSLPINVI	M64;M40;M16;M31;M30;M53;M42;M43;M15;M46;M39;M22;M64; M40;M16;M31;M30;M53;M42;M43;M15;M46;M39;M22
1046	TYERHSLSHFVNLD NLRANNTKGSL	M64;M40;M16;M70;M31;M30;M42;M43;M15;M46;M39;M22;M64; M40;M16;M70;M31;M30;M42;M43;M15;M46;M39;M22
1047	QKTYERHSLSHFVN LDNLRANNTKG	M64;M40;M16;M70;M31;M30;M42;M43;M15;M46;M39;M22;M64; M40;M16;M70;M31;M30;M42;M43;M15;M46;M39;M22
1048	KTYERHSLSHFVNL DNLRANNTKGS	M64;M40;M16;M70;M31;M30;M42;M43;M15;M46;M39;M22;M64; M40;M16;M70;M31;M30;M42;M43;M15;M46;M39;M22
1049	SAFYILPSIISNEKQEI LGTVSWNL	M56;M21;M11;M16;M24;M55;M10;M45;M50;M18;M9;M23;M56;M 21;M11;M16;M24;M55;M10;M45;M50;M18;M9;M23
1050	PGTILRTTNGDFLHF LPRVFSAVGN	M75;M56;M58;M16;M24;M53;M45;M18;M17;M15;M52;M11;M75; M56;M58;M16;M24;M53;M45;M18;M17;M15;M52;M11
1051	GTILRTTNGDFLHFL PRVFSAVGNI	M75;M56;M58;M16;M24;M53;M45;M18;M17;M15;M52;M11;M75; M56;M58;M16;M24;M53;M45;M18;M17;M15;M52;M11
1052	KLVSSFLEMKSEKQ VEQKIAEIPKE	M40;M16;M31;M70;M25;M34;M30;M41;M43;M49;M42;M39;M40; M16;M31;M70;M25;M34;M30;M41;M43;M49;M42;M39
1053	DKLVSSFLEMKSEK QVEQKIAEIPK	M40;M16;M31;M70;M25;M34;M30;M41;M43;M49;M42;M39;M40; M16;M31;M70;M25;M34;M30;M41;M43;M49;M42;M39
1054	DKNLYDKLVSSFLE MKSEKQVEQKI	M40;M16;M31;M70;M25;M34;M30;M41;M43;M49;M42;M39;M40; M16;M31;M70;M25;M34;M30;M41;M43;M49;M42;M39

1055	NLYDKLVSSFLEMK SEKQVEQKIAE	M40;M16;M31;M70;M25;M34;M30;M41;M43;M49;M42;M39;M40; M16;M31;M70;M25;M34;M30;M41;M43;M49;M42;M39
1056	FDKNLYDKLVSSFL EMKSEKQVEQK	M40;M16;M31;M70;M25;M34;M30;M41;M43;M49;M42;M39;M40; M16;M31;M70;M25;M34;M30;M41;M43;M49;M42;M39
1057	LYDKLVSSFLEMKS EKQVEQKIAEI	M40;M16;M31;M70;M25;M34;M30;M41;M43;M49;M42;M39;M40; M16;M31;M70;M25;M34;M30;M41;M43;M49;M42;M39
1058	YDKLVSSFLEMKSE KQVEQKIAEIP	M40;M16;M31;M70;M25;M34;M30;M41;M43;M49;M42;M39;M40; M16;M31;M70;M25;M34;M30;M41;M43;M49;M42;M39
1059	KNLYDKLVSSFLEM KSEKQVEQKIA	M40;M16;M31;M70;M25;M34;M30;M41;M43;M49;M42;M39;M40; M16;M31;M70;M25;M34;M30;M41;M43;M49;M42;M39
1060	IKESVQTFFKLVNKF LALCADSIII	M58;M16;M24;M53;M57;M17;M35;M15;M42;M43;M39;M47;M58; M16;M24;M53;M57;M17;M35;M15;M42;M43;M39;M47
1061	EIKESVQTFFKLVNK FLALCADSII	M58;M16;M24;M53;M57;M17;M35;M15;M42;M43;M39;M47;M58; M16;M24;M53;M57;M17;M35;M15;M42;M43;M39;M47
1062	GTTTLNGLWLDDV VYCPRHVICTSE	M71;M75;M56;M24;M10;M65;M55;M53;M7;M79;M9;M23;M71;M7 5;M56;M24;M10;M65;M55;M53;M7;M79;M9;M23
1063	CGTTTLNGLWLDD VVYCPRHVICTS	M71;M75;M56;M24;M10;M65;M55;M53;M7;M79;M9;M23;M71;M7 5;M56;M24;M10;M65;M55;M53;M7;M79;M9;M23
1064	GVEAVMYMGTLSY EQFKKGVQIPCT	M4;M56;M40;M54;M16;M55;M1;M53;M3;M6;M37;M52;M22;M4;M 56;M40;M54;M16;M55;M1;M53;M3;M6;M37;M52;M22
1065	ASEYTGNYQCGHY KHITSKETLYCI	M4;M40;M52;M31;M1;M34;M3;M41;M42;M8;M43;M39;M9;M4;M4 0;M52;M31;M1;M34;M3;M41;M42;M8;M43;M39;M9
1066	SEYTGNYQCGHYK HITSKETLYCID	M4;M40;M52;M31;M1;M34;M3;M41;M42;M8;M43;M39;M9;M4;M4 0;M52;M31;M1;M34;M3;M41;M42;M8;M43;M39;M9
1067	CASEYTGNYQCGH YKHITSKETLYC	M4;M40;M52;M31;M1;M38;M3;M41;M42;M8;M43;M39;M9;M4;M4 0;M52;M31;M1;M38;M3;M41;M42;M8;M43;M39;M9
1068	TLKGVEAVMYMGT LSYEQFKKGVQI	M4;M56;M21;M40;M54;M55;M1;M60;M53;M3;M6;M37;M22;M4;M 56;M21;M40;M54;M55;M1;M60;M53;M3;M6;M37;M22
1069	TTLKGVEAVMYMG TLSYEQFKKGVQ	M4;M56;M21;M40;M54;M55;M1;M60;M53;M3;M6;M37;M22;M4;M 56;M21;M40;M54;M55;M1;M60;M53;M3;M6;M37;M22
1070	KSHNIALIWNVKDF MSLSEQLRKQI	M56;M28;M66;M19;M1;M25;M6;M45;M37;M18;M72;M68;M59;M5 6;M28;M66;M19;M1;M25;M6;M45;M37;M18;M72;M68;M59
1071	SHNIALIWNVKDFM SLSEQLRKQIR	M56;M28;M66;M19;M1;M25;M6;M45;M37;M18;M72;M68;M59;M5 6;M28;M66;M19;M1;M25;M6;M45;M37;M18;M72;M68;M59
1072	HNIALIWNVKDFMS LSEQLRKQIRS	M56;M28;M66;M19;M1;M25;M6;M45;M37;M18;M72;M68;M59;M5 6;M28;M66;M19;M1;M25;M6;M45;M37;M18;M72;M68;M59
1073	EFLRDGWEIVKFIST CACEIVGGQI	M4;M64;M21;M23;M29;M6;M45;M74;M48;M8;M49;M22;M20;M4; M64;M21;M23;M29;M6;M45;M74;M48;M8;M49;M22;M20
1074	VEFLRDGWEIVKFIS TCACEIVGGQ	M4;M64;M21;M23;M29;M6;M45;M74;M48;M8;M49;M22;M20;M4; M64;M21;M23;M29;M6;M45;M74;M48;M8;M49;M22;M20
1075	QAIASEFSSLPSYAA FATAQEAYEQ	M21;M52;M12;M28;M70;M31;M6;M41;M42;M68;M43;M39;M22;M 21;M52;M12;M28;M70;M31;M6;M41;M42;M68;M43;M39;M22
1076	GNYQCGHYKHITSK ETLYCIDGALL	M40;M21;M52;M58;M31;M34;M36;M41;M42;M8;M43;M39;M9;M4 0;M21;M52;M58;M31;M34;M36;M41;M42;M8;M43;M39;M9
1077	VGGQIVTCAKEIKES VQTFFKLVNK	M56;M66;M78;M65;M7;M53;M55;M10;M79;M50;M33;M8;M23;M5 6;M66;M78;M65;M7;M53;M55;M10;M79;M50;M33;M8;M23
1078	RHSLSHFVNLDNLR ANNTKGSLPIN	M64;M40;M16;M70;M31;M30;M53;M42;M43;M15;M46;M39;M22; M64;M40;M16;M70;M31;M30;M53;M42;M43;M15;M46;M39;M22
1079	ERHSLSHFVNLDNL RANNTKGSLPI	M64;M40;M16;M70;M31;M30;M53;M42;M43;M15;M46;M39;M22; M64;M40;M16;M70;M31;M30;M53;M42;M43;M15;M46;M39;M22

1080	YERHSLSHFVNLDN LRANNTKGSLP	M64;M40;M16;M70;M31;M30;M53;M42;M43;M15;M46;M39;M22; M64;M40;M16;M70;M31;M30;M53;M42;M43;M15;M46;M39;M22
1081	EEAKTVLKKCKSAF YILPSIISNEK	M64;M21;M9;M16;M31;M78;M65;M60;M63;M42;M43;M39;M22;M 64;M21;M9;M16;M31;M78;M65;M60;M63;M42;M43;M39;M22
1082	TTTLNGLWLDDVV YCPRHVICTSED	M71;M75;M56;M24;M78;M65;M10;M55;M53;M7;M79;M9;M23;M7 1;M75;M56;M24;M78;M65;M10;M55;M53;M7;M79;M9;M23
1083	LRDGWEIVKFISTCA CEIVGGQIVT	M4;M64;M21;M23;M29;M6;M45;M74;M48;M72;M8;M49;M22;M20 ;M4;M64;M21;M23;M29;M6;M45;M74;M48;M72;M8;M49;M22;M2 0
1084	FLRDGWEIVKFISTC ACEIVGGQIV	M4;M64;M21;M23;M29;M6;M45;M74;M48;M72;M8;M49;M22;M20 ;M4;M64;M21;M23;M29;M6;M45;M74;M48;M72;M8;M49;M22;M2 0
1085	AKSHNIALIWNVKD FMSLSEQLRKQ	M56;M32;M28;M66;M19;M1;M25;M6;M45;M37;M18;M72;M68;M5 9;M56;M32;M28;M66;M19;M1;M25;M6;M45;M37;M18;M72;M68; M59
1086	FAVDAAKAYKDYL ASGGQPITNCVK	M32;M12;M28;M70;M48;M37;M57;M33;M69;M63;M41;M8;M42;M 39;M32;M12;M28;M70;M48;M37;M57;M33;M69;M63;M41;M8;M42 ;M39
1087	TFHLDGEVITFDNLK TLLSLREVRT	M40;M21;M32;M66;M16;M31;M7;M29;M30;M48;M36;M68;M49;M 22;M40;M21;M32;M66;M16;M31;M7;M29;M30;M48;M36;M68;M49 ;M22
1088	HLDGEVITFDNLKT LLSLREVRTIK	M40;M21;M32;M66;M16;M31;M7;M29;M30;M48;M36;M68;M49;M 22;M40;M21;M32;M66;M16;M31;M7;M29;M30;M48;M36;M68;M49 ;M22
1089	FHLDGEVITFDNLKT LLSLREVRTI	M40;M21;M32;M66;M16;M31;M7;M29;M30;M48;M36;M68;M49;M 22;M40;M21;M32;M66;M16;M31;M7;M29;M30;M48;M36;M68;M49 ;M22
1090	TTFHLDGEVITFDNL KTLLSLREVR	M40;M21;M32;M16;M31;M7;M29;M30;M48;M50;M36;M68;M49;M 22;M40;M21;M32;M16;M31;M7;M29;M30;M48;M50;M36;M68;M49 ;M22
1091	ILASFSASTSAFVET VKGLDYKAFK	M52;M54;M28;M14;M16;M60;M6;M38;M33;M42;M8;M43;M35;M4 7;M52;M54;M28;M14;M16;M60;M6;M38;M33;M42;M8;M43;M35; M47
1092	ASFSASTSAFVETVK GLDYKAFKQI	M52;M54;M14;M16;M1;M60;M6;M38;M37;M42;M8;M43;M35;M47 ;M52;M54;M14;M16;M1;M60;M6;M38;M37;M42;M8;M43;M35;M4 7
1093	DDVVYCPRHVICTS EDMLNPNYEDL	M64;M75;M56;M28;M66;M24;M55;M65;M6;M45;M72;M49;M59;M 20;M64;M75;M56;M28;M66;M24;M55;M65;M6;M45;M72;M49;M59 ;M20
1094	ESVQTFFKLVNKFL ALCADSIIIGG	M58;M16;M24;M34;M53;M45;M57;M41;M8;M17;M15;M35;M43;M 39;M58;M16;M24;M34;M53;M45;M57;M41;M8;M17;M15;M35;M43 ;M39
1095	EIVGGQIVTCAKEIK ESVQTFFKLV	M56;M28;M66;M78;M65;M80;M7;M53;M55;M10;M79;M50;M8;M2 3;M56;M28;M66;M78;M65;M80;M7;M53;M55;M10;M79;M50;M8; M23
1096	CEIVGGQIVTCAKEI KESVQTFFKL	M56;M28;M66;M78;M65;M80;M7;M53;M55;M10;M79;M50;M8;M2 3;M56;M28;M66;M78;M65;M80;M7;M53;M55;M10;M79;M50;M8; M23
1097	TVLKKCKSAFYILPS IISNEKQEIL	M40;M64;M21;M16;M31;M78;M65;M24;M30;M63;M42;M43;M39; M22;M40;M64;M21;M16;M31;M78;M65;M24;M30;M63;M42;M43; M39;M22

1098	TTNGDFLHFLPRVFSAVGNICYTPS	M64;M75;M56;M58;M16;M24;M1;M53;M45;M18;M17;M15;M52;M22;M64;M75;M56;M58;M16;M24;M1;M53;M45;M18;M17;M15;M52;M22
1099	TGNYQCGHYKHITSKETLYCIDGAL	M4;M40;M21;M52;M58;M31;M1;M34;M3;M41;M42;M8;M43;M39;M9;M4;M40;M21;M52;M58;M31;M1;M34;M3;M41;M42;M8;M43;M39;M9
1100	YTGNYQCGHYKHITSKETLYCIDGA	M4;M40;M21;M52;M58;M31;M1;M34;M3;M41;M42;M8;M43;M39;M9;M4;M40;M21;M52;M58;M31;M1;M34;M3;M41;M42;M8;M43;M39;M9
1101	EYTGNYQCGHYKHITSKETLYCIDG	M4;M40;M21;M52;M58;M31;M1;M34;M3;M41;M42;M8;M43;M39;M9;M4;M40;M21;M52;M58;M31;M1;M34;M3;M41;M42;M8;M43;M39;M9
1102	FCAFAVDAAKAYKDYLASGGQPITN	M32;M21;M12;M28;M70;M48;M37;M57;M33;M69;M63;M41;M36;M8;M39;M32;M21;M12;M28;M70;M48;M37;M57;M33;M69;M63;M41;M36;M8;M39
1103	CAFAVDAAKAYKDYLASGGQPITNC	M32;M21;M12;M28;M70;M48;M37;M57;M33;M69;M63;M41;M36;M8;M39;M32;M21;M12;M28;M70;M48;M37;M57;M33;M69;M63;M41;M36;M8;M39
1104	AFAVDAAKAYKDYLASGGQPITNCV	M32;M21;M12;M28;M70;M48;M37;M57;M33;M69;M63;M41;M8;M42;M39;M32;M21;M12;M28;M70;M48;M37;M57;M33;M69;M63;M41;M8;M42;M39
1105	LASFSASTSAFVETVKGLDYKAFKQ	M52;M54;M28;M14;M16;M1;M60;M6;M38;M37;M42;M8;M43;M35;M47;M52;M54;M28;M14;M16;M1;M60;M6;M38;M37;M42;M8;M43;M35;M47
1106	LDGEVITFDNLKTLLSLREVRTIKV	M40;M21;M32;M66;M16;M31;M7;M65;M29;M30;M48;M36;M68;M49;M22;M40;M21;M32;M66;M16;M31;M7;M65;M29;M30;M48;M36;M68;M49;M22
1107	CACEIVGGQIVTCAKEIKESVQTFF	M56;M28;M66;M12;M78;M65;M80;M7;M53;M55;M10;M79;M50;M8;M23;M56;M28;M66;M12;M78;M65;M80;M7;M53;M55;M10;M79;M50;M8;M23
1108	ISTCACEIVGGQIVTCAKEIKESVQ	M56;M28;M66;M12;M78;M65;M80;M7;M53;M55;M10;M79;M50;M8;M23;M56;M28;M66;M12;M78;M65;M80;M7;M53;M55;M10;M79;M50;M8;M23
1109	STCACEIVGGQIVTCAKEIKESVQT	M56;M28;M66;M12;M78;M65;M80;M7;M53;M55;M10;M79;M50;M8;M23;M56;M28;M66;M12;M78;M65;M80;M7;M53;M55;M10;M79;M50;M8;M23
1110	TCACEIVGGQIVTCAKEIKESVQTF	M56;M28;M66;M12;M78;M65;M80;M7;M53;M55;M10;M79;M50;M8;M23;M56;M28;M66;M12;M78;M65;M80;M7;M53;M55;M10;M79;M50;M8;M23
1111	ACEIVGGQIVTCAKEIKESVQTFFK	M56;M28;M66;M12;M78;M65;M80;M7;M53;M55;M10;M79;M50;M8;M23;M56;M28;M66;M12;M78;M65;M80;M7;M53;M55;M10;M79;M50;M8;M23
1112	SPFVMMSAPPAQYELKHGTFTCASE	M40;M58;M16;M31;M19;M25;M34;M46;M41;M43;M35;M15;M52;M39;M44;M40;M58;M16;M31;M19;M25;M34;M46;M41;M43;M35;M15;M52;M39;M44
1113	IVGGQIVTCAKEIKESVQTFFKLVN	M56;M28;M66;M78;M65;M80;M7;M53;M55;M10;M79;M50;M33;M8;M23;M56;M28;M66;M78;M65;M80;M7;M53;M55;M10;M79;M50;M33;M8;M23
1114	KTVLKKCKSAFYILPSIISNEKQEI	M40;M64;M21;M16;M31;M78;M65;M60;M30;M24;M63;M42;M43;M39;M22;M40;M64;M21;M16;M31;M78;M65;M60;M30;M24;M63;M42;M43;M39;M22

1115	KESVQTFFKLVNKFLALCADSIIIG	M58;M16;M24;M34;M53;M45;M57;M41;M17;M35;M15;M42;M43;M39;M47;M58;M16;M24;M34;M53;M45;M57;M41;M17;M35;M15;M42;M43;M39;M47
1116	AKTVLKKCKSAFYILPSIISNEKQE	M40;M64;M21;M9;M16;M31;M78;M65;M60;M30;M63;M42;M43;M39;M22;M40;M64;M21;M9;M16;M31;M78;M65;M60;M30;M63;M42;M43;M39;M22
1117	EAKTVLKKCKSAFYILPSIISNEKQ	M40;M64;M21;M9;M16;M31;M78;M65;M60;M30;M63;M42;M43;M39;M22;M40;M64;M21;M9;M16;M31;M78;M65;M60;M30;M63;M42;M43;M39;M22
1118	TTLNGLWLDDVVYCPRHVICTSEDM	M71;M75;M56;M23;M28;M24;M78;M65;M10;M55;M53;M7;M79;M9;M20;M71;M75;M56;M23;M28;M24;M78;M65;M10;M55;M53;M7;M79;M9;M20
1119	STQEFRYMNSQGLLPPKNSIDAFKL	M40;M16;M34;M30;M47;M48;M33;M18;M41;M42;M8;M43;M15;M46;M39;M44;M40;M16;M34;M30;M47;M48;M33;M18;M41;M42;M8;M43;M15;M46;M39;M44
1120	ESPFVMMSAPPAQYELKHGTFTCAS	M40;M58;M16;M31;M19;M25;M34;M46;M41;M43;M35;M15;M52;M39;M22;M44;M40;M58;M16;M31;M19;M25;M34;M46;M41;M43;M35;M15;M52;M39;M22;M44
1121	TNGDFLHFLPRVFSAVGNICYTPSK	M64;M75;M56;M12;M58;M16;M24;M1;M53;M45;M46;M18;M17;M15;M52;M22;M64;M75;M56;M12;M58;M16;M24;M1;M53;M45;M46;M18;M17;M15;M52;M22
1122	KSAFYILPSIISNEKQEILGTVSWN	M56;M21;M11;M22;M16;M31;M55;M10;M24;M45;M50;M18;M43;M39;M9;M23;M56;M21;M11;M22;M16;M31;M55;M10;M24;M45;M50;M18;M43;M39;M9;M23
1123	TLNGLWLDDVVYCPRHVICTSEDML	M71;M75;M56;M23;M28;M24;M78;M65;M10;M55;M53;M7;M79;M72;M9;M20;M71;M75;M56;M23;M28;M24;M78;M65;M10;M55;M53;M7;M79;M72;M9;M20
1124	VSTQEFRYMNSQGLLPPKNSIDAFK	M40;M49;M16;M34;M30;M47;M48;M33;M18;M41;M42;M8;M43;M15;M46;M39;M44;M40;M49;M16;M34;M30;M47;M48;M33;M18;M41;M42;M8;M43;M15;M46;M39;M44
1125	VQQESPFVMMSAPPAQYELKHGTFT	M40;M58;M16;M31;M19;M25;M34;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44;M40;M58;M16;M31;M19;M25;M34;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44
1126	KQATKYLVQQESPFVMMSAPPAQYE	M40;M58;M16;M31;M19;M25;M34;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44;M40;M58;M16;M31;M19;M25;M34;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44
1127	QQESPFVMMSAPPAQYELKHGTFTC	M40;M58;M16;M31;M19;M25;M34;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44;M40;M58;M16;M31;M19;M25;M34;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44
1128	QESPFVMMSAPPAQYELKHGTFTCA	M40;M58;M16;M31;M19;M25;M34;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44;M40;M58;M16;M31;M19;M25;M34;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44
1129	TKYLVQQESPFVMMSAPPAQYELKH	M40;M58;M16;M31;M19;M25;M34;M30;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44;M40;M58;M16;M31;M19;M25;M34;M30;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44
1130	ATKYLVQQESPFVMMSAPPAQYELK	M40;M58;M16;M31;M19;M25;M34;M30;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44;M40;M58;M16;M31;M19;M25;M34;M30;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44
1131	KYLVQQESPFVMMSAPPAQYELKHG	M40;M58;M16;M31;M19;M25;M34;M30;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44;M40;M58;M16;M31;M19;M25;M34;M30;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44

1132	QATKYLVQQESPFVMMSAPPAQYEL	M40;M58;M16;M31;M19;M25;M34;M30;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44;M40;M58;M16;M31;M19;M25;M34;M30;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44
1133	LVQQESPFVMMSAPPAQYELKHGTF	M40;M58;M16;M31;M19;M25;M34;M30;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44;M40;M58;M16;M31;M19;M25;M34;M30;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44
1134	YLVQQESPFVMMSAPPAQYELKHGT	M40;M58;M16;M31;M19;M25;M34;M30;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44;M40;M58;M16;M31;M19;M25;M34;M30;M46;M41;M42;M43;M35;M15;M52;M39;M22;M44
1135	LNGLWLDDVVYCPRHVICTSEDMLN	M71;M75;M56;M23;M28;M66;M24;M78;M65;M10;M55;M53;M6;M79;M72;M9;M59;M20;M71;M75;M56;M23;M28;M66;M24;M78;M65;M10;M55;M53;M6;M79;M72;M9;M59;M20
1136	NGLWLDDVVYCPRHVICTSEDMLNP	M71;M75;M56;M23;M28;M66;M24;M78;M65;M10;M55;M53;M6;M79;M72;M9;M59;M20;M71;M75;M56;M23;M28;M66;M24;M78;M65;M10;M55;M53;M6;M79;M72;M9;M59;M20
1137	LGVYDYLVSTQEFRYMNSQGLLPPK	M40;M16;M31;M34;M30;M6;M45;M48;M33;M18;M47;M41;M42;M8;M43;M15;M46;M39;M44;M40;M16;M31;M34;M30;M6;M45;M48;M33;M18;M47;M41;M42;M8;M43;M15;M46;M39;M44
1138	LWLDDVVYCPRHVICTSEDMLNPNY	M71;M75;M56;M23;M28;M66;M24;M10;M65;M55;M53;M6;M45;M79;M72;M49;M9;M59;M20;M71;M75;M56;M23;M28;M66;M24;M10;M65;M55;M53;M6;M45;M79;M72;M49;M9;M59;M20
1139	KKCKSAFYILPSIISNEKQEILGTV	M40;M56;M21;M11;M22;M16;M31;M55;M10;M24;M30;M45;M50;M18;M42;M43;M39;M9;M23;M40;M56;M21;M11;M22;M16;M31;M55;M10;M24;M30;M45;M50;M18;M42;M43;M39;M9;M23
1140	KCKSAFYILPSIISNEKQEILGTVS	M40;M56;M21;M11;M22;M16;M31;M55;M10;M24;M30;M45;M50;M18;M42;M43;M39;M9;M23;M40;M56;M21;M11;M22;M16;M31;M55;M10;M24;M30;M45;M50;M18;M42;M43;M39;M9;M23
1141	CKSAFYILPSIISNEKQEILGTVSW	M40;M56;M21;M11;M22;M16;M31;M55;M10;M24;M30;M45;M50;M18;M42;M43;M39;M9;M23;M40;M56;M21;M11;M22;M16;M31;M55;M10;M24;M30;M45;M50;M18;M42;M43;M39;M9;M23
1142	DYLVSTQEFRYMNSQGLLPPKNSID	M40;M49;M19;M16;M25;M34;M30;M47;M45;M48;M33;M18;M41;M42;M8;M43;M15;M46;M39;M44;M40;M49;M19;M16;M25;M34;M30;M47;M45;M48;M33;M18;M41;M42;M8;M43;M15;M46;M39;M44
1143	LVSTQEFRYMNSQGLLPPKNSIDAF	M40;M49;M19;M16;M25;M34;M30;M47;M45;M48;M33;M18;M41;M42;M8;M43;M15;M46;M39;M44;M40;M49;M19;M16;M25;M34;M30;M47;M45;M48;M33;M18;M41;M42;M8;M43;M15;M46;M39;M44
1144	YLVSTQEFRYMNSQGLLPPKNSIDA	M40;M49;M19;M16;M25;M34;M30;M47;M45;M48;M33;M18;M41;M42;M8;M43;M15;M46;M39;M44;M40;M49;M19;M16;M25;M34;M30;M47;M45;M48;M33;M18;M41;M42;M8;M43;M15;M46;M39;M44
1145	LDDVVYCPRHVICTSEDMLNPNYED	M71;M75;M56;M23;M64;M28;M66;M24;M10;M65;M55;M53;M6;M45;M79;M72;M49;M9;M59;M20;M71;M75;M56;M23;M64;M28;M66;M24;M10;M65;M55;M53;M6;M45;M79;M72;M49;M9;M59;M20
1146	WLDDVVYCPRHVICTSEDMLNPNYE	M71;M75;M56;M23;M64;M28;M66;M24;M10;M65;M55;M53;M6;M45;M79;M72;M49;M9;M59;M20;M71;M75;M56;M23;M64;M28;M66;M24;M10;M65;M55;M53;M6;M45;M79;M72;M49;M9;M59;M20
1147	GLWLDDVVYCPRHVICTSEDMLNPN	M71;M75;M56;M23;M28;M66;M24;M78;M65;M10;M55;M53;M6;M45;M79;M72;M49;M9;M59;M20;M71;M75;M56;M23;M28;M66;M24;M78;M65;M10;M55;M53;M6;M45;M79;M72;M49;M9;M59;M20
1148	LKKCKSAFYILPSIISNEKQEILGT	M40;M64;M21;M56;M11;M22;M16;M31;M55;M10;M24;M30;M45;M50;M18;M42;M43;M39;M9;M23;M40;M64;M21;M56;M11;M22;M16;M31;M55;M10;M24;M30;M45;M50;M18;M42;M43;M39;M9;M23

1149	VLKKCKSAFYILPSII SNEKQEILG	M40;M64;M21;M56;M22;M16;M31;M78;M55;M10;M30;M24;M45; M50;M18;M42;M43;M39;M9;M23;M40;M64;M21;M56;M22;M16;M 31;M78;M55;M10;M30;M24;M45;M50;M18;M42;M43;M39;M9;M23
1150	YDYLVSTQEFRYMN SQGLLPPKNSI	M25;M34;M6;M48;M33;M18;M8;M43;M47;M44;M40;M16;M30;M4 5;M42;M39;M19;M41;M49;M15;M46;M25;M34;M6;M48;M33;M18; M8;M43;M47;M44;M40;M16;M30;M45;M42;M39;M19;M41;M49;M 15;M46
1151	VYDYLVSTQEFRYM NSQGLLPPKNS	M25;M34;M6;M48;M33;M18;M8;M43;M47;M44;M40;M16;M30;M4 5;M42;M39;M19;M41;M49;M15;M46;M25;M34;M6;M48;M33;M18; M8;M43;M47;M44;M40;M16;M30;M45;M42;M39;M19;M41;M49;M 15;M46
1152	GVYDYLVSTQEFRY MNSQGLLPPKN	M25;M34;M6;M48;M33;M18;M8;M43;M47;M44;M40;M16;M31;M3 0;M45;M42;M39;M19;M41;M49;M15;M46;M25;M34;M6;M48;M33; M18;M8;M43;M47;M44;M40;M16;M31;M30;M45;M42;M39;M19;M 41;M49;M15;M46

Table 2B – MHC II–binding Epitopes from Orf9b

Peptides	Alleles
TLNSLEDKAFQLTPIAVQMTKLATT	DQB1-0602_DQA1 0102; DRB4_0103; DRB1_0402; DRB1_0407; DPB1-0202_DPA1-0103; DPB1-0201_DPA1-0103
ALRLVDPQIQLAVTRMENAVGRDQN	DQB1-0602_DQA1-0102; DPB1-0402_DPA1-0103; DRB1_0403; DRB1_0402; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DQB1-0302_DQA1-0301; DRB1_0410
RLVDPQIQLAVTRMENAVGRDQNNV	DQB1-0602_DQA1-0102; DPB1-0402_DPA1-0103; DRB1_0403; DRB1_0402; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DQB1-0302_DQA1-0301; DRB1_0410
LRLVDPQIQLAVTRMENAVGRDQNN	DQB1-0602_DQA1-0102; DPB1-0402_DPA1-0103; DRB1_0403; DRB1_0402; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DQB1-0302_DQA1-0301; DRB1_0410
PALRLVDPQIQLAVTRMENAVGRDQ	DQB1-0602_DQA1-0102; DPB1-0402_DPA1-0103; DRB1_0403; DRB1_0402; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DQB1-0302_DQA1-0301; DRB1_0410
LVDPQIQLAVTRMENAVGRDQNNVG	DQB1-0602_DQA1-0102; DPB1-0402_DPA1-0103; DRB1_0403; DRB1_0402; DRB1_0405; DRB1_0901;

	DRB1_0411; DRB1_0404; DQB1-0302_DQA1-0301; DRB1_0410
VDPQIQLAVTRMENAVGRDQNNVGP	DQB1-0602_DQA1-0102; DPB1-0402_DPA1-0103; DRB1_0403; DRB1_0402; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DQB1-0302_DQA1-0301
EDKAFQLTPIAVQMTKLATTEELPD	DQB1-0602_DQA1-0102; DRB4_0103; DRB1_0402; DRB1_0407; DQB1-0202_DQA1-0201
VGPKVYPIILRLGSPLSLNMARKTL	DPB1-0601_DPA1-0103; DQB1-0602_DQA1-0102; DRB1_0102; DRB1_0401; DPB1-1401_DPA1-0201; DPB1-0301_DPA1-0103; DPB1-0901_DPA1-0201; DPB1-1001_DPA1-0201; DRB1_1101
NVGPKVYPIILRLGSPLSLNMARKT	DPB1-0601_DPA1-0103; DQB1-0602_DQA1-0102; DRB1_0102; DRB1_0401; DPB1-1401_DPA1-0201; DPB1-0301_DPA1-0103; DPB1-0901_DPA1-0201; DPB1-1001_DPA1-0201; DRB1_1101
QNNVGPKVYPIILRLGSPLSLNMAR	DPB1-1301_DPA1-0201; DRB1_0102; DQB1-0602_DQA1-0102; DRB1_0401; DPB1-1401_DPA1-0201; DPB1-0301_DPA1-0103; DPB1-0901_DPA1-0201; DPB1-1001_DPA1-0201; DRB1_1101
DPQIQLAVTRMENAVGRDQNNVGPK	DQB1-0602_DQA1-0102; DPB1-0402_DPA1-0103; DRB1_0901; DRB1_0404; DQB1-0302_DQA1-0301
NNVGPKVYPIILRLGSPLSLNMARK	DRB1_0102; DQB1-0602_DQA1-0102; DRB1_0401; DPB1-1401_DPA1-0201; DPB1-0301_DPA1-0103; DPB1-0901_DPA1-0201; DPB1-1001_DPA1-0201; DRB1_1101
KTLNSLEDKAFQLTPIAVQMTKLAT	DPB1-0202_DPA1-0103; DPB1-0201_DPA1-0103; DRB4_0103; DRB1_0407
NSLEDKAFQLTPIAVQMTKLATTEE	DQB1-0602_DQA1-0102; DRB4_0103; DRB1_0402; DRB1_0407; DPB1-0202_DPA1-0103
LNSLEDKAFQLTPIAVQMTKLATTE	DQB1-0602_DQA1-0102; DRB4_0103; DRB1_0402; DRB1_0407; DPB1-0202_DPA1-0103
LEDKAFQLTPIAVQMTKLATTEELP	DRB1_0402; DQB1-0602_DQA1-0102; DRB4_0103; DRB1_0407

SLEDKAFQLTPIAVQMTKLATTEEL	DRB1_0402; DQB1-0602_DQA1-0102; DRB4_0103; DRB1_0407
PLSLNMARKTLNSLEDKAFQLTPIA	DQB1-0201_DQA1-0201; DPB1-1101_DPA1-0201; DRB1_1202; DPB1-0202_DPA1-0103; DQB1-0604_DQA1-0102; DPB1-0201_DPA1-0103; DQB1-0202_DQA1-0201
LSLNMARKTLNSLEDKAFQLTPIAV	DQB1-0201_DQA1-0201; DPB1-1101_DPA1-0201; DRB1_1202; DPB1-0202_DPA1-0103; DQB1-0604_DQA1-0102; DPB1-0201_DPA1-0103; DQB1-0202_DQA1-0201
GPKVYPIILRLGSPLSLNMARKTLN	DRB1_0102; DPB1-0601_DPA1-0103; DQB1-0602_DQA1-0102; DRB1_0401; DPB1-0301_DPA1-0103; DRB1_1101
MARKTLNSLEDKAFQLTPIAVQMTK	DQB1-0201_DQA1-0201; DRB1_1202; DRB1_0407; DPB1-0202_DPA1-0103; DQB1-0604_DQA1-0102; DPB1-0201_DPA1-0103; DQB1-0202_DQA1-0201
ARKTLNSLEDKAFQLTPIAVQMTKL	DQB1-0201_DQA1-0201; DRB1_1202; DRB1_0407; DPB1-0202_DPA1-0103; DQB1-0604_DQA1-0102; DPB1-0201_DPA1-0103; DQB1-0202_DQA1-0201
RDQNNVGPKVYPIILRLGSPLSLNM	DPB1-1301_DPA1-0201; DRB1_0102; DQB1-0602_DQA1-0102; DRB1_0401; DPB1-1401_DPA1-0201; DPB1-0901_DPA1-0201; DPB1-1001_DPA1-0201; DRB1_1101
GRDQNNVGPKVYPIILRLGSPLSLN	DPB1-1301_DPA1-0201; DRB1_0102; DQB1-0602_DQA1-0102; DRB1_0401; DPB1-1401_DPA1-0201; DPB1-0901_DPA1-0201; DPB1-1001_DPA1-0201; DRB1_1101
DQNNVGPKVYPIILRLGSPLSLNMA	DPB1-1301_DPA1-0201; DRB1_0102; DQB1-0602_DQA1-0102; DRB1_0401; DPB1-1401_DPA1-0201; DPB1-0901_DPA1-0201; DPB1-1001_DPA1-0201; DRB1_1101
HPALRLVDPQIQLAVTRMENAVGRD	DQB1-0602_DQA1-0102; DRB1_0403; DRB1_0402; DRB1_0405; DRB1_0901; DRB1_0411; DQB1-0302_DQA1-0301; DRB1_0410

LNMARKTLNSLEDKAFQLTPIAVQM	DQB1-0201_DQA1-0201; DRB1_1202; DPB1-0202_DPA1-0103; DQB1-0604_DQA1-0102; DPB1-0201_DPA1-0103; DQB1-0202_DQA1-0201
NMARKTLNSLEDKAFQLTPIAVQMT	DQB1-0201_DQA1-0201; DRB1_1202; DPB1-0202_DPA1-0103; DQB1-0604_DQA1-0102; DPB1-0201_DPA1-0103; DQB1-0202_DQA1-0201
SLNMARKTLNSLEDKAFQLTPIAVQ	DQB1-0201_DQA1-0201; DRB1_1202; DPB1-0202_DPA1-0103; DQB1-0604_DQA1-0102; DPB1-0201_DPA1-0103; DQB1-0202_DQA1-0201
LTPIAVQMTKLATTEELPDEFVVVT	DRB1_0402; DRB4_0103; DQB1-0202_DQA1-0201
KAFQLTPIAVQMTKLATTEELPDEF	DRB1_0402; DRB4_0103; DQB1-0202_DQA1-0201
FQLTPIAVQMTKLATTEELPDEFVV	DRB1_0402; DRB4_0103; DQB1-0202_DQA1-0201
AFQLTPIAVQMTKLATTEELPDEFV	DRB1_0402; DRB4_0103; DQB1-0202_DQA1-0201
TPIAVQMTKLATTEELPDEFVVVTV	DRB1_0402; DRB4_0103; DQB1-0202_DQA1-0201
QLTPIAVQMTKLATTEELPDEFVVV	DRB1_0402; DRB4_0103; DQB1-0202_DQA1-0201
DKAFQLTPIAVQMTKLATTEELPDE	DRB1_0402; DRB4_0103; DQB1-0202_DQA1-0201
VGRDQNNVGPKVYPIILRLGSPLSL	DPB1-1301_DPA1-0201; DQB1-0602_DQA1-0102; DPB1-1401_DPA1-0201; DPB1-0901_DPA1-0201; DPB1-1001_DPA1-0201; DRB1_1101
AVGRDQNNVGPKVYPIILRLGSPLS	DPB1-1301_DPA1-0201; DQB1-0602_DQA1-0102; DPB1-1401_DPA1-0201; DPB1-0901_DPA1-0201; DPB1-1001_DPA1-0201; DRB1_1101
RKTLNSLEDKAFQLTPIAVQMTKLA	DQB1-0201_DQA1-0201; DRB1_0407; DPB1-0202_DPA1-0103; DQB1-0604_DQA1-0102; DPB1-0201_DPA1-0103
MHPALRLVDPQIQLAVTRMENAVGR	DRB1_0403; DRB1_0402; DRB1_0405; DRB1_0901; DRB1_0411; DQB1-0302_DQA1-0301; DRB1_0410
EMHPALRLVDPQIQLAVTRMENAVG	DRB1_0403; DRB1_0402; DRB1_0405; DRB1_0901; DRB1_0411; DQB1-0302_DQA1-0301
GSPLSLNMARKTLNSLEDKAFQLTP	DQB1-0201_DQA1-0201; DPB1-1101_DPA1-0201; DPB1-0202_DPA1-0103; DQB1-0604_DQA1-0102; DRB1_1202; DQB1-0202_DQA1-0201

LRLGSPLSLNMARKTLNSLEDKAFQ	DQB1-0201_DQA1-0201; DPB1-1101_DPA1-0201; DQB1-0604_DQA1-0102; DRB1_1202; DQB1-0202_DQA1-0201
LGSPLSLNMARKTLNSLEDKAFQLT	DQB1-0201_DQA1-0201; DPB1-1101_DPA1-0201; DQB1-0604_DQA1-0102; DRB1_1202; DQB1-0202_DQA1-0201
RLGSPLSLNMARKTLNSLEDKAFQL	DQB1-0201_DQA1-0201; DPB1-1101_DPA1-0201; DQB1-0604_DQA1-0102; DRB1_1202; DQB1-0202_DQA1-0201
SPLSLNMARKTLNSLEDKAFQLTPI	DQB1-0201_DQA1-0201; DPB1-1101_DPA1-0201; DPB1-0202_DPA1-0103; DQB1-0604_DQA1-0102; DRB1_1202; DQB1-0202_DQA1-0201
MDPKISEMHPALRLVDPQIQLAVTR	DRB5_0101; DRB1_1303; DRB1_0803; DRB5_0102; DRB1_1406
VYPIILRLGSPLSLNMARKTLNSLE	DRB1_0102; DPB1-0601_DPA1-0103; DPB1-0301_DPA1-0103; DRB1_0401
KVYPIILRLGSPLSLNMARKTLNSL	DRB1_0102; DPB1-0601_DPA1-0103; DPB1-0301_DPA1-0103; DRB1_0401
PKVYPIILRLGSPLSLNMARKTLNS	DRB1_0102; DPB1-0601_DPA1-0103; DPB1-0301_DPA1-0103; DRB1_0401
DPKISEMHPALRLVDPQIQLAVTRM	DRB5_0101; DRB1_1303; DRB1_0803; DRB1_1406
YPIILRLGSPLSLNMARKTLNSLED	DRB1_0102; DPB1-0301_DPA1-0103; DRB1_0401
SEMHPALRLVDPQIQLAVTRMENAV	DQB1-0302_DQA1-0301; DRB1_0901
PIAVQMTKLATTEELPDEFVVVTVK	DQB1-0202_DQA1-0201

Table 2C (Table 2Ai and Table 2Aii Allele key)

Allele	**Alias**	**Allele**	**Alias**	**Allele**	**Alias**	**Allele**	**Alias**
DPB1-0201 DPA1-0103	M1	DRB1 0404	M22	DRB1 1602	M43	DRB1 0403	M64
DPB1-0301 DPA1-0103	M2	DRB1 0406	M23	DRB3 0202	M44	DPB1-1001 DPA1-0201	M65
DPB1-0401 DPA1-0103	M3	DRB1 1401	M24	DQB1-0201 DQA1-0501	M45	DPB1-1101 DPA1-0201	M66
DPB1-0402 DPA1-0103	M4	DRB5 0102	M25	DRB1 0102	M46	DQB1-0604 DQA1-0102	M67
DPB1-0601 DPA1-0103	M5	DRB5 0202	M26	DRB1 0803	M47	DRB1 0410	M68
DQB1-0202 DQA1-0201	M6	DPB1-0101 DPA1-0202	M27	DRB1 1501	M48	DPB1-0501 DPA1-0201	M69

Allele	Alias	Allele	Alias	Allele	Alias	Allele	Alias
DRB1 0301	M7	DQB1-0302 DQA1-0301	M28	DRB1 1503	M49	DQB1-0502 DQA1-0102	M70
DRB1 0701	M8	DQB1-0303 DQA1-0201	M29	DRB1 0302	M50	DRB1 1302	M71
DRB1 1404	M9	DRB1 0401	M30	DRB4 0103	M51	DQB1-0603 DQA1-0103	M72
DRB1 1405	M10	DRB1 0405	M31	DRB1 0801	M52	DRB3 0201	M73
DRB3 0301	M11	DRB1 0411	M32	DRB1 1102	M53	DPB1-1301 DPA1-0201	M74
DQB1-0301 DQA1-0505	M12	DRB1 0901	M33	DRB1 1201	M54	DQB1-0401 DQA1-0301	M75
DQB1-0303 DQA1-0301	M13	DRB1 1001	M34	DRB1 1301	M55	DQB1-0402 DQA1-0401	M76
DQB1-0602 DQA1-0102	M14	DRB1 1303	M35	DRB1 1406	M56	DQB1-0601 DQA1-0102	M77
DRB1 0802	M15	DRB3 0101	M36	DPB1-0101 DPA1-0201	M57	DPB1-0901 DPA1-0201	M78
DRB1 1101	M16	DPB1-0202 DPA1-0103	M37	DRB1 0804	M58	DPB1-1701 DPA1-0201	M79
DRB1 1104	M17	DQB1-0601 DQA1-0103	M38	DQB1-0201 DQA1-0201	M59	DQB1-0301 DQA1-0303	M80
DRB1 1402	M18	DRB1 0101	M39	DRB1 1202	M60	DQB1-0301 DQA1-0501	M81
DRB5 0101	M19	DRB1 0407	M40	DPB1-0501 DPA1-0202	M61	DPB1-1401 DPA1-0201	M82
DPB1-0101 DPA1-0103	M20	DRB1 1502	M41	DQB1-0301 DQA1-0601	M62	DQB1-0502 DQA1-0101	M83
DRB1 0402	M21	DRB1 1601	M42	DQB1-0501 DQA1-0101	M63		

[000225] Selected peptides may be synthetically manufactured, prepared into a pharmaceutical composition and may be administered to the subject as an immunotherapeutic vaccine, where viral epitope peptide antigens stimulate T cells in vivo. Additionally, or alternatively, T cells may be from a subject, and stimulated in vitro with the selected viral epitope peptide antigens. Following adequate activation of the T cells, the activated T cells are administered to the subject as immunotherapy. Additionally, or alternatively, antigen presenting cells (APCs) may be from the subject, and the APCs are contacted with the peptides comprising viral epitope antigens in vitro. The peptides comprising the viral epitope antigen may be longer peptides, comprising 20-100 amino acids, or more. The longer peptides may comprise a plurality of epitope peptides presented as a concatemer. The longer peptides are taken up by APCs and processed for antigen presentation in an efficient manner. The viral antigen activated and viral antigen presenting APCs may be administered to the subject as personalized immunotherapy, for the APCs to activate T lymphocytes in vivo. Additionally, or alternatively, antigen presenting cells (APCs) may be from the subject, and the APCs are contacted with the peptides comprising viral epitope antigens in vitro; thereafter, the activated APCs

are incubated with T cells from the subject to activate the T cells in vitro. The subject's T cells thus activated in vitro may be administered into the subject as personalized immunotherapy.

[000226]In some embodiments, the invention disclosed herein also provides a large selection of viral epitope peptide and HLA pairs generated as an information library where the viral epitope : HLA pairs are ranked based on the binding affinity and presentation prediction value (PPV).

[000227]In some embodiments, the invention disclosed herein also provides viral antigenic peptides comprising the epitopes that have been analyzed and selected as described in the steps above, and manufactured synthetically, for shelving and later use as off-the shelf immunotherapy reagents or products for treating coronavirus infection. In some embodiments, the manufactured peptides comprising the epitopes are solubilized in a suitable solution comprising a suitable excipient and may be frozen. In some embodiments, the manufactured peptides may be lyophilized and stored. In some embodiments, the manufactured peptides comprising the epitopes may be stored in a dry powder form. Upon determining an incoming subject's HLA repertoire, wherein the subject is in need for a therapeutic vaccine against a coronavirus, one or more viral antigenic peptides that can bind to the subject's HLA are recovered from the shelved products, mixed into a pharmaceutical composition and administered to the subject in need thereof.

[000228]In some embodiments, the viral genome may be analyzed to identify one or more B cell epitopes. In some embodiments, epitopes identified by analysis of the viral genome can be used for raising antibodies in a suitable host, such as a mammalian host, including but not limited to a mouse, a rat, a rabbit, sheep, pig, goat, lamb. In some embodiments, epitopes identified by analysis of the viral genome can be used for raising antibodies by recombinant technology.

[000229]In certain embodiments, the present invention provides a binding protein (e.g., an antibody or antigen-binding fragment thereof), or a T cell receptor (TCR), or a chimeric antigen receptor (CAR) capable of binding with a high affinity to a viral epitope peptide:human leukocyte antigen (HLA) complex. In some embodiments, the present invention provides a CAR that is capable of binding with a high affinity to a viral epitope peptide derived from the extracellular domain of a protein. In certain embodiments, an antigen-specific binding protein or TCR or CAR as described herein includes variant polypeptide species that have one or more amino acid substitutions, insertions, or deletions, provided that the binding protein retains or substantially retains its specific binding function.

[000230]In certain embodiments, a viral epitope specific binding protein, TCR or CAR is capable of (a) specifically binding to an antigen:HLA complex on a cell surface independent or in the absence of CD8. In certain embodiments, a viral epitope specific binding protein is a T cell receptor (TCR), a chimeric antigen receptor or an antigen-binding fragment of a TCR, any of which can be chimeric, humanized or human. In further embodiments, an antigen-binding fragment of the TCR comprises a single chain TCR (scTCR).

[000231]In certain embodiments, there is provided a composition comprising a viral epitope-specific binding protein or high affinity recombinant TCR according to any one of the above embodiments and a pharmaceutically acceptable carrier, diluent, or excipient.

[000232]Methods useful for isolating and purifying recombinantly produced soluble TCR, by way of example, can include obtaining supernatants from suitable host cell/vector systems that secrete the recombinant soluble TCR into culture media and then concentrating the media, for example using a commercially available filter or concentrator. Following concentration or filtration, the concentrate or filtrate, in some embodiments, can be purified, for example by application to a single suitable purification matrix or to a series of suitable matrices, such as an affinity matrix or an ion exchange resin. Alternatively or additionally, in some embodiments, one or more reverse phase HPLC steps may be employed to further purify a recombinant polypeptide. Such purification methods can also be employed when isolating an immunogen from its natural environment. Methods for large scale production of one or more of the isolated/recombinant soluble TCR described herein include batch cell culture, which is monitored and controlled to maintain appropriate culture conditions. Purification of the soluble TCR may be performed according to methods described herein and known in the art.

[000233]In one aspect, the viral protein may be a protein from a novel coronavirus, strain 2019 SARS-CoV 2 (available at NCBI Reference Sequence NC_045512.2), such as the proteins listed in Table 3.

Table 3.Viral Proteins

Protein	Length (AAs)
orf1ab polyprotein	7096
orf1a polyprotein	4405
surface glycoprotein (S)	1273
nucleocapsid phosphoprotein (N)	419
ORF3a protein	275
membrane glycoprotein (M)	222
ORF7a protein	121
ORF8 protein	121
envelope protein (E)	75
ORF6 protein	61
ORF7b	43
ORF10 protein	38
ORF9b protein	97

Immunogenic and vaccine compositions

[000234] In one embodiment, provided herein is an immunogenic composition, e.g., a vaccine composition capable of raising a viral epitope-specific response (e.g., a humoral or cell-mediated immune response). In some embodiments, the immunogenic composition comprises viral epitope therapeutics (e.g., peptides,

polynucleotides, TCR, CAR, cells containing TCR or CAR, dendritic cell containing polypeptide, dendritic cell containing polynucleotide, antibody, etc.) described herein corresponding to viral-specific viral epitope identified herein.

[000235] A person skilled in the art will be able to select viral epitope therapeutics by testing, for example, the generation of T cells in vitro as well as their efficiency and overall presence, the proliferation, affinity and expansion of certain T cells for certain peptides, and the functionality of the T cells, e.g. by analyzing the IFN-γ production or cell killing by T cells. The most efficient peptides can then combined as an immunogenic composition.

[000236] In one embodiment of the present invention the different viral epitope peptides and/or polypeptides are selected so that one immunogenic composition comprises viral epitope peptides and/or polypeptides capable of associating with different MHC molecules, such as different MHC class I molecule. In some embodiments, an immunogenic composition comprises viral epitope peptides and/or polypeptides capable of associating with the most frequently occurring MHC class I molecules. Hence immunogenic compositions described herein comprise different peptides capable of associating with at least 2, at least 3, or at least 4 MHC class I or class II molecules.

[000237] In one embodiment, an immunogenic composition described herein is capable of raising a specific cytotoxic T cells response, specific helper T cell response, or a B cell response.

[000238] In some embodiments, an immunogenic composition described herein can further comprise an adjuvant and/or a carrier. Examples of useful adjuvants and carriers are given herein below. Polypeptides and/or polynucleotides in the composition can be associated with a carrier such as e.g. a protein or an antigen-presenting cell such as e.g. a dendritic cell (DC) capable of presenting the peptide to a T cell or a B cell. In further embodiments, DC-binding peptides are used as carriers to target the viral epitope peptides and polynucleotides encoding the viral epitope peptides to dendritic cells (Sioud et al. FASEB J 27: 3272-3283 (2013)).

[000239] In embodiments, the viral epitope polypeptides or polynucleotides can be provided as antigen presenting cells (e.g., dendritic cells) containing such polypeptides or polynucleotides. In other embodiments, such antigen presenting cells are used to stimulate T cells for use in patients.

[000240] In some embodiments, the antigen presenting cells are dendritic cells. In related embodiments, the dendritic cells are autologous dendritic cells that are pulsed with the non-mutated protein epitope peptide or nucleic acid. The viral epitope peptide can be any suitable peptide that gives rise to an appropriate T cell response. In some embodiments, the T cell is a CTL. In some embodiments, the T cell is a HTL.

[000241] Thus, one embodiment of the present invention an immunogenic composition containing at least one antigen presenting cell (e.g., a dendritic cell) that is pulsed or loaded with one or more viral epitope polypeptides or polynucleotides described herein. In embodiments, such APCs are autologous (e.g.,

autologous dendritic cells). Alternatively, peripheral blood mononuclear cells (PBMCs) from a patient can be loaded with viral epitope peptides or polynucleotides ex vivo. In related embodiments, such APCs or PBMCs are injected back into the patient.

[000242] The polynucleotide can be any suitable polynucleotide that is capable of transducing the dendritic cell, thus resulting in the presentation of a viral epitope peptide and induction of immunity. In one embodiment, the polynucleotide can be naked DNA that is taken up by the cells by passive loading. In another embodiment, the polynucleotide is part of a delivery vehicle, for example, a liposome, virus like particle, plasmid, or expression vector. In another embodiment, the polynucleotide is delivered by a vector-free delivery system, for example, high performance electroporation and high-speed cell deformation). In embodiments, such antigen presenting cells (APCs) (e.g., dendritic cells) or peripheral blood mononuclear cells (PBMCs) are used to stimulate a T cell (e.g., an autologous T cell). In related embodiments, the T cell is a CTL. In other related embodiments, the T cell is an HTL. Such T cells are then injected into the patient. In some embodiments, CTL is injected into the patient. In some embodiments, HTL is injected into the patient. In some embodiments, both CTL and HTL are injected into the patient. Administration of either therapeutic can be performed simultaneously or sequentially and in any order.

[000243] The pharmaceutical compositions (e.g., immunogenic compositions) described herein for therapeutic treatment are intended for parenteral, topical, nasal, oral or local administration. In some embodiments, the pharmaceutical compositions described herein are administered parenterally, e.g., intravenously, subcutaneously, intradermally, or intramuscularly. In some embodiments, described herein are compositions for parenteral administration which comprise a solution of the viral epitope peptides and immunogenic compositions are dissolved or suspended in an acceptable carrier, for example, an aqueous carrier. A variety of aqueous carriers can be used, e.g., water, buffered water, 0.9% saline, 0.3% glycine, hyaluronic acid and the like. These compositions can be sterilized by conventional, well known sterilization techniques, or can be sterile filtered. The resulting aqueous solutions can be packaged for use as is, or lyophilized, the lyophilized preparation being combined with a sterile solution prior to administration. The compositions can contain pharmaceutically acceptable auxiliary substances as required to approximate physiological conditions, such as pH adjusting and buffering agents, tonicity adjusting agents, wetting agents and the like, for example, sodium acetate, sodium lactate, sodium chloride, potassium chloride, calcium chloride, sorbitan monolaurate, triethanolamine oleate, etc.

[000244] The concentration of viral epitope peptides and polynucleotides described herein in the pharmaceutical formulations can vary widely, i.e., from less than about 0.1%, usually at or at least about 2% to as much as 20% to 50% or more by weight, and will be selected by fluid volumes, viscosities, etc., according to the particular mode of administration selected.

[000245] The viral epitope peptides and polynucleotides described herein can also be administered via liposomes, which target the peptides to a particular cells tissue, such as lymphoid tissue. Liposomes are

also useful in increasing the half-life of the peptides. Liposomes include emulsions, foams, micelles, insoluble monolayers, liquid crystals, phospholipid dispersions, lamellar layers and the like. In these preparations the peptide to be delivered is incorporated as part of a liposome, alone or in conjunction with a molecule which binds to, e.g., a receptor prevalent among lymphoid cells, such as monoclonal antibodies which bind to the DEC205 antigen, or with other therapeutic or immunogenic compositions. Thus, liposomes filled with a desired peptide or polynucleotide described herein can be directed to the site of lymphoid cells, where the liposomes then deliver the selected therapeutic/immunogenic polypeptide/polynucleotide compositions. Liposomes can be formed from standard vesicle-forming lipids, which generally include neutral and negatively charged phospholipids and a sterol, for example, cholesterol. The selection of lipids is generally guided by consideration of, e.g., liposome size, acid lability and stability of the liposomes in the blood stream. A variety of methods are available for preparing liposomes, as described in, e.g., Szoka et al., Ann. Rev. Biophys. Bioeng. 9; 467 (1980), U.S. Pat. Nos. 4,235,871, 4,501,728, 4,501,728, 4,837,028, and 5,019,369.

[000246] For targeting to the immune cells, a viral epitope polypeptides or polynucleotides to be incorporated into the liposome for cell surface determinants of the desired immune system cells. A liposome suspension containing a peptide can be administered intravenously, locally, topically, etc. in a dose which varies according to, inter alia, the manner of administration, the polypeptide or polynucleotide being delivered, and the stage of the disease being treated.

[000247] In some embodiments, viral epitope polypeptides and polynucleotides are targeted to dendritic cells. In one embodiment, the viral epitope polypeptides and polynucleotides are target to dendritic cells using the markers DEC205, XCR1, CD197, CD80, CD86, CD123, CD209, CD273, CD283, CD289, CD184, CD85h, CD85j, CD85k, CD85d, CD85g, CD85a, TSLP receptor, or CD1a.

[000248] For solid compositions, conventional or nanoparticle nontoxic solid carriers can be used which include, for example, pharmaceutical grades of mannitol, lactose, starch, magnesium stearate, sodium saccharin, talcum, cellulose, glucose, sucrose, magnesium carbonate, and the like. For oral administration, a pharmaceutically acceptable nontoxic composition is formed by incorporating any of the normally employed excipients, such as those carriers previously listed, and generally 10-95% of active ingredient, that is, one or more viral epitope polypeptides or polynucleotides described herein at a concentration of 25%-75%.

[000249] For aerosol administration, the viral epitope polypeptides or polynucleotides can be supplied in finely divided form along with a surfactant and propellant. Representative of such agents are the esters or partial esters of fatty acids containing from 6 to 22 carbon atoms, such as caproic, octanoic, lauric, palmitic, stearic, linoleic, linolenic, olesteric and oleic acids with an aliphatic polyhydric alcohol or its cyclic anhydride. Mixed esters, such as mixed or natural glycerides can be employed. The surfactant can

constitute 0.1%-20% by weight of the composition, or 0.25-5%. The balance of the composition can be propellant. A carrier can also be included as desired, as with, e.g., lecithin for intranasal delivery.

[000250] Additional methods for delivering the viral epitope polynucleotides described herein are also known in the art. For instance, the nucleic acid can be delivered directly, as "naked DNA". This approach is described, for instance, in Wolff et al., Science 247: 1465-1468 (1990) as well as U.S. Pat. Nos. 5,580,859 and 5,589,466. The nucleic acids can also be administered using ballistic delivery as described, for instance, in U.S. Pat. No. 5,204,253. Particles comprised solely of DNA can be administered. Alternatively, DNA can be adhered to particles, such as gold particles.

[000251] For therapeutic or immunization purposes, mRNA encoding the viral epitope peptides, or peptide binding agents can also be administered to the patient. In some embodiments an mRNA encoding the viral epitope peptides, or peptide binding agents may be part of a synthetic lipid nanoparticle formulation. In one embodiment, the mRNA is self-amplifying RNA. In a further embodiment, a mRNA, such as a self-amplifying RNA, is a part of a synthetic lipid nanoparticle formulation (Geall et al., Proc Natl Acad Sci U S A. 109: 14604-14609 (2012)).

[000252] The nucleic acids can also be delivered complexed to cationic compounds, such as cationic lipids. In some embodiments, nucleic acids can be encapsulated in lipid nanoparticles (e.g., comprising cationic lipid, non-cationic lipids (e.g., phospholipids and/or sterol), and/or PEG-lipids). Lipid-mediated gene delivery methods are described, for instance, in WO 96/18372, WO 93/24640; Mannino & Gould-Fogerite, BioTechniques 6(7): 682-691 (1988); U.S. Pat. No. 5,279,833; WO 91/06309; and Felgner et al., Proc. Natl. Acad. Sci. USA 84: 7413-7414 (1987).

[000253] The viral epitope peptides and polypeptides described herein can also be expressed by attenuated viruses, such as vaccinia or fowlpox. This approach involves the use of vaccinia virus as a vector to express nucleotide sequences that encode the peptide described herein. Upon introduction into an acutely or chronically infected host or into a noninfected host, the recombinant vaccinia virus expresses the immunogenic peptide, and thereby elicits a host CTL response. Vaccinia vectors and methods useful in immunization protocols are described in, e.g., U.S. Pat. No. 4,722,848. Another vector is BCG (Bacille Calmette Guerin). BCG vectors are described in Stover et al. (Nature 351:456-460 (1991)). A wide variety of other vectors useful for therapeutic administration or immunization of the peptides described herein will be apparent to those skilled in the art from the description herein.

[000254] Adjuvants are any substance whose admixture into the immunogenic composition increases or otherwise modifies the immune response to the therapeutic agent. Carriers are scaffold structures, for example a polypeptide or a polysaccharide, to which a viral epitope polypeptide or polynucleotide, is capable of being associated. Optionally, adjuvants are conjugated covalently or non-covalently to the polypeptides or polynucleotides described herein.

[000255] The ability of an adjuvant to increase the immune response to an antigen is typically manifested by a significant increase in immune-mediated reaction, or reduction in disease symptoms. For example, an increase in humoral immunity can be manifested by a significant increase in the titer of antibodies raised to the antigen, and an increase in T cell activity can be manifested in increased cell proliferation, or cellular cytotoxicity, or cytokine secretion. An adjuvant can also alter an immune response, for example, by changing a primarily humoral or T helper 2 response into a primarily cellular, or T helper 1 response.

[000256] Suitable adjuvants are known in the art *(see,* WO 2015/095811) and include, but are not limited to poly(I:C), poly-I and poly C, STING agonist, 1018 ISS, aluminum salts, Amplivax, AS15, BCG, CP-870,893, CpG7909, CyaA, dSLIM, GM-CSF, IC30, IC31, Imiquimod, ImuFact IMP321, IS Patch, ISS, ISCOMATRIX, JuvImmune, LipoVac, MF59, monophosphoryl lipid A, Montanide IMS 1312, Montanide ISA 206, Montanide ISA 50V, Montanide ISA-51, OK-432, OM-174, OM-197- MP-EC, ONTAK, PepTel®. vector system, PLG microparticles, resiquimod, SRL172, virosomes and other virus-like particles, YF-17D, VEGF trap, R848, beta-glucan, Pam3Cys, Pam3CSK4, Aquila's QS21 stimulon (Aquila Biotech, Worcester, Mass., USA) which is derived from saponin, mycobacterial extracts and synthetic bacterial cell wall mimics, and other proprietary adjuvants such as Ribi's Detox. Quil or Superfos. Adjuvants also include incomplete Freund's or GM-CSF. Several immunological adjuvants (e.g., MF59) specific for dendritic cells and their preparation have been described previously (Dupuis M, et al., Cell Immunol. 1998; 186(1):18-27; Allison A C; Dev Biol Stand. 1998; 92:3-11) (Mosca et al. Frontiers in Bioscience, 2007; 12:4050-4060) (Gamvrellis et al. Immunol & Cell Biol. 2004; 82: 506-516). Also, cytokines can be used. Several cytokines have been directly linked to influencing dendritic cell migration to lymphoid tissues (e.g., TNF-alpha), accelerating the maturation of dendritic cells into efficient antigen-presenting cells for T-lymphocytes (e.g., GM-CSF, PGE1, PGE2, IL-1, IL-lb, IL-4, IL-6 and CD4OL) (U.S. Pat. No. 5,849,589 incorporated herein by reference in its entirety) and acting as immunoadjuvants (e.g., IL-12) (Gabrilovich D I, et al., J Immunother Emphasis Tumor Immunol. 1996 (6):414-418).

[000257] CpG immunostimulatory oligonucleotides have also been reported to enhance the effects of adjuvants in a vaccine setting. Without being bound by theory, CpG oligonucleotides act by activating the innate (non-adaptive) immune system via Toll-like receptors (TLR), mainly TLR9. CpG triggered TLR9 activation enhances antigen-specific humoral and cellular responses to a wide variety of antigens, including peptide or protein antigens, live or killed viruses, dendritic cell vaccines, autologous cellular vaccines and polysaccharide conjugates in both prophylactic and therapeutic vaccines. Importantly, it enhances dendritic cell maturation and differentiation, resulting in enhanced activation of TH1 cells and strong cytotoxic T-lymphocyte (CTL) generation, even in the absence of CD4 T cell help. The TH1 bias induced by TLR9 stimulation is maintained even in the presence of vaccine adjuvants such as alum or incomplete Freund's adjuvant (IFA) that normally promote a TH2 bias. CpG oligonucleotides show even greater adjuvant activity when formulated or co-administered with other adjuvants or in formulations such as microparticles,

nanoparticles, lipid emulsions or similar formulations, which are especially necessary for inducing a strong response when the antigen is relatively weak. They also accelerate the immune response and enabled the antigen doses to be reduced with comparable antibody responses to the full-dose vaccine without CpG in some experiments (Arthur M. Krieg, Nature Reviews, Drug Discovery, 5, June 2006, 471484). U.S. Pat. No. 6,406,705 B1 describes the combined use of CpG oligonucleotides, non-nucleic acid adjuvants and an antigen to induce an antigen-specific immune response. A commercially available CpG TLR9 antagonist is dSLIM (double Stem Loop Immunomodulator) by Mologen (Berlin, GERMANY), which is a component of the pharmaceutical composition described herein. Other TLR binding molecules such as RNA binding TLR 7, TLR 8 and/or TLR 9 can also be used.

[000258] Other examples of useful adjuvants include, but are not limited to, chemically modified CpGs (e.g. CpR, Idera), Poly(I:C)(e.g. polyi:Cl2U), non-CpG bacterial DNA or RNA, ssRNA40 for TLR8, as well as immunoactive small molecules and antibodies such as cyclophosphamide, sunitinib, bevacizumab, celebrex, NCX-4016, sildenafil, tadalafil, vardenafil, sorafinib, XL-999, CP-547632, pazopanib, ZD2171, AZD2171, ipilimumab, tremelimumab, and SC58175, which can act therapeutically and/or as an adjuvant. The amounts and concentrations of adjuvants and additives useful in the context of the present invention can readily be determined by the skilled artisan without undue experimentation. Additional adjuvants include colony-stimulating factors, such as Granulocyte Macrophage Colony Stimulating Factor (GM-CSF, sargramostim).

[000259] In some embodiments, an immunogenic composition according to the present invention can comprise more than one different adjuvants. Furthermore, the invention encompasses a therapeutic composition comprising any adjuvant substance including any of the above or combinations thereof. It is also contemplated that the viral epitope therapeutic can elicit or promote an immune response (e.g., a humoral or cell-mediated immune response). In some embodiments, the immunogenic composition comprises viral epitope therapeutics (e.g., peptides, polynucleotides, TCR, CAR, cells containing TCR or CAR, dendritic cell containing polypeptide, dendritic cell containing polynucleotide, antibody, etc.) and the adjuvant can be administered separately in any appropriate sequence.

[000260] A carrier can be present independently of an adjuvant. The function of a carrier can for example be to increase the molecular weight of in particular mutant in order to increase their activity or immunogenicity, to confer stability, to increase the biological activity, or to increase serum half-life. Furthermore, a carrier can aid presenting peptides to T cells. The carrier can be any suitable carrier known to the person skilled in the art, for example a protein or an antigen presenting cell. A carrier protein could be but is not limited to keyhole limpet hemocyanin, serum proteins such as transferrin, bovine serum albumin, human serum albumin, thyroglobulin or ovalbumin, immunoglobulins, or hormones, such as insulin or palmitic acid. In one embodiment, the carrier comprises a human fibronectin type III domain (Koide et al. Methods Enzymol. 2012;503:135-56). For immunization of humans, the carrier must be a

physiologically acceptable carrier acceptable to humans and safe. However, tetanus toxoid and/or diptheria toxoid are suitable carriers in one embodiment of the invention. Alternatively, the carrier can be dextrans for example sepharose.

[000261] In some embodiments, the polypeptides can be synthesized as multiply linked peptides as an alternative to coupling a polypeptide to a carrier to increase immunogenicity. Such molecules are also known as multiple antigenic peptides (MAPS).

[000262] In one aspect, the method presented herein comprises isolating and/or characterizing one or more coronavirus antigenic peptides or nucleic acids encoding characterizing one or more coronavirus antigenic peptides, wherein the coronavirus antigenic peptides are predicted to bind to one or more HLA encoded MHC class I or MHC Class II molecules expressed in a subject, wherein the subject is in need of a coronavirus immunotherapy such as a coronavirus vaccine thereof. In some embodiments, the method comprises: (a) processing amino acid information of a plurality of candidate peptide sequences using a machine learning HLA peptide presentation prediction model to generate a plurality of presentation predictions, wherein each candidate peptide sequence of the plurality of candidate peptide sequences is encoded by a genome or exome of a coronavirus, wherein the plurality of presentation predictions comprises an HLA presentation prediction for each of the plurality of candidate viral peptide sequences, wherein each HLA presentation prediction is indicative of a likelihood that one or more proteins encoded by a class II HLA allele of a cell of the subject can present a given candidate viral peptide sequence of the plurality of candidate viral peptide sequences, wherein the machine learning HLA peptide presentation prediction model is trained using training data comprising sequence information of sequences of training peptides identified by mass spectrometry to be presented by an HLA protein expressed in training cells; and (b) identifying, based at least on the plurality of presentation predictions, a viral peptide sequence of the plurality of peptide sequences as being presented by at least one of the one or more proteins encoded by a class II HLA allele of a cell of the subject; wherein the machine learning HLA peptide presentation prediction model has a positive predictive value (PPV) of at least 0.07 according to a presentation PPV determination method.

[000263] Provided herein is a method comprising: (a) processing amino acid information of a plurality of peptide sequences of encoded by a genome or exome of a coronavirus, using a machine learning HLA peptide binding prediction model to generate a plurality of binding predictions, wherein the plurality of binding predictions comprises an HLA binding prediction for each of the plurality of candidate peptide sequences, each binding prediction indicative of a likelihood that one or more proteins encoded by a class II HLA allele of a cell of the subject binds to a given candidate peptide sequence of the plurality of candidate peptide sequences, wherein the machine learning HLA peptide binding prediction model is trained using training data comprising sequence information of sequences of peptides identified to bind to an HLA class II protein or an HLA class II protein analog; and (b) identifying, based at least on the plurality

of binding predictions, a peptide sequence of the plurality of peptide sequences that has a probability greater than a threshold binding prediction probability value of binding to at least one of the one or more proteins encoded by a class II HLA allele of a cell of the subject; wherein the machine learning HLA peptide binding prediction model has a positive predictive value (PPV) of at least 0.1 according to a binding PPV determination method.

[000264] In some embodiments, the machine learning HLA peptide presentation prediction model is trained using training data comprising sequence information of sequences of training peptides identified by mass spectrometry to be presented by an HLA protein expressed in training cells.

[000265] In some embodiments, the method comprises ranking, based on the presentation predictions, at least two peptides identified as being presented by at least one of the one or more proteins encoded by a class II HLA allele of a cell of the subject.

[000266] In some embodiments, the method comprises selecting one or more peptides of the two or more ranked peptides.

[000267] In some embodiments, the method comprises selecting one or more peptides of the plurality that were identified as being presented by at least one of the one or more proteins encoded by a class II HLA allele of a cell of the subject.

[000268] In some embodiments, the method comprises selecting one or more peptides of two or more peptides ranked based on the presentation predictions.

[000269] In some embodiments, the machine learning HLA peptide presentation prediction model has a positive predictive value (PPV) of at least 0.07 when amino acid information of a plurality of test peptide sequences are processed to generate a plurality of test presentation predictions, each test presentation prediction indicative of a likelihood that the one or more proteins encoded by a class II HLA allele of a cell of the subject can present a given test peptide sequence of the plurality of test peptide sequences, wherein the plurality of test peptide sequences comprises at least 500 test peptide sequences comprising (i) at least one hit peptide sequence identified by mass spectrometry to be presented by an HLA protein expressed in cells and (ii) at least 499 decoy peptide sequences contained within a protein encoded by a genome of an organism, wherein the organism and the subject are the same species, wherein the plurality of test peptide sequences comprises a ratio of 1:499 of the at least one hit peptide sequence to the at least 499 decoy peptide sequences and a top percentage of the plurality of test peptide sequences are predicted to be presented by the HLA protein expressed in cells by the machine learning HLA peptide presentation prediction model.

[000270] In some embodiments, the machine learning HLA peptide presentation prediction model has a positive predictive value (PPV) of at least 0.1 when amino acid information of a plurality of test peptide sequences are processed to generate a plurality of test binding predictions, each test binding prediction indicative of a likelihood that the one or more proteins encoded by a class II HLA allele of a cell of the

subject binds to a given test peptide sequence of the plurality of test peptide sequences, wherein the plurality of test peptide sequences comprises at least 20 test peptide sequences comprising (i) at least one hit peptide sequence identified by mass spectrometry to be presented by an HLA protein expressed in cells and (ii) at least 19 decoy peptide sequences contained within a protein comprising at least one peptide sequence identified by mass spectrometry to be presented by an HLA protein expressed in cells, such as a single HLA protein expressed in cells (e.g., mono-allelic cells), wherein the plurality of test peptide sequences comprises a ratio of 1:19 of the at least one hit peptide sequence to the at least 19 decoy peptide sequences and a top percentage of the plurality of test peptide sequences are predicted to bind to the HLA protein expressed in cells by the machine learning HLA peptide presentation prediction model.

[000271] In some embodiments, no amino acid sequence overlap exist among the at least one hit peptide sequence and the decoy peptide sequences.

Combinations of CTL peptides and HTL peptides

[000272] Immunogenic or vaccine compositions comprising the viral epitope polypeptides and polynucleotides described herein, or analogs thereof, which have immunostimulatory activity can be modified to provide desired attributes, such as improved serum half-life, or to enhance immunogenicity.

[000273] For instance, the ability of the viral epitope peptides to induce CTL activity can be enhanced by linking the peptide to a sequence which contains at least one epitope that is capable of inducing a T helper cell response. In one embodiment, CTL epitope/HTL epitope conjugates are linked by a spacer molecule. The spacer is typically comprised of relatively small, neutral molecules, such as amino acids or amino acid mimetics, which are substantially uncharged under physiological conditions. The spacers are typically selected from, e.g., Ala, Gly, or other neutral spacers of nonpolar amino acids or neutral polar amino acids. It will be understood that the optionally present spacer need not be comprised of the same residues and thus can be a hetero- or homo-oligomer. When present, the spacer will usually be at least one or two residues, more usually three to six residues. Alternatively, the CTL peptide can be linked to the T helper peptide without a spacer.

[000274] Although the CTL peptide epitope can be linked directly to the T helper peptide epitope, CTL epitope/HTL epitope conjugates can be linked by a spacer molecule. The spacer is typically comprised of relatively small, neutral molecules, such as amino acids or amino acid mimetics, which are substantially uncharged under physiological conditions. The spacers are typically selected from, e.g., Ala, Gly, or other neutral spacers of nonpolar amino acids or neutral polar amino acids. It will be understood that the optionally present spacer need not be comprised of the same residues and thus can be a hetero- or homo-oligomer. When present, the spacer will usually be at least one or two residues, more usually three to six residues. The CTL peptide epitope can be linked to the **T** helper peptide epitope either directly or via a spacer either at the amino or carboxy terminus of the CTL peptide. The amino terminus of either the immunogenic peptide or the T helper peptide can be acylated.

[000275] HTL peptide epitopes can also be modified to alter their biological properties. For example, peptides comprising HTL epitopes can contain D-amino acids to increase their resistance to proteases and thus extend their serum half-life. Also, the epitope peptides can be conjugated to other molecules such as lipids, proteins or sugars, or any other synthetic compounds, to increase their biological activity. For example, the T helper peptide can be conjugated to one or more palmitic acid chains at either the amino or carboxyl termini.

[000276] In certain embodiments, the T helper peptide is one that is recognized by T helper cells present in the majority of the population. This can be accomplished by selecting amino acid sequences that bind to many, most, or all of the HLA class II molecules. These are known as "loosely HLA-restricted" or "promiscuous" T helper sequences. Examples of amino acid sequences that are promiscuous include sequences from antigens such as tetanus toxoid at positions 830-843 (QYIKANSKFIGITE), *Plasmodium falciparum* CS protein at positions 378-398 (DIEKKIAKMEKASSVFNVVNS), and Streptococcus 18kD protein at positions 116 (GAVDSILGGVATYGAA). Other examples include peptides bearing a DR 1-4-7 supermotif, or either of the DR3 motifs.

[000277] Alternatively, it is possible to prepare synthetic peptides capable of stimulating T helper lymphocytes, in a loosely HLA-restricted fashion, using amino acid sequences not found in nature (see, e.g., PCT publication WO 95/07707). These synthetic compounds called Pan-DR-binding epitopes (e.g., PADRE, Epimmune, Inc., San Diego, CA) are designed to bind most HLA-DR (human HLA class II) molecules. For instance, a pan-DR-binding epitope peptide having the formula: aKXVWANTLKAAa, where "X" is either cyclohexyl alanine, phenylalanine, or tyrosine, and a is either D-alanine or L-alanine, has been found to bind to most HLA-DR alleles, and to stimulate the response of T helper lymphocytes from most individuals, regardless of their HLA type. An alternative of a pan-DR binding epitope comprises all "L" natural amino acids and can be provided in the form of nucleic acids that encode the epitope.

[000278] In some embodiments it can be desirable to include in a viral epitope therapeutic (e.g., peptides, polynucleotides, TCR, CAR, cells containing TCR or CAR, dendritic cell containing polypeptide, dendritic cell containing polynucleotide, antibody, etc.) in pharmaceutical compositions (e.g., immunogenic compositions) at least one component of which primes cytotoxic T lymphocytes. Lipids have been identified as agents capable of priming CTL in vivo against viral antigens. For example, palmitic acid residues can be attached to the c-and a- amino groups of a lysine residue and then linked, e.g., via one or more linking residues such as Gly, Gly-Gly-, Ser, Ser-Ser, or the like, to an immunogenic viral epitope peptide. The lipidated peptide can then be administered either directly in a micelle or particle, incorporated into a liposome, or emulsified in an adjuvant. In one embodiment, a particularly effective immunogenic construct comprises palmitic acid attached to c- and a- amino groups of Lys, which is attached via linkage, e.g., Ser-Ser, to the amino terminus of the immunogenic peptide.

[000279] As another example of lipid priming of CTL responses, E. coli lipoproteins, such as tripalmitoyl-S-glycerylcysteinlyseryl- serine (P3CSS) can be used to prime virus specific CTL when covalently attached to an appropriate peptide. (See, e.g., Deres, et al., Nature 342:561, 1989). Viral epitope peptides described herein can be coupled to P3CSS, for example, and the lipopeptide administered to an individual to specifically prime a CTL response to the target antigen. Moreover, because the induction of neutralizing antibodies can also be primed with P3CSS-conjugated epitopes, two such compositions can be combined to more effectively elicit both humoral and cell-mediated responses to infection.

[000280] As noted herein, additional amino acids can be added to the termini of a viral epitope peptide to provide for ease of linking peptides one to another, for coupling to a carrier support or larger peptide, for modifying the physical or chemical properties of the peptide or oligopeptide, or the like. Amino acids such as tyrosine, cysteine, lysine, glutamic or aspartic acid, or the like, can be introduced at the C- or N-terminus of the peptide or oligopeptide. However, it is to be noted that modification at the carboxyl terminus of a T cell epitope can, in some cases, alter binding characteristics of the peptide. In addition, the peptide or oligopeptide sequences can differ from the natural sequence by being modified by terminal-NH2 acylation, e.g., by alkanoyl (C1-C20) or thioglycolyl acetylation, terminal-carboxyl amidation, e.g., ammonia, methylamine, etc. In some instances, these modifications can provide sites for linking to a support or other molecule.

[000281] An embodiment of an immunogenic composition described herein comprises *ex vivo* administration of a cocktail of epitope-bearing viral epitope polypeptide or polynucleotides to PBMC, or DC therefrom, from the patient's blood. A pharmaceutical to facilitate harvesting of dendritic cells (DCs) can be used, including GM-CSF, IL-4, IL-6, IL-1b, and TNFa. After pulsing the DCs with peptides or polynucleotides encoding the peptides, and prior to reinfusion into patients, the DC are washed to remove unbound peptides. In this embodiment, a vaccine or immunogenic composition comprises peptide-pulsed DCs which present the pulsed peptide epitopes complexed with HLA molecules on their surfaces. The composition is then administered to the patient. In other embodiments, such pulsed DCs are used to stimulate T cells suitable for use in T cell therapy.

Multi-epitope immunogenic compositions

[000282] A number of different approaches are available which allow simultaneous delivery of multiple epitopes. Nucleic acids encoding the viral epitope peptides described herein are a particularly useful embodiment of the invention. In one embodiment, the nucleic acid is RNA. In some embodiments, minigene constructs encoding a viral epitope peptide comprising one or multiple epitopes described herein may be used to administer nucleic acids encoding the viral epitope peptides described herein. In some embodiments, a RNA construct (e.g., mRNA construct) encoding a viral epitope peptide comprising one or multiple epitopes described herein is administered.

[000283] Exemplary use of multi-epitope minigenes is described An, L. and Whitton, J. L., J. Virol. 71:2292, 1997; Thomson, S. A. et al., J. Immunol. 157:822, 1996; Whitton, J. L. et al., **J.** Virol 67:348, 1993; Hanke, R. et al., Vaccine 16:426, 1998. For example, a multi-epitope DNA plasmid encoding super motif- and/or motif-bearing antigen peptides, a universal helper T cell epitope (or multiple viral antigen HTL epitopes), and an endoplasmic reticulum-translocating signal sequence can be engineered.

[000284] The immunogenicity of a multi-epitopic minigene can be tested in transgenic mice to evaluate the magnitude of immune response induced against the epitopes tested. Further, the immunogenicity of DNA-encoded epitopes in vivo can be correlated with the in vitro responses of specific CTL lines against target cells transfected with the DNA plasmid. Thus, these experiments can show that the minigene serves to both: 1). generate a cell mediated and/or humoral response and 2). that the induced immune cells recognized cells expressing the encoded epitopes.

[000285] For example, to create a DNA sequence encoding the selected viral epitope (minigene) for expression in human cells, the amino acid sequences of the epitopes can be reverse translated. A human codon usage table can be used to guide the codon choice for each amino acid. These viral epitope-encoding DNA sequences can be directly adjoined, so that when translated, a continuous polypeptide sequence is created. To optimize expression and/or immunogenicity, additional elements can be incorporated into the minigene design. Examples of amino acid sequences that can be reverse translated and included in the minigene sequence include: HLA class I epitopes, HLA class II epitopes, a ubiquitination signal sequence, and/or an endoplasmic reticulum targeting signal. In addition, HLA presentation of CTL and HTL epitopes can be improved by including synthetic (e.g. poly-alanine) or naturally-occurring flanking sequences adjacent to the CTL or HTL epitopes; these larger peptides comprising the epitope(s) are within the scope of the invention.

[000286] The minigene sequence can be converted to DNA by assembling oligonucleotides that encode the plus and minus strands of the minigene. Overlapping oligonucleotides (30-100 bases long) can be synthesized, phosphorylated, purified and annealed under appropriate conditions using well known techniques. The ends of the oligonucleotides can be joined, for example, using T4 DNA ligase. This synthetic minigene, encoding the epitope polypeptide, can then be cloned into a desired expression vector.

[000287] Standard regulatory sequences well known to those of skill in the art can be included in the vector to ensure expression in the target cells. For example, a promoter with a down-stream cloning site for minigene insertion; a polyadenylation signal for efficient transcription termination; an E. coli origin of replication; and an E. coli selectable marker (e.g. ampicillin or kanamycin resistance). Numerous promoters can be used for this purpose, e.g., the human cytomegalovirus (hCMV) promoter. See, e.g., U.S. Patent Nos. 5,580,859 and 5,589,466 for other suitable promoter sequences.

[000288] Additional vector modifications can be used to optimize minigene expression and immunogenicity. In some cases, introns are utilized for efficient gene expression, and one or more synthetic

or naturally-occurring introns could be incorporated into the transcribed region of the minigene. The inclusion of mRNA stabilization sequences and sequences for replication in mammalian cells can also be considered for increasing minigene expression.

[000289] Once an expression vector is selected, the minigene can be cloned into the polylinker region downstream of the promoter. This plasmid is transformed into an appropriate E. coli strain, and DNA is prepared using standard techniques. The orientation and DNA sequence of the minigene, as well as all other elements included in the vector, can be confirmed using restriction mapping and DNA sequence analysis. Bacterial cells harboring the correct plasmid can be stored as a master cell bank and a working cell bank.

[000290] In addition, immunomodulatory sequences appear to play a role in the immunogenicity of DNA vaccines. These sequences can be included in the vector, outside the minigene coding sequence, if desired to enhance immunogenicity. In one embodiment, the sequences are immunostimulatory. In another embodiment, the sequences are ISSs or CpGs.

[000291] In some embodiments, a bi-cistronic expression vector which allows production of both the minigene-encoded epitopes and a second protein (included to enhance or decrease immunogenicity) can be used. Examples of proteins or polypeptides that could beneficially enhance the immune response if co-expressed include cytokines (e.g., IL-2, IL-12, GM-CSF), cytokine-inducing molecules (e.g., LeIF), costimulatory molecules, or for HTL responses, pan-DR binding proteins. Helper (HTL) epitopes can be joined to intracellular targeting signals and expressed separately from expressed CTL epitopes; this allows direction of the HTL epitopes to a cell compartment different than that of the CTL epitopes. If required, this could facilitate more efficient entry of HTL epitopes into the HLA class II pathway, thereby improving HTL induction. In contrast to HTL or CTL induction, specifically decreasing the immune response by co-expression of immunosuppressive molecules (e.g. TGF-(3) can be beneficial in certain diseases.

[000292] Therapeutic quantities of plasmid DNA can be produced for example, by fermentation in E. coli, followed by purification. Aliquots from the working cell bank are used to inoculate growth medium, and grown to saturation in shaker flasks or a bioreactor according to well-known techniques. Plasmid DNA can be purified using standard bioseparation technologies such as solid phase anion-exchange resins supplied by QIAGEN, Inc. (Valencia, California). If required, supercoiled DNA can be from the open circular and linear forms using gel electrophoresis or other methods.

[000293] Purified plasmid DNA can be prepared for injection using a variety of formulations. The simplest of these is reconstitution of lyophilized DNA in sterile phosphate-buffer saline (PBS). This approach, known as "naked DNA," is currently being used for intramuscular (IM) administration in clinical trials. To maximize the immunotherapeutic effects of minigene DNA vaccines, an alternative method for formulating purified plasmid DNA can be used. A variety of methods have been described, and new techniques can become available. Cationic lipids can also be used in the formulation (see, e.g., as described by WO

93/24640; Mannino & Gould-Fogerite, BioTechniques 6(7): 682 (1988); U.S. Pat No. 5,279,833; WO 91/06309; and Felgner, et al., Proc. Nat'l Acad. Sci. USA 84:7413 (1987). In addition, glycolipids, fusogenic liposomes, peptides and compounds referred to collectively as protective, interactive, non-condensing compounds (PINC) could also be complexed to purified plasmid DNA to influence variables such as stability, intramuscular dispersion, or trafficking to specific organs or cell types.

[000294] In another embodiment, the nucleic acid is introduced into cells by use of high-speed cell deformation. During high-speed deformation, cells are squeezed such that temporary disruptions occur in the cell membrane, thus allowing the nucleic acid to enter the cell. Alternatively, protein can be produced from expression vectors — in a bacterial expression vector, for example, and the proteins can then be delivered to the cell.

[000295] Target cell sensitization can be used as a functional assay for expression and HLA class I presentation of minigene-encoded CTL epitopes. For example, the plasmid DNA is introduced into a mammalian cell line that is suitable as a target for standard CTL chromium release assays. The transfection method used will be dependent on the final formulation. Electroporation can be used for "naked" DNA, whereas cationic lipids allow direct in vitro transfection. A plasmid expressing green fluorescent protein (GFP) can be co-transfected to allow enrichment of transfected cells using fluorescence activated cell sorting (FACS). These cells are then chromium-51 (^{51}Cr) labeled and used as target cells for epitope-specific CTL lines; cytolysis, detected by ^{51}Cr release, indicates both production of, and HLA presentation of, minigene-encoded CTL epitopes. Expression of HTL epitopes can be evaluated in an analogous manner using assays to assess HTL activity.

[000296] In vivo immunogenicity is a second approach for functional testing of minigene DNA formulations. Transgenic mice expressing appropriate human HLA proteins are immunized with the DNA product. The dose and route of administration are formulation dependent (e.g., IM for DNA in PBS, intraperitoneal (IP) for lipid-complexed DNA). An exemplary protocol is twenty-one days after immunization, splenocytes are harvested and restimulated for 1 week in the presence of peptides encoding each epitope being tested. Thereafter, for CTL effector cells, assays are conducted for cytolysis of peptide-loaded, ^{51}Cr-labeled target cells using standard techniques. Lysis of target cells that were sensitized by HLA loaded with peptide epitopes, corresponding to minigene-encoded epitopes, demonstrates DNA vaccine function for in vivo induction of CTLs. Immunogenicity of HTL epitopes is evaluated in transgenic mice in an analogous manner.

[000297] Alternatively, the nucleic acids can be administered using ballistic delivery as described, for instance, in U.S. Patent No. 5,204,253. Using this technique, particles comprised solely of DNA are administered. In a further alternative embodiment, DNA can be adhered to particles, such as gold particles.

Cells

[000298] In one aspect, the present invention also provides cells expressing a viral epitope-recognizing receptor that activates an immunoresponsive cell (e.g., T cell receptor (TCR) or chimeric antigen receptor (CAR)), and methods of using such cells for the treatment of a disease that requires an enhanced immune response.

[000299] Such cells include genetically modified immunoresponsive cells (e.g., T cells, Natural Killer (NK) cells, cytotoxic T lymphocytes (CTL) cells, helper T lymphocyte (HTL) cells) expressing an antigen-recognizing receptor (e.g., TCR or CAR) that binds one of the viral epitope peptides described herein, and methods of use therefore for the treatment of neoplasia and other pathologies where an increase in an antigen-specific immune response is desired. T cell activation is mediated by a TCR or a CAR targeted to an antigen.

[000300] The present invention provides cells expressing a combination of an antigen-recognizing receptor that activates an immunoresponsive cell (e.g., TCR, CAR) and a chimeric co-stimulating receptor (CCR), and methods of using such cells for the treatment of a disease that requires an enhanced immune response. In one embodiment, viral antigen-specific T cells, NK cells, CTL cells or other immunoresponsive cells are used as shuttles for the selective enrichment of one or more co-stimulatory ligands for the treatment or prevention of neoplasia. Such cells are administered to a human subject in need thereof for the treatment or prevention of a particular viral infection.

[000301] In one embodiment, the viral antigen-specific human lymphocytes that can be used in the methods of the invention include, without limitation, peripheral donor lymphocytes genetically modified to express chimeric antigen receptors (CARs) (Sadelain, M., et al. 2003 Nat Rev Cancer 3:35-45), peripheral donor lymphocytes genetically modified to express a full-length viral antigen-recognizing T cell receptor complex comprising the a and p heterodimer (Morgan, R. A., et al. 2006 Science 314:126-129), and selectively in vitro-expanded antigen-specific peripheral blood leukocytes employing artificial antigen-presenting cells (AAPCs) or pulsed dendritic cells (Dupont, J., et al. 2005 Cancer Res 65:5417-5427; Papanicolaou, G. A., et al. 2003 Blood 102:2498-2505). The T cells may be autologous, allogeneic, or derived in vitro from engineered progenitor or stem cells.

Co-Stimulatory Ligands

[000302] In one embodiment, the cells of the invention are provided with at least one co-stimulatory ligand which is a non-antigen specific signal important for full activation of an immune cell. Co-stimulatory ligands include, without limitation, tumor necrosis factor (TNF) ligands, cytokines (such as IL-2, IL-12, 1L-15 or IL21), and immunoglobulin (Ig) superfamily ligands. Tumor necrosis factor (TNF) is a cytokine involved in systemic inflammation and stimulates the acute phase reaction. Its primary role is in the regulation of immune cells. Tumor necrosis factor (TNF) ligands share a number of common features. The majority of the ligands are synthesized as type II transmembrane proteins containing a short cytoplasmic segment and a relatively long extracellular region. TNF ligands include, without limitation, nerve growth

factor (NGF), CD4OL (CD4OL)/CD154, CD137L/4-1BBL, tumor necrosis factor alpha (TNFa), CD134L/OX4OL/CD252, CD27L/CD70, Fas ligand (FasL), CD3OL/CD153, tumor necrosis factor f3 (TNF(3)/lymphotoxin-alpha (LTa), lymphotoxin-beta (ur(3), CD257/B cell-activating factor (BAFF)/Blys/THANK/Ta11-1, glucocorticoid-induced TNF Receptor ligand (GITRL), and TNF-related apoptosis-inducing ligand (TRAIL), LIGHT (TNFSF14). The immunoglobulin (Ig) superfamily is a large group of cell surface and soluble proteins that are involved in the recognition, binding, or adhesion processes of cells. These proteins share structural features with immunoglobulins, they possess an immunoglobulin domain (fold). Immunoglobulin superfamily ligands include, without limitation, CD80 and CD86, both ligands for CD28.

[000303] Compositions comprising genetically modified immunoresponsive cells of the invention can be provided systemically or directly to a subject for the treatment of a neoplasia. In one embodiment, cells of the invention are directly injected into an organ of interest. Alternatively, compositions comprising genetically modified immunoresponsive cells are provided indirectly to the organ of interest, for example, by administration into the circulatory system. Expansion and differentiation agents can be provided prior to, during or after administration of the cells to increase production of T cells, NK cells, or CTL cells in vitro or in vivo.

[000304] The modified cells can be administered in any physiologically acceptable vehicle, normally intravascularly, although they may also be introduced into bone or other convenient site where the cells may find an appropriate site for regeneration and differentiation (e.g., thymus). The modified cells can be autologous or allogeneic. Genetically modified immunoresponsive cells of the invention can comprise a purified population of cells. Those skilled in the art can readily determine the percentage of genetically modified immunoresponsive cells in a population using various well-known methods, such as fluorescence activated cell sorting (FACS). Dosages can be readily adjusted by those skilled in the art (e.g., a decrease in purity may require an increase in dosage). The cells can be introduced by injection, catheter, or the like. If desired, factors can also be included, including, but not limited to, interleukins, e.g. IL-2, IL-3, IL-6, and IL-11, as well as the other interleukins, the colony stimulating factors, such as G-, M- and GM-CSF, interferons, e.g. interferon gamma and erythropoietin.

[000305] Compositions of the invention include pharmaceutical compositions comprising genetically modified immunoresponsive cells or their progenitors and a pharmaceutically acceptable carrier. Administration can be autologous or heterologous. For example, immunoresponsive cells, or progenitors can be obtained from one subject, and administered to the same subject or a different, compatible subject. Peripheral blood derived immunoresponsive cells of the invention or their progeny (e.g., in vivo, ex vivo or in vitro derived) can be administered via localized injection, including catheter administration, systemic injection, localized injection, intravenous injection, or parenteral administration. When administering a therapeutic composition of the present invention (e.g., a pharmaceutical composition containing a

genetically modified immunoresponsive cell), it will generally be formulated in a unit dosage injectable form (solution, suspension, emulsion).

Methods of use and pharmaceutical compositions

[000306] The viral epitope therapeutics (e.g., peptides, polynucleotides, TCR, CAR, cells containing TCR or CAR, dendritic cell containing polypeptide, dendritic cell containing polynucleotide, antibody, etc.) described herein are useful in a variety of applications including, but not limited to, therapeutic treatment methods, such as the treatment or prevention of a viral infection. In some embodiments, the therapeutic treatment methods comprise immunotherapy. In certain embodiments, a viral epitope peptide is useful for activating, promoting, increasing, and/or enhancing an immune response or redirecting an existing immune response to a new target. The methods of use can be *in vitro, ex vivo,* or *in vivo* methods.

[000307] In some aspects, the present invention provides methods for activating an immune response in a subject using a viral epitope therapeutic described herein. In some embodiments, the invention provides methods for promoting an immune response in a subject using a viral epitope therapeutic described herein. In some embodiments, the invention provides methods for increasing an immune response in a subject using a viral epitope peptide described herein. In some embodiments, the invention provides methods for enhancing an immune response using a viral epitope peptide. In some embodiments, the activating, promoting, increasing, and/or enhancing of an immune response comprises increasing cell-mediated immunity. In some embodiments, the activating, promoting, increasing, and/or enhancing of an immune response comprises increasing T cell activity or humoral immunity. In some embodiments, the activating, promoting, increasing, and/or enhancing of an immune response comprises increasing CTL or HTL activity. In some embodiments, the activating, promoting, increasing, and/or enhancing of an immune response comprises increasing NK cell activity. In some embodiments, the activating, promoting, increasing, and/or enhancing of an immune response comprises increasing T cell activity and increasing NK cell activity. In some embodiments, the activating, promoting, increasing, and/or enhancing of an immune response comprises increasing CTL activity and increasing NK cell activity. In some embodiments, the activating, promoting, increasing, and/or enhancing of an immune response comprises inhibiting or decreasing the suppressive activity of Tregs. In some embodiments, the immune response is a result of antigenic stimulation.

[000308] In some embodiments, the invention provides methods of activating, promoting, increasing, and/or enhancing of an immune response using a viral epitope therapeutic described herein. In some embodiments, a method comprises administering to a subject in need thereof a therapeutically effective amount of a viral epitope therapeutic that delivers a viral epitope polypeptide or polynucleotide to a cell. In some embodiments, a method comprises administering to a subject in need thereof a therapeutically effective amount of a viral epitope that is internalized by a cell, and the viral epitope peptide is processed by the cell. In some embodiments, a method comprises administering to a subject in need thereof a

therapeutically effective amount of a viral epitope polypeptide that is internalized by a cell, and an antigenic peptide is presented on the surface of the cell. In some embodiments, a method comprises administering to a subject in need thereof a therapeutically effective amount of a viral epitope polypeptide that is internalized by the cell, is processed by the cell, and an antigenic peptide is presented on the surface of the cell.

[000309] In some embodiments, a method comprises administering to a subject in need thereof a therapeutically effective amount of a viral epitope polypeptide or polynucleotide described herein that delivers an exogenous polypeptide comprising at least one antigenic peptide to a cell, wherein the antigenic peptide is presented on the surface of the cell. In some embodiments, the antigenic peptide is presented on the surface of the cell in complex with a MHC class I molecule. In some embodiments, the antigenic peptide is presented on the surface of the cell in complex with a MHC class II molecule.

[000310] In some embodiments, a method comprises contacting a cell with a viral epitope polypeptide or polynucleotide described herein that delivers an exogenous polypeptide comprising at least one antigenic peptide to the cell, wherein the antigenic peptide is presented on the surface of the cell. In some embodiments, the antigenic peptide is presented on the surface of the cell in complex with a MHC class I molecule. In some embodiments, the antigenic peptide is presented on the surface of the cell in complex with a MHC class II molecule.

[000311] In some embodiments, a method comprises administering to a subject in need thereof a therapeutically effective amount of a viral epitope polypeptide or polynucleotide described herein that delivers an exogenous polypeptide comprising at least one antigenic peptide to a cell, wherein the antigenic peptide is presented on the surface of the cell, and an immune response against the cell is induced. In some embodiments, the immune response against the cell is increased. In some embodiments, the viral epitope polypeptide or polynucleotide delivers an exogenous polypeptide comprising at least one antigenic peptide to a cell, wherein the antigenic peptide is presented on the surface of the cell.

[000312] In some embodiments, a method comprises administering to a subject in need thereof a therapeutically effective amount of a viral epitope polypeptide or polynucleotide described herein that delivers an exogenous polypeptide comprising at least one antigenic peptide to a cell, wherein the antigenic peptide is presented on the surface of the cell, and T cell killing directed against the cell is induced. In some embodiments, T cell killing directed against the cell is enhanced. In some embodiments, T cell killing directed against the cell is increased.

[000313] In some embodiments, a method of increasing an immune response in a subject comprises administering to the subject a therapeutically effective amount of a viral epitope therapeutic described herein, wherein the agent is an antibody that specifically binds the viral epitope described herein. In some embodiments, a method of increasing an immune response in a subject comprises administering to the subject a therapeutically effective amount of the antibody.

[000314] The present invention provides methods of inducing or promoting or enhancing an immune response to a virus. In some embodiments, a method of inducing or promoting or enhancing an immune response to a virus comprises administering to a subject a therapeutically effective amount of a viral epitope therapeutic described herein. In some embodiments, the immune response is against a virus. In preferred embodiments, the existing immune response is against a coronavirus. In preferred embodiments, the existing immune response is against a COVID19. In some embodiments, the virus is selected from the group consisting of: measles virus, varicella-zoster virus (VZV; chickenpox virus), influenza virus, mumps virus, poliovirus, rubella virus, rotavirus, hepatitis A virus (HAV), hepatitis B virus (HBV), Epstein Barr virus (EBV), and cytomegalovirus (CMV). In some embodiments, the virus is varicella-zoster virus. In some embodiments, the virus is cytomegalovirus. In some embodiments, the virus is measles virus. In some embodiments, the immune response has been acquired after a natural viral infection. In some embodiments, the immune response has been acquired after vaccination against a virus. In some embodiments, the immune response is a cell-mediated response. In some embodiments, the existing immune response comprises cytotoxic T cells (CTLs) or HTLs.

[000315] In some embodiments, a method of inducing or promoting or enhancing an immune response to a virus in a subject comprises administering a fusion protein comprising (i) an antibody that specifically binds a viral epitope and (ii) at least one viral epitope peptide described herein, wherein (a) the fusion protein is internalized by a cell after binding to the viral antigen; (b) the viral epitope peptide is processed and presented on the surface of the cell associated with a MHC class I molecule; and (c) the viral epitope peptide/MHC Class I complex is recognized by cytotoxic T cells. In some embodiments, the cytotoxic T cells are memory T cells. In some embodiments, the memory T cells are the result of a vaccination with the viral epitope peptide.

[000316] The present invention provides methods of increasing the immunogenicity of a virus. In some embodiments, a method of increasing the immunogenicity of a virus comprises contacting virally infected cells with an effective amount of a viral epitope therapeutic described herein. In some embodiments, a method of increasing the immunogenicity of a virus comprises administering to a subject a therapeutically effective amount of a viral epitope therapeutic described herein. In certain embodiments, the subject is a human.

[000317] In some embodiments, a method can comprise treating or preventing cancer in a subject in need thereof by administering to a subject a therapeutically effective amount of a viral epitope therapeutic described herein**.** In some embodiments, the cancer is a liquid cancer, such as a lymphoma or leukemia. In some embodiments, the cancer is a solid tumor. In certain embodiments, the tumor is a tumor selected from the group consisting of: colorectal tumor, pancreatic tumor, lung tumor, ovarian tumor, liver tumor, breast tumor, kidney tumor, prostate tumor, neuroendocrine tumor, gastrointestinal tumor, melanoma, cervical tumor, bladder tumor, glioblastoma, and head and neck tumor. In certain embodiments, the tumor is a

colorectal tumor. In certain embodiments, the tumor is an ovarian tumor. In some embodiments, the tumor is a breast tumor. In some embodiments, the tumor is a lung tumor. In certain embodiments, the tumor is a pancreatic tumor. In certain embodiments, the tumor is a melanoma tumor. In some embodiments, the tumor is a solid tumor.

[000318] The present invention further provides methods for treating or preventing a viral infection in a subject comprising administering to the subject a therapeutically effective amount of a viral epitope therapeutic described herein.

[000319] In some embodiments, a method of treating or preventing a viral infection comprises redirecting an existing immune response to a new target, the method comprising administering to a subject a therapeutically effective amount of viral epitope therapeutic, wherein the existing immune response is against an antigenic peptide delivered to a cell or a cell infected with a virus by the viral epitope peptide.

[000320] The present invention provides for methods of treating or preventing a viral infection comprising administering to a subject a therapeutically effective amount of a viral epitope therapeutic described herein (e.g., a subject in need of treatment). In certain embodiments, the subject is a human. In certain embodiments, the subject has a coronavirus infection or is at risk of a coronavirus infection.

[000321] In certain embodiments, in addition to administering a viral epitope therapeutic described herein, the method or treatment further comprises administering at least one additional therapeutic agent. An additional therapeutic agent can be administered prior to, concurrently with, and/or subsequently to, administration of the agent. In some embodiments, the at least one additional therapeutic agent comprises 1, 2, 3, or more additional therapeutic agents.

[000322] In some embodiments, the viral epitope therapeutic can be administered in combination with a biologic molecule selected from the group consisting of: adrenomedullin (AM), angiopoietin (Ang), BMPs, BDNF, EGF, erythropoietin (EPO), FGF, GDNF, granulocyte colony stimulating factor (G-CSF), granulocyte-macrophage colony stimulating factor (GM-CSF), macrophage colony stimulating factor (M-CSF), stem cell factor (SCF), GDF9, HGF, HDGF, IGF, migration-stimulating factor, myostatin (GDF-8), NGF, neurotrophins, PDGF, thrombopoietin, TGF-α, TGF TNF-α, VEGF, P1GF, gamma-IFN, IL-1, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-12, IL-15, and IL-18.

[000323] In certain embodiments, treatment involves the administration of a viral epitope therapeutic described herein in combination with an additional therapy. In certain embodiments, the additional therapy is a therapy for another virus, for example, influenza. Exemplary therapies for viruses include but are not limited to oseltamivir, oseltamivir phosphate (available as a generic version or under the trade name Tamiflu®), zanamivir (trade name Relenza®), peramivir (trade name Rapivab®), baloxavir marboxil (trade name Xofluza®), amantadine, moroxydine, rimantadine, umifenovir (trade name Arbidol®) and zanamivir (trade name Relenza®).

[000324] Treatment with an agent can occur prior to, concurrently with, or subsequent to administration of an additional therapy. Dosing schedules for such additional therapies can be determined by the skilled medical practitioner.

[000325] Combined administration can include co-administration, either in a single pharmaceutical formulation or using separate formulations, or consecutive administration in either order but generally within a time period such that all active agents can exert their biological activities simultaneously.

[000326] It will be appreciated that the combination of a viral epitope therapeutic described herein and at least one additional therapeutic agent can be administered in any order or concurrently. In some embodiments, the agent will be administered to patients that have previously undergone treatment with a second therapeutic agent. In certain other embodiments, the viral epitope therapeutic and a second therapeutic agent will be administered substantially simultaneously or concurrently. For example, a subject can be given an agent while undergoing a course of treatment with a second therapeutic agent (e.g., chemotherapy). In certain embodiments, a viral epitope therapeutic will be administered within 1 year of the treatment with a second therapeutic agent. It will further be appreciated that the two (or more) agents or treatments can be administered to the subject within a matter of hours or minutes (i.e., substantially simultaneously).

[000327] For the treatment of a disease, the appropriate dosage of a viral epitope therapeutic described herein depends on the type of disease to be treated, the severity and course of the disease, the responsiveness of the disease, whether the agent is administered for therapeutic or preventative purposes, previous therapy, the patient's clinical history, and so on, all at the discretion of the treating physician. The viral epitope therapeutic can be administered one time or over a series of treatments lasting from several days to several months, or until a cure is effected or a diminution of the disease state is achieved. Optimal dosing schedules can be calculated from measurements of drug accumulation in the body of the patient and will vary depending on the relative potency of an individual agent. The administering physician can determine optimum dosages, dosing methodologies, and repetition rates.

[000328] In some embodiments, a viral epitope therapeutic can be administered at an initial higher "loading" dose, followed by one or more lower doses. In some embodiments, the frequency of administration can also change. In some embodiments, a dosing regimen can comprise administering an initial dose, followed by additional doses (or "maintenance" doses) once a week, once every two weeks, once every three weeks, or once every month. For example, a dosing regimen can comprise administering an initial loading dose, followed by a weekly maintenance dose of, for example, one-half of the initial dose. Or a dosing regimen can comprise administering an initial loading dose, followed by maintenance doses of, for example one-half of the initial dose every other week. Or a dosing regimen can comprise administering three initial doses for 3 weeks, followed by maintenance doses of, for example, the same amount every other week.

[000329] As is known to those of skill in the art, administration of any therapeutic agent can lead to side effects and/or toxicities. In some cases, the side effects and/or toxicities are so severe as to preclude administration of the particular agent at a therapeutically effective dose. In some cases, therapy must be discontinued, and other agents can be tried. However, many agents in the same therapeutic class display similar side effects and/or toxicities, meaning that the patient either has to stop therapy, or if possible, suffer from the unpleasant side effects associated with the therapeutic agent.

[000330] In some embodiments, the dosing schedule can be limited to a specific number of administrations or "cycles". In some embodiments, the agent is administered for 3, 4, 5, 6, 7, 8, or more cycles. For example, the agent is administered every 2 weeks for 6 cycles, the agent is administered every 3 weeks for 6 cycles, the agent is administered every 2 weeks for 4 cycles, the agent is administered every 3 weeks for 4 cycles, etc. Dosing schedules can be decided upon and subsequently modified by those skilled in the art.

[000331] The present invention provides methods of administering to a subject a viral epitope therapeutic described herein comprising using an intermittent dosing strategy for administering one or more agents, which can reduce side effects and/or toxicities associated with administration of an agent, chemotherapeutic agent, etc. In some embodiments, a method for treating or preventing a viral infection in a human subject comprises administering to the subject a therapeutically effective dose of a viral epitope therapeutic in combination with a therapeutically effective dose of another therapeutic agent, such as an anti-viral agent, wherein one or both of the agents are administered according to an intermittent dosing strategy. In some embodiments, a method for treating or preventing a viral infection in a human subject comprises administering to the subject a therapeutically effective dose of a viral epitope therapeutic in combination with a therapeutically effective dose of a second viral epitope therapeutic, wherein one or both of the agents are administered according to an intermittent dosing strategy. In some embodiments, the intermittent dosing strategy comprises administering an initial dose of a viral epitope therapeutic to the subject, and administering subsequent doses of the agent about once every 2 weeks. In some embodiments, the intermittent dosing strategy comprises administering an initial dose of a viral epitope therapeutic to the subject, and administering subsequent doses of the agent about once every 3 weeks. In some embodiments, the intermittent dosing strategy comprises administering an initial dose of a viral epitope therapeutic to the subject, and administering subsequent doses of the agent about once every 4 weeks. In some embodiments, the agent is administered using an intermittent dosing strategy and the additional therapeutic agent is administered weekly.

[000332] The present invention provides compositions comprising the viral epitope therapeutic described herein. The present invention also provides pharmaceutical compositions comprising a viral epitope therapeutic described herein and a pharmaceutically acceptable vehicle. In some embodiments, the pharmaceutical compositions find use in immunotherapy. In some embodiments, the compositions find use

in inhibiting viral replication. In some embodiments, the pharmaceutical compositions find use in inhibiting viral replication in a subject (e.g., a human patient).

[000333] Formulations are prepared for storage and use by combining an antigen therapeutic of the present invention with a pharmaceutically acceptable vehicle (e.g., a carrier or excipient). Those of skill in the art generally consider pharmaceutically acceptable carriers, excipients, and/or stabilizers to be inactive ingredients of a formulation or pharmaceutical composition. Exemplary formulations are listed in WO 2015/095811.

[000334] Suitable pharmaceutically acceptable vehicles include, but are not limited to, nontoxic buffers such as phosphate, citrate, and other organic acids; salts such as sodium chloride; antioxidants including ascorbic acid and methionine; preservatives such as octadecyldimethylbenzyl ammonium chloride, hexamethonium chloride, benzalkonium chloride, benzethonium chloride, phenol, butyl or benzyl alcohol, alkyl parabens, such as methyl or propyl paraben, catechol, resorcinol, cyclohexanol, 3-pentanol, and m-cresol; low molecular weight polypeptides (e.g., less than about 10 amino acid residues); proteins such as serum albumin, gelatin, or immunoglobulins; hydrophilic polymers such as polyvinylpyrrolidone; amino acids such as glycine, glutamine, asparagine, histidine, arginine, or lysine; carbohydrates such as monosaccharides, disaccharides, glucose, mannose, or dextrins; chelating agents such as EDTA; sugars such as sucrose, mannitol, trehalose or sorbitol; salt-forming counter-ions such as sodium; metal complexes such as Zn-protein complexes; and non-ionic surfactants such as TWEEN or polyethylene glycol (PEG). (Remington: The Science and Practice of Pharmacy, 22st Edition, 2012, Pharmaceutical Press, London.). In one embodiment, the vehicle is 5% dextrose in water.

[000335] The pharmaceutical compositions described herein can be administered in any number of ways for either local or systemic treatment. Administration can be topical by epidermal or transdermal patches, ointments, lotions, creams, gels, drops, suppositories, sprays, liquids and powders; pulmonary by inhalation or insufflation of powders or aerosols, including by nebulizer, intratracheal, and intranasal; oral; or parenteral including intravenous, intraarterial, subcutaneous, intraperitoneal, intramuscular (e.g., injection or infusion), or intracranial (e.g., intrathecal or intraventricular).

[000336] The therapeutic formulation can be in unit dosage form. Such formulations include tablets, pills, capsules, powders, granules, solutions or suspensions in water or non-aqueous media, or suppositories

[000337] The viral epitope peptides described herein can also be entrapped in microcapsules. Such microcapsules are prepared, for example, by coacervation techniques or by interfacial polymerization, for example, hydroxymethylcellulose or gelatin-microcapsules and poly-(methylmethacylate) microcapsules, respectively, in colloidal drug delivery systems (for example, liposomes, albumin microspheres, microemulsions, nanoparticles and nanocapsules) or in macroemulsions as described in Remington: The Science and Practice of Pharmacy, 22st Edition, 2012, Pharmaceutical Press, London.

[000338] In certain embodiments, pharmaceutical formulations include a viral epitope therapeutic described herein complexed with liposomes. Methods to produce liposomes are known to those of skill in the art. For example, some liposomes can be generated by reverse phase evaporation with a lipid composition comprising phosphatidylcholine, cholesterol, and PEG-derivatized phosphatidylethanolamine (PEG-PE). Liposomes can be extruded through filters of defined pore size to yield liposomes with the desired diameter.

[000339] In certain embodiments, sustained-release preparations comprising the viral epitope peptides described herein can be produced. Suitable examples of sustained-release preparations include semi-permeable matrices of solid hydrophobic polymers containing an agent, where the matrices are in the form of shaped articles (e.g., films or microcapsules). Examples of sustained-release matrices include polyesters, hydrogels such as poly(2-hydroxyethyl-methacrylate) or poly(vinyl alcohol), polylactides, copolymers of L-glutamic acid and 7 ethyl-L-glutamate, nondegradable ethylene-vinyl acetate, degradable lactic acid-glycolic acid copolymers such as the LUPRON DEPOTTM (injectable microspheres composed of lactic acid-glycolic acid copolymer and leuprolide acetate), sucrose acetate isobutyrate, and poly-D-(-)-3-hydroxybutyric acid.

String construct designs and vaccine compositions

[000340] In one aspect, provided herein are compositions and methods for augmenting, inducing, promoting, enhancing or improving an immune response against 2019 SARS CoV-2 virus. In one embodiment, the composition and methods described here are designed to augmen, induce, promote, enhance or improve immunological memory against 2019 SARS CoV-2 virus. In one embodiment, the composition and methods described here are designed to act as immunological boost to a primary vaccine, such as a vaccine directed to a spike protein of the 2019 SARS CoV-2 virus. In one embodiments, the composition comprises one or more polynucleotide constructs (designated herein as “Strings”) that encode one or more SARS COV-2 epitopes. Both coding and non-coding strands are contemplated herein. In some embodiments, the strings refer to polynucleotide chains that encode a plurality of SARS COV-2 epitopes in tandem. In some embodiments there are about 2 to about 100, about 2 to about 1000 or about 2 to about 10,000 epitopes encoded in one string. In some embodiments about 2- 5000 SARS COV-2 epitopes are encoded in one polynucleotide string. In some embodiments about 2- 4000 SARS COV-2 epitopes are encoded in one polynucleotide string. In some embodiments about 2- 3000 SARS COV-2 epitopes are encoded in one polynucleotide string. In some embodiments about 2- 2000 SARS COV-2 epitopes are encoded in one polynucleotide string. In some embodiments about 2- 1000 SARS COV-2 epitopes are encoded in one polynucleotide string. In some embodiments about 10- 500 SARS COV-2 epitopes are encoded in one polynucleotide string. In some embodiments about 10- 200 SARS COV-2 epitopes are encoded in one polynucleotide string. In some embodiments about 20 - 100 SARS COV-2 epitopes are encoded in one polynucleotide string.

[000341] In some embodiments the SARS COV-2 epitopes encoded by the string constructs comprise epitopes that are predicted by a HLA binding and presentation prediction software to be of high likelihood to be presented by a protein encoded by an HLA to a T cell for eliciting immune response. In some embodiments the SARS COV-2 epitopes encoded by the string constructs that are predicted to have a high likelihood to be presented by a protein encoded by an HLA, are selected from any one of the proteins or peptides described in Tables 1-12, 14A, 14B and 15. In some embodiments the SARS CoV-2 epitopes encoded by the string constructs comprise epitopes that are predicted to have a high likelihood to be presented by a protein encoded by an HLA, and the epitope is selected from any one of the proteins described in Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B and/or Table 15. In some embodiments, the epitopes in a string construct comprise nucleocapsid epitopes.

[000342] In some embodiments, the epitopes in a string construct comprise spike (S) epitopes. In some embodiments, the epitopes in a string construct comprise membrane protein epitopes. In some embodiments, the epitopes in a string construct comprise NSP 1, NSP2, NSP3, or NSP 4 epitopes. In some embodiments, the string constructs comprise a multitude of epitopes that are from 2, 3, 4, or more proteins in the virus. In some embodiments the string constructs comprise the features described in Tables 9-12, and 15. In some embodiments the String constructs comprise a sequence as depicted in SEQ ID RS C1n, RS C2n, RS C3n, RS C4n, SEQ ID RS C5n, RS C6n, RS C7n, RS C8n or a sequence that has at least 70% sequence identity to any one of the sequences depicted in SEQ ID RS C1n, RS C2n, RS C3n, RS C4n, SEQ ID RS C5n, RS C6n, RS C7n, RS C8n. In some embodiments, the string constructs comprise additional sequences such as linkers, and sequences encoding peptide autocleavage sequences, for example, T2A, or P2A sequences. In some embodiments the string constructs comprises two or more overlapping epitope sequences. In some embodiments a String construct comprise a sequence that is 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99% or 100% sequence identity to any one of the sequences SEQ ID RS C1n, RS C2n, RS C3n, RS C4n, SEQ ID RS C5n, RS C6n, RS C7n, RS C8n.

[000343] In some embodiments, the epitopes are arranged on a string to maximize immunogenicity of the string, for example by maximizing recognition by HLA allele repertoire of a subject. In some embodiments, the same string encodes epitopes that can bind to or are predicted to bind to different HLA alleles. For instance, as is well exemplified in the sequences tables, e.g., at least in Tables 9, 10, 11, 12, 14A and 14B, and 15, a string may encode epitope(s) that comprise: (a) a first epitope that binds to or is predicted to bind to a first MHC peptide encoded by a first HLA allele; (b) a second epitope that binds to or is predicted to bind to a second MHC peptide encoded by a second HLA allele; (c) a third epitope that binds to or is predicted to bind to a third MHC peptide encoded by a third HLA allele – and more such epitopes can be added, as in for example in sting sequences of RS- C1 , or RS-C2 etc.; wherein the first, second and third

epitopes are epitopes from the same viral protein, or from different viral proteins. In this way, the epitope distribution encoded by a single string is maximized for hitting the different MHC based presentation to T cells, thereby maximizing the probability of generating an antiviral response from a wider range of patients in the given population and the robustness of the response of each patent. In some embodiments, the epitopes are selected on the basis of high scoring prediction for binding to an HLA by a reliable prediction algorithm or system, such as the RECON prediction algorithm. In some embodiments, the present disclosure provides an insight that particularly successful strings can be provided by selecting epitopes based on highly reliable and efficient prediction algorithm, in the layout of the epitopes encoded by the string, with or without non-epitope sequences or sequences flanking the epitopes, and is such that the immunogenicity of the string is validated in an ex vivo cell culture model, or in an animal model, specifically in showing T cell induction following vaccination with a string construct or a polypeptide encoded by a string construct with the finding of epitope specific T cell response. In some embodiments, the validation may be from using in human patients, and with a finding that T cells obtained from a patient post vaccination shows epitope specific efficient and lasting T cell response. In one embodiment, the efficiency of a string as a vaccine is influenced by its design, that in part depends on strength of the bioinformatic information used in the thoughtful execution of the design, the reliability of the MHC presentation prediction model, the efficiency of epitope processing when a string vaccine is expressed in a cell, among others.

[000344] In some embodiments the epitope-coding sequences in a string construct are flanked by one or more sequences selected for higher immunogenicity, better cleavability for peptide presentation to MHCs, better expression, and/or improved translation in a cell in a subject. The flanking sequences may comprise a linker with a specific cleavable sequences. In some embodiments the epitope-coding sequences in a string construct are flanked by a secretory protein sequence. In some embodiments a string sequence encodes an epitope that may comprise or otherwise be linked to a secretory sequence such as MFVFLVLLPLVSSQCVNLT, or at least a sequence having 1, 2, 3, 4, or at the most 5 amino acid differences relative thereto. In some embodiments, a string sequence encodes an epitope that may be linked at the N-terminal end by a sequence MFVFLVLLPLVSSQCVNLT or a sequence having 1, 2, 3, 4, or at the most 5 amino acid differences relative thereto. The linked sequences may comprise a linker with a specific cleavable sequences. In some embodiments the string construct is linked to a transmembrane domain (TM). In some embodiments, a string sequence encodes an epitope that may be linked at the C terminal sequence by a TM domain sequence EQYIKWPWYIWLGFIAGLIAIVMVTIMLCCMTSCCSCLKGCCSCGSCCKFDEDDSEPVLKGVKL HYT, or a sequence having 1, 2, 3, 4, or at the most 5 amino acid differences relative thereto. In some embodiments, one or more linker sequences may comprise cleavage sequences. In some embodiments, a linker may have a length of 2, 3, 4, 5, 6, 7, 8, 9, 10 or more amino acid. In some embodiments a linker of

not more than about 30, 25, 20, 15, 10 or fewer amino acids is used. In general, any amino acid may be present as a linker sequence. In some embodiments, a linker or cleavage sequence contains a lysine (K). In some embodiments, a linker or cleavage sequence contains an arginine (R). In some embodiments, a linker or cleavage sequence contains a methionine (M). In some embodiments, a linker or cleavage sequence contains a tyrosine (Y). In some embodiments, a linker is designed to comprise amino acids based on a cleavage predictor to generate highly-cleavable sequences peptide sequences, and is a novel and effective way of delivering immunogenic T cell epitopes in a T cell vaccine setting. In some embodiments, the epitope distribution and their juxtaposition encoded in a string construct are so designed to facilitate cleavage sequences contributed by the amino acid sequences of the epitopes and/or the flanking or linking residues and thereby using minimal linker sequences. Some exemplary cleavage sequences may be one or more of FRAC, KRCF, KKRY, ARMA, RRSG, MRAC, KMCG, ARCA, KKQG, YRSY, SFMN, FKAA, KRNG, YNSF, KKNG, RRRG, KRYS, and ARYA. Among other things, MS data included herein demonstrates that the epitopes that are highly predicted for binding ended up being presented to T cells, and immunogenic.

[000345] In some embodiments the string constructs may be mRNA. In some embodiments a pharmaceutical composition may comprise one or more mRNA string construct, each comprising a sequence encoding a plurality of SARS CoV-2 epitopes. In some embodiments the one or more mRNA may comprise a plurality of epitopes from the SARS-CoV2 spike protein, wherein each of the plurality of epitopes is predicted by an HLA binding and presentation prediction algorithm to be of high likelihood to be presented by a protein encoded by an HLA to a T cell for eliciting immune response. In some embodiments the one or more mRNA may comprise a plurality of epitopes from the SARS-CoV2 nucleocapsid protein, wherein each of the plurality of epitopes is predicted by an HLA binding and presentation prediction algorithm to be of high likelihood to be presented by a protein encoded by an HLA to a T cell for eliciting immune response. In some embodiments the one or more mRNA may comprise a plurality of epitopes from the SARS-CoV2 spike, or nucleocapsid protein, or membrane protein or any other protein wherein each of the plurality of epitopes is predicted by an HLA binding and presentation prediction algorithm to be of high likelihood to be presented by a protein encoded by an HLA to a T cell for eliciting immune response. In some embodiments the plurality of epitopes may comprise epitopes from a single 2019 SARS CoV-2 protein. In some embodiments the plurality of epitopes may comprise epitopes from multiple 2019 SARS CoV-2 protein. In some embodiments the plurality of epitopes may comprise epitopes from 2019 SARS CoV-2 nucleocapsid protein. In some embodiments, the mRNA may comprise a 5'UTR and a 3'UTR. In some embodiments, the UTR may comprise a poly A sequence. A poly A sequence may be between 50-200 nucleotides long. In some embodiments the 2019 SARS CoV-2 viral epitopes may be flanked by a signal peptide sequence, e.g., SP1 sequence to enhance epitope processing and presentation. In some embodiments the 2019 SARS CoV-2 viral epitopes are flanked with an MITD

sequence to enhance epitope processing and presentation. In some embodiments, the polynucleotide comprises a dEarI-hAg sequence. In some embodiments, the poly A tail comprises a specific number of Adenosines, such as about 50 or more, about 60 or more, about 70 or more, about 80 or more, about 90 or more, about 100 or more, about 120, or about 150 or about 200. In some embodiments a poly A tail of a string construct may comprise 200 A residues or less. In some embodiments a poly A tail of a string construct may comprise about 200 A residues. In some embodiments a poly A tail of a string construct may comprise 180 A residues or less. In some embodiments a poly A tail of a string construct may comprise about 180 A residues. In some embodiments, the poly A tail may comprise 150 residues or less. In some embodiments a poly A tail of a string construct may comprise about 150 A residues. In some embodiments, the poly A tail may comprise 120 residues or less. In some embodiments a poly A tail of a string construct may comprise about 120 A residues.

[000346] In some embodiments the nucleotide sequence of the string constructs, encoding the plurality of epitopes, may be codon optimized. An example of a codon optimized sequence may be a sequence optimized for expression in a eukaryote, e.g., humans (i.e. being optimized for expression in humans), or for another eukaryote, animal or mammal. Codon optimization for a host species other than human, or for codon optimization for specific organs is known. In some embodiments, the coding sequence encoding a protein may be codon optimized for expression in eukaryotic cells, such as human cells. Codon optimization refers to a process of modifying a nucleic acid sequence for enhanced expression in the host cells of interest by replacing at least one codon (e.g., about or more than about 1, 2, 3, 4, 5, 10, 15, 20, 25, 50, or more codons) of the native sequence with codons that are more frequently or most frequently used in the genes of that host cell while maintaining the native amino acid sequence. Various species exhibit particular bias for certain codons of a particular amino acid. Codon bias (differences in codon usage between organisms) often correlates with the efficiency of translation of messenger RNA (mRNA), which is in turn believed to be dependent on, among other things, the properties of the codons being translated and the availability of particular transfer RNA (tRNA) molecules. The predominance of selected tRNAs in a cell may generally be a reflection of the codons used most frequently in peptide synthesis. Accordingly, genes may be tailored for optimal gene expression in a given organism based on codon optimization. Codon usage tables are readily available, for example, at the "Codon Usage Database" available at www.kazusa.orjp/codon/ and these tables may be adapted in a number of ways. Computer algorithms for codon optimizing a particular sequence for expression in a particular host cell are also available, such as Gene Forge (Aptagen; Jacobus, PA), are also available.

[000347] In some embodiments, the stability and translation efficiency of RNA may incorporate one or more elements established to contribute to stability and/or translation efficiency of RNA; exemplary such elements are described, for example, in PCT/EP2006/009448 incorporated herein by reference. In order to increase expression of the RNA used according to the present invention, it may be modified within the

coding region, i.e. the sequence encoding the expressed peptide or protein, without altering the sequence of the expressed peptide or protein, so as to increase the GC-content to increase mRNA stability and to perform a codon optimization and, thus, enhance translation in cells.

[000348] In some embodiments, the string construct may comprise an F element. In some embodiments, the F element sequence is a 3 UTR of amino-terminal enhancer of split (AES).

[000349] In some embodiments a String mRNA construct as described above may comprise 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 or more epitopes. In some embodiments the pharmaceutical composition comprises 2, 3, 4, 5, 6, 7, 8, 9, or 10 or more strings. In some embodiments the pharmaceutical composition comprises 6 strings. In some embodiments the pharmaceutical composition comprises 7 strings. In some embodiments the pharmaceutical composition comprises 8 strings. In some embodiments the pharmaceutical composition comprises 9 strings. In some embodiments the pharmaceutical composition comprises 10 strings.

[000350] In some embodiments a string construct may be a polynucleotide, wherein the polynucleotide is DNA.

[000351] In some embodiments the pharmaceutical composition comprising one or more String mRNA construct as described above may be encapsulated in a lipid nanoparticle. A lipid nanoparticle (LNP) may be 100-250 nm in diameter. In some embodiments, a plurality of lipid nanoparticles may have an average particle size of less than 200 nm, less than 150 nm, less than 100 nm, less than 80 nm, less than 75 nm, or lower. In some embodiments, a plurality of lipid nanoparticles may have an average particle size of at least 30 nm, at least 50 nm, at least 60 nm, at least 70 nm, at least 80 nm, at least 90 nm, at least 100 nm, at least 125 nm, at least 150 nm, or more. Combinations of the above-mentioned ranges are also possible. In some embodiments, a plurality of lipid nanoparticles may have an average particle size of 30 nm to 200 nm, or 30 nm to 100 nm or 50 nm to 80 nm, or 50 nm to less than 80 nm. In some embodiments, an LNP may comprise a cationic lipid. An LNP may comprise a non-cationic lipid. An LNP may comprise a PEG-modified lipid. An LNP may comprise a sterol or a steroidal lipid. In some embodiments the pharmaceutical composition comprising one or more String mRNA construct as described above may be administered with another 2019 SARS COV-2 vaccine, which can be in some embodiments, e.g., protein-based, RNA-based, DNA-based, viral vector-based vaccines, and may be administered either before, after, or simultaneously with. In some embodiments, a pharmaceutical composition comprising one or more String mRNA construct as described above may be administered to a subject in need thereof such that the subject receives a combination of the pharmaceutical composition described herein and an another 2019 SARS CoV-2 vaccine (e.g., a vaccine that induces production of antibodies to SARS CoV-2 protein such as S protein or an immunogenic fragment thereof). For example, in some embodiments, a pharmaceutical composition comprising one or more String mRNA construct as described above may be administered to a subject who

is receiving or has received another 2019 SARS CoV-2 vaccine (e.g., a vaccine that induces production of antibodies to 2019 SARS CoV-2 protein such as S protein or an immunogenic fragment thereof).

[000352] In some embodiments the pharmaceutical composition comprising one or more String mRNA construct as described above may be co-administered with a vaccine directed against SARS COV-2 spike protein. In some embodiments, the vaccine comprises a SARS-CoV-2 spike protein of 2019 SARS COV-2 or a nucleic acid sequence encoding the same, for example which may have any of the following specifications:

Exemplary Construct Encoding a SARS-CoV-2 Spike Protein

Structure $m_2^{7,3'\text{-}O}$Gppp($m_1^{2'\text{-}O}$)ApG)-hAg-Kozak-S1S2-PP-FI-A30L70

Encoded antigen Viral spike protein (S1S2 protein) of the SARS CoV-2 (S1S2 full-length protein, sequence variant)

Exemplary Nucleotide Sequence Encoding a SARS-CoV-2 Spike Protein

Nucleotide sequence is shown with individual sequence elements as indicated in bold letters. In addition, the sequence of the translated protein is shown in italic letters below the coding nucleotide sequence (* = stop codon).

```
10        20         30         40         50          53
AGAAUAAACU AGUAUUCUUC UGGUCCCCAC AGACUCAGAG AGAACCCGCC ACC
                                 hAg-Kozak
          63         73         83         93         103         113
AUGUUUGUGU UUCUUGUGCU GCUGCCUCUU GUGUCUUCUC AGUGUGUGAA UUUGACAACA
  M   F   V    F   L   V    L   L   P   L    V   S   S    Q   C   V    N   L   T   T
                                 S protein
        123        133        143        153        163         173
AGAACACAGC UGCCACCAGC UUAUACAAAU UCUUUUACCA GAGGAGUGUA UUAUCCUGAU
  R   T   Q    L   P   P    A   Y   T   N    S   F   T    R   G   V    Y   Y   P   D
                                 S protein
        183        193        203        213        223         233
AAAGUGUUUA GAUCUUCUGU GCUGCACAGC ACACAGGACC UGUUUCUGCC AUUUUUUAGC
  K   V   F    R   S   S    V   L   H   S    T   Q   D    L   F   L    P   F   F   S
                                 S protein
        243        253        263        273        283         293
AAUGUGACAU GGUUUCAUGC AAUUCAUGUG UCUGGAACAA AUGGAACAAA AAGAUUUGAU
  N   V   T    W   F   H    A   I   H   V    S   G   T    N   G   T    K   R   F   D
                                 S protein
        303        313        323        333        343         353
AAUCCUGUGC UGCCUUUUAA UGAUGGAGUG UAUUUUGCUU CAACAGAAAA GUCAAAUAUU
  N   P   V    L   P   F    N   D   G   V    Y   F   A    S   T   E    K   S   N   I
                                 S protein
        363        373        383        393        403         413
AUUAGAGGAU GGAUUUUUGG AACAACACUG GAUUCUAAAA CACAGUCUCU GCUGAUUGUG
  I   R   G    W   I   F    G   T   T   L    D   S   K    T   Q   S    L   L   I   V
                                 S protein
        423        433        443        453        463         473
AAUAAUGCAA CAAAUGUGGU GAUUAAAGUG UGUGAAUUUC AGUUUUGUAA UGAUCCUUUU
  N   N   A    T   N   V    V   I   K   V    C   E   F    Q   F   C    N   D   P   F
                                 S protein
```

```
       483        493        503        513        523        533
CUGGGAGUGU AUUAUCACAA AAAUAAUAAA UCUUGGAUGG AAUCUGAAUU UAGAGUGUAU
  L  G  V   Y  Y  H   K  N  N  K   S  W  M   E  S  E   F  R  V  Y
```

S protein

```
       543        553        563        573        583        593
UCCUCUGCAA AUAAUUGUAC AUUUGAAUAU GUGUCUCAGC CUUUUCUGAU GGAUCUGGAA
  S  S  A   N  N  C   T  F  E  Y   V  S  Q   P  F  L   M  D  L  E
```

S protein

```
       603        613        622        633        643        653
GGAAAACAGG GCAAUUUUAA AAAUCUGAGA GAAUUUGUGU UUAAAAAUAU UGAUGGAUAU
  G  K  Q   G  N  F   K  N  L  R   E  F  V   F  K  N   I  D  G  Y
```

S protein

```
       663        673        683        693        703        713
UUUAAAAUUU AUUCUAAACA CACACCAAUU AAUUUAGUGA GAGAUCUGCC UCAGGGAUUU
  F  K  I   Y  S  K   H  T  P  I   N  L  V   R  D  L   P  Q  G  F
```

S protein

```
       723        733        743        753        763        773
UCUGCUCUGG AACCUCUGGU GGAUCUGCCA AUUGGCAUUA AUAUUACAAG AUUUCAGACA
  S  A  L   E  P  L   V  D  L  P   I  G  I   N  I  T   R  F  Q  T
```

S protein

```
       783        793        803        813        823        833
CUGCUGGCUC UGCACAGAUC UUAUCUGACA CCUGGAGAUU CUUCUUCUGG AUGGACAGCC
  L  L  A   L  H  R   S  Y  L  T   P  G  D   S  S  S   G  W  T  A
```

S protein

```
       843        853        863        873        883        893
GGAGCUGCAG CUUAUUAUGU GGGCUAUCUG CAGCCAAGAA CAUUUCUGCU GAAAUAUAAU
  G  A  A   A  Y  Y   V  G  Y  L   Q  P  R   T  F  L   L  K  Y  N
```

S protein

```
       903        913        923        933        943        953
GAAAAUGGAA CAAUUACAGA UGCUGUGGAU UGUGCUCUGG AUCCUCUGUC UGAAACAAAA
  E  N  G   T  I  T   D  A  V  D   C  A  L   D  P  L   S  E  T  K
```

S protein

```
       963        973        983        993       1003       1013
UGUACAUUAA AAUCUUUUAC AGUGGAAAAA GGCAUUUAUC AGACAUCUAA UUUUAGAGUG
  C  T  L   K  S  F   T  V  E  K   G  I  Y   Q  T  S   N  F  R  V
```

S protein

```
      1023       1033       1043       1053       1063       1073
CAGCCAACAG AAUCUAUUGU GAGAUUUCCA AAUAUUACAA AUCUGUGUCC AUUUGGAGAA
  Q  P  T   E  S  I   V  R  F  P   N  I  T   N  L  C   P  F  G  E
```

S protein

```
      1083       1093       1103       1113       1123       1133
GUGUUUAAUG CAACAAGAUU UGCAUCUGUG UAUGCAUGGA AUAGAAAAAG AAUUUCUAAU
  V  F  N   A  T  R   F  A  S  V   Y  A  W   N  R  K   R  I  S  N
```

S protein

```
      1143       1153       1163       1173       1183       1193
UGUGUGGCUG AUUAUUCUGU GCUGUAUAAU AGUGCUUCUU UUUCCACAUU UAAAUGUUAU
  C  V  A   D  Y  S   V  L  Y  N   S  A  S   F  S  T   F  K  C  Y
```

S protein

```
      1203       1213       1223       1233       1243       1253
GGAGUGUCUC CAACAAAAUU AAAUGAUUUA UGUUUUACAA AUGUGUAUGC UGAUUCUUUU
  G  V  S   P  T  K   L  N  D  L   C  F  T   N  V  Y   A  D  S  F
```

S protein

```
      1263       1273       1283       1293       1303       1313
GUGAUCAGAG GUGAUGAAGU GAGACAGAUU GCCCCCGGAC AGACAGGAAA AAUUGCUGAU
  V  I  R   G  D  E   V  R  Q  I   A  P  G   Q  T  G   K  I  A  D
```

S protein

```
      1323       1333       1343       1353       1363       1373
UACAAUUACA AACUGCCUGA UGAUUUUACA GGAUGUGUGA UUGCUUGGAA UUCUAAUAAU
  Y  N  Y   K  L  P   D  D  F  T   G  C  V   I  A  W   N  S  N  N
```

S protein

```
      1383        1393        1403        1413        1423        1433
UUAGAUUCUA AAGUGGGAGG AAAUUACAAU UAUCUGUACA GACUGUUUAG AAAAUCAAAU
  L  D  S   K  V  G   G  N  Y  N   Y  L  Y   R  L  F   R  K  S  N
```

S protein

```
      1443        1453        1463        1473        1483        1493
CUGAAACCUU UUGAAAGAGA UAUUUCAACA GAAAUUUAUC AGGCUGGAUC AACACCUUGU
  L  K  P   F  E  R   D  I  S  T   E  I  Y   Q  A  G   S  T  P  C
```

S protein

```
      1503        1513        1523        1533        1543        1553
AAUGGAGUGG AAGGAUUUAA UUGUUAUUUU CCAUUACAGA GCUAUGGAUU UCAGCCAACC
  N  G  V   E  G  F   N  C  Y  F   P  L  Q   S  Y  G   F  Q  P  T
```

S protein

```
      1563        1573        1583        1593        1603        1613
AAUGGUGUGG GAUAUCAGCC AUAUAGAGUG GUGGUGCUGU CUUUUGAACU GCUGCAUGCA
  N  G  V   G  Y  Q   P  Y  R  V   V  V  L   S  F  E   L  L  H  A
```

S protein

```
      1623        1633        1643        1653        1663        1673
CCUGCAACAG UGUGUGGACC UAAAAAAUCU ACAAAUUUAG UGAAAAAUAA AUGUGUGAAU
  P  A  T   V  C  G   P  K  K  S   T  N  L   V  K  N   K  C  V  N
```

S protein

```
      1683        1693        1703        1713        1723        1733
UUUAAUUUUA AUGGAUUAAC AGGAACAGGA GUGCUGACAG AAUCUAAUAA AAAAUUUCUG
  F  N  F   N  G  L   T  G  T  G   V  L  T   E  S  N   K  K  F  L
```

S protein

```
      1743        1753        1763        1773        1783        1793
CCUUUUCAGC AGUUUGGCAG AGAUAUUGCA GAUACCACAG AUGCAGUGAG AGAUCCUCAG
  P  F  Q   Q  F  G   R  D  I  A   D  T  T   D  A  V   R  D  P  Q
```

S protein

```
      1803        1813        1823        1833        1843        1853
ACAUUAGAAA UUCUGGAUAU UACACCUUGU UCUUUUGGGG GUGUGUCUGU GAUUACACCU
  T  L  E   I  L  D   I  T  P  C   S  F  G   G  V  S   V  I  T  P
```

S protein

```
      1863        1873        1883        1893        1903        1913
GGAACAAAUA CAUCUAAUCA GGUGGCUGUG CUGUAUCAGG AUGUGAAUUG UACAGAAGUG
  G  T  N   T  S  N   Q  V  A  V   L  Y  Q   D  V  N   C  T  E  V
```

S protein

```
      1923        1933        1943        1953        1963        1973
CCAGUGGCAA UUCAUGCAGA UCAGCUGACA CCAACAUGGA GAGUGUAUUC UACAGGAUCU
  P  V  A   I  H  A   D  Q  L  T   P  T  W   R  V  Y   S  T  G  S
```

S protein

```
      1983        1993        2003        2013        2023        2033
AAUGUGUUUC AGACAAGAGC AGGAUGUCUG AUUGGAGCAG AACAUGUGAA UAAUUCUUAU
  N  V  F   Q  T  R   A  G  C  L   I  G  A   E  H  V   N  N  S  Y
```

S protein

```
      2043        2053        2063        2073        2083        2093
GAAUGUGAUA UUCCAAUUGG AGCAGGCAUU UGUGCAUCUU AUCAGACACA GACAAAUUCC
  E  C  D   I  P  I   G  A  G  I   C  A  S   Y  Q  T   Q  T  N  S
```

S protein

```
      2103        2113        2123        2133        2143        2153
CCAAGGAGAG CAAGAUCUGU GGCAUCUCAG UCUAUUAUUG CAUACACCAU GUCUCUGGGA
  P  R  R   A  R  S   V  A  S  Q   S  I  I   A  Y  T   M  S  L  G
```

S protein

```
      2163        2173        2183        2193        2203        2213
GCAGAAAAUU CUGUGGCAUA UUCUAAUAAU UCUAUUGCUA UUCCAACAAA UUUUACCAUU
  A  E  N   S  V  A   Y  S  N  N   S  I  A   I  P  T   N  F  T  I
```

S protein

```
      2223        2233        2243        2253        2263        2273
UCUGUGACAA CAGAAAUUUU ACCUGUGUCU AUGACAAAAA CAUCUGUGGA UUGUACCAUG
```

```
  S  V  T   T  E  I   L  P  V  S   M  T  K   T  S  V   D  C  T  M
                              S protein
      2283       2293       2303       2313       2323       2333
UACAUUUGUG GAGAUUCUAC AGAAUGUUCU AAUCUGCUGC UGCAGUAUGG AUCUUUUUGU
  Y  I  C   G  D  S   T  E  C  S   N  L  L   L  Q  Y   G  S  F  C
                              S protein
      2343       2353       2363       2373       2383       2393
ACACAGCUGA AUAGAGCUUU AACAGGAAUU GCUGUGGAAC AGGAUAAAAA UACACAGGAA
  T  Q  L   N  R  A   L  T  G  I   A  V  E   Q  D  K   N  T  Q  E
                              S protein
      2403       2413       2423       2433       2443       2453
GUGUUUGCUC AGGUGAAACA GAUUUACAAA ACACCACCAA UUAAAGAUUU UGGAGGAUUU
  V  F  A   Q  V  K   Q  I  Y  K   T  P  P   I  K  D   F  G  G  F
                              S protein
      2463       2473       2483       2493       2503       2513
AAUUUUAGCC AGAUUCUGCC UGAUCCUUCU AAACCUUCUA AAAGAUCUUU UAUUGAAGAU
  N  F  S   Q  I  L   P  D  P  S   K  P  S   K  R  S   F  I  E  D
                              S protein
      2523       2533       2543       2553       2563       2573
CUGCUGUUUA AUAAAGUGAC ACUGGCAGAU GCAGGAUUUA UUAAACAGUA UGGAGAUUGC
  L  L  F   N  K  V   T  L  A  D   A  G  F   I  K  Q   Y  G  D  C
                              S protein
      2583       2593       2603       2613       2623       2633
CUGGGUGAUA UUGCUGCAAG AGAUCUGAUU UGUGCUCAGA AAUUUAAUGG ACUGACAGUG
  L  G  D   I  A  A   R  D  L  I   C  A  Q   K  F  N   G  L  T  V
                              S protein
      2643       2653       2663       2673       2683       2693
CUGCCUCCUC UGCUGACAGA UGAAAUGAUU GCUCAGUACA CAUCUGCUUU ACUGGCUGGA
  L  P  P   L  L  T   D  E  M  I   A  Q  Y   T  S  A   L  L  A  G
                              S protein
      2703       2713       2723       2733       2743       2753
ACAAUUACAA GCGGAUGGAC AUUUGGAGCU GGAGCUGCUC UGCAGAUUCC UUUUGCAAUG
  T  I  T   S  G  W   T  F  G  A   G  A  A   L  Q  I   P  F  A  M
                              S protein
      2763       2773       2783       2793       2803       2813
CAGAUGGCUU ACAGAUUUAA UGGAAUUGGA GUGACACAGA AUGUGUUAUA UGAAAAUCAG
  Q  M  A   Y  R  F   N  G  I  G   V  T  Q   N  V  L   Y  E  N  Q
                              S protein
      2823       2833       2843       2853       2863       2873
AAACUGAUUG CAAAUCAGUU UAAUUCUGCA AUUGGCAAAA UUCAGGAUUC UCUGUCUUCU
  K  L  I   A  N  Q   F  N  S  A   I  G  K   I  Q  D   S  L  S  S
                              S protein
      2883       2893       2903       2913       2923       2933
ACAGCUUCUG CUCUGGGAAA ACUGCAGGAU GUGGUGAAUC AGAAUGCACA GGCACUGAAU
  T  A  S   A  L  G   K  L  Q  D   V  V  N   Q  N  A   Q  A  L  N
                              S protein
      2943       2953       2963       2973       2983       2993
ACUCUGGUGA AACAGCUGUC UAGCAAUUUU GGGGCAAUUU CUUCUGUGCU GAAUGAUAUU
  T  L  V   K  Q  L   S  S  N  F   G  A  I   S  S  V   L  N  D  I
                              S protein
      3003       3013       3023       3033       3043       3053
CUGUCUAGAC UGGAUCCUCC UGAAGCUGAA GUGCAGAUUG AUAGACUGAU CACAGGAAGA
  L  S  R   L  D  P   P  E  A  E   V  Q  I   D  R  L   I  T  G  R
                              S protein
      3063       3073       3083       3093       3103       3113
CUGCAGUCUC UGCAGACUUA UGUGACACAG CAGCUGAUUA GAGCUGCUGA AAUUAGAGCU
  L  Q  S   L  Q  T   Y  V  T  Q   Q  L  I   R  A  A   E  I  R  A
                              S protein
      3123       3133       3143       3153       3163       3173
```

```
UCUGCUAAUC UGGCUGCUAC AAAAAUGUCU GAAUGUGUGC UGGGACAGUC AAAAAGAGUG
  S  A  N   L  A  A   T  K  M  S   E  C  V   L  G  Q   S  K  R  V
```

S protein

```
      3183       3193       3203       3213       3223       3233
GAUUUUUGUG GAAAAGGAUA UCAUCUGAUG UCUUUUCCAC AGUCUGCUCC ACAUGGAGUG
  D  F  C   G  K  G   Y  H  L  M   S  F  P   Q  S  A   P  H  G  V
```

S protein

```
      3243       3253       3263       3273       3283       3293
GUGUUUUUAC AUGUGACAUA UGUGCCAGCA CAGGAAAAGA AUUUUACCAC AGCACCAGCA
  V  F  L   H  V  T   Y  V  P  A   Q  E  K   N  F  T   T  A  P  A
```

S protein

```
      3303       3313       3323       3333       3343       3353
AUUUGUCAUG AUGGAAAAGC ACAUUUUCCA AGAGAAGGAG UGUUUGUGUC UAAUGGAACA
  I  C  H   D  G  K   A  H  F  P   R  E  G   V  F  V   S  N  G  T
```

S protein

```
      3363       3373       3383       3393       3403       3413
CAUUGGUUUG UGACACAGAG AAAUUUUUAU GAACCUCAGA UUAUUACAAC AGAUAAUACA
  H  W  F   V  T  Q   R  N  F  Y   E  P  Q   I  I  T   T  D  N  T
```

S protein

```
      3423       3433       3443       3453       3463       3473
UUUGUGUCAG GAAAUUGUGA UGUGGUGAUU GGAAUUGUGA AUAAUACAGU GUAUGAUCCA
  F  V  S   G  N  C   D  V  V  I   G  I  V   N  N  T   V  Y  D  P
```

S protein

```
      3483       3493       3503       3513       3523       3533
CUGCAGCCAG AACUGGAUUC UUUUAAAGAA GAACUGGAUA AAUAUUUUAA AAAUCACACA
  L  Q  P   E  L  D   S  F  K  E   E  L  D   K  Y  F   K  N  H  T
```

S protein

```
      3543       3553       3563       3573       3583       3593
UCUCCUGAUG UGGAUUUAGG AGAUAUUUCU GGAAUCAAUG CAUCUGUGGU GAAUAUUCAG
  S  P  D   V  D  L   G  D  I  S   G  I  N   A  S  V   V  N  I  Q
```

S protein

```
      3603       3613       3623       3633       3643       3653
AAAGAAAUUG AUAGACUGAA UGAAGUGGCC AAAAAUCUGA AUGAAUCUCU GAUUGAUCUG
  K  E  I   D  R  L   N  E  V  A   K  N  L   N  E  S   L  I  D  L
```

S protein

```
      3663       3673       3683       3693       3703       3713
CAGGAACUUG GAAAAUAUGA ACAGUACAUU AAAUGGCCUU GGUACAUUUG GCUUGGAUUU
  Q  E  L   G  K  Y   E  Q  Y  I   K  W  P   W  Y  I   W  L  G  F
```

S protein

```
      3723       3733       3743       3753       3763       3773
AUUGCAGGAU UAAUUGCAAU UGUGAUGGUG ACAAUUAUGU UAUGUUGUAU GACAUCAUGU
  I  A  G   L  I  A   I  V  M  V   T  I  M   L  C  C   M  T  S  C
```

S protein

```
      3783       3793       3803       3813       3823       3833
UGUUCUUGUU UAAAAGGAUG UUGUUCUUGU GGAAGCUGUU GUAAAUUUGA UGAAGAUGAU
  C  S  C   L  K  G   C  C  S  C   G  S  C   C  K  F   D  E  D  D
```

S protein

```
      3843       3853       3863       3873   3878
UCUGAACCUG UGUUAAAAGG AGUGAAAUUG CAUUACACAU GAUGA
  S  E  P   V  L  K   G  V  K  L   H  Y  T   *  *
```

S protein

```
      3888       3898       3908       3918       3928       3938
CUCGAGCUGG UACUGCAUGC ACGCAAUGCU AGCUGCCCCU UUCCCGUCCU GGGUACCCCG
```

FI element

```
      3948       3958       3968       3978       3988       3998
AGUCUCCCCC GACCUCGGGU CCCAGGUAUG CUCCCACCUC CACCUGCCCC ACUCACCACC
```

FI element

```
      4008       4018       4028       4038       4048       4058
UCUGCUAGUU CCAGACACCU CCCAAGCACG CAGCAAUGCA GCUCAAAACG CUUAGCCUAG
```

FI element

```
      4068        4078        4088        4098        4108        4118
CCACACCCCC ACGGGAAACA GCAGUGAUUA ACCUUUAGCA AUAAACGAAA GUUUAACUAA
                          FI element
      4128        4138        4148        4158        4168   4173
GCUAUACUAA CCCCAGGGUU GGUCAAUUUC GUGCCAGCCA CACCCUGGAG CUAGC
                          FI element
      4183        4193        4203        4213        4223        4233
AAAAAAAAAA AAAAAAAAAA AAAAAAAAAA GCAUAUGACU AAAAAAAAAA AAAAAAAAAA
                          Poly(A)
      4243        4253        4263        4273        4283
AAAAAAAAAA AAAAAAAAAA AAAAAAAAAA AAAAAAAAAA AAAAAAAAAA
                          Poly(A)
```

Exemplary Construct Encoding a SARS-CoV-2 Spike Protein

Structure $m_2^{7,3'\text{-}O}$Gppp($m_1^{2'\text{-}O}$)ApG)-hAg-Kozak-S1S2-PP-FI-A30L70

Encoded antigen Viral spike protein (S1S2 protein) of the SARS CoV-2 (S1S2 full-length protein, sequence variant)

Exemplary Nucleotide Sequence Encoding a SARS-CoV-2 Spike Protein

Nucleotide sequence is shown with individual sequence elements as indicated in bold letters. In addition, the sequence of the translated protein is shown in italic letters below the coding nucleotide sequence (* = stop codon).

```
         10         20         30         40          50  53
AGAAUAAACU AGUAUUCUUC UGGUCCCCAC AGACUCAGAG AGAACCCGCC ACC
                          hAg-Kozak
        63         73         83         93         103        113
AUGUUCGUGU UCCUGGUGCU GCUGCCUCUG GUGUCCAGCC AGUGUGUGAA CCUGACCACC
  M  F  V   F  L  V   L  L  P  L   V  S  S   Q  C  V   N  L  T  T
                          S protein
       123        133        143        153        163        173
AGAACACAGC UGCCUCCAGC CUACACCAAC AGCUUUACCA GAGGCGUGUA CUACCCCGAC
  R  T  Q   L  P  P   A  Y  T  N   S  F  T   R  G  V   Y  Y  P  D
                          S protein
       183        193        203        213        223        233
AAGGUGUUCA GAUCCAGCGU GCUGCACUCU ACCCAGGACC UGUUCCUGCC UUUCUUCAGC
  K  V  F   R  S  S   V  L  H  S   T  Q  D   L  F  L   P  F  F  S
                          S protein
       243        253        263        273        283        293
AACGUGACCU GGUUCCACGC CAUCCACGUG UCCGGCACCA AUGGCACCAA GAGAUUCGAC
  N  V  T   W  F  H   A  I  H  V   S  G  T   N  G  T   K  R  F  D
                          S protein
       303        313        323        333        343        353
AACCCCGUGC UGCCCUUCAA CGACGGGGUG UACUUUGCCA GCACCGAGAA GUCCAACAUC
  N  P  V   L  P  F   N  D  G  V   Y  F  A   S  T  E   K  S  N  I
                          S protein
       363        373        383        393        403        413
AUCAGAGGCU GGAUCUUCGG CACCACACUG GACAGCAAGA CCCAGAGCCU GCUGAUCGUG
  I  R  G   W  I  F   G  T  T  L   D  S  K   T  Q  S   L  L  I  V
                          S protein
       423        433        443        453        463        473
AACAACGCCA CCAACGUGGU CAUCAAAGUG UGCGAGUUCC AGUUCUGCAA CGACCCCUUC
  N  N  A   T  N  V   V  I  K  V   C  E  F   Q  F  C   N  D  P  F
                          S protein
       483        493        503        513        523        533
CUGGGCGUCU ACUACCACAA GAACAACAAG AGCUGGAUGG AAAGCGAGUU CCGGGUGUAC
  L  G  V   Y  Y  H   K  N  N  K   S  W  M   E  S  E   F  R  V  Y
                          S protein
       543        553        563        573        583        593
AGCAGCGCCA ACAACUGCAC CUUCGAGUAC GUGUCCCAGC CUUUCCUGAU GGACCUGGAA
  S  S  A   N  N  C   T  F  E  Y   V  S  Q   P  F  L   M  D  L  E
                          S protein
       603        613        623        633        643        653
GGCAAGCAGG GCAACUUCAA GAACCUGCGC GAGUUCGUGU UUAAGAACAU CGACGGCUAC
  G  K  Q   G  N  F   K  N  L  R   E  F  V   F  K  N   I  D  G  Y
                          S protein
       663        673        683        693        703        713
UUCAAGAUCU ACAGCAAGCA CACCCCUAUC AACCUCGUGC GGGAUCUGCC UCAGGGCUUC
  F  K  I   Y  S  K   H  T  P  I   N  L  V   R  D  L   P  Q  G  F
```

S protein

```
       723        733        743        753        763        773
UCUGCUCUGG AACCCCUGGU GGAUCUGCCC AUCGGCAUCA ACAUCACCCG GUUUCAGACA
  S  A  L   E  P  L   V  D  L  P   I  G  I   N  I  T   R  F  Q  T
```

S protein

```
       783        793        803        813        823        833
CUGCUGGCCC UGCACAGAAG CUACCUGACA CCUGGCGAUA GCAGCAGCGG AUGGACAGCU
  L  L  A   L  H  R   S  Y  L  T   P  G  D   S  S  S   G  W  T  A
```

S protein

```
       843        853        863        873        883        893
GGUGCCGCCG CUUACUAUGU GGGCUACCUG CAGCCUAGAA CCUUCCUGCU GAAGUACAAC
  G  A  A   A  Y  Y   V  G  Y  L   Q  P  R   T  F  L   L  K  Y  N
```

S protein

```
       903        913        923        933        943        953
GAGAACGGCA CCAUCACCGA CGCCGUGGAU UGUGCUCUGG AUCCUCUGAG CGAGACAAAG
  E  N  G   T  I  T   D  A  V  D   C  A  L   D  P  L   S  E  T  K
```

S protein

```
       963        973        983        993       1003       1013
UGCACCCUGA AGUCCUUCAC CGUGGAAAAG GGCAUCUACC AGACCAGCAA CUUCCGGGUG
  C  T  L   K  S  F   T  V  E  K   G  I  Y   Q  T  S   N  F  R  V
```

S protein

```
      1023       1033       1043       1053       1063       1073
CAGCCCACCG AAUCCAUCGU GCGGUUCCCC AAUAUCACCA AUCUGUGCCC CUUCGGCGAG
  Q  P  T   E  S  I   V  R  F  P   N  I  T   N  L  C   P  F  G  E
```

S protein

```
      1083       1093       1103       1113       1123       1133
GUGUUCAAUG CCACCAGAUU CGCCUCUGUG UACGCCUGGA ACCGGAAGCG GAUCAGCAAU
  V  F  N   A  T  R   F  A  S  V   Y  A  W   N  R  K   R  I  S  N
```

S protein

```
      1143       1153       1163       1173       1183       1193
UGCGUGGCCG ACUACUCCGU GCUGUACAAC UCCGCCAGCU UCAGCACCUU CAAGUGCUAC
  C  V  A   D  Y  S   V  L  Y  N   S  A  S   F  S  T   F  K  C  Y
```

S protein

```
      1203       1213       1223       1233       1243       1253
GGCGUGUCCC CUACCAAGCU GAACGACCUG UGCUUCACAA ACGUGUACGC CGACAGCUUC
  G  V  S   P  T  K   L  N  D  L   C  F  T   N  V  Y   A  D  S  F
```

S protein

```
      1263       1273       1283       1293       1303       1313
GUGAUCCGGG GAGAUGAAGU GCGGCAGAUU GCCCCUGGAC AGACAGGCAA GAUCGCCGAC
  V  I  R   G  D  E   V  R  Q  I   A  P  G   Q  T  G   K  I  A  D
```

S protein

```
      1323       1333       1343       1353       1363       1373
UACAACUACA AGCUGCCCGA CGACUUCACC GGCUGUGUGA UUGCCUGGAA CAGCAACAAC
  Y  N  Y   K  L  P   D  D  F  T   G  C  V   I  A  W   N  S  N  N
```

S protein

```
      1383       1393       1403       1413       1423       1433
CUGGACUCCA AAGUCGGCGG CAACUACAAU UACCUGUACC GGCUGUUCCG GAAGUCCAAU
  L  D  S   K  V  G   G  N  Y  N   Y  L  Y   R  L  F   R  K  S  N
```

S protein

```
      1443       1453       1463       1473       1483       1493
CUGAAGCCCU UCGAGCGGGA CAUCUCCACC GAGAUCUAUC AGGCCGGCAG CACCCCUUGU
  L  K  P   F  E  R   D  I  S  T   E  I  Y   Q  A  G   S  T  P  C
```

S protein

```
      1503       1513       1523       1533       1543       1553
AACGGCGUGG AAGGCUUCAA CUGCUACUUC CCACUGCAGU CCUACGGCUU UCAGCCCACA
  N  G  V   E  G  F   N  C  Y  F   P  L  Q   S  Y  G   F  Q  P  T
```

S protein

```
      1563       1573       1583       1593       1603       1613
AAUGGCGUGG GCUAUCAGCC CUACAGAGUG GUGGUGCUGA GCUUCGAACU GCUGCAUGCC
```

```
  N  G  V   G  Y  Q   P  Y  R  V   V  V  L   S  F  E   L  L  H  A
```

S protein

```
     1623       1633       1643       1653       1663       1673
CCUGCCACAG UGUGCGGCCC UAAGAAAAGC ACCAAUCUCG UGAAGAACAA AUGCGUGAAC
  P  A  T   V  C  G   P  K  K  S   T  N  L   V  K  N   K  C  V  N
```

S protein

```
     1683       1693       1703       1713       1723       1733
UUCAACUUCA ACGGCCUGAC CGGCACCGGC GUGCUGACAG AGAGCAACAA GAAGUUCCUG
  F  N  F   N  G  L   T  G  T  G   V  L  T   E  S  N   K  K  F  L
```

S protein

```
     1743       1753       1763       1773       1783       1793
CCAUUCCAGC AGUUUGGCCG GGAUAUCGCC GAUACCACAG ACGCCGUUAG AGAUCCCCAG
  P  F  Q   Q  F  G   R  D  I  A   D  T  T   D  A  V   R  D  P  Q
```

S protein

```
     1803       1813       1823       1833       1843       1853
ACACUGGAAA UCCUGGACAU CACCCCUUGC AGCUUCGGCG GAGUGUCUGU GAUCACCCCU
  T  L  E   I  L  D   I  T  P  C   S  F  G   G  V  S   V  I  T  P
```

S protein

```
     1863       1873       1883       1893       1903       1913
GGCACCAACA CCAGCAAUCA GGUGGCAGUG CUGUACCAGG ACGUGAACUG UACCGAAGUG
  G  T  N   T  S  N   Q  V  A  V   L  Y  Q   D  V  N   C  T  E  V
```

S protein

```
     1923       1933       1943       1953       1963       1973
CCCGUGGCCA UUCACGCCGA UCAGCUGACA CCUACAUGGC GGGUGUACUC CACCGGCAGC
  P  V  A   I  H  A   D  Q  L  T   P  T  W   R  V  Y   S  T  G  S
```

S protein

```
     1983       1993       2003       2013       2023       2033
AAUGUGUUUC AGACCAGAGC CGGCUGUCUG AUCGGAGCCG AGCACGUGAA CAAUAGCUAC
  N  V  F   Q  T  R   A  G  C  L   I  G  A   E  H  V   N  N  S  Y
```

S protein

```
     2043       2053       2063       2073       2083       2093
GAGUGCGACA UCCCCAUCGG CGCUGGAAUC UGCGCCAGCU ACCAGACACA GACAAACAGC
  E  C  D   I  P  I   G  A  G  I   C  A  S   Y  Q  T   Q  T  N  S
```

S protein

```
     2103       2113       2123       2133       2143       2153
CCUCGGAGAG CCAGAAGCGU GGCCAGCCAG AGCAUCAUUG CCUACACAAU GUCUCUGGGC
  P  R  R   A  R  S   V  A  S  Q   S  I  I   A  Y  T   M  S  L  G
```

S protein

```
     2163       2173       2183       2193       2203       2213
GCCGAGAACA GCGUGGCCUA CUCCAACAAC UCUAUCGCUA UCCCCACCAA CUUCACCAUC
  A  E  N   S  V  A   Y  S  N  N   S  I  A   I  P  T   N  F  T  I
```

S protein

```
     2223       2233       2243       2253       2263       2273
AGCGUGACCA CAGAGAUCCU GCCUGUGUCC AUGACCAAGA CCAGCGUGGA CUGCACCAUG
  S  V  T   T  E  I   L  P  V  S   M  T  K   T  S  V   D  C  T  M
```

S protein

```
     2283       2293       2303       2313       2323       2333
UACAUCUGCG GCGAUUCCAC CGAGUGCUCC AACCUGCUGC UGCAGUACGG CAGCUUCUGC
  Y  I  C   G  D  S   T  E  C  S   N  L  L   L  Q  Y   G  S  F  C
```

S protein

```
     2343       2353       2363       2373       2383       2393
ACCCAGCUGA AUAGAGCCCU GACAGGGAUC GCCGUGGAAC AGGACAAGAA CACCCAAGAG
  T  Q  L   N  R  A   L  T  G  I   A  V  E   Q  D  K   N  T  Q  E
```

S protein

```
     2403       2413       2423       2433       2443       2453
GUGUUCGCCC AAGUGAAGCA GAUCUACAAG ACCCCUCCUA UCAAGGACUU CGGCGGCUUC
  V  F  A   Q  V  K   Q  I  Y  K   T  P  P   I  K  D   F  G  G  F
```

S protein

```
     2463       2473       2483       2493       2503       2513
```

```
AAUUUCAGCC AGAUUCUGCC CGAUCCUAGC AAGCCCAGCA AGCGGAGCUU CAUCGAGGAC
  N  F  S   Q  I  L   P  D  P  S   K  P  S   K  R  S   F  I  E  D
```

S protein

```
      2523       2533       2543       2553       2563       2573
CUGCUGUUCA ACAAAGUGAC ACUGGCCGAC GCCGGCUUCA UCAAGCAGUA UGGCGAUUGU
  L  L  F   N  K  V   T  L  A  D   A  G  F   I  K  Q   Y  G  D  C
```

S protein

```
      2583       2593       2603       2613       2623       2633
CUGGGCGACA UUGCCGCCAG GGAUCUGAUU UGCGCCCAGA AGUUUAACGG ACUGACAGUG
  L  G  D   I  A  A   R  D  L  I   C  A  Q   K  F  N   G  L  T  V
```

S protein

```
      2643       2653       2663       2673       2683       2693
CUGCCUCCUC UGCUGACCGA UGAGAUGAUC GCCCAGUACA CAUCUGCCCU GCUGGCCGGC
  L  P  P   L  L  T   D  E  M  I   A  Q  Y   T  S  A   L  L  A  G
```

S protein

```
      2703       2713       2723       2733       2743       2753
ACAAUCACAA GCGGCUGGAC AUUUGGAGCA GGCGCCGCUC UGCAGAUCCC CUUUGCUAUG
  T  I  T   S  G  W   T  F  G  A   G  A  A   L  Q  I   P  F  A  M
```

S protein

```
      2763       2773       2783       2793       2803       2813
CAGAUGGCCU ACCGGUUCAA CGGCAUCGGA GUGACCCAGA AUGUGCUGUA CGAGAACCAG
  Q  M  A   Y  R  F   N  G  I  G   V  T  Q   N  V  L   Y  E  N  Q
```

S protein

```
      2823       2833       2843       2853       2863       2873
AAGCUGAUCG CCAACCAGUU CAACAGCGCC AUCGGCAAGA UCCAGGACAG CCUGAGCAGC
  K  L  I   A  N  Q   F  N  S  A   I  G  K   I  Q  D   S  L  S  S
```

S protein

```
      2883       2893       2903       2913       2923       2933
ACAGCAAGCG CCCUGGGAAA GCUGCAGGAC GUGGUCAACC AGAAUGCCCA GGCACUGAAC
  T  A  S   A  L  G   K  L  Q  D   V  V  N   Q  N  A   Q  A  L  N
```

S protein

```
      2943       2953       2963       2973       2983       2993
ACCCUGGUCA AGCAGCUGUC CUCCAACUUC GGCGCCAUCA GCUCUGUGCU GAACGAUAUC
  T  L  V   K  Q  L   S  S  N  F   G  A  I   S  S  V   L  N  D  I
```

S protein

```
      3003       3013       3023       3033       3043       3053
CUGAGCAGAC UGGACCCUCC UGAGGCCGAG GUGCAGAUCG ACAGACUGAU CACAGGCAGA
  L  S  R   L  D  P   P  E  A  E   V  Q  I   D  R  L   I  T  G  R
```

S protein

```
      3063       3073       3083       3093       3103       3113
CUGCAGAGCC UCCAGACAUA CGUGACCCAG CAGCUGAUCA GAGCCGCCGA GAUUAGAGCC
  L  Q  S   L  Q  T   Y  V  T  Q   Q  L  I   R  A  A   E  I  R  A
```

S protein

```
      3123       3133       3143       3153       3163       3173
UCUGCCAAUC UGGCCGCCAC CAAGAUGUCU GAGUGUGUGC UGGGCCAGAG CAAGAGAGUG
  S  A  N   L  A  A   T  K  M  S   E  C  V   L  G  Q   S  K  R  V
```

S protein

```
      3183       3193       3203       3213       3223       3233
GACUUUUGCG GCAAGGGCUA CCACCUGAUG AGCUUCCCUC AGUCUGCCCC UCACGGCGUG
  D  F  C   G  K  G   Y  H  L  M   S  F  P   Q  S  A   P  H  G  V
```

S protein

```
      3243       3253       3263       3273       3283       3293
GUGUUUCUGC ACGUGACAUA UGUGCCCGCU CAAGAGAAGA AUUUCACCAC CGCUCCAGCC
  V  F  L   H  V  T   Y  V  P  A   Q  E  K   N  F  T   T  A  P  A
```

S protein

```
      3303       3313       3323       3333       3343       3353
AUCUGCCACG ACGGCAAAGC CCACUUUCCU AGAGAAGGCG UGUUCGUGUC CAACGGCACC
  I  C  H   D  G  K   A  H  F  P   R  E  G   V  F  V   S  N  G  T
```

S protein

```
      3363        3373        3383        3393        3403        3413
CAUUGGUUCG UGACACAGCG GAACUUCUAC GAGCCCCAGA UCAUCACCAC CGACAACACC
  H   W   F   V   T   Q   R   N   F   Y   E   P   Q   I   I   T   T   D   N   T
```

S protein

```
      3423        3433        3443        3453        3463        3473
UUCGUGUCUG GCAACUGCGA CGUCGUGAUC GGCAUUGUGA ACAAUACCGU GUACGACCCU
  F   V   S   G   N   C   D   V   V   I   G   I   V   N   N   T   V   Y   D   P
```

S protein

```
      3483        3493        3503        3513        3523        3533
CUGCAGCCCG AGCUGGACAG CUUCAAAGAG GAACUGGACA AGUACUUUAA GAACCACACA
  L   Q   P   E   L   D   S   F   K   E   E   L   D   K   Y   F   K   N   H   T
```

S protein

```
      3543        3553        3563        3573        3583        3593
AGCCCCGACG UGGACCUGGG CGAUAUCAGC GGAAUCAAUG CCAGCGUCGU GAACAUCCAG
  S   P   D   V   D   L   G   D   I   S   G   I   N   A   S   V   V   N   I   Q
```

S protein

```
      3603        3613        3623        3633        3643        3653
AAAGAGAUCG ACCGGCUGAA CGAGGUGGCC AAGAAUCUGA ACGAGAGCCU GAUCGACCUG
  K   E   I   D   R   L   N   E   V   A   K   N   L   N   E   S   L   I   D   L
```

S protein

```
      3663        3673        3683        3693        3703        3713
CAAGAACUGG GGAAGUACGA GCAGUACAUC AAGUGGCCCU GGUACAUCUG GCUGGGCUUU
  Q   E   L   G   K   Y   E   Q   Y   I   K   W   P   W   Y   I   W   L   G   F
```

S protein

```
      3723        3733        3743        3753        3763        3773
AUCGCCGGAC UGAUUGCCAU CGUGAUGGUC ACAAUCAUGC UGUGUUGCAU GACCAGCUGC
  I   A   G   L   I   A   I   V   M   V   T   I   M   L   C   C   M   T   S   C
```

S protein

```
      3783        3793        3803        3813        3823        3833
UGUAGCUGCC UGAAGGGCUG UUGUAGCUGU GGCAGCUGCU GCAAGUUCGA CGAGGACGAU
  C   S   C   L   K   G   C   C   S   C   G   S   C   C   K   F   D   E   D   D
```

S protein

```
      3843        3853        3863        3873   3878
UCUGAGCCCG UGCUGAAGGG CGUGAAACUG CACUACACAU GAUGA
  S   E   P   V   L   K   G   V   K   L   H   Y   T   *   *
```

S protein

```
      3888        3898        3908        3918        3928        3938
CUCGAGCUGG UACUGCAUGC ACGCAAUGCU AGCUGCCCCU UUCCCGUCCU GGGUACCCCG
```

FI element

```
      3948        3958        3968        3978        3988        3998
AGUCUCCCCC GACCUCGGGU CCCAGGUAUG CUCCCACCUC CACCUGCCCC ACUCACCACC
```

FI element

```
      4008        4018        4028        4038        4048        4058
UCUGCUAGUU CCAGACACCU CCCAAGCACG CAGCAAUGCA GCUCAAAACG CUUAGCCUAG
```

FI element

```
      4068        4078        4088        4098        4108        4118
CCACACCCCC ACGGGAAACA GCAGUGAUUA ACCUUUAGCA AUAAACGAAA GUUUAACUAA
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FI element

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      4128        4138        4148        4158        4168   4173
GCUAUACUAA CCCCAGGGUU GGUCAAUUUC GUGCCAGCCA CACCCUGGAG CUAGC
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FI element

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      4183        4193        4203        4213        4223        4233
AAAAAAAAAA AAAAAAAAAA AAAAAAAAAA GCAUAUGACU AAAAAAAAAA AAAAAAAAAA
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Poly(A)

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      4243        4253        4263        4273        4283
AAAAAAAAAA AAAAAAAAAA AAAAAAAAAA AAAAAAAAAA AAAAAAAAAA
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Poly(A)

[000353] In some embodiments, a pharmaceutical composition comprising one or more polynucleotides encoding a polypeptide encoded by a string construct may be co-administered with another vaccine for treating a viral disease, e.g., COVID. In some embodiments, the pharmaceutical composition comprising a string construct may be co-administered, for example, with an antibody, such as a neutralizing antibody that can bind to a SARS COV-2 protein, e.g., orf1ab polyprotein, orf1a polyprotein, surface glycoprotein (S), nucleocapsid phosphoprotein (N), ORF3a protein, membrane glycoprotein (M), ORF7a protein, ORF8 protein, envelope protein (E), ORF6 protein, ORF7b protein or ORF10 protein. In some embodiments, the pharmaceutical composition may be co-administered with an antibody directed to the SARS spike protein. In some embodiments, the pharmaceutical composition comprising one or more polynucleotides encoding a polypeptide encoded by a string construct may be administered before, after or simultaneously with a therapeutic regime comprising another vaccine described above.

[000354] In some aspects, a polypeptide encoded by a string construct, especially comprising SARS COV-2 nucleocapsid protein epitopes are designed to boost the immunogenicity and immune memory against the virus. Certain of the present day vaccines in trial comprise vaccines directed to the viral spike proteins, that are likely to confer an immunogenic response, but do not appear to elicit or promote a T cell response. In some embodiments, vaccines comprising a string construct or a polypeptide encoded by a string construct described herein can elicit or promote a T cell response and/or elicit or promote a lasting immunological memory. In some embodiments, a vaccine against SARS CoV-2 may be accompanied by one or more string vaccine compositions described herein, e.g., as part of an administration regimen, such as for a boost after priming. In some embodiments, a vaccine against SARS CoV-2 may be mRNA-based, viral vector-based (e.g., replicating and/or non-replicating), DNA-based, protein-based (e.g., protein subunit and/or virus like particles), and/or inactivated/attenuated virus-based. In some embodiments, such a vaccine is directed to a spike protein or an immunogenic fragment thereof. In some embodiments, such a SARS CoV-2 vaccine may be or comprise an mRNA-based vaccine against SARs-CoV-2, e.g., in some embodiments a mRNA-based vaccine (mRNA-1273) developed by Moderna that encodes a prefusion stabilized form of SARS CoV-2 Spike protein. In some embodiments, such a SARS CoV-2 vaccine may be or comprise a viral vector based vaccine against SARS-CoV-2, e.g., in some embodiments an adenovirus vaccine vector-based vaccine (AZD1222) developed by AstraZeneca that is made from a virus (e.g., ChAdOx1), which is a weakened version of an adenovirus, and encodes a SARS CoV-2 spike protein.

Pharmaceutical composition comprising String constructs or a polypeptide encoded by a string construct

[000355] In one aspect, a pharmaceutical composition comprising the string vaccines may be administered to a patient alone or in combination with other drugs or vaccines.

[000356] In some embodiments, the pharmaceutical composition comprising the string vaccine may be administered before, simultaneously or after an initial administration of another vaccine or drug for SARS CoV-2 viral infection.

[000357] In some embodiments, the pharmaceutical composition comprising the string vaccine may be administered 7 days, 2 weeks, 3 weeks, 4 weeks, 5 weeks, 6 weeks, 7 weeks, 8 weeks, 9 weeks, 10 weeks, 11 weeks, 12 weeks, 14 weeks, 16 weeks, 18 weeks, or 20 weeks or more before administering another vaccine or drug for SARS CoV-2 viral infection. The pharmaceutical composition comprising the string vaccine may be administered prophylactically, or as a preventive vaccine, similar to for example, the flu vaccine at the onset of annual flu season.

[000358] In some embodiments, the pharmaceutical composition comprising the string vaccine may be administered 7 days, 2 weeks, 3 weeks, 4 weeks, 5 weeks, 6 weeks, 7 weeks, 8 weeks, 9 weeks, 10 weeks, 11 weeks, 12 weeks, 14 weeks, 16 weeks, 18 weeks, or 20 weeks or more after the administration of a vaccine or a drug for2019 SARS CoV-2 viral infection. In some embodiments, the pharmaceutical composition comprising the string vaccine may be administered 3 months after another 2019 SARS-CoV2 vaccine therapy. In some embodiments, the pharmaceutical composition comprising the string vaccine may be administered 6 months after another 2019 SARS-CoV2 vaccine therapy. In some embodiments, the pharmaceutical composition comprising the string vaccine may be administered 8 months after another 2019 SARS-CoV2 vaccine therapy. In some embodiments, the pharmaceutical composition comprising the string vaccine may be administered 9 months after another 2019 SARS-CoV2 vaccine therapy. In some embodiments, the pharmaceutical composition comprising the string vaccine may be administered 10 months after another SARS-CoV2 vaccine therapy. In some embodiments, the pharmaceutical composition comprising the string vaccine may be administered 12 months after another 2019 SARS-CoV2 vaccine therapy.

[000359] In some embodiments, the pharmaceutical composition comprising the string vaccine may be administered once every 2 days, 7 days, 2 weeks, 3 weeks, 4 weeks, 5 weeks, 6 weeks, 7 weeks, 8 weeks, 9 weeks, 10 weeks, 12 weeks or more. In some embodiments, the pharmaceutical composition comprising a string vaccine (e.g., as described herein) may be administered once every 20 days, 21 days, 22 days, 23 days, 24 days, 25 days, 26 days, 27 days, 28 days, 29 days, 30 days, or more. In some embodiments, the pharmaceutical composition comprising a string vaccine (e.g., as described herein) may be administered once every 3 months, 4 months, 5 months, 6 months, 7 months, 8 months, 9 months, 10 months, 11 months, 12 months, or longer. In some embodiments, a subject may be administered at least two doses of the pharmaceutical composition comprising a string vaccine (e.g., as described herein), and the at least two doses of the pharmaceutical composition comprising the string vaccine may be administered at an interval of 20 days. In some embodiments, two such doses may be administered at an interval of 21 days. In some embodiments, two such doses may be administered at an interval of 22 days. In some embodiments, two

such doses may be administered at an interval of 23 days. In some embodiments, two such doses may be administered at an interval of 24 days. In some embodiments, two such doses may be administered at an interval of 25 days. In some embodiments, two such doses may be administered at an interval of 26 days. In some embodiments, two such doses may be administered at an interval of 27 days. In some embodiments, two such doses may be administered at an interval of 28 days. In some embodiments, the pharmaceutical composition comprising the string vaccine may be administered as a boost (or maintenance) once every 6 months, or once 8 month or once every 12 months after an initial phase of priming dose comprising more frequent dosing. In some embodiments the priming dose may comprise 2, 3, 4, 5, 6, 7, 8, 9, 10 or more doses.

[000360] In some embodiments the string vaccine compositions may be used at a dose between 1-1000 microgram per dose per person. In some embodiments, the string vaccine composition may be administered at a dose of 1-600 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 1-500 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 1-400 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 1-300 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 1-200 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 10-300 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 10-200 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 10-100 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 10 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 20 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 30 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 40 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 50 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 60 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 70 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 80 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 90 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 100 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 120 micrograms per dose, per person. In some embodiments, the string vaccine composition may be administered at a dose of 150 micrograms per dose, per person.

[000361] In some embodiments where a string vaccine composition (e.g., as described herein) is administered in combination with a BNT RNA vaccine composition, e.g., a composition comprising an RNA (e.g., mRNA) encoding a viral spike protein (e.g., a SARS CoV-2 S protein or an immunogenic fragment thereof (e.g., RBD)), which in some embodiments may be encapsulated in a lipid nanoparticle, such a BNT RNA vaccine composition may be administered at a dose ranging from 0.1 micrograms to 100 micrograms, 1 to 60 micrograms, 3 to 50 micrograms, 3- 30 micrograms, or 10-30 micrograms. In some embodiments, such a BNT RNA vaccine composition may be administered at a dose of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30 micrograms or more. In some embodiments, a BNT RNA vaccine comprises an RNA (e.g., mRNA) construct encoding a SARS CoV-2 S protein, which can have a structure represented as $m_2^{7,3'-O}$Gppp($m_1^{2'-O}$)ApG)-hAg-Kozak-S1S2-PP-FI-A30L70.

[000362] In some embodiments, a BNT RNA vaccine composition (e.g., as described herein) to be administered in combination with a string vaccine composition (e.g., as described herein) may comprise an initial dose, e.g., the priming dose; and a follow up dose, e.g., a booster dose. In some embodiments, the priming dose and the booster dose are administered at an interval of 20 days. In some embodiments, such BNT RNA vaccine composition doses may be administered at an interval of 21 days. In some embodiments, such BNT RNA vaccine composition doses may be administered at an interval of 22 days. In some embodiments, such BNT RNA vaccine composition doses may be administered at an interval of 23 days. In some embodiments, such BNT RNA vaccine composition may be administered at an interval of 24 days. In some embodiments, such BNT RNA vaccine composition doses may be administered at an interval of 25 days. In some embodiments, such BNT RNA vaccine composition doses may be administered at an interval of 26 days. In some embodiments, such BNT RNA vaccine composition doses may be administered at an interval of 27 days. In some embodiments, such BNT RNA vaccine composition doses may be administered at an interval of 28 days. In some embodiments, such BNT RNA vaccine composition may be administered at an interval of longer than 28 days, e.g., including, e.g., every 1 month, 2 months, 3 months, 4 months, 5 months, 6 months, 7 months, 8 months, 9 months, 10 months, 11 months, 12 months, or longer.

[000363] In some embodiments, a BNT RNA vaccine composition (e.g., as described herein) to be administered in combination with a string vaccine composition (e.g., as described herein)may comprise a modified RNA encoding a viral spike protein (e.g., a SARS CoV-2 S protein or an immunogenic fragment thereof (e.g., RBD)), in which one or more uridine nucleotide residues is replaced with a modified uridine nucleotide (e.g., 1-methylpseudouridine). In some embodiments, at least 10%, or at least 20%, or at least 30%, or at least 40%, or at least 50%, or at least 60% or at least 70%, or at least 80% or at least 90% of the U nucleotides of the structure are replaced by a modified uridine nucleotide (e.g., 1-methylpseudouridine). In some embodiments, 100% of the U nucleotides of the structure are replaced by a modified uridine nucleotide (e.g., 1-methylpseudouridine).

[000364] In some embodiments the vaccine comprising a nucleotide sequence encoding a spike protein may be co-administered with an RNA vaccine comprising a string construct. In some embodiments, the vaccine comprising a nucleotide sequence encoding a spike protein vaccine is administered as an initial dose, followed by an RNA vaccine comprising a string construct comprising sequences encoding 2, 3, 4, 5, 6, 7, 8, 9, 10 or more epitopes from 2 or more viral proteins, as a follow up dose, a maintenance dose, a second dose, a third dose or as one or more booster doses. In some embodiments, a vaccine comprising a nucleotide sequence encoding a spike protein is administered as an initial dose, followed by an RNA vaccine comprising a string construct comprising sequences encoding 2, 3, 4, 5, 6, 7, 8, 9, 10 or more epitopes from 2 or more viral proteins as a follow up dose, a maintenance dose, a second dose, a third dose or as one or more booster doses. In some embodiments, an RNA vaccine comprising a string construct comprising sequences encoding 2, 3, 4, 5, 6, 7, 8, 9, 10 or more epitopes from 2 or more viral proteins is administered to a subject as an initial dose, followed by a vaccine comprising a nucleotide sequence encoding a spike protein as a follow up dose, a maintenance dose, a second dose, a third dose or as one or more booster doses.

[000365] In some embodiments, the pharmaceutical composition comprising a string construct may comprise a coformulation vaccine. In some embodiments, the coformulation vaccine composition may comprise a first string vaccine at a first concentration, and a second string vaccine at a second concentration, and third string vaccine at a third concentration and so on. In some embodiments, a first string vaccine may comprise a vaccine comprising a nucleotide sequence encoding a spike protein.

[000366] In some embodiments, a coformulation composition may comprise a first polynucleotide composition, comprising a nucleotide vaccine encoding a spike protein or fragment thereof.. In some embodiments, the coformulation may comprise a first nucleotide sequence, having a structure $m_2^{7,3'-O}$Gppp($m_1^{2'-O}$)ApG)-hAg-Kozak-S1S2-PP-FI-A30L70, as described above. In some embodiments, the coformulation may comprise a second composition comprising a RS C5, RS C6, RS C7, and RS C8 or a combination thereof. In some embodiments, the coformulation may comprise a second composition comprising a RS C1, RS C2, RS C3, and RS C4 or a combination thereof. In some embodiments, a first nucleotide sequence, having a structure $m_2^{7,3'-O}$Gppp($m_1^{2'-O}$)ApG)-hAg-Kozak-S1S2-PP-FI-A30L70 and a second nucleotide sequence having a RS C1, RS C2, RS C3, RS C4, RS C5, RS C6, RS C7, or RS C8 may be present at a ratio of 20:1, 19:1, 18:1, 17:1, 16:1, 15:1, 14:1, 13:1, 12:1, 11:1, 10:1, 9:1, 8:1, 7:1, 6:1, 5:1, 4:1, 3:1, 2:1 or 1:1. In some embodiments, the coformulation may comprise a second composition comprising a RS C1, RS C2, RS C3, and RS C4 or a combination thereof. In some embodiments, a first nucleotide sequence, having a structure $m_2^{7,3'-O}$Gppp($m_1^{2'-O}$)ApG)-hAg-Kozak-S1S2-PP-FI-A30L70 and a second nucleotide sequence having a RS C1, RS C2, RS C3, RS C4, RS C5, RS C6, RS C7, or RS C8 may be present at a ratio of 1:1, 1:2, 1:3, 1:4, 1:5, 1:6, 1:7, 1:8, 1:9, 1:10, 1:11, 1:12, 1:13, 1:14, 1:15, 1:16, 1:17, 1:18, 1:19 or 1:20.

[000367] In some embodiments, polynucleotides described herein (e.g., a polynucleotide encoding a viral spike protein and/or a polynucleotide encoding a peptide (e.g., comprising an epitope sequence as described herein) may be encapsulated in lipid nanoparticles. In some embodiments, such lipid nanoparticle may comprise one or more cationic or ionizable lipids. In some embodiments, such lipid nanoparticle may optionally comprise neutral lipids (e.g., phospholipids and/or sterols such as, e.g., cholesterol), and/or polymer-conjugated lipids, such as PEGylated lipids.

[000368] In some embodiments, a pharmaceutical composition comprising subject specific T cells may be generated ex vivo, where the subject specific T cell population may be responsive to at least one of the epitopes in Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B, Table 15 or Table 16, or any antigen disclosed in the specification corresponding to a viral antigen. In one embodiment, PBMC from a subject may be isolated (e.g., from a leukapheresis sample), and incubated in the presence of one or more epitopes that are disclosed in any one of the tables (Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B, Table 15 or Table 16) In some embodiments the antigen may be selected based on the MHC peptides present in the subject, such that the antigen peptides have high affinity and presentation prediction score in combination with the MHC, based on the peptide: MHC pairs disclosed in Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B, Table 15 or Table 16.

[000369] In some embodiments, a pharmaceutical composition comprises: (i) a peptide comprising an epitope sequence selected from: NYNYLYRLF; KWPWYIWLGF; QYIKWPWYI; LPFNDGVYF; QPTESIVRF; IPFAMQMAY; YLQPRTFLL; and/or RLQSLQTYV; (ii) a polynucleotide encoding the peptide; (iii) a T cell receptor (TCR) or a T cell comprising the TCR, wherein the TCR binds to the epitope sequence in complex with a corresponding MHC class I or class II molecule; (iv) an antigen presenting cell comprising (i) or (ii); or (v) an antibody or B cell comprising the antibody, wherein the antibody binds to the epitope sequence.

[000370] In some embodiments, a pharmaceutical composition comprising T cells may be generated ex vivo wherein the T cells may be responsive to an epitope sequence comprising or consisting of NYNYLYRLF, wherein in some embodiments the subject expresses an MHC protein encoded by HLA-A*2402. In some embodiments, a pharmaceutical composition comprising subject specific T cells may be generated ex vivo wherein the T cells may be responsive to an epitope sequence comprising or consisting of, KYIKWPWYI, wherein in some embodiments the subject expresses an MHC protein encoded by HLA-A*2402. In some embodiments, a pharmaceutical composition comprising subject specific T cells may be generated ex vivo wherein the T cells may be responsive to an epitope sequence comprising or consisting of KWPWYIWLGF, wherein in some embodiments the subject expresses an MHC protein encoded by HLA-A*2402. In some embodiments, a pharmaceutical composition comprising subject specific T cells

may be generated ex vivo wherein the T cells may be responsive to an epitope sequence comprising or consisting of QYIKWPWYI, wherein in some embodiments the subject expresses an MHC protein encoded by HLA-A*2402.

[000371] In some embodiments, a pharmaceutical composition comprising T cells may be generated ex vivo wherein the T cells may be responsive to an epitope sequence comprising or consisting of LPFNDGVYF, wherein in some embodiments the subject expresses an MHC protein encoded by HLA-B*3501. In some embodiments, a pharmaceutical composition comprising T cells may be generated ex vivo wherein the T cells may be responsive to an epitope sequence comprising or consisting of QPTESIVRF, wherein in some embodiments the subject expresses an MHC protein encoded by HLA-B*3501. In some embodiments, a pharmaceutical composition comprising T cells may be generated ex vivo wherein the T cells may be responsive to an epitope sequence comprising or consisting of, IPFAMQMAY, wherein in some embodiments the subject expresses an MHC protein encoded by HLA-B*3501.

[000372] In some embodiments, a pharmaceutical composition comprising T cells may be generated ex vivo wherein the T cells may be responsive to an epitope sequence comprising or consisting of YLQPRTFLL, wherein in some embodiments the subject expresses an MHC protein encoded by HLA-A*0201. In some embodiments, a pharmaceutical composition comprising T cells may be generated ex vivo wherein the T cells may be responsive to an epitope sequence comprising or consisting of RLQSLQTYV, wherein in some embodiments the subject expresses an MHC protein encoded by HLA-A*0201.

[000373] In some embodiment, a string vaccine may be formulated to be delivered in an aqueous solution systemically by injection to a subject. The string vaccine may comprise one or more polynucleotides, such as RNA, such as mRNA. In some embodiments the mRNA may be associated with one or more lipids. In some embodiments, the string vaccine may be co-formulated to comprise one or more strings, one or more spike mRNA vaccines and one or more strings comprising epitope sequences covering one or more of the other viral proteins, ORF1ab, nucleocapsid, membrane protein or a combination thereof. In some embodiments, the vaccine is formulated for systemic injection, such as intramuscular, subcutaneous, intravenous, intraocular.

[000374] In some embodiments the string mRNA is contacted to a cell population, comprising antigen presenting cells and T cells. In some embodiments, the string mRNA is electroporated in a cell, such as an APC. In some embodiments, T cells are generated as described elsewhere within the application, that are primed with APCs expressing one or more strings.

[000375] In some embodiments, any vaccine composition comprising the spike mRNA vaccine or a string vaccine or a string vaccine in combination with other therapeutics may be administered to a selected patient group, depending on the age, health condition, gender, medical histories, ethnicity in relation to disease

propensity and outcome and so forth. In some embodiments, patient population may be categorized as high risk based on age, health condition, gender, medical histories, ethnicity in relation to disease propensity and outcome and so forth. A therapeutic comprising a string vaccine or a string vaccine in combination with a second therapeutic may be administered to a patient population only if the patient population has been categorized as high risk. Conversely, a therapeutic comprising a string vaccine or a string vaccine in combination with a second therapeutic may be administered to a patient population only if the patient population has been categorized as low risk. In some embodiments, the vaccine composition, alone or in combination may be to patients of 19-55 years of age. In some embodiments, the vaccine composition, alone or in combination may be to patients of 12-65 years of age. In some embodiments, the vaccine composition, alone or in combination may be to patients of 12-35 years of age. In some embodiments, the vaccine composition, alone or in combination may be to patients of 19-35 years of age. In some embodiments, the vaccine composition, alone or in combination may be to patients of 35-55 years of age. In some embodiments, the vaccine composition, alone or in combination may be to patients of 40-65 years of age. In some embodiments, the vaccine composition, alone or in combination may be to patients of 65-85 years of age. In some embodiments, the vaccine composition, alone or in combination may be to patients of age 12 or younger. In some embodiments, the vaccine composition, alone or in combination may be to patients of age 10 or younger. In some embodiments, the vaccine composition, alone or in combination may be to adolescent populations (e.g., individuals approximately 12 to approximately 17 years of age). In some embodiments, the vaccine composition, alone or in combination may be to a pediatric population. In various embodiments, the pediatric population comprises or consists of subjects under 18 years, e.g., 5 to less than 18 years of age, 12 to less than 18 years of age, 16 to less than 18 years of age, 12 to less than 16 years of age, or 5 to less than 12 years of age. In various embodiments, the pediatric population comprises or consists of subjects under 5 years, e.g., 2 to less than 5 years of age, 12 to less than 24 months of age, 7 to less than 12 months of age, or less than 6 months of age.

[000376] In some embodiments, a therapeutic comprising a string vaccine or a string vaccine in combination with a second therapeutic may be administered to a patient who has one or more comorbidities, such as a chronic illness, e.g., cancer, diabetes, kidney disease or CFTR. In some embodiments, a therapeutic comprising a string vaccine or a string vaccine in combination with a second therapeutic may not be administered to a patient who has one or more comorbidities, such as a chronic illnesses. In some embodiments, a therapeutic comprising a string vaccine or a string vaccine in combination with a second therapeutic may be administered to subjects whose profession and/or environmental exposure may dramatically increase their risk of getting SARS CoV-2 infection (including, e.g., but not limited to mass transportation, prisoners, grocery store workers, residents in long-term care facilities, butchers or other meat processing workers, healthcare workers, and/or first responders, e.g., emergency responders). In some embodiments, a therapeutic comprising a string vaccine or a string vaccine in combination with a second

therapeutic may be administered to healthcare workers and/or first responders, e.g., emergency responders. In some embodiments, a therapeutic comprising a string vaccine or a string vaccine in combination with a second therapeutic may be administered to those with a history of smoking or vaping (e.g., within 6 months, 12 months or more, including a history of chronic smoking or vaping). In some embodiments, a therapeutic comprising a string vaccine or a string vaccine in combination with a second therapeutic may be administered to certain ethnic groups that have been determined to be more susceptible to SARS CoV-2 infection. In some embodiments, a therapeutic comprising a string vaccine or a string vaccine in combination with a second therapeutic may be administered to certain populations with a blood type that may have been determined to more susceptible to SARS CoV-2 infection. In some embodiments, a therapeutic comprising a string vaccine or a string vaccine in combination with a second therapeutic may be administered to immunocompromised subjects (e.g., those with HIV/AIDS; cancer and transplant patients who are taking certain immunosuppressive drugs; autoimmune diseases or other physiological conditions expected to warrant immunosuppressive therapy (e.g., within 3 months, within 6 months, or more); and those with inherited diseases that affect the immune system (e.g., congenital agammaglobulinemia, congenital IgA deficiency)). In some embodiments, a therapeutic comprising a string vaccine or a string vaccine in combination with a second therapeutic may be administered to those with an infectious disease. For example, in some embodiments, a therapeutic comprising a string vaccine or a string vaccine in combination with a second therapeutic may be administered to those infected with human immunodeficiency virus (HIV) and/or a hepatitis virus (e.g., HBV, HCV). In some embodiments, a therapeutic comprising a string vaccine or a string vaccine in combination with a second therapeutic may be administered to those with underlying medical conditions. Examples of such underlying medical conditions may include, but are not limited to hypertension, cardiovascular disease, diabetes, chronic respiratory disease, e.g., chronic pulmonary disease, asthma, etc., cancer, and other chronic diseases such as, e.g., lupus, rheumatoid arthritis, chronic liver diseases, chronic kidney diseases (e.g., Stage 3 or worse such as in some embodiments as characterized by a glomerular filtration rate (GFR) of less than 60 mL/min/1.73m2). In some embodiments, a therapeutic comprising a string vaccine or a string vaccine in combination with a second therapeutic may be administered to overweight or obese subjects, e.g., specifically including those with a body mass index (BMI) above about 30 kg/m2. In some embodiments, a therapeutic comprising a string vaccine or a string vaccine in combination with a second therapeutic may be administered to subjects who have prior diagnosis of COVID-19 or evidence of current or prior SARS CoV-2 infection, e.g., based on serology or nasal swab.

[000377] In some embodiments, the string vaccine described herein may confer resistance, cross protection and generate immunogenicity against other SARS viruses or to a variety of viral strains having similarity to the 2019 SARS-Cov 2.

Kits

[000378] The viral epitope therapeutic described herein can be provided in kit form together with instructions for administration. Typically, the kit would include the desired antigen therapeutic in a container, in unit dosage form and instructions for administration. Additional therapeutics, for example, cytokines, lymphokines, checkpoint inhibitors, antibodies, can also be included in the kit. Other kit components that can also be desirable include, for example, a sterile syringe, booster dosages, and other desired excipients.

[000379] The invention will be described in greater detail by way of specific examples. The following examples are offered for illustrative purposes, and are not intended to limit the invention in any manner. Those of skill in the art will readily recognize a variety of non-critical parameters that can be changed or modified to yield alternative embodiments according to the invention. All patents, patent applications, and printed publications listed herein are incorporated herein by reference in their entirety.

EMBODIMENTS

WHAT IS EMBODIMENTED IS:

1. An embodiment of the disclosure is a composition comprising:

(i) a polypeptide comprising at least two of the following (a) a sequence comprising an epitope sequence from ORF1ab, (b) a sequence comprising an epitope sequence from membrane glycoprotein (M) and (c) a sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N);

(ii) a polynucleotide encoding the polypeptide;

(iii) a T cell receptor (TCR) or a T cell comprising the TCR, wherein the TCR binds to an epitope sequence of the polypeptide in complex with a corresponding HLA class I or class II molecule;

(iv) an antigen presenting cell comprising (i) or (ii); or

(v) an antibody or B cell comprising the antibody, wherein the antibody binds to an epitope sequence of the polypeptide; and

a pharmaceutically acceptable excipient.

2. The composition, in one embodiment comprises (a) a sequence comprising an epitope sequence from ORF1ab, (b) a sequence comprising an epitope sequence from membrane glycoprotein (M) and (c) a sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N).

3. The composition of the embodiment, wherein the sequence comprising an epitope sequence from ORF1ab is C-terminal to the sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N).

4. The composition of the embodiment, wherein the sequence comprising an epitope sequence from ORF1ab is N-terminal to the sequence comprising an epitope sequence from membrane glycoprotein (M).

5. The composition of the embodiment, wherein the sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N) is N-terminal to the sequence comprising an epitope sequence from membrane glycoprotein (M).

6. The composition of the embodiment, wherein the composition comprises (a) 2, 3, 4, 5, 6, 7, 8, 9 or 10 or more epitope sequence from ORF1ab, (b) a sequence comprising an epitope sequence from membrane glycoprotein (M) and (c) a sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N).

7. The composition of the embodiments above, wherein the epitope sequence from ORF1ab is an epitope sequence from a non-structural protein.

8. The composition of the embodiments above, wherein the non-structural protein is selected from the group consisting of NSP1, NSP2, NSP3, NSP4 and combinations thereof.

9. The composition of the embodiments above, wherein the polypeptide comprises a sequence comprising an epitope sequence from NSP1, a sequence comprising an epitope sequence from NSP2, a sequence comprising an epitope sequence from NSP3 and a sequence comprising an epitope sequence from NSP4.

10. The composition of the embodiments above, wherein the epitope sequence from ORF1ab is selected from the group consisting of YLFDESGEFKL, YLFDESGEF, FGDDTVIEV, QLMCQPILL, TTDPSFLGRY, PTDNYITTY, PSFLGRY, AEAELAKNV, KTIQPRVEK and any combination thereof.

11. The composition of the embodiments above, wherein the epitope sequence from nucleocapsid glycoprotein (N) is LLLDRLNQL.

12. The composition of the embodiments above, wherein the epitope sequence from membrane phosphoprotein (M) is VATSRTLSY.

13. The composition of the embodiments above, wherein the polypeptide comprises an epitope sequence from nucleocapsid glycoprotein (N) that is LLLDRLNQL and an epitope sequence from membrane phosphoprotein (M) that is VATSRTLSY.

14. The composition of the embodiments above, wherein the polypeptide comprises (a) each of the following epitope sequences from ORF1ab: YLFDESGEFKL, YLFDESGEF, FGDDTVIEV, QLMCQPILL, TTDPSFLGRY, PTDNYITTY, PSFLGRY, AEAELAKNV, KTIQPRVEK; (b) an epitope sequence from nucleocapsid glycoprotein (N) that is LLLDRLNQL; and (c) an epitope sequence from membrane phosphoprotein (M) that is VATSRTLSY.

15. The composition of the embodiments above, wherein the sequence comprising an epitope sequence from ORF1ab is selected from the group consisting of the following sequences or fragments thereof:
MVTNNTFTLKVPHVGEIPVAYRKVLLKTIQPRVEKYLFDESGEFKLSEVGPEHSLAEYYIFFASFYY;
MVTNNTFTLKVPHVGEIPVAYRKVLLKTIQPRVEKYLFDESGEFKLSEVGPEHSLAEY;
APKEIIFLEGETLFGDDTVIEVAIILASFSAST;
APKEIIFLEGETLFGDDTVIEV;
HTTDPSFLGRYMSALFADDLNQLTGYHTDFSSEIIGYQLMCQPILLAEAELAKNVSLILGTVSWNL;
TTDPSFLGRYMSALFADDLNQLTGYHTDFSSEIIGYQLMCQPILLAEAELAKNVSLILGTVSWNL;
LLSAGIFGAITDVFYKENSYKVPTDNYITTY; and combinations thereof.

16. The composition of the embodiments above, wherein the sequence comprising an epitope sequence from membrane glycoprotein (M) is selected from the group consisting of the following sequences or fragments thereof:

ADSNGTITVEELKKLLEQWNLVIGFLFLTWICLLQFAYANRNRFLYIIKLIFLWLLWPVTLACFVLAA
VYRINWITGGIAIAMACLVGLMWLSYFIASFRLFARTRSMWSFNPETNILLNVPLHGTILTRPLLESEL
VIGAVILRGHLRIAGHHLGRCDIKDLPKEITVATSRTLSYYKLGASQRVAGDSGFAAYSRYRIGNYKL
NTDHSSSSDNIALLVQ;
FAYANRNRFLYIIKLIFLWLLWPVTLACFVLAAVYRINWITGGIAIAMACLVGLMWLSYFIASFRLF;
LGRCDIKDLPKEITVATSRTLSYYKLGASQRVA;
KLLEQWNLVIGF;
NRNRFLYIIKLIFLWLLWPVTLACFVLAAVY;
SELVIGAVILRGHLRIAGHHLGR;
VATSRTLSYYKLGASQRV;
GLMWLSYF; and combinations thereof.

17. The composition of the embodiments above, wherein the sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N) is selected from the group consisting of the following sequences or fragments thereof:

KDLSPRWYFYYLGTGPEAGLPYGANKDGIIWVATEGALNTPKDHIGTRNPANNAAIVLQLPQGTTLP
KGFYAEGSRGGSQASSRSSSRSRNSSRNSTPGSSRGTSPARMAGNGGDAALALLLLDRLNQLESKMS
GKGQQQQGQTVTKKSAAEASKKPRQKRTATKAYNVTQAFGRRGPEQTQGNFGDQELIRQGTDYKH
WPQIAQFAPSASAFFGMSRIGMEVTPSGTWLTYTGAIKLDDKDPNFKDQVILLNKHIDAYKTFPPTEP
KKDKKKKADETQALPQRQKKQQTVTLLPAADLDDFSKQLQQSMSSADSTQA;
RMAGNGGDAALALLLLDRLNQLESKMSGKGQQQ;
YKHWPQIAQFAPSASAFFGMSRIGMEVTPSGTWLTYTGAIKLDDKDPNFKDQVILLNKHIDAYKTFP;
SPARMAGNGGDAALALLLLDRLNQLESKMSGKGQQQQGQTVTKKSAAEASKKPRQKRTATKAYN
VTQAFGRRGPEQTQGNFGDQELIRQGTDYKHWPQIAQFAPSASAFFGMSRIGMEVTPSGTWLTYTGA
IKLDDKDPNFKDQVILLNKHIDAYKTFPPTEPKKDK and combinations thereof.

18. The composition of the embodiments above, wherein the polypeptide further comprises a signal peptide sequence.

19. The composition of the embodiments above, wherein the signal peptide sequence is MRVMAPRTLILLLSGALALTETWAGS.

20. The composition of embodiment 1, wherein the polypeptide further comprises an MITD sequence.

21. The composition of the embodiments above, wherein the MITD sequence is IVGIVAGLAVLAVVVIGAVVATVMCRRKSSGGKGGSYSQAASSDSAQGSDVSLTA.

22. The composition of embodiment 1, wherein the polypeptide comprises one or more linker sequences.

23. The composition of the embodiments above, wherein the one or more linker sequences are selected from the group consisting of GGSGGGGSGG, GGSLGGGGSG.

24. The composition of embodiment 22, wherein the one or more linker sequences comprise cleavage sequences.

25. The composition of the embodiments above, wherein the one or more cleavage sequences are selected from the group consisting of FRAC, KRCF, KKRY, ARMA, RRSG, MRAC, KMCG, ARCA, KKQG, YRSY, SFMN, FKAA, KRNG, YNSF, KKNG, RRRG, KRYS, and ARYA.

26. The composition of embodiment 1, wherein the polypeptide comprises a transmembrane domain sequence.

27. The composition of embodiment 26, wherein the transmembrane sequence is C-terminal to the sequence comprising an epitope sequence from ORF1ab, the sequence comprising an epitope sequence from membrane glycoprotein (M) and the sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N).

28. The composition of embodiment 26, wherein the transmembrane sequence is EQYIKWPWYIWLGFIAGLIAIVMVTIMLCCMTSCCSCLKGCCSCGSCCKFDEDDSEPVLKGVKLHYT.

29. The composition of embodiment 1, wherein the polypeptide comprises an SEC sequence.

30. The composition of embodiment 29, wherein the SEC sequence is N-terminal to the sequence comprising an epitope sequence from ORF1ab, the sequence comprising an epitope sequence from membrane glycoprotein (M) and the sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N).

31. The composition of embodiment 29, wherein the SEC sequence is MFVFLVLLPLVSSQCVNLT.

32. The composition of embodiment 1, wherein the composition comprises the polynucleotide encoding the polypeptide.

33. The composition of embodiment 32, wherein the polynucleotide is an mRNA.

34. The composition of embodiment 32, wherein the polynucleotide comprises a codon optimized sequence for expression in a human.

35. The composition of embodiment 32, wherein the polynucleotide comprises a dEarI-hAg sequence.

36. The composition of embodiment 35, wherein the dEarI-hAg sequence is ATTCTTCTGGTCCCCACAGACTCAGAGAGAACCC, optionally wherein each T is a U.

37. The composition of embodiment 32, wherein the polynucleotide comprises a Kozak sequence.

38. The composition of embodiment 37, wherein the a Kozak sequences is GCCACC.

39. The composition of embodiment 32, wherein the polynucleotide comprises an F element sequence.

40. The composition of embodiment 39, wherein the F element sequence is a 3 UTR of aminoterminal enhancer of split (AES).

41. The composition of embodiment 39, wherein the F element sequence is CTGGTACTGCATGCACGCAATGCTAGCTGCCCCTTTCCCGTCCTGGGTACCCCGAGTCTCCCCCG ACCTCGGGTCCCAGGTATGCTCCCACCTCCACCTGCCCCACTCACCACCTCTGCTAGTTCCAGAC ACCTCC, optionally wherein each T is a U.

42. The composition of embodiment 32, wherein the polynucleotide comprises an I element sequence.

43. The composition of embodiment 42, wherein the I element sequence is a 3' UTR of mitochondrially encoded 12S rRNA (mtRNR1).

44. The composition of embodiment 42, wherein the I element sequence is CAAGCACGCAGCAATGCAGCTCAAAACGCTTAGCCTAGCCACACCCCCACGGGAAACAGCAGTG ATTAACCTTTAGCAATAAACGAAAGTTTAACTAAGCTATACTAACCCCAGGGTTGGTCAATTTCG TGCCAGCCACACC, optionally wherein each T is a U.

45. The composition of embodiment 32, wherein the polynucleotide comprises a poly A sequence.

46. The composition of embodiment 45, wherein the poly A sequence is AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGCATATGACTAAAAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA, optionally wherein each T is a U.

47. The composition of embodiment 1, wherein each of the epitope sequences from the ORF1ab, the membrane glycoprotein, and the nucleocapsid phosphoprotein are from 2019 SARS-CoV-2.

48. The composition of embodiment 1, wherein one or more or each epitope elicits a T cell response.

49. The composition of embodiment 1, wherein one or more or each epitope has been observed by mass spectrometry as being presented by an HLA molecule.

50. The composition of embodiment 1, wherein the polypeptide comprises a sequence selected from the group consisting of RS C1n, RS C2n, RS C3n, RSC4n, RS C5n, RS C6n, RS C7n, and RS C8n.

51. A pharmaceutical composition comprising the composition of any one of embodiments above.

52. A pharmaceutical composition comprising:

(i) a polypeptide comprising an epitope sequence of Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B and/or Table 16;

(ii) a polynucleotide encoding the polypeptide;

(iii) a T cell receptor (TCR) or a T cell comprising the TCR, wherein the TCR binds to the epitope sequence in complex with a corresponding HLA class I or class II molecule;

(iv) an antigen presenting cell comprising (i) or (ii); or

(v) an antibody or B cell comprising the antibody, wherein the antibody binds to the epitope sequence; and a pharmaceutically acceptable excipient.

53. The pharmaceutical composition of the embodiment 52, wherein the epitope sequence comprises one or more or each of the following: YLFDESGEFKL, YLFDESGEF, FGDDTVIEV, LLLDRLNQL, QLMCQPILL, TTDPSFLGRY, PTDNYITTY, PSFLGRY, AEAELAKNV, VATSRTLSY and KTIQPRVEK.

54. The pharmaceutical composition of the embodiment 52, wherein the epitope sequence comprises one or more or each of the following: SAPPAQYEL, AVASKILGL, EYADVFHLY, DEFTPFDVV, VRIQPGQTF, SFRLFARTR, KFLPFQQF, VVQEGVLTA, RLDKVEAEV, FGADPIHSL, NYNYLYRLF, KYIKWPWYI, KWPWYIWLGF, LPFNDGVYF, QPTESIVRF, IPFAMQMAY, YLQPRTFLL and RLQSLQTYV.

55. The pharmaceutical composition of embodiment 52, wherein the epitope sequence is from an orf1ab protein.

56. The pharmaceutical composition of embodiment 52, wherein the epitope sequence is from an orf1a protein

57. The pharmaceutical composition of embodiment 52, wherein the epitope sequence is from a surface glycoprotein (S) or a shifted reading frame thereof.

58. The pharmaceutical composition of embodiment 52, wherein the epitope sequence is from a nucleocapsid phosphoprotein (N).

59. The pharmaceutical composition of embodiment 52, wherein the epitope sequence is from an ORF3a protein.

60. The pharmaceutical composition of embodiment 52, wherein the epitope sequence is from a membrane glycoprotein (M).

61. The pharmaceutical composition of embodiment 52, wherein the epitope sequence is from an ORF7a protein.

62. The pharmaceutical composition of embodiment 52, wherein the epitope sequence is from an ORF8 protein.

63. The pharmaceutical composition of embodiment 52, wherein the epitope sequence is from an envelope protein (E).

64. The pharmaceutical composition of embodiment 52, wherein the epitope sequence is from an ORF6 protein.

65. The pharmaceutical composition of embodiment 52, wherein the epitope sequence is from an ORF7b protein.

66. The pharmaceutical composition of embodiment 52, wherein the epitope sequence is from an ORF10 protein.

67. The pharmaceutical composition of embodiment 52, wherein the epitope sequence is from an ORF9b protein.

68. A pharmaceutical composition comprising: one or more polypeptides having an amino acid sequence of any one of the sequences depicted in column 2 of Table 11 and 12 and column 3 of Table 15; or one or more recombinant polynucleotide constructs each encoding a polypeptide having an amino acid sequence of any one of the sequences depicted in column 2 of Table 11 and 12, and column 3 of Table 15.

69. The pharmaceutical composition of embodiment 68, wherein the one or more polypeptides comprises at least 2, 3, 4, 5, 6, 7 or 8 different polypeptides having an amino acid sequence of any one of the sequences depicted in column 2 of Table 11, and Table 12, and an amino acid sequence of any one of the sequences depicted in column 3 of Table 15; or wherein the one or more recombinant polynucleotide constructs comprises at least 2, 3, 4, 5, 6, 7 or 8 recombinant polynucleotide constructs each encoding a different polypeptide having an amino acid sequence of any one of the sequences depicted in column 2 of Table 11 and 12 and column 3 of Table 15.

70. The pharmaceutical composition of embodiment 68, wherein the one or more recombinant polynucleotide constructs comprises a sequence with at least 70%, 80%, 90% or 100% sequence identity to a sequence selected from the group consisting of SEQ IDs: RS C1n, RS C2n, RS C3n, RSC4n, RS C5n, RS C6n, RS C7n, and RS C8n.

71. The pharmaceutical composition of embodiment 68, wherein the recombinant polynucleotide construct is an mRNA.

72. The pharmaceutical composition of any one of the embodiments 51, 52 or 68, further comprising one or more lipid components.

73. The pharmaceutical composition of embodiment 72, wherein the one or more lipids comprise a lipid nanoparticle (LNP).

74. The pharmaceutical composition of embodiment 73 wherein the LNP encapsulates the recombinant polynucleotide construct.

75. The pharmaceutical composition of any one of the embodiments 51, 52 or 68, wherein the polypeptide is synthetic.

76. The pharmaceutical composition of any one of the embodiments 51, 52 or 68, wherein the polypeptide is recombinant.

77. The pharmaceutical composition of any one of the embodiments 51, 52 or 68,, wherein the polypeptide is from 8-1000 amino acids in length.

78. The pharmaceutical composition of any one of the embodiments 51, 52 or 68, wherein the epitope sequence binds to or is predicted to bind to an HLA class I or class II molecule with a KD of 1000 nM or less.

79. The pharmaceutical composition of any one of the embodiments 51, 52 or 68, wherein the epitope sequence binds to or is predicted to bind to an HLA class I or class II molecule with a KD of 500 nM or less.

80. The pharmaceutical composition of any one of the embodiments 51, 52 or 68, wherein the epitope sequence comprises a sequence of a viral protein expressed by a virus-infected cell of a subject.

81. The pharmaceutical composition of embodiment 80, wherein the virus is 2019 SARS-CoV 2.

82. A method of treating or preventing an infection by a virus or treating a respiratory disease or condition associated with an infection by a virus comprising administering to a subject in need thereof the pharmaceutical composition of any one of the embodiments 51, 52 or 68.

83. The method of embodiment 82, wherein the virus is a coronavirus.

84. The method of embodiment 82, wherein the virus is 2019 SARS-CoV 2.

85. The method of embodiment 82, wherein an HLA molecule expressed by the subject is unknown at the time of administration.

86. The method of embodiment 82, wherein the ability of the virus or a mutant version thereof to avoid escape of recognition by an immune system of the subject is less compared to the ability of the virus or a mutant version thereof to avoid escape of recognition by an immune system of a subject administered a pharmaceutical composition containing an epitope from a single protein or epitopes from fewer proteins than in the pharmaceutical composition of any one of the embodiments 51, 52 or 68.

87. The method of embodiment 82, wherein the subject express an HLA molecule encoded by an HLA allele of any one of Table 1A, Table 1B, Table 1C, Table 2Ai or Table 2Aii, Table 2B or Table 16 and the epitope sequence is an HLA allele-matched epitope sequence.

88. The method of embodiment 82, wherein the epitope sequence comprises one or more or each of the following: SAPPAQYEL, AVASKILGL, EYADVFHLY, DEFTPFDVV, VRIQPGQTF, SFRLFARTR, KFLPFQQF, VVQEGVLTA, RLDKVEAEV and FGADPIHSL.

89. A method of treating or preventing a 2019 SARS-CoV 2 infection in a subject in need thereof, comprising administering to the subject a pharmaceutical composition of any one of the embodiments 51, 52 or 68.

90. The method of embodiment 89, wherein the pharmaceutical composition is administered in addition to one or more therapeutics for the 2019 SARS-CoV 2 viral infection in the subject.

91. The method of embodiment 89, wherein the pharmaceutical composition is administered in combination with (a) a polypeptide having an amino acid sequence of a 2019 SARS-CoV 2 spike protein or fragment thereof; (b) a recombinant polynucleotide encoding a 2019 SARS-CoV 2 spike protein or fragment thereof; or a 2019 SARS-CoV 2 spike protein pharmaceutical composition comprising (a) or (b).

92. The method of embodiment 89, wherein the 2019 SARS-CoV 2 spike protein or fragment thereof is a SARS-CoV-2 spike protein or a fragment thereof.

93. The method of embodiment 89, wherein the pharmaceutical composition is administered 1-10 weeks after a first administration of the 2019 SARS-CoV 2 spike protein pharmaceutical composition.

94. The method of embodiment 89, wherein the pharmaceutical composition is administered 1-6 weeks, 1-6 months or 1-2 years or later after a first administration of the 2019 SARS-CoV 2 spike protein pharmaceutical composition.

95. The method of embodiment 89, wherein the pharmaceutical composition is administered on the same day or simultaneously with an administration of the 2019 SARS-CoV 2 spike protein pharmaceutical composition.

96. The method of embodiment 95, wherein the pharmaceutical composition is co-formulated with the polypeptide having an amino acid sequence of a 2019 SARS-CoV 2 spike protein or fragment thereof or the recombinant polynucleotide encoding a 2019 SARS-CoV 2 spike protein or fragment thereof.

97. The method of embodiment 89, wherein the pharmaceutical composition is administered before an administration of the 2019 SARS-CoV 2 spike protein pharmaceutical composition, such as 2-10 weeks before an administration of the 2019 SARS-CoV 2 spike protein pharmaceutical composition.

98. The method of embodiment 89, wherein the pharmaceutical composition is administered prophylactically.

99. The method of embodiment 89, wherein the pharmaceutical composition is administered once every 1, 2, 3, 4, 5, 6 or more weeks; or once every 1-7, 7-14, 14-21, 21-28, or 28-35 days; or once every 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, or 35 days.

100. Use of the composition of any one of the embodiments 1-50 for preparing a therapeutic for treating or preventing a respiratory viral infection caused by 2019 SARS CoV-2 virus.

101. A method of treating or preventing a viral infection or treating a respiratory disease or condition associated with the viral infection comprising: administering to a subject in need thereof the pharmaceutical composition of embodiment 1.

102. The method of embodiment 101, wherein the virus is a coronavirus.

103. The method of embodiment 101, wherein the virus is 2019 SARS-CoV 2.

104. The method of embodiment 101, wherein the subject express an MHC molecule encoded by an HLA allele of any one of Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii or Table 2B or Table 16 and the epitope sequence is an HLA allele-matched epitope sequence.

105. The method of embodiment 101, wherein the epitope sequence comprises one or more or each of the following: SAPPAQYEL, AVASKILGL, EYADVFHLY, DEFTPFDVV, VRIQPGQTF, SFRLFARTR, KFLPFQQF, VVQEGVLTA, RLDKVEAEV and FGADPIHSL.

EXAMPLES

Example 1: Sequence-based prediction of vaccine targets for inducing T cell responses to SARS-COV-2

[000380] Coronaviruses are positive-sense single-stranded RNA viruses that have occasionally emerged from zoonotic sources to infect human populations. Most coronavirus infections cause mild respiratory symptoms. However, some recent coronavirus infections have resulted in serious morbidity and mortality, including the severe acute respiratory syndrome coronavirus (SARS-CoV), Middle East respiratory syndrome coronavirus (MERS-CoV) and 2019 SARS-CoV-2, which is responsible for the current worldwide pandemic, COVID-19. These three viruses belong to the genus *Betacoronaviridae*. SARS-CoV was identified in South China in 2002 and its global spread led to 8,096 cases and 774 deaths. The first case of MERS-CoV emerged in 2012 in Saudi Arabia, and since then a total of 2,494 cases and 858 associated deaths have been reported. In contrast to the more limited scope of these other coronavirus infections, SARS-CoV-2, which emerged in Wuhan, China at the end of December 2019, has resulted in 4,077,355 cases, including 279,043 deaths globally as of May 9, 2020. The rapid spread of SARS CoV-2 has resulted in the World Health Organization declaring a global pandemic. Thus, there is an urgent need for effective vaccines and antiviral treatments against SARS CoV-2 to reduce the spread of this highly infectious agent.

[000381] The genome of SARS CoV-2 spans 30 kilobases in length and encodes for 13 open reading frames (ORFs), including four structural proteins. These structural proteins are the spike protein (S), the membrane protein (M), the envelope protein (E), and the nucleocapsid protein (N). In addition, there are over 20 non-structural proteins that account for all the proteins involved in the transcription and replication of the virus. All encoded proteins of the virus are potential candidates for developing vaccines to induce robust T cell immunity.

[000382] SARS-CoV and SARS CoV-2 share 76% amino acid identity across the genome. This high degree of sequence similarity allows us to leverage the previous research on protective immune responses to SARS-CoV to aid in vaccine development for SARS-CoV-2. Both humoral and cellular immune responses have been shown to be important in host responses to SARS-CoV. Antibody responses generated against the S and the N proteins have shown to protect from SARS-CoV infection in mice and have been detected in SARS-CoV infected patients. However, the antibody responses detected against the S protein were undetectable in patients six years post-recovery. In addition, higher titers of antibodies have been found in more severe clinical cases of viral infection suggesting that a robust antibody response alone may be insufficient for controlling SARs-CoV and SARS CoV-2 infection.

[000383] Together with B cell immunity, T cell responses seem important in the immune response's control of SARS-CoV and is most likely important for the control of SARS-CoV-2. In mice, studies have shown that adoptive transfer of SARS-CoV-specific memory CD8+ T cells provided protection against a

lethal SARS-CoV infection in aged mice and that adoptive transfer of effector CD4+ and CD8+ T cells to immunodeficient or young mice expedited virus clearance and improved clinical results. Both CD4+ and CD8+ T cell responses have also been detected in SARS-CoV and SARS-CoV-2-infected patients. Additionally, SARS-CoV specific memory CD8+ T cells have been found to persist for up to 11 years post-infection in patients who recovered from SARS. These viral specific CD8+ T cells can be cytotoxic and can kill virally infected cells to reduce disease severity. In addition to having effector functions, CD4+ T cells can promote the production of virus-specific antibodies by activating T-dependent B cells. Given the wealth of data from SARS-CoV, the homology between the SARS CoV-2 and SARS-CoV, as well as emerging data from SARS-CoV-2, T cell immunity likely plays a critical role in providing protection against SARS-CoV-2.

[000384] Here, we utilized mass spectrometry (MS)-based HLA-I and HLA-II epitope binding prediction tools to identify SARS CoV-2 epitopes recognized by CD4+and CD8+T cells. These binding predictors were trained on high-quality mono-allelic HLA immunopeptidome data generated via MS. The use of MS for the identification of MHC peptide ligandome yields an extensive and relatively unbiased population of naturally processed and presented MHC binding peptides *in vivo*. Unlike traditional binding assays which rely on chemical synthesis and a priori knowledge of peptides and ligands to be assayed, MS uses natural peptide-MHC complexes which are subject to the endogenous processing and presentation pathways within the cell. Additionally, the use of engineered mono-allelic cell lines avoids dependence on in-silico deconvolution techniques and allows for allele coverage to be expanded in a targeted manner.

[000385] With this approach, we generated binding predictors for 74 HLA-I and 83 HLA-II alleles. Alleles selected for data collection were prioritized to maximize population coverage. This MS data enabled us to train allele-specific neural network-based binding predictors that outperform the leading affinity-based predictors for both HLA-I and HLA-II. Furthermore, we demonstrated in Abelin et al., 2019 that this improved binding prediction led to improved immunogenicity prediction by validating this approach on a data set of immune responses to a diverse collection of pathogens and allergens. Here, we specifically validated the binding predictors utilizing *Coronaviridae* family peptides that had been assayed for T cell reactivity or MHC binding from the Virus Pathogen Resource (ViPR) database. The ViPR database integrates viral pathogen data from internally curated data, researcher submissions, and data from various external sources. Our approach provides a significant improvement in both the breadth of predictions, and their validity, compared with a recent study that had a similar aim, but relied upon a smaller validation data set and fewer covered alleles, leading to a much more limited set of bioinformatically predicted SARS CoV-2 epitopes.

[000386] We used our MS-based HLA-I and HLA-II binding predictors to predict the binding potential of peptide sequences from across the entire SARS CoV-2 genome for a broad set of HLA-I and HLA-II alleles, covering the vast majority of USA, European, and Asian populations. We additionally confirm that a subset

of these epitopes can raise specific CD8+T cell responses in T cell induction assays using donor PBMCs. Furthermore, we interrogate publicly available proteomics data and demonstrate that the relative expression of multiple SARS CoV-2 proteins in virally infected cells vary significantly, indicating another parameter that should be considered in vaccine design to induce cellular immunity. Epitopes predicted to have a high likelihood of binding to multiple HLA-I and HLA-II alleles and exhibit high expression in infected human cells are promising vaccine candidates to elicit T cell responses against SARS-CoV-2.

METHODS

Analysis of Coronaviridae family T cell epitopes from ViPR

[000387] Experimentally determined epitopes for the *Coronaviridae* family for human hosts were retrieved from the ViPR database (viprbrc.org/; accessed March 5 2020). To build a validation dataset, both positives and negatives for T cell assays and MHC binding assays were obtained. Only assays associated with alleles identified with at least four-digit resolution and supported by our predictors were included for this analysis.

[000388] Positive calls were prioritized – that is, if a given peptide-allele pair was assayed multiple times by a specific assay type and was determined to be positive in any single one of the assays, the peptide-allele pair was classified as positive. Specifically, the priority was given by the following order: Positive-High > Positive-Intermediate > Positive-Low > Positive > Negative (e.g., a peptide allele pairing that was assayed three times with the results Positive-High, Positive, and Negative were assigned a Positive-High result). Of note, alternative approaches such as prioritizing negative assay results, or random choice in cases of multiple results, yielded very similar results (data not shown).

Binding prediction for ViPR Coronaviridae family T cell epitopes

[000389] Peptide-HLA-I allele pairs in the ViPR validation dataset were scored using our HLA-I binding predictor, a neural network trained on mono-allelic MS data. Similarly, peptide-HLA-II allele pairs in the ViPR validation dataset were scored using our HLA-II binding predictor, a recently published convolutional neural network-based model also trained on mono-allelic MS data. We scored all 12-20mers contained within a given assay peptide with the HLA-II binding predictor and took the maximum score as the representative binding score for the assay peptide. *In vitro* MHC binding assays, which represent the vast majority of the ViPR dataset, do not require endogenous processing and presentation for a positive binding result. Since our binding predictor, which is trained on naturally processed and presented ligands observed via MS, is also implicitly learning these endogenous processing rules, we score all potential ligands within an assayed peptide (rather than just the full-length assay peptide itself) to account for this distinction.

Retrieval of 2019 SARS CoV-2 sequence

[000390] The GenBank reference sequence for 2019 SARS CoV-2 (accession: NC_045512.2) was used for this study. All twelve annotated open reading frames (ORF1a, ORF1b, S, ORF3a, E, M, ORF6, ORF7a, ORF7b, ORF8, N, and ORF10) were considered as sources of potential epitopes. In addition, due to its

high expression level in recently published proteomic datasets, ORF9b, as annotated by UniProt (P0DTD2), was also used for epitope predictions.

Identification of HLA-I epitopes and prioritization by population coverage

[000391] To identify candidate HLA-I epitopes, we exhaustively scored all possible 8-12mer peptide sequences from 2019 SARS CoV-2 with our HLA-I binding predictor for 74 alleles, including 21 HLA-A alleles, 35 HLA-B alleles, and 18 HLA-C alleles. Peptide-allele pairs were assigned a percent rank by comparing their binding scores to those of 1,000,000 reference peptides (selected from a partition of the human proteome that had not been used for model training) for the same respective allele. Peptide-allele pairs that scored in the top 1% of the scores of these reference peptides were considered strong potential binders.

[000392] Since a vaccine should ideally benefit a large fraction of the population, these top-ranking peptides were then prioritized based on expected population coverage, given all the alleles each peptide was expected to bind to (i.e., all the alleles for which the peptide scored in the top 1%). The estimate of population coverage for each peptide was calculated as

$$\text{coverage} = 1 - \Pi_{\text{loci}} \left(1 - \Sigma_{\text{locus alleles}} f_{\text{allele,avg}}\right)^2$$

where $f_{\text{allele,avg}}$ is the (unweighted) average allele frequency across the USA, European, and Asian Pacific Islander (API) populations, and the cumulative product

taken across the three HLA-I loci: HLA-A, HLA-B, and HLA-C. The cumulative product itself represents the chance that an individual in the population does not express any one of the contained alleles; hence, the complement describes the probability that at least one is present.

[000393] The USA population allele frequency is calculated as the following weighted average of a few subpopulations: 0.623*EUR+0.133*AFA+0.068*API+0.176*HIS, where EUR= European, AFA=African American, API= Asian Pacific Islander, and HIS= Hispanic populations. For alleles where AFA, HIS, or API population frequencies were not available, the USA population allele frequency values were set to match EUR. Missing API allele frequency values were conservatively imputed with 0 for our analyses.

[000394] We then constructed two types of ranked lists of HLA-I epitopes by coverage. The first ranks all SARS CoV-2 epitopes by their absolute coverage, such that peptides predicted to bind similar collections of alleles would be ranked similarly This approach provides the full list of predicted class I epitopes sorted by the expected coverage for each peptide, with the generous assumption that every binding prediction is correct.

[000395] The second type of list, referred to as a "disjoint" list, is constructed in an iterative fashion where the peptide with the greatest coverage is selected first, and then the coverage for the remaining epitopes is updated to nullify contributions from any alleles that have already been selected (**Table 6**). Disjoint lists were generated for M, N, and S proteins (the most highly expressed structural proteins) individually, instead of across the entire 2019 SARS CoV-2 genome, to provide protein-level prioritizations. This

approach produces a parsimonious list of peptides that is designed to maximize cumulative population coverage with the fewest number of selections and was used to generate **FIG. 4A (left)**, and **FIG. 4B (Upper Panel)**.

Identification of HLA-II epitopes and prioritization by population coverage

[000396] To identify HLA-II epitopes, we used our MS-based HLA-II binding predictor to score all 12-20mer sequences in the SARS CoV-2 proteome to predict both binding potential and the likely binding core within each 12-20mer. Scoring was performed across all supported HLA-II alleles, consisting of 46 HLA-DR alleles, 17 HLA-DP alleles, and 20 HLA-DQ alleles.

[000397] Peptide-allele pairs were assigned a percent rank by comparing their binding scores to those of 100,000 reference peptides (as before, sampled from a partition of the human proteome that was held out from training). Pairs scoring in the top 1% were deemed likely to bind. Additionally, we define the "epitope" of a 12-20mer to be the predicted binding core within the sequence. As such, overlapping 12-20mers with the same predicted binding core for a given allele would constitute a single epitope. **Table 5** shows counts of these epitopes.

[000398] Additionally, we prioritized predicted HLA-II binding 25mers in SARS CoV-2 by population coverage, given the desire to design vaccines that are effective broadly across the global population. To do this, we associated each 25mer with all subsequences that were likely binders and calculated the population coverage of the corresponding HLA-II alleles. Given a collection of alleles, we calculated the coverage as described in the previous section, the only difference being the cumulative product is taken across the following four HLA-II loci: HLA-DRB1, HLA-DRB3/4/5, HLA-DP, and HLA-DQ. HLA-II allele frequencies were obtained from and Allele Frequency Net Database.

[000399] As with HLA-I, two types of sorted lists of predicted binding sequences were generated. The first type ranks every predicted SARS CoV-2 25mer by absolute coverage provided by the HLA-II alleles to which a constituent subsequence is expected to bind. The second type of ranking was again performed for predicted binders in M, N, and S proteins individually, using disjoint coverage, to maximize cumulative population coverage with a parsimonious list of peptides (**Table 7**). This was used to generate **FIG. 4A (right)**, and **FIG. 4B (Lower Panel)**.

Comparison of predicted epitopes to the human proteome

[000400] 8-12mer sequences (corresponding to predicted HLA-I epitopes), 9mer sequences (corresponding to predicted HLA-II binding cores), and 25mer sequences (corresponding to predicted HLA-II sequences that bound multiple alleles) from SARS CoV-2 were compared against all subsequences of the same length from the human proteome, using UCSC Genome Browser genes with hg19 annotation of the human genome and its protein coding transcripts (63,691 entries). Exact matches were identified and omitted from the disjoint coverage ranking analysis to avoid prioritizing peptides that may inadvertently

induce an autoimmune response. No exact matches were found for the predicted HLA-II binding cores or 25mer sequences.

T cell induction and assessment of peptide-MHC positive T cell responses

[000401] Human PBMCs from HLA-A02:01-positive human donors were isolated using Ficoll separation from apheresis material (AllCells, USA). Twenty three SARS CoV-2 epitopes predicted to be strong binders to HLA-A02:01 were pooled by similar binding potential, with up to 6 peptides per pool. The selected peptides represent high ranking peptides predicted to bind HLA-A02:01 from across the S, N, M, E, and ORF1ab proteins, avoiding sequences also prioritized by Grifoni et al. Five of the 23 peptide sequences are also found in SARS-CoV and were previously assayed and confirmed as HLA-A02:01 binders in ViPR. PBMCs were incubated with peptide pools, matured, and cultured in the presence of IL-7 and IL-15 (CellGenix GmbH, Germany) to promote T cell growth. Cells were then harvested and the frequency of CD8+ T cells specific to peptide-MHC (pMHC) were assayed using combinatorial coding of pMHC multimers. pMHC multimers were prepared as described elsewhere by the Applicants. Briefly, biotinylated HLA-A02:01 monomers loaded with UV cleavable peptides were exchanged under UV light with SARS CoV-2 predicted peptides. The streptavidin labelled fluorophores PE, APC, BV421 (Biolegend, Inc., USA), BV650 and BUV395 (BD Biosciences, USA) were added to UV exchanged monomers to create fluorescently labelled multimer reagents. Harvested cells were then stained with LIVE/DEAD Fixable Near-IR Dead Cell Stain Kit for 633 or 635 nm excitation (Life Technologies Corporation, USA), anti-CD4 FITC, anti-CD14 FITC, anti-CD16 FITC, and anti-CD19 FITC (BD Biosciences, USA) and anti-CD8 AF700 (Biolegend Inc., USA). Only live CD8+ T cells staining for both fluorochromes of the relevant pMHC multimers were considered positive. Samples were analyzed on FACS LSR Fortessa 18 X20 cytometers (BD Biosciences) and data was analyzed using FlowJo (TreeStar). The respective peptides used in the assay are displayed in **Table 4**.

Table 4. Viral epitopes and T cell induction

Protein	Sequence	No. Donors with pMHC specific T cells	Confirmed in VIPR
Envelope protein (E)	FLAFVVFLL		
Envelope protein (E)	FLAFVVFLLV		
Envelope protein (E)	FLLVTLAIL		
Envelope protein (E)	FLAFVVFL	2	
Membrane glycoprotein (M)	FLWLLWPVTL		
Membrane glycoprotein (M)	FLYILLIFL		
Membrane glycoprotein (M)	FLFLTWICL	2	
Membrane glycoprotein (M)	KLLEQWNL		
Nucleocapsid phosphoprotein (N)	KLDDKDPNF	2	
Nucleocapsid phosphoprotein (N)	DLDDFSKQL		
Nucleocapsid phosphoprotein (N)	YLGTGPEAGL	2	
Nucleocapsid phosphoprotein (N)	ILLNKHIDA		*
Nucleocapsid phosphoprotein (N)	LLLDRLNQL	1	*
ORF1ab polyprotein	FGDDTVIEV	3	
ORF1ab polyprotein	FLLPSLATV	2	
ORF1ab polyprotein	WLMWLINL		
ORF1ab polyprotein	ALWEIQQV		
Spike protein (S)	SIIDLQEL		
Spike protein (S)	NLNESLIDL		*
Spike protein (S)	KLNDLCFTNV	2	
Spike protein (S)	GLTVLPPLL	1	
Spike protein (S)	FIAGLIAV	2	*
Spike protein (S)	RLQSLQTYV	3	*

Analysis of publicly available SARS CoV-2 proteomic datasets

[000402] 2019 SARS CoV-2 proteomic datasets were downloaded from the PRIDE repository (Bojkova *et al.*: PXD017710; Bezstarosti *et al.*: PXD018760; Davidson *et al.*: PXD018241). In these studies, either Caco-2 human colorectal adenocarcinoma cells (Bojkova) or Vero E6 African green monkey kidney epithelial cells (Bezstarosti and Davidson) were subject to infection with 2019 SARS-CoV-2. Tandem mass spectra (MS/MS) acquired with data-dependent acquisition (DDA) were interpreted using Spectrum Mill

MS Proteomics software package v7.0 pre-release (Agilent Technologies). Cysteine carbamidomethylation was selected as a fixed modification. Methionine oxidation, asparagine deamidation, protein N-termini acetylation, peptide N-terminal glutamine to pyroglutamic acid, and peptide N-terminal cysteine pyro-carbamidomethylation were selected as variable modifications. For the Bojkova dataset which employed isobaric mass tags, TMT11 was added as a fixed modification to peptide N-termini and lysines, and 13C6-15N2-TMT11-lysine and $^{13}C_6$-$^{15}N_4$-arginine were added as variable modifications. All datasets were searched against the 2019 SARS CoV-2 proteome (UniProtKB, 28-April-2020, 14 entries) concatenated to databases containing either the Homo sapiens proteome (Bojkova, UCSC Genome Browser hg19 annotation, 63691 entries) or the Chlorocebus sabaeus proteome (Bezstarosti and Davidson, UniProtKB, 9229 entries). Precursor and fragment mass tolerances were set as described in each manuscript, or as 20 ppm when not specified. Database search results were exported as a list of peptide-spectrum matches (PSMs) with a target-decoy based false discovery rate (FDR) estimation of 1%. Individual fractions from each study were combined into a single list. To perform spectral counting, PSMs assigned to a single 2019 SARS CoV-2 protein were counted, with ORF1a and ORF1ab treated as a single protein group. Peptides matched to both a host and SARS CoV-2 protein were discarded. Spectral counts were normalized to the length of each protein, and the maximum value within each dataset was set to 100%.

RESULTS

Bioinformatics predictor validation for viral epitopes using ViPR

[000403] We first sought to validate the ability of our predictors to identify epitopes from genomes of the *Coronaviridae* family. Since SARS CoV-2 only emerged recently, specific data on SARS CoV-2 peptide MHC-binding and immunogenic epitopes are currently limited. However, other viruses from the *Coronaviridae* family have been studied thoroughly, specifically MERS-CoV and SARS-CoV. The latter has significant sequence homology to 2019 SARS-CoV-2. We therefore sought to leverage previously tested epitopes from across the *Coronaviridae* family to validate our predictions of viral peptides, with special interest in peptide sequences that exactly matched protein sequences of the novel 2019 SARS CoV-2 virus. To that end, we used the ViPR database, which lists the results of T cell immunogenicity and MHC peptide-binding assays for both HLA-I and HLA-II alleles for viral pathogen epitopes. We used all assays of *Coronaviridae* family viruses with human hosts from ViPR as our validation dataset. Assays that did not have an associated four-digit HLA allele or were associated with an allele our models did not support were omitted.

[000404] For HLA-I, within the validation dataset there were a total of 4,445 unique peptide-HLA allele pairs that were assayed for MHC-binding, using variations of: 1) cellular MHC or purified MHC; 2) a direct or competitive assay; and 3) measurement by fluorescence or radioactivity. Two additional peptide-MHC allele pairs were confirmed via X-ray crystallography. Depending on the study from which the data was collected, peptide-MHC allele pairs were either defined in ViPR simply as “Negative” and “Positive”

for binding, or with a more granular scale of positivity: Low, Intermediate, and High. We assigned peptide-MHC allele pairs with multiple measurements with the highest MHC-binding detected across the replicates (see Methods).

[000405] We then applied our HLA-I binding predictor to the peptide-MHC allele pairs in the validation dataset and compared the computed HLA-I percent ranks of these pairs with the reported MHC-binding assay results. A low percent rank value corresponds to high likelihood of binding (e.g., a peptide with a percent rank of 1% scores amongst the top 1% in a reference set of random peptides). The percent ranks of peptide-MHC allele pairs that had a binary "Positive" result in the MHC-binding assay were significantly lower than pairs with a "Negative" result. Further, in the more granular positive results, stronger assay results (low < intermediate < high) were associated with increasingly lower percent ranks (**FIG. 2, Upper Left**). In addition, the two peptide-MHC alleles that were confirmed by X-ray crystallography were predicted as very likely binders, with low percent rank scores of 0.07% and 0.30%r Although our HLA-I binding predictor was initially built with the purpose of supporting neoantigen prediction in cancer, this analysis shows that it can be successfully applied to coronavirus proteomes. We evaluated our predictor by performing a Precision-Recall analysis, demonstrating the tradeoff between accurate calling of positive binders and the fraction of true binders that are detected (**FIG. 2, Lower Left**).

[000406] Assays of T cell reactivity (e.g., interferon-gamma ELISpots, tetramers), which are stricter measures for T cell immunogenicity to epitopes, were performed in significantly lower numbers compared with MHC-binding assays. For HLA-I, the overlap between peptide-MHC allele pairs for which we had a prediction (supported alleles) and pairs with a reported T cell assay consisted of only 32 pairs, of which 23 had a positive result. We did not detect differences in the percent ranks across the positive and negative groups, however sample sizes are extremely small (data not shown). In addition, for HLA-I epitopes, the validation dataset only contained T cell assay results for peptide-MHC allele pairs that had a positive result in a binding assay, suggesting a highly biased pool of epitopes selected for testing, as also reflected in the high rate of positive T cell assay results. Indeed, the high rate of positive MHC binding assays compared to what would be expected for completely randomly selected peptides also implies that peptides expected to bind based on prediction or prior data were prioritized for testing (or negative results were under-reported). This underlying bias in peptides assayed is important to keep in mind in evaluating the binding predictor performance on this validation dataset. An even more dramatic difference in scores for positives versus negatives could be expected had random peptides been selected for testing.

[000407] In addition to the identification of targets for CD8+T cells, we have recently demonstrated the ability to predict HLA-II binders, allowing us to target CD4+T cell responses which could be harnessed for 2019 SARS CoV-2 vaccines. These CD4+responses can potentially bolster both T cell immunity and enhance humoral immunity.

[000408] In a similar fashion to the HLA-I analysis, we scored all *Coronaviridae* family peptide-MHC allele pairs with supported HLA-II alleles in ViPR using our HLA-II binding predictor. There were 259 unique peptide-MHC allele pairs assayed by MHC-binding assays in the ViPR validation dataset for HLA-II. As before, we compared their percent rank with their reported 'best' (in the case of multiple measurements) MHC-binding assay result. This comparison could not be performed with the "Negative" pairs as an independent group since there was only one negative result in the validation dataset for HLA-II. The low negative counts may be due to under-reporting of negative assay results or biased selection of the peptides to be assayed. Therefore, we merged the "Negative" and "Positive-Low" groups into one group and compared their percent ranks with either the "Positive-Intermediate" or the "Positive-High" groups (**FIG. 2, Upper Right**). This analysis revealed a trend similar to that observed with HLA-I predictions, indicating that stronger MHC-binding assay results are associated with a lower predicted percent rank for HLA-II binders, as we expect for a robust predictor. We also evaluated our HLA-II binding predictor by performing a Precision-Recall analysis (**FIG. 2, Lower Right**). The area under the Precision-Recall curve (AUC) indicated only a small advantage to our predictor over a random guess, which is explained by the heavy bias towards peptides with positive HLA-II binding assay results. Similar to the HLA-I T cell assays, there were too few recorded HLA-II T cell assays in our validation dataset to determine percent rank differences between peptide-HLA II allele pairs testing positive and negative. Together, these findings further corroborate the validity of our epitope predictors, as peptide-MHC allele pairs with positive results in binding assays consistently have lower percent ranks (better scores) by both our HLA-I and HLA-II MHC-binding predictors.

Epitope prediction for SARS-CoV-2

[000409] We harnessed our MS-based HLA binding prediction ability to identify the peptides most relevant to the generation of SARS CoV-2 T cell responses. We first performed the analysis for HLA-I peptide binding and computed the likelihood of each peptide of lengths 8-12 amino-acids from the 13 SARS CoV-2 ORFs to bind to any HLA-I allele in our database. We then calculated the percent rank of each peptide-MHC allele pair by comparing their binding scores to those of a set of reference peptides; putative binders were identified as sequences predicted to bind to a given allele with a percent rank of 1% or lower **(FIG. 1).**

[000410] By this metric, we detected a total of 11,897 unique SARS CoV-2 peptides that were predicted to bind at least one HLA-I allele. 16 of these peptides overlapped with a subsequence of the human proteome and were marked for considerations of potential autoimmunity.

[000411] Unlike HLA-I, which has a closed binding groove that constrains bound peptide lengths to approximately 8 to 12 amino acids, peptides binding HLA-II have a wider length distribution (up to 30 amino acids or even longer) since the HLA-II binding groove is open at both ends. Peptides bind with a 9 amino acid subsequence (termed the binding core) occupying the HLA-II binding groove, with any flanking

sequence overhanging the edges of the molecule. We consider a group of peptides that differ in the flanking regions but share a common binding core as a single epitope. Using the HLA-II predictor we identified 3,372 unique binding-cores that are predicted to bind at least one HLA-II allele with a percent rank score of 1% or lower (**Table 5**). The majority of predicted peptide-MHC allele pairs are from ORF1a and ORF1ab, primarily driven by the length of these ORFs. In addition, ORF1a and ORF1ab have very similar sequences, with over 18,000 identical binding peptide-HLA-I allele pairs predicted for both ORFs. We therefore opted to exclude redundant predictions and only reported unique pairs (see * in **Table 5**). Similarly, all HLA-II predicted epitopes from ORF1a were covered by those reported for ORF1ab.

[000412] To test the validity of the SARS CoV-2 predicted peptide-HLA pairs, we looked for peptide sequences in the *Coronaviridae* portion of the ViPR database which exactly matched SARS CoV-2 peptide sequences (Figure 2D). A total of 374 HLA-I peptide-MHC allele pairs from SARS CoV-2 had both a percent rank lower than 1% by our predictor and were found in the HLA-I MHC-binding validation dataset. Strikingly, of these HLA-I peptide-MHC allele pairs, 333 (89%) had a positive assay result. As a comparison, we also tested for overlap between epitopes predicted to have low likelihood of MHC-binding (percent rank 50% or higher) and the validation dataset. 37 peptide-MHC allele pairs overlapped between these sets, of which 36 (97.2%) had a negative assay result, as predicted. Further, we sought to determine whether our highly predicted 2019 SARS CoV-2 peptide-HLA-I allele pairs (percent rank lower than 1%) would be validated by reported T cell assay results. Despite the significantly smaller number of peptide-MHC allele pairs that were tested for T cell reactivity in the validation dataset, 10 assayed pairs were also highly predicted by our HLA-I binding predictor. Nine out of these 10 (90%) predicted pairs had a positive result to the T cell assay. No low-scoring pairs (percent rank of 50% or above) were reported in the validation dataset. These findings demonstrate the validity of our prediction for peptide-HLA-I allele pairs for SARS CoV-2 epitopes. Notably, while our algorithms are not trained on T cell reactivity data and are aimed at peptide-MHC binding, for the few examples in ViPR for which T cell reactivity assay results were reported, we were able to show our highly-scoring peptide-MHC allele pairs are indeed immunogenic in the vast majority of cases.

[000413] For HLA-II peptide-MHC allele pairs, only a single HLA-II peptide-MHC allele pair had both a percent rank lower than 1% and was reported in the validation dataset; this single pair (from the envelope protein) had a “Positive-High” assay result.

Table 5

Protein	Length (AA)	Peptide HLA-I pair count	Reported in ViPR	Assay: Negative	Assay: Positive	Percent-positive	Binding-core and HLA-II pair count
envelope protein (E)	75	556	34	3	31	91.2	29
membrane glycoprotein (M)	222	1236	41	0	41	100.0	68

nucleocapsid phosphoprotein (N)	419	1054	40	9	31	77.5	107
ORF1a polyprotein*	4405	14*	0	0	0	NA	0*
ORF1ab polyprotein	7096	28965	0	0	0	0NA	2516
ORF3a protein	275	1408	127	11	116	91.3	94
ORF6 protein	61	322	0	0	0	NA	23
ORF7a protein	121	642	3	0	3	100.0	28
ORF7b	43	327	8	1	7	87.5	2
ORF8 protein	121	449	20	2	18	90.0	27
ORF9b protein**	97	453	6	1	5	83.3	37
ORF10 protein	38	258	0	0	0	NA	4
surface glycoprotein	1273	4686	95	14	81	85.3	437

*peptides unique to orf1a (not found in orf1ab).

**annotated in UniProt.

Immunogenicity of HLA-A02:01-predicted 2019 SARS CoV-2 epitopes

[000414] The MS-based binding prediction algorithms used predict the likelihood of an epitope to be presented by a specific HLA allele, but do not directly predict the ability of a T cell receptor to recognize the epitope presented by the MHC molecule. Due to the process of central tolerance, which deletes T cells that could cross-react with peptides from self-antigens, not every epitope that is a strong MHC binder will elicit a T cell response. Therefore, there is a need to further validate high affinity MHC binding peptides in T cell assays **(FIG. 1).** To address the immunogenicity of a subset of highly predicted MHC binding peptides, we synthesized 23 highly predicted HLA-A02:01 binding epitopes from each of the following SARS CoV-2 proteins: S, M, N, E, and ORF1ab. Of these highly predicted SARS CoV-2 epitopes, five sequences were positive in ViPR for MHC binding or T cell reactivity in association with HLA-A02:01. Pools of these peptides were cultured with PBMCs from three human donors, and the predicted epitopes were considered immunogenic if they elicited a T cell response as detected by binding to pMHC multimers for HLA-A02:01 in at least one of three donors.

[000415] As shown in **FIG. 3**, CD8+ T cell responses were validated in at least one donor for 11 of the 23 highly predicted epitopes (**Table 7** and **FIG. 3**). Of the five epitopes previously reported as either immunogenic or strong binders in ViPR, three were confirmed to elicit a CD8+ T cell response, confirming that our binding predictor can identify epitopes that are immunogenic. In addition, we were able to identify eight novel epitopes not previously reported in ViPR that were recognized by specific CD8+ T cells in donor PBMCs. The responses were generally robust, with nine of the 11 epitopes positive in our assay were recognized by specific CD8+ T cell responses in at least two donors (**Table 7**), and encouragingly, every ORF from 2019 SARS CoV-2 that was assayed had at least one peptide that led to a T cell response (**Table 7**). Taken together, these data show that many novel 2019 SARS CoV-2 epitopes that were predicted to be strong binders from MHC-I binding predictor were found to be immunogenic.

Population coverage of peptides predicted to bind multiple HLA-I and HLA-II alleles

[000416] The concordance between the validation dataset and the highly predicted peptide-MHC allele pairs provided herein indicate that the HLA binding predictors significantly expand the list of predicted MHC binding peptides from the ORFs of 2019 SARS-CoV-2. Next, peptides from the M, N, and S proteins were prioritized, that were predicted to provide broad coverage for the USA, European (EU) and Asian Pacific Islander (API) populations based on the prevalence of MHC alleles in these populations. It was found that a subset of the peptides was predicted to bind a broad set of either HLA-I or HLA-II alleles. For each protein, it was determined that a small number of peptide sequences provide saturating coverage for the USA, European, and Asian Pacific Islander populations, with >99% population coverage achieved with selected 8-12mer epitopes for HLA-I, and >95% population coverage achieved with selected 25mer sequences for HLA-II, respectively (**FIG. 4B**). Even if the generous assumption that all peptide-MHC allele pairs for which a given peptide scores in the top 1% are indeed immunogenic is not fully upheld, this finding could facilitate the design of a parsimonious, broadly effective vaccine to induce broad T cell immunity.

[000417] **Table 6** shows the top HLA-I predicted binders from each of the three SARS CoV-2 proteins: spike, nucleocapsid and membrane with the broadest cumulative allele coverage. The table provides the peptide sequence, its rank, the 2019 SARS CoV-2 protein it is derived from, the alleles the peptide is predicted to bind to and the cumulative HLA-I coverage for USA, European (EUR), and Asian Pacific Islander (API) populations for all peptides up to this rank.

[000418] **Table 7** shows the top HLA-II predicted binders from each of the three 2019 SARS CoV-2 proteins: spike, nucleocapsid and membrane For each 25mer, the table provides the rank, the peptide sequence, the 2019 SARS CoV-2 protein it is derived from, the cumulative alleles that are covered by all 25mers up to this rank, and the associated USA, European (EUR), and Asian Pacific Islander (API) population coverage. Note that it is not the case that any of these 25mers, or their binding subsequences, are found as subsequences within the human proteome.

Table 6

Rank	Peptide	P	Cumulative Alleles	USA	EUR	API
1	YQPYR VVVL	S	HLA-A02:07; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B37:01; HLA-B39:01; HLA-B42:01; HLA-B48:01; HLA-B52:01; HLA-C01:02; HLA-C02:02; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C12:02; HLA-C14:02; HLA-C14:03; HLA-C15:02	0.9701	0.978332	0.973286
2	FVFLVL LPL	S	HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A68:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B35:01; HLA-B35:03;	0.9977	0.998821	0.997513

			HLA-B37:01; HLA-B39:01; HLA-B42:01; HLA-B48:01; HLA-B51:01; HLA-B52:01; HLA-B54:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01			
3	CVADY SVLY	S	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A32:01; HLA-A36:01; HLA-A68:01; HLA-A68:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B35:01; HLA-B35:03; HLA-B37:01; HLA-B39:01; HLA-B42:01; HLA-B48:01; HLA-B51:01; HLA-B52:01; HLA-B54:01; HLA-B58:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01	0.9996	0.999899	0.999257
4	QPTESI VRF	S	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A32:01; HLA-A36:01; HLA-A68:01; HLA-A68:02; HLA-B07:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B18:01; HLA-B35:01; HLA-B35:03; HLA-B37:01; HLA-B38:01; HLA-B39:01; HLA-B42:01; HLA-B48:01; HLA-B51:01; HLA-B52:01; HLA-B53:01; HLA-B54:01; HLA-B58:01; HLA-B81:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01	0.9999	0.999991	0.999754
5	AEVQID RLI	S	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A32:01; HLA-A36:01; HLA-A68:01; HLA-A68:02; HLA-B07:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B18:01; HLA-B35:01; HLA-B35:03; HLA-B37:01; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B40:02; HLA-B41:01; HLA-B42:01; HLA-B44:02; HLA-B44:03; HLA-B45:01; HLA-B48:01; HLA-B49:01; HLA-B50:01; HLA-B51:01; HLA-B52:01; HLA-B53:01; HLA-B54:01; HLA-B58:01; HLA-B58:02; HLA-B81:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-	0.9999	0.999999	0.999879

			C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01			
6	QSAPHGVVF	S	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A32:01; HLA-A36:01; HLA-A68:01; HLA-A68:02; HLA-B07:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B18:01; HLA-B35:01; HLA-B35:03; HLA-B37:01; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B40:02; HLA-B41:01; HLA-B42:01; HLA-B44:02; HLA-B44:03; HLA-B45:01; HLA-B46:01; HLA-B48:01; HLA-B49:01; HLA-B50:01; HLA-B51:01; HLA-B52:01; HLA-B53:01; HLA-B54:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-B58:02; HLA-B81:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01	0.9999	1	0.999962
7	VYYPDKVFR	S	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A31:01; HLA-A32:01; HLA-A33:03; HLA-A36:01; HLA-A68:01; HLA-A68:02; HLA-A74:01; HLA-B07:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B18:01; HLA-B35:01; HLA-B35:03; HLA-B37:01; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B40:02; HLA-B41:01; HLA-B42:01; HLA-B44:02; HLA-B44:03; HLA-B45:01; HLA-B46:01; HLA-B48:01; HLA-B49:01; HLA-B50:01; HLA-B51:01; HLA-B52:01; HLA-B53:01; HLA-B54:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-B58:02; HLA-B81:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01	0.9999	1	0.999988
8	RRARSVASQ	S	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A31:01; HLA-A32:01; HLA-A33:03; HLA-A36:01; HLA-A68:01; HLA-A68:02; HLA-A74:01; HLA-B07:02; HLA-B08:01; HLA-B13:02; HLA-	0.9999	1	0.999989

			B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B18:01; HLA-B27:05; HLA-B35:01; HLA-B35:03; HLA-B37:01; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B40:02; HLA-B41:01; HLA-B42:01; HLA-B44:02; HLA-B44:03; HLA-B45:01; HLA-B46:01; HLA-B48:01; HLA-B49:01; HLA-B50:01; HLA-B51:01; HLA-B52:01; HLA-B53:01; HLA-B54:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-B58:02; HLA-B81:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01			
9	CPFGEVFNA	S	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A31:01; HLA-A32:01; HLA-A33:03; HLA-A36:01; HLA-A68:01; HLA-A68:02; HLA-A74:01; HLA-B07:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B18:01; HLA-B27:05; HLA-B35:01; HLA-B35:03; HLA-B37:01; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B40:02; HLA-B41:01; HLA-B42:01; HLA-B44:02; HLA-B44:03; HLA-B45:01; HLA-B46:01; HLA-B48:01; HLA-B49:01; HLA-B50:01; HLA-B51:01; HLA-B52:01; HLA-B53:01; HLA-B54:01; HLA-B55:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-B58:02; HLA-B81:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01	0.9999	1	0.999989
10	SAPHGVVFL	S	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A31:01; HLA-A32:01; HLA-A33:03; HLA-A36:01; HLA-A68:01; HLA-A68:02; HLA-A74:01; HLA-B07:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B18:01; HLA-B27:05; HLA-B35:01; HLA-B35:03; HLA-B37:01; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B40:02; HLA-B41:01; HLA-B42:01; HLA-B44:02; HLA-B44:03; HLA-B45:01; HLA-B46:01; HLA-B48:01; HLA-B49:01; HLA-B50:01; HLA-B51:01; HLA-B52:01; HLA-B53:01; HLA-B54:01; HLA-B55:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-B58:02; HLA-B81:01;	0.9999	1	0.999989

			HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01			
1	FNPETNILL	M	HLA-A02:07; HLA-C01:02; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C14:02; HLA-C17:01	0.8460	0.8464	0.888243
2	SSSDNIALL	M	HLA-A01:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A68:01; HLA-A68:02; HLA-B15:09; HLA-B38:01; HLA-B39:01; HLA-B48:01; HLA-B57:03; HLA-B81:01; HLA-C01:02; HLA-C02:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C12:03; HLA-C14:02; HLA-C15:02; HLA-C17:01	0.9949	0.9981	0.987775
3	KLLEQWNLV	M	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A30:01; HLA-A32:01; HLA-A68:01; HLA-A68:02; HLA-B13:02; HLA-B15:09; HLA-B38:01; HLA-B39:01; HLA-B48:01; HLA-B57:03; HLA-B81:01; HLA-C01:02; HLA-C02:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C12:03; HLA-C14:02; HLA-C15:02; HLA-C17:01	0.9987	0.999727	0.992178
4	LWLLWPVTL	M	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A23:01; HLA-A24:02; HLA-A30:01; HLA-A32:01; HLA-A68:01; HLA-A68:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:09; HLA-B35:01; HLA-B38:01; HLA-B39:01; HLA-B48:01; HLA-B51:01; HLA-B54:01; HLA-B57:03; HLA-B58:02; HLA-B81:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01	0.9997	0.99994	0.999326
5	SELVIGAVI	M	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A23:01; HLA-A24:02; HLA-A30:01; HLA-A32:01; HLA-A68:01; HLA-A68:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:09; HLA-B18:01; HLA-B35:01; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B40:02; HLA-B41:01; HLA-B44:02; HLA-B44:03; HLA-B45:01; HLA-B48:01; HLA-B49:01; HLA-B51:01; HLA-B52:01; HLA-B54:01; HLA-B57:03; HLA-B58:02; HLA-B81:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-	0.9998	0.999979	0.999644

			C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01			
6	ATSRTLSYY	M	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A32:01; HLA-A36:01; HLA-A68:01; HLA-A68:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:09; HLA-B18:01; HLA-B35:01; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B40:02; HLA-B41:01; HLA-B44:02; HLA-B44:03; HLA-B45:01; HLA-B48:01; HLA-B49:01; HLA-B51:01; HLA-B52:01; HLA-B54:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-B58:02; HLA-B81:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01	0.9999	0.999999	0.999913
7	LPKEITVAT	M	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A32:01; HLA-A36:01; HLA-A68:01; HLA-A68:02; HLA-B07:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:09; HLA-B18:01; HLA-B35:01; HLA-B35:03; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B40:02; HLA-B41:01; HLA-B42:01; HLA-B44:02; HLA-B44:03; HLA-B45:01; HLA-B46:01; HLA-B48:01; HLA-B49:01; HLA-B51:01; HLA-B52:01; HLA-B54:01; HLA-B55:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-B58:02; HLA-B81:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01	0.9999	1	0.99995
8	EQWNLVIGF	M	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A32:01; HLA-A36:01; HLA-A68:01; HLA-A68:02; HLA-B07:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B18:01; HLA-B27:05; HLA-B35:01; HLA-B35:03; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B40:02; HLA-B41:01; HLA-B42:01; HLA-B44:02; HLA-B44:03; HLA-B45:01; HLA-	0.9999	1	0.999961

			B46:01; HLA-B48:01; HLA-B49:01; HLA-B51:01; HLA-B52:01; HLA-B54:01; HLA-B55:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-B58:02; HLA-B81:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01			
9	FVLAA VYR	M	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A31:01; HLA-A32:01; HLA-A33:03; HLA-A36:01; HLA-A68:01; HLA-A68:02; HLA-A74:01; HLA-B07:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B18:01; HLA-B27:05; HLA-B35:01; HLA-B35:03; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B40:02; HLA-B41:01; HLA-B42:01; HLA-B44:02; HLA-B44:03; HLA-B45:01; HLA-B46:01; HLA-B48:01; HLA-B49:01; HLA-B51:01; HLA-B52:01; HLA-B54:01; HLA-B55:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-B58:02; HLA-B81:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01	0.9999	1	0.999987
10	SELVIG AV	M	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A31:01; HLA-A32:01; HLA-A33:03; HLA-A36:01; HLA-A68:01; HLA-A68:02; HLA-A74:01; HLA-B07:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B18:01; HLA-B27:05; HLA-B35:01; HLA-B35:03; HLA-B37:01; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B40:02; HLA-B41:01; HLA-B42:01; HLA-B44:02; HLA-B44:03; HLA-B45:01; HLA-B46:01; HLA-B48:01; HLA-B49:01; HLA-B50:01; HLA-B51:01; HLA-B52:01; HLA-B54:01; HLA-B55:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-B58:02; HLA-B81:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01	0.9999	1	0.999989

1	FAPSASAF	NP	HLA-B46:01; HLA-B51:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C07:02; HLA-C08:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C17:01	0.8892	0.893062	0.909801
2	LLLDRLNQL	NP	HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A23:01; HLA-A32:01; HLA-B08:01; HLA-B14:02; HLA-B46:01; HLA-B51:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:02; HLA-C08:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C17:01	0.9837	0.98958	0.964647
3	SSPDDQIGY	NP	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A32:01; HLA-A36:01; HLA-B08:01; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B46:01; HLA-B51:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:02; HLA-C08:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C17:01	0.9973	0.999047	0.989434
4	TPSGTWLTY	NP	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A32:01; HLA-A36:01; HLA-B07:02; HLA-B08:01; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B35:01; HLA-B35:03; HLA-B42:01; HLA-B46:01; HLA-B51:01; HLA-B53:01; HLA-B55:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C17:01	0.9997	0.999954	0.994134
5	MEVTPSGTW	NP	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A32:01; HLA-A36:01; HLA-B07:02; HLA-B08:01; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B18:01; HLA-B35:01; HLA-B35:03; HLA-B40:01; HLA-B42:01; HLA-B44:02; HLA-B44:03; HLA-B46:01; HLA-B49:01; HLA-B50:01; HLA-B51:01; HLA-B53:01; HLA-B55:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C17:01	0.9999	0.999992	0.996542

6	KHWPQIAQF	NP	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A32:01; HLA-A36:01; HLA-B07:02; HLA-B08:01; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B18:01; HLA-B35:01; HLA-B35:03; HLA-B37:01; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B42:01; HLA-B44:02; HLA-B44:03; HLA-B46:01; HLA-B48:01; HLA-B49:01; HLA-B50:01; HLA-B51:01; HLA-B53:01; HLA-B55:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C17:01	0.9999	0.999999	0.998895
7	ASAFFGMSR	NP	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A31:01; HLA-A32:01; HLA-A33:03; HLA-A36:01; HLA-A68:01; HLA-A74:01; HLA-B07:02; HLA-B08:01; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B18:01; HLA-B35:01; HLA-B35:03; HLA-B37:01; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B42:01; HLA-B44:02; HLA-B44:03; HLA-B46:01; HLA-B48:01; HLA-B49:01; HLA-B50:01; HLA-B51:01; HLA-B53:01; HLA-B55:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C17:01	0.9999	1	0.999685
8	DAALALLLL	NP	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A31:01; HLA-A32:01; HLA-A33:03; HLA-A36:01; HLA-A68:01; HLA-A68:02; HLA-A74:01; HLA-B07:02; HLA-B08:01; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B18:01; HLA-B35:01; HLA-B35:03; HLA-B37:01; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B42:01; HLA-B44:02; HLA-B44:03; HLA-B46:01; HLA-B48:01; HLA-B49:01; HLA-B50:01; HLA-B51:01; HLA-B53:01; HLA-B55:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-	0.9999	1	0.999977

			C12:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01			
9	RQKKQQTV	NP	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A31:01; HLA-A32:01; HLA-A33:03; HLA-A36:01; HLA-A68:01; HLA-A68:02; HLA-A74:01; HLA-B07:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B18:01; HLA-B35:01; HLA-B35:03; HLA-B37:01; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B42:01; HLA-B44:02; HLA-B44:03; HLA-B46:01; HLA-B48:01; HLA-B49:01; HLA-B50:01; HLA-B51:01; HLA-B52:01; HLA-B53:01; HLA-B55:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01	0.9999	1	0.999983
10	SRIGMEVTP	NP	HLA-A01:01; HLA-A02:01; HLA-A02:03; HLA-A02:04; HLA-A02:07; HLA-A03:01; HLA-A11:01; HLA-A23:01; HLA-A24:02; HLA-A25:01; HLA-A26:01; HLA-A29:02; HLA-A30:01; HLA-A30:02; HLA-A31:01; HLA-A32:01; HLA-A33:03; HLA-A36:01; HLA-A68:01; HLA-A68:02; HLA-A74:01; HLA-B07:02; HLA-B08:01; HLA-B13:02; HLA-B14:02; HLA-B15:01; HLA-B15:03; HLA-B15:09; HLA-B18:01; HLA-B27:05; HLA-B35:01; HLA-B35:03; HLA-B37:01; HLA-B38:01; HLA-B39:01; HLA-B40:01; HLA-B42:01; HLA-B44:02; HLA-B44:03; HLA-B46:01; HLA-B48:01; HLA-B49:01; HLA-B50:01; HLA-B51:01; HLA-B52:01; HLA-B53:01; HLA-B55:01; HLA-B57:01; HLA-B57:03; HLA-B58:01; HLA-C01:02; HLA-C02:02; HLA-C03:02; HLA-C03:03; HLA-C03:04; HLA-C04:01; HLA-C05:01; HLA-C06:02; HLA-C07:01; HLA-C07:02; HLA-C08:01; HLA-C08:02; HLA-C12:02; HLA-C12:03; HLA-C14:02; HLA-C14:03; HLA-C15:02; HLA-C17:01	0.9999	1	0.999984

Index for Table: P, viral protein; S, Surface glycoprotein; M, membrane glycoprotein; NP, nucleocapsid phosphoprotein.

Table 7

Sl	Peptide	P	Cumulative Alleles	USA	EUR	API
1	TPPIKDFGGFNFSQILPDPSKPSKR	S	DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB3_0101; DPB1-0401_DPA1-0103; DPB1-0402_DPA1-0103; DRB1_1303; DQB1-0303_DQA1-0201; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DPB1-0201_DPA1-0103; DQB1-0302_DQA1-0301; DPB1-0101_DPA1-0202	0.973835	0.972746	0.757235

2	EIDRLNEVAKNLNESLIDLQELGKY	S	DRB4_0103; DPB1-1401_DPA1-0201; DPB1-0301_DPA1-0103; DRB3_0301; DPB1-0901_DPA1-0201; DPB1-1701_DPA1-0201; DPB1-1001_DPA1-0201; DQB1-0604_DQA1-0102; DQB1-0502_DQA1-0102; DPB1-0501_DPA1-0202; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB3_0101; DPB1-0401_DPA1-0103; DPB1-0402_DPA1-0103; DRB1_1303; DQB1-0303_DQA1-0201; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DPB1-0201_DPA1-0103; DQB1-0302_DQA1-0301; DPB1-0101_DPA1-0202	0.997968	0.997785	0.982844
3	EKGIYQTSNFRVQPTESIVRFPNIT	S	DRB1_0701; DRB1_0101; DRB1_1502; DRB1_0406; DPB1-0202_DPA1-0103; DRB1_1501; DRB1_0302; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB3_0101; DPB1-0401_DPA1-0103; DPB1-0402_DPA1-0103; DRB1_1303; DQB1-0303_DQA1-0201; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DPB1-0201_DPA1-0103; DQB1-0302_DQA1-0301; DPB1-0101_DPA1-0202; DRB4_0103; DPB1-1401_DPA1-0201; DPB1-0301_DPA1-0103; DRB3_0301; DPB1-0901_DPA1-0201; DPB1-1701_DPA1-0201; DPB1-1001_DPA1-0201; DQB1-0604_DQA1-0102; DQB1-0502_DQA1-0102; DPB1-0501_DPA1-0202	0.99924	0.999337	0.993125
4	NPVLPFNDGVYFASTEKSNIIRGWI	S	DQB1-0301_DQA1-0505; DQB1-0201_DQA1-0501; DRB1_0403; DRB1_1401; DRB1_1405; DQB1-0202_DQA1-0201; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB3_0101; DPB1-0401_DPA1-0103; DPB1-0402_DPA1-0103; DRB1_1303; DQB1-0303_DQA1-0201; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DPB1-0201_DPA1-0103; DQB1-0302_DQA1-0301; DPB1-0101_DPA1-0202; DRB4_0103; DPB1-1401_DPA1-0201; DPB1-0301_DPA1-0103; DRB3_0301; DPB1-0901_DPA1-0201; DPB1-1701_DPA1-0201; DPB1-1001_DPA1-0201; DQB1-0604_DQA1-0102; DQB1-0502_DQA1-0102; DPB1-0501_DPA1-0202; DRB1_0701; DRB1_0101; DRB1_1502; DRB1_0406; DPB1-0202_DPA1-0103; DRB1_1501; DRB1_0302	0.999858	0.999877	0.995801
5	VFNATRFASVYAWNRKRISNCVADY	S	DPB1-1301_DPA1-0201; DRB5_0101; DRB5_0102; DRB1_1301; DRB1_1102; DRB1_1101; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB3_0101; DPB1-0401_DPA1-0103; DPB1-0402_DPA1-0103; DRB1_1303; DQB1-0303_DQA1-0201; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DPB1-0201_DPA1-0103; DQB1-0302_DQA1-0301; DPB1-0101_DPA1-0202; DRB4_0103; DPB1-1401_DPA1-0201; DPB1-0301_DPA1-0103; DRB3_0301; DPB1-0901_DPA1-0201; DPB1-1701_DPA1-0201; DPB1-1001_DPA1-0201; DQB1-0604_DQA1-0102; DQB1-0502_DQA1-0102; DPB1-0501_DPA1-0202; DRB1_0701; DRB1_0101; DRB1_1502; DRB1_0406; DPB1-0202_DPA1-0103; DRB1_1501; DRB1_0302; DQB1-0301_DQA1-0505; DQB1-0201_DQA1-0501; DRB1_0403; DRB1_1401; DRB1_1405; DQB1-0202_DQA1-0201	0.999973	0.999978	0.997479
6	ISNCVADYSV	S	DRB1_0802; DRB1_0301; DRB3_0201; DRB3_0202; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401;	0.999997	0.999998	0.999835

	LYNSASFSTFKCYGV		DRB3_0101; DPB1-0401_DPA1-0103; DPB1-0402_DPA1-0103; DRB1_1303; DQB1-0303_DQA1-0201; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DPB1-0201_DPA1-0103; DQB1-0302_DQA1-0301; DPB1-0101_DPA1-0202; DRB4_0103; DPB1-1401_DPA1-0201; DPB1-0301_DPA1-0103; DRB3_0301; DPB1-0901_DPA1-0201; DPB1-1701_DPA1-0201; DPB1-1001_DPA1-0201; DQB1-0604_DQA1-0102; DQB1-0502_DQA1-0102; DPB1-0501_DPA1-0202; DRB1_0701; DRB1_0101; DRB1_1502; DRB1_0406; DPB1-0202_DPA1-0103; DRB1_1501; DRB1_0302; DQB1-0301_DQA1-0505; DQB1-0201_DQA1-0501; DRB1_0403; DRB1_1401; DRB1_1405; DQB1-0202_DQA1-0201; DPB1-1301_DPA1-0201; DRB5_0101; DRB5_0102; DRB1_1301; DRB1_1102; DRB1_1101			
7	IGIVNNTVYDPLQPELDSFKEELDK	S	DQB1-0201_DQA1-0201; DQB1-0603_DQA1-0103; DRB1_0803; DQB1-0501_DQA1-0101; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB3_0101; DPB1-0401_DPA1-0103; DPB1-0402_DPA1-0103; DRB1_1303; DQB1-0303_DQA1-0201; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DPB1-0201_DPA1-0103; DQB1-0302_DQA1-0301; DPB1-0101_DPA1-0202; DRB4_0103; DPB1-1401_DPA1-0201; DPB1-0301_DPA1-0103; DRB3_0301; DPB1-0901_DPA1-0201; DPB1-1701_DPA1-0201; DPB1-1001_DPA1-0201; DQB1-0604_DQA1-0102; DQB1-0502_DQA1-0102; DPB1-0501_DPA1-0202; DRB1_0701; DRB1_0101; DRB1_1502; DRB1_0406; DPB1-0202_DPA1-0103; DRB1_1501; DRB1_0302; DQB1-0301_DQA1-0505; DQB1-0201_DQA1-0501; DRB1_0403; DRB1_1401; DRB1_1405; DQB1-0202_DQA1-0201; DPB1-1301_DPA1-0201; DRB5_0101; DRB5_0102; DRB1_1301; DRB1_1102; DRB1_1101; DRB1_0802; DRB1_0301; DRB3_0201; DRB3_0202	0.999999	1	0.999149
8	DEVRQIAPGQTGKIADYNYKLPDDF	S	DQB1-0301_DQA1-0601; DQB1-0601_DQA1-0103; DQB1-0301_DQA1-0303; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB3_0101; DPB1-0401_DPA1-0103; DPB1-0402_DPA1-0103; DRB1_1303; DQB1-0303_DQA1-0201; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DPB1-0201_DPA1-0103; DQB1-0302_DQA1-0301; DPB1-0101_DPA1-0202; DRB4_0103; DPB1-1401_DPA1-0201; DPB1-0301_DPA1-0103; DRB3_0301; DPB1-0901_DPA1-0201; DPB1-1701_DPA1-0201; DPB1-1001_DPA1-0201; DQB1-0604_DQA1-0102; DQB1-0502_DQA1-0102; DPB1-0501_DPA1-0202; DRB1_0701; DRB1_0101; DRB1_1502; DRB1_0406; DPB1-0202_DPA1-0103; DRB1_1501; DRB1_0302; DQB1-0301_DQA1-0505; DQB1-0201_DQA1-0501; DRB1_0403; DRB1_1401; DRB1_1405; DQB1-0202_DQA1-0201; DPB1-1301_DPA1-0201; DRB5_0101; DRB5_0102; DRB1_1301; DRB1_1102; DRB1_1101; DRB1_0802; DRB1_0301; DRB3_0201; DRB3_0202; DQB1-0201_DQA1-0201; DQB1-0603_DQA1-0103; DRB1_0803; DQB1-0501_DQA1-0101	1	1	0.999546

9	GDSTE CSNLL LQYGS FCTQL NRALT	S	DRB1_0102; DQB1-0303_DQA1-0301; DRB1_1602; DRB1_1503; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB3_0101; DPB1-0401_DPA1-0103; DPB1-0402_DPA1-0103; DRB1_1303; DQB1-0303_DQA1-0201; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DPB1-0201_DPA1-0103; DQB1-0302_DQA1-0301; DPB1-0101_DPA1-0202; DRB4_0103; DPB1-1401_DPA1-0201; DPB1-0301_DPA1-0103; DRB3_0301; DPB1-0901_DPA1-0201; DPB1-1701_DPA1-0201; DPB1-1001_DPA1-0201; DQB1-0604_DQA1-0102; DQB1-0502_DQA1-0102; DPB1-0501_DPA1-0202; DRB1_0701; DRB1_0101; DRB1_1502; DRB1_0406; DPB1-0202_DPA1-0103; DRB1_1501; DRB1_0302; DQB1-0301_DQA1-0505; DQB1-0201_DQA1-0501; DRB1_0403; DRB1_1401; DRB1_1405; DQB1-0202_DQA1-0201; DPB1-1301_DPA1-0201; DRB5_0101; DRB5_0102; DRB1_1301; DRB1_1102; DRB1_1101; DRB1_0802; DRB1_0301; DRB3_0201; DRB3_0202; DQB1-0201_DQA1-0201; DQB1-0603_DQA1-0103; DRB1_0803; DQB1-0501_DQA1-0101; DQB1-0301_DQA1-0601; DQB1-0601_DQA1-0103; DQB1-0301_DQA1-0303	1	1	0.999816
10	KNIDG YFKIYS KHTPIN LVRDL PQG	S	DRB1_1302; DRB1_0801; DRB1_0407; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB3_0101; DPB1-0401_DPA1-0103; DPB1-0402_DPA1-0103; DRB1_1303; DQB1-0303_DQA1-0201; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DPB1-0201_DPA1-0103; DQB1-0302_DQA1-0301; DPB1-0101_DPA1-0202; DRB4_0103; DPB1-1401_DPA1-0201; DPB1-0301_DPA1-0103; DRB3_0301; DPB1-0901_DPA1-0201; DPB1-1701_DPA1-0201; DPB1-1001_DPA1-0201; DQB1-0604_DQA1-0102; DQB1-0502_DQA1-0102; DPB1-0501_DPA1-0202; DRB1_0701; DRB1_0101; DRB1_1502; DRB1_0406; DPB1-0202_DPA1-0103; DRB1_1501; DRB1_0302; DQB1-0301_DQA1-0505; DQB1-0201_DQA1-0501; DRB1_0403; DRB1_1401; DRB1_1405; DQB1-0202_DQA1-0201; DPB1-1301_DPA1-0201; DRB5_0101; DRB5_0102; DRB1_1301; DRB1_1102; DRB1_1101; DRB1_0802; DRB1_0301; DRB3_0201; DRB3_0202; DQB1-0201_DQA1-0201; DQB1-0603_DQA1-0103; DRB1_0803; DQB1-0501_DQA1-0101; DQB1-0301_DQA1-0601; DQB1-0601_DQA1-0103; DQB1-0301_DQA1-0303; DRB1_0102; DQB1-0303_DQA1-0301; DRB1_1602; DRB1_1503	1	1	0.999882
11	HADQL TPTWR VYSTG SNVFQ TRAGC	S	DPB1-0601_DPA1-0103; DQB1-0401_DQA1-0301; DRB1_0804; DRB1_1104; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB3_0101; DPB1-0401_DPA1-0103; DPB1-0402_DPA1-0103; DRB1_1303; DQB1-0303_DQA1-0201; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DPB1-0201_DPA1-0103; DQB1-0302_DQA1-0301; DPB1-0101_DPA1-0202; DRB4_0103; DPB1-1401_DPA1-0201; DPB1-0301_DPA1-0103; DRB3_0301; DPB1-0901_DPA1-0201; DPB1-1701_DPA1-0201; DPB1-1001_DPA1-0201; DQB1-0604_DQA1-0102; DQB1-0502_DQA1-0102; DPB1-0501_DPA1-0202; DRB1_0701; DRB1_0101; DRB1_1502;	1	1	0.999926

			DRB1_0406; DPB1-0202_DPA1-0103; DRB1_1501; DRB1_0302; DQB1-0301_DQA1-0505; DQB1-0201_DQA1-0501; DRB1_0403; DRB1_1401; DRB1_1405; DQB1-0202_DQA1-0201; DPB1-1301_DPA1-0201; DRB5_0101; DRB5_0102; DRB1_1301; DRB1_1102; DRB1_1101; DRB1_0802; DRB1_0301; DRB3_0201; DRB3_0202; DQB1-0201_DQA1-0201; DQB1-0603_DQA1-0103; DRB1_0803; DQB1-0501_DQA1-0101; DQB1-0301_DQA1-0601; DQB1-0601_DQA1-0103; DQB1-0301_DQA1-0303; DRB1_0102; DQB1-0303_DQA1-0301; DRB1_1602; DRB1_1503; DRB1_1302; DRB1_0801; DRB1_0407			
12	FIAGLI AIVMV TIMLC CMTSC CSCL	S	DRB1_1601; DRB1_1202; DPB1-0501_DPA1-0201; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB3_0101; DPB1-0401_DPA1-0103; DPB1-0402_DPA1-0103; DRB1_1303; DQB1-0303_DQA1-0201; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_0404; DPB1-0201_DPA1-0103; DQB1-0302_DQA1-0301; DPB1-0101_DPA1-0202; DRB4_0103; DPB1-1401_DPA1-0201; DPB1-0301_DPA1-0103; DRB3_0301; DPB1-0901_DPA1-0201; DPB1-1701_DPA1-0201; DPB1-1001_DPA1-0201; DQB1-0604_DQA1-0102; DQB1-0502_DQA1-0102; DPB1-0501_DPA1-0202; DRB1_0701; DRB1_0101; DRB1_1502; DRB1_0406; DPB1-0202_DPA1-0103; DRB1_1501; DRB1_0302; DQB1-0301_DQA1-0505; DQB1-0201_DQA1-0501; DRB1_0403; DRB1_1401; DRB1_1405; DQB1-0202_DQA1-0201; DPB1-1301_DPA1-0201; DRB5_0101; DRB5_0102; DRB1_1301; DRB1_1102; DRB1_1101; DRB1_0802; DRB1_0301; DRB3_0201; DRB3_0202; DQB1-0201_DQA1-0201; DQB1-0603_DQA1-0103; DRB1_0803; DQB1-0501_DQA1-0101; DQB1-0301_DQA1-0601; DQB1-0601_DQA1-0103;DQB1-0301_DQA1-0303; DRB1_0102;cDQB1-0303_DQA1-0301; DRB1_1602; DRB1_1503; DRB1_1302; DRB1_0801; DRB1_0407; DPB1-0601_DPA1-0103; DQB1-0401_DQA1-0301; DRB1_0804; DRB1_1104	1	1	0.99 9989
1	KDLPK EITVAT SRTLS YYKLG ASQR	M	DQB1-0301_DQA1-0505; DRB1_0102; DQB1-0502_DQA1-0102; DRB1_1601; DRB1_1503; DRB1_0101; DRB1_0403; DRB1_0406; DRB5_0102; DQB1-0303_DQA1-0201; DRB1_0402; DRB1_1301; DRB1_0404; DRB1_0901; DRB1_1406; DRB1_1501; DQB1-0202_DQA1-0201; DRB1_1602	0.802 347	0.814 186	0.61 0992
2	MADSN GTITVE ELKKL LEQWN LVIG	M	DRB1_1101; DPB1-0402_DPA1-0103; DRB1_0803; DRB1_1104; DQB1-0201_DQA1-0201; DRB1_0804; DQB1-0302_DQA1-0301; DRB1_0801; DRB1_1102; DQB1-0301_DQA1-0303; DQB1-0301_DQA1-0505; DRB1_0102; DQB1-0502_DQA1-0102; DRB1_1601; DRB1_1503; DRB1_0101; DRB1_0403; DRB1_0406; DRB5_0102; DQB1-0303_DQA1-0201; DRB1_0402; DRB1_1301; DRB1_0404; DRB1_0901; DRB1_1406; DRB1_1501; DQB1-0202_DQA1-0201; DRB1_1602	0.939 299	0.942 213	0.82 7034
3	LWLL WPVTL	M	DQB1-0602_DQA1-0102; DQB1-0501_DQA1-0101; DRB3_0202; DQB1-0301_DQA1-0505; DRB1_0102; DQB1-	0.987 316	0.987 925	0.85 6152

	ACFVL AAVYR INWITG		0502_DQA1-0102; DRB1_1601; DRB1_1503; DRB1_0101; DRB1_0403; DRB1_0406; DRB5_0102; DQB1-0303_DQA1-0201; DRB1_0402; DRB1_1301; DRB1_0404; DRB1_0901; DRB1_1406; DRB1_1501; DQB1-0202_DQA1-0201; DRB1_1602; DRB1_1101; DPB1-0402_DPA1-0103; DRB1_0803; DRB1_1104; DQB1-0201_DQA1-0201; DRB1_0804; DQB1-0302_DQA1-0301; DRB1_0801; DRB1_1102; DQB1-0301_DQA1-0303			
4	FIASFR LFART RSMWS FNPET NILL	M	DRB1_0802; DRB1_0701; DRB1_0401; DRB1_0407; DQB1-0301_DQA1-0505; DRB1_0102; DQB1-0502_DQA1-0102; DRB1_1601; DRB1_1503; DRB1_0101; DRB1_0403; DRB1_0406; DRB5_0102; DQB1-0303_DQA1-0201; DRB1_0402; DRB1_1301; DRB1_0404; DRB1_0901; DRB1_1406; DRB1_1501; DQB1-0202_DQA1-0201; DRB1_1602; DRB1_1101; DPB1-0402_DPA1-0103; DRB1_0803; DRB1_1104; DQB1-0201_DQA1-0201; DRB1_0804; DQB1-0302_DQA1-0301; DRB1_0801; DRB1_1102; DQB1-0301_DQA1-0303; DQB1-0602_DQA1-0102; DQB1-0501_DQA1-0101; DRB3_0202	0.995 85	0.996 745	0.90 5042
5	ASQRV AGDSG FAAYS RYRIG NYKLN	M	DRB1_1302; DQB1-0303_DQA1-0301; DRB1_1502; DQB1-0301_DQA1-0505; DRB1_0102; DQB1-0502_DQA1-0102; DRB1_1601; DRB1_1503; DRB1_0101; DRB1_0403; DRB1_0406; DRB5_0102; DQB1-0303_DQA1-0201; DRB1_0402; DRB1_1301; DRB1_0404; DRB1_0901; DRB1_1406; DRB1_1501; DQB1-0202_DQA1-0201; DRB1_1602; DRB1_1101; DPB1-0402_DPA1-0103; DRB1_0803; DRB1_1104; DQB1-0201_DQA1-0201; DRB1_0804; DQB1-0302_DQA1-0301; DRB1_0801; DRB1_1102; DQB1-0301_DQA1-0303; DQB1-0602_DQA1-0102; DQB1-0501_DQA1-0101; DRB3_0202; DRB1_0802; DRB1_0701; DRB1_0401; DRB1_0407	0.997 289	0.997 843	0.96 6492
1	NGGDA ALALL LLDRL NQLES KMSGK	N	DRB4_0103; DRB3_0101; DRB1_1104; DRB3_0301; DRB1_0804; DRB1_1301; DRB1_1406; DRB1_1405; DQB1-0303_DQA1-0301; DRB1_1102; DRB1_1101	0.825 314	0.821 672	0.41 1628
2	VTPSG TWLTY TGAIK LDDKD PNFKD	N	DRB1_0701; DRB5_0101; DRB1_0301; DRB1_1303; DRB1_1502; DRB4_0103; DRB3_0101; DRB1_1104; DRB3_0301; DRB1_0804; DRB1_1301; DRB1_1406; DRB1_1405; DQB1-0303_DQA1-0301; DRB1_1102; DRB1_1101	0.961 338	0.963 945	0.66 1484
3	GLPYG ANKDG IIWVAT EGALN TPKD	N	DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB1_1503; DRB1_0403; DRB1_0404; DRB1_0407; DQB1-0202_DQA1-0201; DPB1-0101_DPA1-0201; DRB4_0103; DRB3_0101; DRB1_1104; DRB3_0301; DRB1_0804; DRB1_1301; DRB1_1406; DRB1_1405; DQB1-0303_DQA1-0301; DRB1_1102; DRB1_1101; DRB1_0701; DRB5_0101; DRB1_0301; DRB1_1303; DRB1_1502	0.989 536	0.990 346	0.76 2635
4	RPQGL PNNTA SWFTA	N	DQB1-0601_DQA1-0103; DRB1_1402; DQB1-0303_DQA1-0201; DRB1_0802; DQB1-0302_DQA1-0301; DQB1-0502_DQA1-0102; DRB4_0103; DRB3_0101; DRB1_1104; DRB3_0301; DRB1_0804; DRB1_1301; DRB1_1406;	0.993 939	0.993 903	0.87 2582

	LTQHG KEDLK		DRB1_1405; DQB1-0303_DQA1-0301; DRB1_1102; DRB1_1101; DRB1_0701; DRB5_0101; DRB1_0301; DRB1_1303; DRB1_1502; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB1_1503; DRB1_0403; DRB1_0404; DRB1_0407; DQB1-0202_DQA1-0201; DPB1-0101_DPA1-0201			
5	GTTLP KGFYA EGSRG GSQAS SRSSS	N	DPB1-0601_DPA1-0103; DQB1-0401_DQA1-0301; DRB1_1601; DQB1-0201_DQA1-0501; DRB4_0103; DRB3_0101; DRB1_1104; DRB3_0301; DRB1_0804; DRB1_1301; DRB1_1406; DRB1_1405; DQB1-0303_DQA1-0301; DRB1_1102; DRB1_1101; DRB1_0701; DRB5_0101; DRB1_0301; DRB1_1303; DRB1_1502; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB1_1503; DRB1_0403; DRB1_0404; DRB1_0407; DQB1-0202_DQA1-0201; DPB1-0101_DPA1-0201; DQB1-0601_DQA1-0103; DRB1_1402; DQB1-0303_DQA1-0201; DRB1_0802; DQB1-0302_DQA1-0301; DQB1-0502_DQA1-0102	0.996624	0.996645	0.914328
6	IKLDD KDPNF KDQVI LLNKH IDAYK	N	DRB1_0803; DRB1_0801; DRB3_0202; DRB3_0201; DRB4_0103; DRB3_0101; DRB1_1104; DRB3_0301; DRB1_0804; DRB1_1301; DRB1_1406; DRB1_1405; DQB1-0303_DQA1-0301; DRB1_1102; DRB1_1101; DRB1_0701; DRB5_0101; DRB1_0301; DRB1_1303; DRB1_1502; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB1_1503; DRB1_0403; DRB1_0404; DRB1_0407; DQB1-0202_DQA1-0201; DPB1-0101_DPA1-0201; DQB1-0601_DQA1-0103; DRB1_1402; DQB1-0303_DQA1-0201; DRB1_0802; DQB1-0302_DQA1-0301; DQB1-0502_DQA1-0102; DPB1-0601_DPA1-0103; DQB1-0401_DQA1-0301; DRB1_1601; DQB1-0201_DQA1-0501	0.999218	0.999236	0.930092
7	RQKKQ QTVTL LPAAD LDDFS KQLQQ	N	DRB1_0102; DRB1_0101; DRB5_0202; DRB1_1202; DRB1_1201; DRB4_0103; DRB3_0101; DRB1_1104; DRB3_0301; DRB1_0804; DRB1_1301; DRB1_1406; DRB1_1405; DQB1-0303_DQA1-0301; DRB1_1102; DRB1_1101; DRB1_0701; DRB5_0101; DRB1_0301; DRB1_1303; DRB1_1502; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB1_1503; DRB1_0403; DRB1_0404; DRB1_0407; DQB1-0202_DQA1-0201; DPB1-0101_DPA1-0201; DQB1-0601_DQA1-0103; DRB1_1402; DQB1-0303_DQA1-0201; DRB1_0802; DQB1-0302_DQA1-0301; DQB1-0502_DQA1-0102; DPB1-0601_DPA1-0103; DQB1-0401_DQA1-0301; DRB1_1601; DQB1-0201_DQA1-0501; DRB1_0803; DRB1_0801; DRB3_0202; DRB3_0201	0.999695	0.999724	0.960521
8	KPRQK RTATK AYNVT QAFGR RGPEQ	N	DPB1-0301_DPA1-0103; DRB5_0102; DPB1-0901_DPA1-0201; DRB4_0103; DRB3_0101; DRB1_1104; DRB3_0301; DRB1_0804; DRB1_1301; DRB1_1406; DRB1_1405; DQB1-0303_DQA1-0301; DRB1_1102; DRB1_1101; DRB1_0701; DRB5_0101; DRB1_0301; DRB1_1303; DRB1_1502; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB1_1503; DRB1_0403; DRB1_0404; DRB1_0407; DQB1-0202_DQA1-0201; DPB1-0101_DPA1-0201; DQB1-0601_DQA1-0103; DRB1_1402; DQB1-0303_DQA1-0201; DRB1_0802; DQB1-0302_DQA1-0301; DQB1-0502_DQA1-	0.999814	0.999831	0.968823

			0102; DPB1-0601_DPA1-0103; DQB1-0401_DQA1-0301; DRB1_1601; DQB1-0201_DQA1-0501; DRB1_0803; DRB1_0801; DRB3_0202; DRB3_0201; DRB1_0102; DRB1_0101; DRB5_0202; DRB1_1202; DRB1_1201			
9	LPAAD LDDFS KQLQQ SMSSA DSTQA	N	DRB1_0405; DRB1_0901; DRB1_0411; DRB1_1302; DRB4_0103; DRB3_0101; DRB1_1104; DRB3_0301; DRB1_0804; DRB1_1301; DRB1_1406; DRB1_1405; DQB1-0303_DQA1-0301; DRB1_1102; DRB1_1101; DRB1_0701; DRB5_0101; DRB1_0301; DRB1_1303; DRB1_1502; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB1_1503; DRB1_0403; DRB1_0404; DRB1_0407; DQB1-0202_DQA1-0201; DPB1-0101_DPA1-0201; DQB1-0601_DQA1-0103; DRB1_1402; DQB1-0303_DQA1-0201; DRB1_0802; DQB1-0302_DQA1-0301; DQB1-0502_DQA1-0102; DPB1-0601_DPA1-0103; DQB1-0401_DQA1-0301; DRB1_1601; DQB1-0201_DQA1-0501; DRB1_0803; DRB1_0801; DRB3_0202; DRB3_0201; DRB1_0102; DRB1_0101; DRB5_0202; DRB1_1202; DRB1_1201; DPB1-0301_DPA1-0103; DRB5_0102; DPB1-0901_DPA1-0201	0.999905	0.999894	0.992082
10	KDGII WVATE GALNT PKDHI GTRNP	N	DQB1-0603_DQA1-0103; DRB4_0103; DRB3_0101; DRB1_1104; DRB3_0301; DRB1_0804; DRB1_1301; DRB1_1406; DRB1_1405; DQB1-0303_DQA1-0301; DRB1_1102; DRB1_1101; DRB1_0701; DRB5_0101; DRB1_0301; DRB1_1303; DRB1_1502; DRB1_1001; DQB1-0602_DQA1-0102; DRB1_0401; DRB1_1503; DRB1_0403; DRB1_0404; DRB1_0407; DQB1-0202_DQA1-0201; DPB1-0101_DPA1-0201; DQB1-0601_DQA1-0103; DRB1_1402; DQB1-0303_DQA1-0201; DRB1_0802; DQB1-0302_DQA1-0301; DQB1-0502_DQA1-0102; DPB1-0601_DPA1-0103; DQB1-0401_DQA1-0301; DRB1_1601; DQB1-0201_DQA1-0501; DRB1_0803; DRB1_0801; DRB3_0202; DRB3_0201; DRB1_0102; DRB1_0101; DRB5_0202; DRB1_1202; DRB1_1201; DPB1-0301_DPA1-0103; DRB5_0102; DPB1-0901_DPA1-0201; DRB1_0405; DRB1_0901; DRB1_0411; DRB1_1302	0.999927	0.999918	0.992082

Index for Table: Sl, Selection; P, viral protein; S, Surface glycoprotein;
M, membrane glycoprotein; NP, nucleocapsid phosphoprotein.

Leveraging proteomic data to infer relative viral protein abundance

[000419] In addition to peptide-MHC binding, another important consideration in the design of a potential SARS CoV-2 vaccine is the degree of viral protein expression in infected host cells. In order to determine the relative abundance of SARS CoV-2 proteins, we analyzed three publicly available proteomic datasets that acquired unbiased LC-MS/MS on tryptic digestions of SARS-CoV-2- infected host cells. Relative abundance of the viral proteins was estimated by spectral counting, a semi-quantitative approach whereby peptide-spectrum matches are counted, and totals are compared across proteins (**Table 8**). Table 8 shows spectral counts from published SARS CoV-2 proteomic datasets_MS/MS spectra assigned to peptides from

SARS CoV-2 proteins were tallied across datasets, divided by protein length, and normalized within each dataset to generate FIG. 5. This analysis demonstrated the significantly wide range of expression levels of the SARS CoV-2 proteins. Specifically, it confirmed that the N protein is the most abundant viral protein across all three datasets following SARS CoV-2 infection (**FIG. 5**). This finding is corroborated by reports of N-derived peptides being detected in gargle solution samples from COVID-19 patients. Furthermore, the N protein has been used as a biomarker for diagnosing patients infected with the SARS-CoV virus. On the other hand, based solely on genomic information, ORF10 might be considered a potential target for vaccine development. However, there is very little proteomic and transcriptomic evidence that ORF10 is actually expressed in SARS CoV-2 infected cells. These findings emphasize the value of considering SARS CoV-2 protein expression levels in addition to HLA binding predictions and the immunogenicity of these epitopes in vaccine design strategies.

Table 8

Protein	Seq. length	PSMs			PSMs/Length			PSMs/Length-relative (%)		
		Dav.	Boj.	Bez.	Dav.	Boj.	Bez.	Dav.	Boj.	Bez.
S	1273	1778	112	109	1.396700707	0.087981147	0.085624509	12	7.68	5.57
Pp1ab	7096	1245	17	131	0.175450958	0.002395716	0.018461105	1.51	0.21	1.20
Orf9b	97	59	31	43	0.608247423	0.319587629	0.443298969	5.23	27.9	28.84
Orf8	121	32			0.26446281	0	0	2.27	0.00	0.00
Orf7a	121	21	2	5	0.173553719	0.016528926	0.041322314	1.49	1.44	2.69
Orf6	61	4	8	7	0.06557377	0.131147541	0.114754098	0.56	11.45	7.47
Orf3a	275	115	22	25	0.418181818	0.08	0.090909091	3.59	6.98	5.91
N	419	4876	480	644	11.6372315	1.145584726	1.53699284	100	100	100
E	75	1		1	0.013333333	0	0.013333333	0.11	0.00	0.87

M	222	293	36	55	1.31981982	0.162162162	0.247747748	11.34	14.16	16.12

Table index: Boj, Bojkova *et al.*: PXD017710; Bez, Bezstarosti *et al.*: PXD018760; Dav, Davidson *et al.*: PXD018241.

Discussion

[000420] In this work, the utility and validity of the HLA-I and HLA-II binding prediction algorithms used were demonstrated to the *Coronaviridae* virus family, and specifically to SARS-CoV-2. The strength of the prediction is two-fold: first, we have MS-based validated predictors for both HLA-I and HLA-II binders, which potentially could be leveraged to induce both long-term CD4+and CD8+T cell immunity against the virus. Specifically, our HLA-II predictor, which has also been trained on a large set of mono-allelic MS data, has been shown to significantly outperform previously published tools and is used here to identify high-quality CD4+epitopes that may contribute to both cellular and humoral immunity. Second, our expansive database of supported HLA-I and HLA-II alleles provides us with the ability to not only identify many peptide-MHC allele pairs, but to generate a narrow list of peptides with many potential HLA pairings that could be presented by the entire USA, European and Asian Pacific Islander populations. By applying these algorithms to previously assayed peptide-MHC allele pairs in ViPR, we were able to demonstrate excellent concordance between our binding predictions and the results of the binding assays for both HLA-I and HLA-II epitopes. We leveraged the homology within the *Coronaviridae* family to demonstrate that an exceedingly high portion (~90%) of our high-ranking SARS CoV-2 peptide-MHC allele pairs for which validation was available was indeed confirmed to bind the predicted MHC allele. We also confirmed that our binding predictors can identify epitopes that are immunogenic and can lead to CD8+T cell responses to multiple SARS CoV-2 proteins in donor PBMCs. It is plausible that our significant fraction of experimentally confirmed epitopes (of all highly predicted, tested epitopes) is only an underestimate for overall immunogenicity, since PBMCs from only three donors were used in this initial experiment. Though we did not perform T cell assays to evaluate the immunogenicity of the HLA-II predicted epitopes, such analysis would be valuable, especially given the importance of CD4+ T cells in both the cellular and humoral anti-viral response. We thus propose that a combination of B and T cell epitopes could provide long-lasting immunity from SARS CoV-2 or mitigate the severity of disease when protection is partial.

[000421] We therefore concluded that using MS-based HLA binding predictors to predict T cell epitopes from the ORFs of SARS CoV-2 provides a significantly expanded, novel set of high-quality T cell vaccine targets for the virus. This was specifically the case when comparing this study to the recent publication by Grifoni, et al.. We provide ten-fold more highly predicted epitopes, across many more HLA alleles which allow us to better prioritize vaccine candidates. In addition, we provide not only bioinformatic validation

with a larger set of previously reported epitopes from other viruses from the *Coronaviridae* family in ViPR, but also experimentally validated, novel 2019 SARS CoV-2 T cell epitopes.

[000422] The selection of target sequences can be further guided by protein expression, epitopes predicted to provide coverage to a big fraction of the population, and conserved 2019 SARS CoV-2 epitopes. First, designing therapeutics against predicted epitopes is only effective if the proteins containing those epitopes are expressed at high enough levels for efficient antigen processing and presentation to take place. Therefore, it is crucial that protein expression be considered when selecting therapeutic targets. Second, prioritization of epitopes that are predicted to bind multiple alleles could provide coverage to significant fractions of the population, while including few epitopes in the vaccine. Lastly, during the viral spread and expansion through the population, genomic modifications are acquired, generating sequence diversity among the 2019 SARS CoV-2 population. This diversity may allow evasion of immune pressure, and therefore it is important to prioritize epitopes that are conserved across the 2019 SARS CoV-2 population.

[000423] While limiting epitope selection to highly expressed proteins, epitopes predicted to bind multiple high frequency HLA alleles, and conserved viral epitopes restricts the number of potential epitopes, the breadth of the list we provide increases the likelihood of identifying many high-quality, highly expressed epitopes. The epitopes characterized here, combined with insights on 2019 SARS CoV-2 protein expression along with further efforts to confirm immunogenicity, can provide pre-clinical validation of epitopes that may be vaccine candidates to induce strong cellular immunity.

Conclusions

[000424] In summary, the work provides the most extensive set of both CD4+ and CD8+ T cells epitopes that are spanning the entire 2019 SARS CoV-2 genome and binding a wide set of HLA-I and HLA-II alleles. Combining this epitope list to protein expression levels, population coverage and viral sequence conservation will lead to generation of a short list of vaccine epitope candidates that are likely immunogenic in the majority of the population. Our predicted list of CD4+ and CD8+ T cell epitopes will complement B cell epitopes and serve as a resource for the scientific community to generate potent 2019 SARS CoV-2 vaccine epitopes and generate long-lasting T cell immunity.

Example 2: HLA Class I and Class II Binding Assays

[000425] The following example of peptide binding to HLA molecules demonstrates quantification of binding affinities of HLA class I and class II peptides. Binding assays can be performed with peptides that are either motif-bearing or not motif-bearing. 2019 SARS CoV-2 infected cell lines were prepared. Cell lysates are prepared and HLA molecules purified in accordance with disclosed protocols (Sidney et al., Current Protocols in Immunology 18.3.1 (1998); Sidney, et al., J. Immunol. 154:247 (1995); Sette, et al., Mol. Immunol. 31:813 (1994)). HLA molecules are purified from lysates by affinity chromatography. The lysates are passed over a column of Sepharose CL-4B beads coupled to an appropriate antibody. The anti-HLA column is then washed with 10mM Tris-HCL, pH 8.0, in 1% NP-40, PBS, and PBS containing 0.4%

n-octylglucoside and HLA molecules are eluted with 50mM diethylamine in 0.15M NaCl containing 0.4% n-octylglucoside, pH 11.5. A 1/25 volume of 2.0M Tris, pH 6.8, is added to the eluate to reduce the pH. Eluates are then concentrated by centrifugation in Centriprep 30 concentrators (Amicon, Beverly, MA). Protein content is evaluated by a BCA protein assay (Pierce Chemical Co., Rockford, IL) and confirmed by SDS-PAGE.

[000426] A detailed description of the protocol utilized to measure the binding of peptides to Class I and Class II MHC has been published (Sette et al., Mol. Immunol. 31:813, 1994; Sidney et al., in Current Protocols in Immunology, Margulies, Ed., John Wiley & Sons, New York, Section 18.3, 1998). Briefly, purified MHC molecules (5 to 500nM) are incubated with various unlabeled peptide inhibitors and 1-10nM ^{125}1-radiolabeled probe peptides for 48h in PBS containing 0.05% Nonidet P40 (NP40) (or 20% w/v digitonin for H-2 IA assays) in the presence of a protease inhibitor cocktail. All assays are at pH 7.0 with the exception of DRB1*0301, which was performed at pH 4.5, and DRB1*1601 (DR2w21131) and DRB4*0101 (DRw53), which were performed at pH 5.0.

[000427] Following incubation, MHC-peptide complexes are separated from free peptide by gel filtration on 7.8 mm x 15 cm TSK200 columns (TosoHaas 16215, Montgomeryville, PA). Because the large size of the radiolabeled peptide used for the DRB1*1501 (DR2w2(31) assay makes separation of bound from unbound peaks more difficult under these conditions, all DRB1*1501 (DR2w2(31) assays were performed using a 7.8mm x 30cm TSK2000 column eluted at 0.6 mLs/min. The eluate from the TSK columns is passed through a Beckman 170 radioisotope detector, and radioactivity is plotted and integrated using a Hewlett-Packard 3396A integrator, and the fraction of peptide bound is determined.

[000428] Radiolabeled peptides are iodinated using the chloramine-T method. Typically, in preliminary experiments, each MHC preparation is titered in the presence of fixed amounts of radiolabeled peptides to determine the concentration of HLA molecules necessary to bind 10-20% of the total radioactivity. All subsequent inhibition and direct binding assays are performed using these HLA concentrations.

[000429] Since under these conditions [label]<[HLA] and IC_{50}>[HLA], the measured IC_{50} values are reasonable approximations of the true K_D values. Peptide inhibitors are typically tested at concentrations ranging from 120 μg/ml to 1.2 ng/ml, and are tested in two to four completely independent experiments. To allow comparison of the data obtained in different experiments, a relative binding figure is calculated for each peptide by dividing the IC_{50} of a positive control for inhibition by the IC_{50} for each tested peptide (typically unlabeled versions of the radiolabeled probe peptide). For database purposes, and inter-experiment comparisons, relative binding values are compiled. These values can subsequently be converted back into IC_{50} nM values by dividing the IC5o nM of the positive controls for inhibition by the relative binding of the peptide of interest. This method of data compilation has proven to be the most accurate and consistent for comparing peptides that have been tested on different days, or with different lots of purified MHC.

[000430] Because the antibody used for HLA-DR purification (LB3.1) is a-chain specific, 131 molecules are not separated from 133 (and/or 134 and (35) molecules. The 131 specificity of the binding assay is obvious in the cases of DRB1*0101 (DR1), DRB1*0802 (DR8w2), and DRB1*0803 (DR8w3), where no 133 is expressed. It has also been demonstrated for DRB1*0301 (DR3) and DRB3*0101 (DR52a), DRB1*0401 (DR4w4), DRB1*0404 (DR4w14), DRB1*0405 (DR4w15), DRB1*1101 (DR5), DRB1*1201 (DR5w12), DRB1*1302 (DR6w19) and DRB1*0701 (DR7). The problem of13 chain specificity for DRB1*1501 (DR2w2(31), DRB5*0101 (DR2w2(32), DRB1*1601 (DR2w21131), DRB5*0201 (DR51Dw21), and DRB4*0101 (DRw53) assays is circumvented by the use of fibroblasts. Development and validation of assays with regard to DRP molecule specificity have been described previously (see, e.g., Southwood et al., J. Immunol. 160:3363-3373, 1998).

[000431] The live cell/flow cytometry-based assays can also be used. This is a well-established assay utilizing the TAP-deficient hybridoma cell line T2 (American Type Culture Collection (ATCC Accession No. CRL-1992), Manassas, Va.). The TAP deficiency in this cell line leads to inefficient loading of MHCI in the ER and an excess of empty MHCIs. Salter and Cresswell, EMBO J. 5:94349 (1986); Salter, Immunogenetics 21:235-46 (1985). Empty MHCIs are highly unstable, and are therefore short-lived. When T2 cells are cultured at reduced temperatures, empty MHCIs appear transiently on the cell surface, where they can be stabilized by the exogenous addition of MHCI-binding peptides. To perform this binding assay, peptide-receptive MHCIs were induced by culturing aliquots of 10^7 T2 cells overnight at 26°C in serum free AIM-V medium alone, or in medium containing escalating concentrations (0.1 to 100 μM) of peptide. Cells were then washed twice with PBS, and subsequently incubated with a fluorescent tagged HLA-A02:01-specific monoclonal antibody, BB7.2, to quantify cell surface expression. Samples were acquired on a FACS Calibur instrument (Becton Dickinson) and the mean fluorescence intensity (MFI) determined using the accompanying Cellquest software.

Example 3: Confirmation of Immunogenicity

[000432] In an exemplary method for confirmation of immunogenicity, in vitro education (IVE) assays are used to test the ability of each test peptide to expand CD8+ T cells. Mature professional APCs are prepared for these assays in the following way. 80-90x10^6 PBMCs from a healthy human donor are plated in 20 ml of RPMI media containing 2% human AB serum, and incubated at 37°C for 2 hours to allow for plastic adherence by monocytes. Non-adherent cells are removed and the adherent cells are cultured in RPMI, 2% human AB serum, 800 IU/ml of GM-CSF and 500 IU/ml of IL-4. After 6 days, TNF-alpha is added to a final concentration of 10 ng/ml. On day 7, the dendritic cells (DC) are matured either by the addition of 12.5 mg/m1 poly I:C or 0.3 μg/ml of CD4OL. The mature dendritic cells (mDC) are harvested on day 8, washed, and either used directly or cryopreserved for future use.

[000433] For the IVE of CD8+ T cells, aliquots of 2x10^5 mDCs are pulsed with each peptide at a final concentration of 100 micromole, incubated for 4 hours at 37°C, and then irradiated (2500 rads). The

peptide-pulsed mDCs are washed twice in RPMI containing 2% human AB serum. $2x10^5$ mDCs and $2x10^6$ autologous CD8+ cells are plated per well of a 24-well plate in 2 ml of RPMI containing 2% human AB, 20 ng/ml IL-7 and 100 pg/ml of IL-12, and incubated for 12 days. The CD8+ T cells are then re-stimulated with peptide-pulsed, irradiated mDCs. Two to three days later, 20 IU/ml IL-2 and 20 ng/IL7 are added. Expanding CD8+ T cells are re-stimulated every 8-10 days, and are maintained in media containing IL-2 and IL-7. Cultures are monitored for peptide-specific T cells using a combination of functional assays and/or tetramer staining. Parallel IVES with the modified and parent peptides allowed for comparisons of the relative efficiency with which the peptides expanded peptide-specific T cells.

Quantitative and Functional Assessment of CD8+ and CD4+ T cells

Tetramer Staining

[000434] MHC tetramers are purchased or manufactured on-site, and are used to measure peptide-specific T cell expansion in the IVE assays. For the assessment, tetramer is added to $lx10^5$ cells in PBS containing 1% FCS and 0.1% sodium azide (FACS buffer) according to manufacturer's instructions. Cells are incubated in the dark for 20 minutes at room temperature. Antibodies specific for T cell markers, such as CD8, are then added to a final concentration suggested by the manufacturer, and the cells are incubated in the dark at $4^{\circ}C$ for 20 minutes. Cells are washed with cold FACS buffer and resuspended in buffer containing 1% formaldehyde. Cells are acquired on a FACS Calibur (Becton Dickinson) instrument, and are analyzed by use of Cellquest software (Becton Dickinson). For analysis of tetramer positive cells, the lymphocyte gate is taken from the forward and side-scatter plots. Data are reported as the percentage of cells that were CD8+/Tetramer+.

[000435] $CD4^+$ T cell responses towards the peptide antigens can be tested using the *ex vivo* induction protocol. In this example, $CD4^+$ T cell responses were identified by monitoring IFNγ and/or TNFα production in an antigen specific manner.

[000436] Evaluation of Antigen Presentation: For a subset of predicted antigens, the affinity of the viral epitopes for the indicated HLA alleles and stability of the neoepitopes with the HLA alleles was determined. An exemplary detailed description of the protocol utilized to measure the binding affinity of peptides to Class I MHC has been published (Sette et al, Mol. Immunol. 31(11):813-22, 1994). In brief, MHCI complexes were prepared and bound to radiolabeled reference peptides. Peptides were incubated at varying concentrations with these complexes for 2 days, and the amount of remaining radiolabeled peptide bound to MHCI was measured using size exclusion gel-filtration. The lower the concentration of test peptide needed to displace the reference radiolabeled peptide demonstrates a stronger affinity of the test peptide for MHCI. Peptides with affinities to MHCI <50nM are generally considered strong binders while those with affinities <150nM are considered intermediate binders and those <500nM are considered weak binders (Fritsch et al, 2014).

[000437] An exemplary detailed description of the protocol utilized to measure the binding stability of peptides to Class I MHC has been published (Harndahl et al. J Immunol Methods. 374:5-12, 2011). Briefly, synthetic genes encoding biotinylated MHC-I heavy and light chains are expressed in E. coli and purified from inclusion bodies using standard methods. The light chain (β2m) is radio-labeled with iodine (125I), and combined with the purified MHC-I heavy chain and peptide of interest at 18°C to initiate pMHC-I complex formation. These reactions are carried out in streptavidin coated microplates to bind the biotinylated MHC-I heavy chains to the surface and allow measurement of radiolabeled light chain to monitor complex formation. Dissociation is initiated by addition of higher concentrations of unlabeled light-chain and incubation at 37°C. Stability is defined as the length of time in hours it takes for half of the complexes to dissociate, as measured by scintillation counts. MHC-II binding affinity with peptides is measured following the same general procedure as with measuring MHCI-peptide binding affinity. Prediction algorithms utilized for predicting MHCII alleles for binding to a given peptide are described herein. Besides, NetMHCIIpan may be utilized for prediction of binding.

[000438] To assess whether antigens could be processed and presented from the larger polypeptide context, peptides eluted from HLA (class I or class II) molecules isolated from cells expressing the genes of interest were analyzed by tandem mass spectrometry (MS/MS).

ELISPOT

[000439] Peptide-specific T cells are functionally enumerated using the ELISPOT assay (BD Biosciences), which measures the release of IFNgamma from T cells on a single cell basis. Target cells (T2 or HLA-A0201 transfected C1Rs) were pulsed with 10 uM peptide for 1 hour at 37°C, and washed three times. $1x10^5$ peptide-pulsed targets are co-cultured in the ELISPOT plate wells with varying concentrations of T cells ($5x10^2$ to 2x103) taken from the IVE culture. Plates are developed according to the manufacturer's protocol, and analyzed on an ELISPOT reader (Cellular Technology Ltd.) with accompanying software. Spots corresponding to the number of IFNgamma-producing T cells are reported as the absolute number of spots per number of T cells plated. T cells expanded on modified peptides are tested not only for their ability to recognize targets pulsed with the modified peptide, but also for their ability to recognize targets pulsed with the parent peptide.

CD107 Staining

[000440] CD107a and b are expressed on the cell surface of CD8+ T cells following activation with cognate peptide. The lytic granules of T cells have a lipid bilayer that contains lysosomal-associated membrane glycoproteins ("LAMPs"), which include the molecules CD107a and b. When cytotoxic T cells are activated through the T cell receptor, the membranes of these lytic granules mobilize and fuse with the plasma membrane of the T cell. The granule contents are released, and this leads to the death of the target cell. As the granule membrane fuses with the plasma membrane, C107a and b are exposed on the cell surface, and therefore are markers of degranulation. Because degranulation as measured by CD107 a and

b staining is reported on a single cell basis, the assay is used to functionally enumerate peptide-specific T cells. To perform the assay, peptide is added to HLA-A0201-transfected cells C1R to a final concentration of 20 μM, the cells were incubated for 1 hour at 37°C, and washed three times. $1x10^5$ of the peptide-pulsed C1R cells were aliquoted into tubes, and antibodies specific for CD107 a and b are added to a final concentration suggested by the manufacturer (Becton Dickinson). Antibodies are added prior to the addition of T cells in order to "capture" the CD107 molecules as they transiently appear on the surface during the course of the assay. $1x10^5$ T cells from the culture are added next, and the samples were incubated for 4 hours at 37°C. The T cells are further stained for additional cell surface molecules such as CD8 and acquired on a FACS Calibur instrument (Becton Dickinson). Data is analyzed using the accompanying Cellquest software, and results were reported as the percentage of CD8+ CD107 a and b+ cells.

CTL Lysis

[000441] Cytotoxic activity is measured using a chromium release assay. Target T2 cells are labeled for 1 hour at 37°C with $Na^{51}Cr$ and washed $5x10^3$ target T2 cells were then added to varying numbers of T cells from the IVE culture. Chromium release is measured in supernatant harvested after 4 hours of incubation at 37°C. The percentage of specific lysis is calculated as:

[000442] Experimental release-spontaneous release/Total release-spontaneous release x100

Example 4: Peptide Composition for Prophylactic or Therapeutic Uses

[000443] Immunogenic or vaccine compositions of the invention are used to inhibit viral replication. For example, a polyepitopic composition (or a nucleic acid comprising the same) containing multiple CTL and HTL epitopes is administered to individuals having viral infections. The composition is provided as a single lipidated polypeptide that encompasses multiple epitopes. The composition is administered in an aqueous carrier comprised of alum. The dose of peptide for the initial immunization is from about 1 to about 50,000 lig, generally 100-5,000 ps, for a 70 kg patient. The initial administration is followed by booster dosages at 4 weeks followed by evaluation of the magnitude of the immune response in the patient, by techniques that determine the presence of epitope-specific CTL populations in a PBMC sample. Additional booster doses are administered as required. The composition is found to be both safe and efficacious to inhibit viral replication.

[000444] Alternatively, the polyepitopic composition can be administered as a nucleic acid, for example as RNA, in accordance with methodologies known in the art and disclosed herein.

[000445] Viral epitope binding agents, such as TCR or CARs can be administered in accordance with methodologies known in the art and disclosed herein. The binding agents can be administered as polypeptides or polynucleotides, for example RNA, encoding the binding agents, or as a cellular therapy, by administering cells expressing the binding agents.

[000446] Viral epitope peptides, polynucleotides, binding agents, or cells expressing these molecules can be delivered to the same patient via multiple methodologies known in the art, and can further be combined with other therapies (e.g., anti-viral therapies).

Example 5. Administration of Compositions Using Dendritic Cells

[000447] Vaccines comprising epitopes of the invention may be administered using dendritic cells. In this example, the peptide-pulsed dendritic cells can be administered to a patient to stimulate a CTL response *in vivo*. In this method dendritic cells are isolated, expanded, and pulsed with a vaccine comprising peptide CTL and HTL epitopes of the invention. The dendritic cells are infused back into the patient to elicit CTL and HTL responses *in vivo*. The induced CTL and HTL then destroy (CTL) or facilitate destruction (HTL) of the specific target cells that bear the proteins from which the epitopes in the vaccine are derived.

[000448] Alternatively, *ex vivo* CTL or HTL responses to a particular viral antigen can be induced by incubating in tissue culture the patient's, or genetically compatible, CTL or HTL precursor cells together with a source of antigen-presenting cells, such as dendritic cells, and the appropriate immunogenic peptides.

[000449] After an appropriate incubation time (typically about 7-28 days), in which the precursor cells are activated and expanded into effector cells, the cells are infused back into the patient, where they will destroy (CTL) or facilitate destruction (HTL) of their specific target cells, i.e., cells displaying viral epitopes.

Example 6: Identification of mutant sequences with immunogenic potential

[000450] For each epitope, the full-length amino acid sequence of the viral epitope was derived. Any constituent 9-mer or 10-mer protein sequence was scored for binding potential on six common HLA alleles (HLA-A01:01, HLA-A02:01. HLA-A03:01, HLA-A24:02, HLA-B07:02, and HLA-B08:01) using available algorithms. Any peptide scoring better than 1000 nM was nominated.

[000451] For each epitope, the full-length amino acid sequence of the viral epitope was derived. Any constituent 9mer or l0mer not found in the germline protein sequence was flagged and scored for binding potential on six common HLA alleles (HLA-A01:01, HLA-A02:01. HLA-A03:01, HLA-A24:02, HLA-B07:02, and HLA-B08:01) using available algorithms.

Example 7: SARS COV-2 (2019 SARS-Cov 2) peptide string designs

[000452] Provided herein are special constructs “strings” of multiple 2019 SARS COV-2 nucleocapsid epitopes for therapeutic application. These strings are designed to contain specific epitopes of the 2019 SARS COV-2 nucleocapsid each of which are individually disclosed in the previous examples in this application, and predicted by the MHC-binding algorithm as described above. These strings are designed for therapeutic use in treating COVID 19 and can be administered as the nucleic acid string constructs, e.g. mRNA encapsulated in a lipid nanoparticle.

[000453] The strings are designed to include a 5'UTR and a 3'UTR. Epitopes are interconnected by peptide linkers, encoded by the respective nucleic acid sequences. Some linkers have specific cleavage sites. **Table 11 and Table 12** show the complete sequences of amino acids and the nucleotide sequences encoding them. The nucleotide sequences are further codon optimized for efficient translation in human. **Tables 9** and **10** provide construct maps, detailing the segments and sequences corresponding to each string in the Table 11 and 12 respectively. **FIGs 6A and 6B** exemplify graphically the design of the strings of Group 1, sequences of RS C1-C4. FIG. 6B display a more detailed layout of FIG. 6A. **FIGs 7A and 7B** exemplify graphically the design of the strings of Group 2, sequences of RS C5-C8. FIG. 7B display a more detailed layout of FIG. 7A. In some cases, the strings are also identified as RS C1n, RS-C2n etc.

[000454] The string named "RS_C1 GSS linkers" (abbreviated RS C1) encodes an ORF having an amino acid length of 1266 amino acids, and the nucleotide sequence encoding the ORF is 3798 nucleotides long. The entire string is 4107 nucleotides long and encodes a peptide string that is 1369 amino acids long. **Table 11** exemplifies the amino acid and nucleic acid sequences (not codon optimized). An exemplary codon optimized sequence for string named "RS C1 GSS linkers" is:

[000455] ATGAGGGTAATGGCTCCGCGCACCCTTATATTGCTTCTGTCTGGGGCGCTTGCGCTT
ACGGAAACTTGGGCAGGGTCTGGTGGGTCTGGAGGTGGTGGTTCCGGCGGGAGTGATAATG
GACCTCAGAACCAACGCAACGCACCCAGGATCACATTTGGTGGGCCATCCGACTCCACTGG
CAGCAACCAAAACGGTGAACGAAGTGGCGCGAGATCCAAGCAGCGCCGCCCTCAAGGTTT
GCCGAATAACACAGCCAGCTGGTTCACTGCCTTGACTCAGCATGGCAAGGAAGATTTGAAA
TTCCCACGAGGACAGGGTGTCCCTATAAATACGAATTCCAGTCCCGATGATCAGATCGGTTA
TTATAGAAGAGCTACAAGGCGAATCCGGGGCGGGGATGGCAAGATGAAAGACCTGAGCCC
GCGCTGGTATTTCTATTACCTGGGAACTGGACCTGAAGCGGGCCTCCCTTATGGTGCGAATA
AAGACGGAATAATCTGGGTGGCTACGGAAGGGGCCCTGAACACGCCCAAGGATCACATCG
GCACACGCAATCCGGCGAACAATGCCGCGATAGTGCTGCAGCTGCCACAAGGCACCACACT
GCCAAAGGGGTTTTACGCAGAAGGCTCCAGAGGTGGGTCACAAGCCTCTTCTCGATCCTCTT
CCCGGAGCAGAAATAGCTCACGAAACTCCACCCCGGGCAGTTCCAGAGGCACAAGTCCTGC
TCGCATGGCAGGTAATGGAGGTGACGCCGCTCTCGCGCTTCTTCTCCTCGACAGACTGAATC
AGCTTGAGAGTAAAATGAGTGGAAAGGGACAGCAGCAACAGGGGCAAACAGTGACCAAAA
AATCAGCTGCGGAAGCCAGCAAGAAGCCGCGCCAGAAACGGACAGCGACTAAAGCCTACA
ATGTTACCCAAGCCTTCGGCCGCAGAGGGCCGGAGCAAACTCAGGGCAACTTCGGCGATCA
GGAACTGATCCGCCAGGGAACAGATTATAAACATTGGCCCCAAATCGCACAATTTGCACCC
TCCGCGTCTGCGTTCTTCGGCATGAGCCGGATTGGTATGGAAGTAACACCGAGCGGCACCT
GGCTTACATATACAGGCGCGATTAAATTGGATGACAAGGATCCCAATTTTAAGGACCAAGT
GATATTGCTCAACAAACATATTGATGCGTATAAGACTTTTCCTCCTACTGAACCAAAGAAGG
ATAAGAAAAAAAAGGCTGATGAAACACAAGCTCTTCCTCAACGCCAGAAAAAGCAACAGA

CAGTTACCTTGCTCCCGGCGGCCGATCTTGATGATTTTTCCAAGCAGCTGCAACAGTCTATG
TCATCAGCCGACTCTACCCAAGCAGGCGGTTCAGGTGGCGGCGGTTCTGGTGGCGACCCTA
AGATATCCGAAATGCACCCCGCACTCAGACTGGTAGACCCCCAAATACAACTGGCGGTTAC
ACGGATGGAGAACGCGGTTGGCAGGGACCAGAATAACGTGGGGCCAAAGGTGTATCCTAT
CATCCTCAGATTGGGTAGTCCCCTCAGCTTGAATATGGCTAGAAAAACACTGAATTCATTGG
AAGACAAGGCGTTCCAACTGACACCGATTGCGGTGCAGATGACAAAGCTCGCTACAACCGA
GGAACTCCCAGACGAGTTTGTAGTAGTCACAGTCAAGGGTGGCTCAGGCGGCGGAGGCTCA
GGTGGATACCATTTTTTTCATACGACGGATCCATCTTTTCTCGGCCGATATATGAGCGCGCT
CTTCGCAGACGATCTGAATCAGCTCACGGGATACCACACAGACTTCAGTAGTGAAATTATC
GGTTATCAGTTGATGTGCCAGCCGATATTGTTGGCTGAGGCTGAACTTGCTAAGAATGTCTC
CCTCATCTTGGGGACAGTCAGCTGGAACCTTAAACGCCGCTACTTGCTGTCTGCGGGTATCT
TTGGGGCTATTACGGATGTATTTTACAAAGAAAACAGCTATAAAGTACCGACCGACAATTA
CATCACGACTTATGCACGCATGGCGGCACCAAAGGAAATCATATTTCTTGAGGGGGAAACT
CTGTTCGGAGACGATACAGTAATAGAAGTCGCTATTATACTTGCTTCATTTTCAGCCAGTAC
TCGACGCATGGCTATGGTGACCAATAATACTTTCACGCTGAAGGTTCCTCATGTGGGCGAAA
TCCCCGTCGCCTATCGCAAGGTCCTGCTCAAGACTATTCAACCTCGCGTTGAAAAGTACCTT
TTCGATGAAAGCGGGGAATTTAAACTCAGCGAAGTGGGCCCTGAACACTCACTCGCAGAAT
ATTATATTTTCTTTGCCTCCTTTTATTATAAACGGAATGGCGGCGGCTCTGGCGGAGGTGGG
TCTGGTGGCGATCTCTTTATGCGGATCTTTACAATAGGGACCGTTACATTGAAGCAAGGGGA
AATCAAGGACGCCACACCGTCCGATTTCGTTAGAGCAACCGCCACGATTCCTATCCAGGCA
TCCTTGCCCTTCGGGTGGCTGATAGTAGGTGTAGCACTCCTTGCAGTCTTTCAAAGCGCATC
CAAAATCATTACCCTCAAGAAACGCTGGCAGCTTGCCCTTTCTAAGGGAGTACATTTCGTAT
GTAATCTGTTGCTCCTGTTCGTTACAGTTTATAGCCATCTCTTGCTCGTTGCCGCTGGGCTGG
AAGCCCCATTTTTGTACCTGTACGCCCTTGTGTATTTTCTTCAAAGCATAAATTTCGTGAGGA
TTATCATGCGCCTCTGGCTGTGCTGGAAATGCCGCTCAAAAAATCCACTTCTTTATGACGCA
AACTATTTTCTCTGTTGGCATACAAATTGTTACGATTATTGTATACCTTACAACAGTGTGACG
TCCTCCATAGTCATCACCAGCGGAGATGGTACAACGTCACCCATTTCTGAGCACGACTACCA
AATAGGCGGCTATACGGAGAAGTGGGAATCTGGTGTAAAAGATTGCGTGGTGCTTCACTCT
TATTTTACTTCAGATTACTACCAGCTTTATAGCACTCAACTTTCTACCGATACAGGAGTGGA
ACACGTCACATTTTTTATATACAACAAGATTGTCGATGAACCCGAAGAACACGTGCAAATA
CATACAATCGACGGCTCCTCAGGAGTCGTCAATCCAGTCATGGAACCAATCTACGATGAGC
CGACAACTACCACTAGTGTACCGCTCGGGGGAAGCGGGGGCGGAGGTAGCGGCGGAGCAG
ACAGTAATGGTACTATAACTGTGGAGGAGCTCAAGAAGCTCCTTGAGCAATGGAATCTGGT
CATAGGTTTTCTGTTTCTTACCTGGATATGCCTTCTTCAGTTCGCCTATGCGAATCGCAACCG
CTTCCTGTACATCATAAAGCTCATATTCCTCTGGCTGCTCTGGCCGGTTACTCTTGCCTGTTT

TGTTCTTGCTGCTGTATACCGCATTAATTGGATAACGGGGGGAATAGCGATCGCGATGGCAT
GCTTGGTGGGATTGATGTGGCTGAGCTACTTTATAGCGTCATTTAGGCTTTTTGCGAGGACT
AGATCCATGTGGTCCTTTAATCCCGAAACTAACATTCTTCTCAATGTACCGTTGCATGGAAC
TATTTTGACTAGACCCCTTCTCGAGAGTGAGCTGGTGATAGGAGCCGTGATACTCAGGGGTC
ATCTCCGGATTGCCGGTCACCATTTGGGTAGATGTGACATAAAAGATCTCCCAAAGGAAAT
TACGGTAGCTACGTCTCGAACCCTTTCATACTACAAACTCGGTGCTAGCCAGCGAGTGGCTG
GGGATAGCGGCTTCGCGGCGTATTCTCGCTACAGAATTGGAAACTACAAGTTGAATACGGA
CCACTCATCAAGTAGCGATAACATTGCACTGCTTGTGCAGGGTGGTAGTCTCGGGGGGGGC
GGATCCGGTATCGTGGGCATAGTTGCGGGTCTCGCTGTGCTGGCTGTGGTCGTGATCGGCGC
GGTCGTAGCTACCGTGATGTGTAGGCGGAAAAGCAGTGGTGGTAAAGGTGGATCATATAGT
CAGGCTGCATCATCTGATTCCGCTCAAGGAAGCGACGTCAGCCTGACAGCTTGATAA **(SEQ ID RS C1n)**

[000456] The string named "RS C2 GSS linkers inverted" (abbreviated RS C2) encodes an ORF having an amino acid length of 1266 amino acids, and the nucleotide sequence encoding the ORF is 3798 nucleotides long. The entire string is 4107 nucleotides long and encodes a peptide string that is 1369 amino acids long. **Table 11** exemplifies the amino acid sequence and the nucleic acid sequences (not codon optimized) encoding the same. An exemplary codon optimized sequence for string named "RS C2 GSS linkers inverted" is:

[000457] ATGCGAGTCATGGCGCCGCGCACCCTGATACTTCTGCTTAGCGGCGCTTTGGCCCT
CACCGAGACATGGGCTGGCAGCGGTGGTTCTGGAGGCGGAGGATCAGGCGGAGCGGACAG
CAATGGCACGATCACTGTGGAGGAGCTCAAAAAACTTTTGGAACAATGGAATTTGGTAATT
GGTTTCTTGTTTCTTACTTGGATATGCCTGCTTCAGTTCGCCTATGCGAACAGAAATAGATTT
TTGTATATCATTAAATTGATATTTCTTTGGTTGCTTTGGCCTGTTACTCTGGCTTGTTTCGTCC
TCGCTGCGGTTTATCGGATAAATTGGATTACGGGTGGAATCGCAATTGCCATGGCCTGTCTG
GTCGGTCTGATGTGGCTTTCCTACTTCATAGCATCATTTAGGCTGTTCGCGAGAACGCGAAG
CATGTGGAGTTTCAACCCCGAGACGAATATCCTTTTGAACGTGCCTCTTCATGGCACTATTC
TCACTCGACCTCTGCTTGAATCCGAGCTCGTCATCGGCGCGGTAATCCTCCGGGGTCATCTG
CGGATCGCAGGTCACCACCTCGGGCGGTGTGATATCAAGGATCTTCCGAAAGAAATTACCG
TAGCTACTTCACGCACACTCAGCTACTACAAGCTGGGTGCTTCACAAAGAGTCGCCGGTGAT
TCTGGTTTCGCTGCGTATAGCAGGTACCGAATAGGAAATTACAAGCTCAATACCGATCATTC
CTCCAGCTCAGATAACATAGCCCTGCTTGTGCAAGGGGGATCCGGAGGAGGAGGTTCAGGC
GGTGACTTGTTTATGAGGATCTTTACCATCGGAACAGTGACACTCAAACAAGGGGAAATAA
AGGACGCCACTCCGTCAGACTTTGTTAGAGCAACAGCGACTATTCCGATTCAAGCCAGCCTT
CCTTTCGGGTGGCTCATAGTGGGCGTCGCATTGCTGGCGGTGTTTCAGAGTGCGAGTAAGAT
CATAACCCTCAAAAAGCGGTGGCAGTTGGCGTTGTCTAAAGGGGTACATTTTGTCTGCAACC

TTCTGCTCCTGTTCGTAACAGTTTATTCTCACCTGCTGTTGGTTGCGGCCGGTCTGGAGGCCC
CATTTCTTTATCTTTACGCACTTGTTTATTTCCTTCAATCCATAAATTTCGTTCGGATCATCAT
GAGATTGTGGCTCTGCTGGAAGTGCAGATCCAAAAACCCTCTCCTCTACGACGCGAATTATT
TCTTGTGTTGGCACACAAATTGCTATGACTATTGCATACCGTATAACTCCGTCACTTCTTCAA
TCGTAATCACCTCAGGCGACGGAACCACATCTCCCATCTCTGAGCACGACTACCAGATTGGC
GGATATACTGAAAAGTGGGAATCCGGTGTAAAGGACTGCGTAGTACTCCACTCATACTTCA
CTAGTGATTACTATCAACTCTACAGCACCCAGTTGAGCACTGATACGGGGGTCGAGCATGT
AACCTTCTTCATCTATAACAAAATAGTTGACGAGCCAGAGGAGCATGTACAAATACATACC
ATTGACGGTTCTTCTGGAGTCGTGAATCCGGTAATGGAACCTATTTATGATGAACCCACAAC
TACTACAAGTGTACCCCTTGGAGGCAGCGGCGGGGGTGGGTCTGGCGGATATCATTTCTTTC
ACACGACGGACCCTAGTTTTCTTGGTAGGTATATGAGCGCTCTTTTTGCGGATGATCTCAAT
CAGCTTACGGGCTACCACACGGACTTCAGTAGTGAAATAATCGGGTATCAATTGATGTGCC
AACCTATTCTGCTCGCGGAGGCAGAACTCGCCAAGAACGTTTCTCTGATCCTCGGCACGGTA
TCTTGGAATCTTAAAAGGAGATACCTTCTGAGCGCAGGCATTTTTGGCGCAATAACAGATGT
GTTTTACAAAGAAAATAGCTATAAGGTTCCTACAGACAACTACATAACCACATATGCAAGG
ATGGCAGCCCCGAAAGAAATTATATTCTTGGAGGGGGAGACTTTGTTCGGTGACGACACAG
TCATAGAGGTAGCAATTATACTCGCGAGCTTCTCCGCGTCTACTAGACGAATGGCGATGGTT
ACCAACAACACGTTTACGTTGAAGGTCCCCCACGTTGGCGAAATACCCGTCGCTTACAGAA
AGGTACTTCTCAAGACGATACAACCACGGGTGGAGAAGTATCTCTTCGACGAAAGTGGGGA
GTTTAAGCTTTCAGAAGTTGGGCCGGAACACTCCTTGGCGGAATACTATATTTTTTTTGCGT
CATTTTATTACAAGAGGAATGGGGGGGGTTCTGGGGGGGGGTGGATCTGGCGGGGATCCTAA
GATCTCTGAGATGCACCCTGCCCTGCGCCTTGTGGATCCACAGATACAGTTGGCTGTCACGA
GAATGGAGAATGCGGTGGGCAGGGATCAGAATAACGTTGGTCCAAAGGTATACCCGATCAT
TCTCCGACTTGGATCTCCCCTCTCTCTGAACATGGCCAGGAAGACGCTCAACAGTCTCGAGG
ATAAGGCTTTTCAGCTCACGCCGATTGCAGTGCAAATGACAAAACTCGCCACTACAGAGGA
ACTTCCAGATGAATTTGTCGTTGTAACCGTTAAAGGAGGTTCAGGCGGGGGTGGCTCCGGC
GGGAGTGACAACGGGCCGCAAAATCAGAGAAATGCACCTCGCATAACGTTCGGAGGACCG
TCCGACTCTACCGGGAGCAACCAAAATGGGGAGCGGAGCGGTGCGCGAAGCAAACAACGA
CGGCCGCAGGGTCTGCCGAACAACACGGCTTCCTGGTTTACAGCGTTGACTCAGCATGGGA
AAGAGGACCTTAAATTCCCACGGGGGCAGGGGGTTCCTATTAACACAAATTCTAGTCCAGA
CGACCAAATCGGATATTATCGCAGAGCTACACGCAGGATTAGGGGAGGTGATGGCAAAATG
AAAGACTTGTCACCGAGGTGGTATTTTTATTACCTCGGTACAGGCCCTGAAGCTGGCCTCCC
GTATGGAGCGAATAAGGATGGCATCATTTGGGTCGCCACCGAAGGCGCTTTGAATACACCT
AAAGATCATATCGGCACAAGAAACCCCGCGAACAATGCAGCAATAGTATTGCAACTCCCTC
AGGGGACCACTTTGCCTAAAGGTTTCTACGCCGAAGGTAGCCGAGGCGGTTCACAAGCGAG

TAGTAGATCTAGCTCTCGGTCTCGGAACTCTAGTAGGAATAGCACACCTGGTTCTTCACGCG
GCACCAGCCCGGCTAGAATGGCGGGTAACGGCGGCGACGCAGCTTTGGCATTGCTGCTTCT
GGACAGACTCAACCAACTTGAATCTAAAATGAGCGGTAAGGGGCAACAGCAACAAGGGCA
AACTGTTACGAAAAAATCAGCTGCGGAAGCGTCCAAAAAACCACGACAGAAACGGACGGC
CACTAAGGCTTACAATGTGACACAAGCTTTTGGTAGACGGGGCCCTGAACAGACGCAAGGT
AACTTCGGTGATCAAGAACTGATTCGACAAGGAACAGATTACAAGCACTGGCCACAAATTG
CACAATTCGCCCCCAGCGCGTCAGCTTTCTTTGGGATGAGCCGCATTGGAATGGAAGTCACC
CCGAGCGGAACCTGGCTCACCTATACGGGGGCAATCAAACTCGATGATAAAGACCCTAATT
TCAAGGATCAGGTTATTTTGCTTAATAAGCACATAGACGCATATAAAACCTTTCCACCGACG
GAACCTAAAAAGGACAAGAAAAAAAAGGCAGATGAGACGCAAGCACTCCCTCAGAGACAA
AAGAAGCAACAGACGGTGACATTGCTCCCAGCGGCAGATTTGGATGATTTCAGTAAGCAGT
TGCAGCAATCTATGTCTTCCGCGGATTCCACTCAGGCAGGTGGGTCTTTGGGCGGCGGAGGT
TCCGGAATTGTTGGCATAGTGGCGGGCCTCGCTGTGTTGGCCGTGGTTGTCATAGGAGCAGT
CGTTGCCACGGTCATGTGTAGAAGGAAGTCATCAGGTGGGAAGGGGGGCAGTTATTCACAG
GCGGCGAGTTCCGACAGTGCGCAGGGTAGCGACGTATCACTCACTGCCTAGTAA (**SEQ ID RS C2n**).

[000458] The string named "RS_C3 2A linkers" (abbreviated RS C3) encodes an ORF having an amino acid length of 1326 amino acids, and the nucleotide sequence encoding the ORF is 3978 nucleotides long. The entire string is 4287 nucleotides long and encodes a peptide string that is 1429 amino acids long. **Table 11** exemplifies the amino acid sequence and the nucleic acid sequences (not codon optimized) encoding the same. An exemplary codon optimized sequence for string named "RS_C3 2A linkers" is:

[000459] ATGCGCGTCATGGCCCCACGAACTTTGATACTTCTGCTGTCCGGCGCATTGGCCCTT
ACGGAAACGTGGGCGGGAAGCGGCGGCTCCGGCGGAGGAGGCAGTGGCGGTTCTGATAAC
GGACCGCAAAATCAAAGGAATGCCCCGAGGATAACCTTCGGCGGACCCAGTGATTCTACCG
GCTCTAATCAGAACGGAGAACGATCCGGCGCTAGATCAAAACAACGACGACCGCAGGGGT
TGCCGAACAATACTGCGAGCTGGTTTACGGCCCTGACCCAACATGGGAAGGAAGATCTCAA
ATTTCCGCGCGGTCAAGGGGTCCCTATTAACACCAATAGTTCTCCTGACGATCAAATTGGAT
ACTACCGGAGAGCCACCCGACGAATACGCGGAGGAGATGGTAAAATGAAAGATCTTTCCCC
ACGCTGGTATTTCTATTACCTCGGGACAGGACCAGAAGCGGGATTGCCTTATGGTGCTAATA
AAGATGGTATCATTTGGGTAGCGACAGAAGGTGCGCTGAATACGCCGAAAGATCACATCGG
GACACGCAACCCAGCTAATAATGCCGCTATCGTATTGCAACTGCCCCAAGGAACAACGCTG
CCTAAGGGATTTTATGCAGAGGGAAGTCGGGGGGGGTCTCAAGCCTCATCTCGGAGCAGTT
CCCGCAGTCGAAATTCCTCTCGCAATTCCACACCAGGAAGTTCCCGAGGAACTTCACCGGC
AAGAATGGCGGGGAACGGCGGTGATGCTGCCCTTGCTCTGCTTTTGCTCGATCGCCTCAACC
AGCTTGAAAGCAAGATGTCTGGGAAGGGACAACAACAGCAGGGCCAAACGGTCACAAAGA

AAAGTGCCGCCGAAGCCTCCAAGAAACCACGACAAAAGCGGACAGCCACTAAAGCTTACA
ACGTGACTCAAGCTTTCGGTCGACGGGGCCCTGAGCAGACCCAAGGGAATTTCGGAGATCA
AGAACTGATACGGCAAGGGACGGATTACAAGCACTGGCCCCAAATTGCCCAGTTTGCTCCT
TCTGCATCTGCCTTTTTCGGTATGTCACGGATCGGAATGGAGGTAACGCCGTCCGGAACATG
GCTGACTTATACAGGAGCCATTAAACTCGACGATAAAGATCCTAACTTTAAAGATCAGGTT
ATACTGCTCAACAAACACATAGATGCATACAAAACTTTCCCCCCTACGGAACCAAAGAAGG
ATAAGAAGAAGAAAGCTGACGAGACGCAGGCCCTCCCGCAAAGACAAAAGAAACAACAGA
CTGTCACCCTGTTGCCGGCGGCTGATCTGGACGACTTCAGCAAGCAATTGCAGCAATCCATG
TCTAGTGCAGACTCCACTCAGGCCGGAAGTGGTGGTTCCGGGGAGGGTAGGGGGTCTCTCT
TGACATGTGGCGACGTGGAAGAAAACCCTGGGCCTGATCCCAAGATTTCAGAAATGCACCC
AGCTCTCAGACTGGTGGACCCTCAAATACAGCTTGCGGTAACAAGAATGGAAAACGCTGTA
GGGCGCGACCAGAATAACGTCGGGCCAAAGGTTTACCCCATAATTCTGCGACTTGGTAGTC
CTCTTTCCCTGAATATGGCGCGCAAAACACTGAATTCATTGGAGGATAAGGCGTTTCAACTT
ACGCCTATAGCAGTCCAAATGACGAAACTGGCAACCACAGAAGAACTCCCGGACGAGTTTG
TTGTAGTGACCGTTAAAGGGAGTGGGGGCAGCGGAGCCACCAACTTCTCACTCCTCAAACA
AGCAGGTGACGTCGAAGAGAATCCCGGACCCTACCACTTCTTCCACACCACTGACCCGAGC
TTCCTGGGTAGATACATGTCTGCCCTCTTTGCAGACGATTTGAATCAACTTACTGGTTACCAT
ACTGACTTTTCAAGTGAAATAATTGGCTACCAGCTCATGTGTCAACCCATCCTGCTTGCGGA
AGCGGAATTGGCCAAAAATGTGTCCCTCATACTGGGGACAGTCAGTTGGAACTTGAAGCGG
CGCTACCTCCTGTCAGCCGGTATTTTTGGGGCAATCACAGATGTATTCTACAAAGAGAACTC
ATACAAAGTGCCTACGGACAACTATATAACTACTTATGCTAGAATGGCTGCTCCAAAAGAA
ATAATTTTTCTGGAGGGCGAGACTCTCTTTGGTGACGACACGGTCATTGAGGTAGCGATAAT
ACTTGCGAGCTTCTCTGCCAGTACAAGACGAATGGCTATGGTAACGAACAACACATTTACG
TTGAAGGTGCCGCACGTTGGAGAAATCCCCGTTGCATATCGAAAAGTTTTGCTGAAAACCA
TTCAGCCTCGAGTAGAGAAATACTTGTTCGACGAATCCGGTGAGTTTAAACTGAGCGAAGT
AGGCCCCGAACACTCCCTCGCAGAATACTATATATTTTTCGCTTCCTTTTACTATAAAAGAA
ACGGTGGCAGTGGTGTCAAGCAAACCCTGAACTTCGATCTCCTCAAGTTGGCAGGGGATGT
AGAGTCTAACCCTGGTCCGGACCTTTTCATGAGGATCTTTACTATCGGTACGGTCACCCTCA
AACAAGGCGAGATAAAAGACGCCACGCCCTCAGACTTCGTGCGAGCTACTGCAACCATCCC
AATACAGGCAAGCCTGCCCTTTGGCTGGTTGATCGTCGGGGTGGCACTCCTGGCTGTGTTTC
AGAGTGCGTCAAAGATAATTACTTTGAAGAAGAGGTGGCAATTGGCACTCTCCAAAGGTGT
CCACTTTGTTTGCAATTTGCTTCTCCTGTTTGTCACCGTCTACAGCCACCTTCTGCTGGTCGC
TGCTGGCCTGGAAGCACCGTTCCTGTACCTTTATGCCTTGGTGTACTTCCTCCAGAGCATTA
ACTTTGTTAGAATCATCATGCGCTTGTGGCTGTGTTGGAAATGTCGGTCCAAGAACCCGCTC
CTCTATGATGCAAATTATTTCCTTTGTTGGCATACGAATTGCTATGACTACTGTATTCCATAT

AATTCTGTAACGTCATCAATTGTTATAACGAGCGGAGACGGTACGACCTCCCCTATTAGCGA
ACATGATTACCAAATTGGTGGCTACACCGAAAAATGGGAATCAGGAGTAAAAGACTGCGTT
GTGTTGCATAGTTATTTTACCAGTGACTATTACCAATTGTACTCAACTCAACTGAGCACTGA
CACAGGTGTGGAGCACGTTACCTTCTTCATTTACAACAAGATTGTGGACGAGCCCGAAGAA
CACGTGCAGATTCATACAATTGATGGGTCCAGTGGTGTTGTCAATCCGGTCATGGAGCCCAT
ATACGATGAGCCGACTACCACAACTTCCGTGCCGCTCGGGAGCGGCGGATCAGGACAATGC
ACAAATTACGCACTCTTGAAGTTGGCCGGTGATGTAGAAAGCAATCCTGGTCCGGCCGACA
GCAACGGAACCATAACTGTAGAGGAATTGAAAAAGCTCCTGGAACAATGGAATCTCGTGAT
CGGTTTCCTCTTCCTTACATGGATCTGTTTGCTTCAGTTTGCGTATGCTAATCGCAATCGCTT
TCTGTATATCATAAAACTTATTTTCCTTTGGCTCCTGTGGCCCGTAACGCTGGCCTGCTTCGT
GCTTGCGGCGGTATATAGAATTAACTGGATCACTGGCGGCATAGCGATCGCTATGGCATGC
TTGGTGGGGCTCATGTGGTTGAGCTACTTTATTGCATCTTTTAGATTGTTCGCGCGAACGCG
ATCCATGTGGAGTTTTAATCCTGAAACGAATATATTGCTGAATGTACCTTTGCATGGAACAA
TTTTGACGCGCCCCTTGTTGGAAAGCGAACTCGTCATAGGCGCTGTGATATTGAGGGGACAC
CTGCGGATCGCGGGTCACCACCTCGGACGATGCGATATTAAGGATCTGCCCAAAGAGATCA
CGGTAGCCACCTCCCGAACCCTGAGTTACTACAAGCTTGGTGCTAGCCAACGAGTGGCTGG
GGACTCAGGTTTCGCGGCCTATAGTCGATATCGCATCGGCAATTACAAGCTGAATACGGAC
CATTCTAGTAGTAGTGATAATATCGCTCTCCTGGTACAAGGGGGAAGCCTCGGTGGAGGGG
GATCCGGTATTGTCGGAATTGTCGCCGGTTTGGCTGTGCTGGCAGTAGTAGTGATTGGAGCA
GTTGTCGCTACTGTAATGTGCAGAAGAAAGTCCAGCGGCGGCAAAGGGGGATCTTATAGCC
AGGCGGCAAGTAGTGATTCAGCGCAGGGATCCGATGTGAGCTTGACGGCTTAGTAA **(SEQ ID: RS C3n)**

[000460] The string named "RS C4 ORF1ab as linkers" (abbreviated RS C4) encodes an ORF having an amino acid length of 1234 amino acids, and the nucleotide sequence encoding the ORF is 3702 nucleotides long. The entire string is 4011 nucleotides long and encodes a peptide string that is 1337 amino acids long. **Table 11** exemplifies the amino acid sequence and the nucleic acid sequences (not codon optimized) encoding the same. An exemplary codon optimized sequence for string named " RS C4 ORF1ab as linkers" is:

[000461] ATGCGGGTTATGGCCCCGCGGACCCTTATCCTCCTTCTCTCAGGCGCACTTGCCTTG
ACCGAAACGTGGGCTGGGAGCGGGGGATCTGGTGGTGGGGGTTCAGGGGGCTCCGACAAT
GGACCTCAGAACCAGAGGAATGCCCCTAGAATTACTTTTGGTGGGCCTTCTGACTCCACGG
GCTCCAACCAAAACGGCGAACGATCTGGCGCCAGATCAAAGCAGCGGAGGCCTCAGGGCTT
GCCGAACAACACCGCCTCCTGGTTCACAGCCCTGACCCAGCATGGCAAGGAAGACCTCAAA
TTTCCAAGAGGCCAGGGCGTTCCAATCAACACGAATAGCAGCCCTGATGATCAAATAGGTT
ATTACAGAAGAGCCACCAGAAGGATCAGAGGAGGCGATGGGAAAATGAAGGACCTTAGCC

CAAGGTGGTACTTCTACTATCTCGGAACCGGGCCTGAAGCTGGGTTGCCTTACGGCGCCAAT
AAGGACGGTATAATATGGGTTGCTACAGAAGGGGCGCTTAACACTCCCAAAGATCATATCG
GTACGCGAAATCCCGCAAACAATGCCGCAATAGTGTTGCAGCTGCCGCAAGGAACAACGCT
CCCCAAGGGATTTTATGCAGAGGGTTCTCGGGGAGGCAGTCAGGCATCAAGCCGCTCCAGT
TCAAGATCACGAAATAGCTCTAGGAATTCTACTCCAGGCAGTTCACGAGGAACGTCTCCGG
CCCGAATGGCCGGGAATGGGGGCGATGCCGCTTTGGCGCTTTTGCTGCTGGATAGGCTCAA
CCAACTGGAGAGTAAAATGAGTGGAAAAGGCCAGCAGCAACAAGGGCAGACTGTCACTAA
GAAGTCAGCAGCCGAAGCAAGCAAGAAACCACGACAAAAGCGGACCGCGACTAAGGCATA
TAATGTAACGCAGGCCTTCGGAAGACGAGGGCCAGAGCAAACCCAAGGCAACTTCGGTGA
CCAAGAATTGATCAGGCAAGGCACCGATTATAAACATTGGCCGCAAATCGCGCAATTTGCT
CCTAGCGCAAGCGCCTTTTTCGGCATGAGCAGGATTGGCATGGAAGTCACACCAAGTGGAA
CATGGCTCACGTATACGGGGGCAATTAAACTCGATGACAAGGACCCGAATTTCAAGGATCA
AGTGATTTTGTTGAACAAGCACATAGACGCGTACAAAACTTTCCCGCCAACTGAGCCCAAG
AAGGATAAAAAAAAGAAAGCAGACGAGACACAGGCACTCCCGCAGCGACAAAAGAAACA
ACAGACGGTGACGCTTCTGCCAGCTGCCGACCTCGACGATTTCTCCAAGCAACTTCAGCAAT
CAATGTCAAGCGCAGATTCTACTCAAGCCTTTAGAGCTTGCATGGTCACTAACAATACATTT
ACACTCAAGGTACCGCATGTAGGGGAAATTCCCGTGGCCTACCGGAAGGTACTGCTCAAAA
CGATTCAACCTAGGGTAGAAAAATATCTTTTCGATGAATCAGGCGAATTTAAGCTTAGCGA
AGTGGGCCCAGAACATAGCCTCGCTGAGTATTATATTTTTTTCGCGTCCTTTTATTATAAGA
GAAATGGCGATCCCAAGATTTCAGAAATGCATCCTGCCCTTCGCCTCGTGGATCCTCAAATC
CAGCTCGCCGTTACAAGAATGGAGAACGCGGTAGGTAGAGATCAGAATAATGTTGGGCCTA
AAGTCTATCCGATTATTTTGCGGTTGGGCAGCCCCCTGAGTTTGAACATGGCTCGCAAGACC
TTGAATTCACTTGAGGACAAGGCATTCCAGCTGACGCCTATTGCGGTACAGATGACCAAGC
TGGCAACCACGGAAGAACTGCCGGATGAGTTTGTAGTCGTCACCGTAAAGTTTAACTCCTTC
CATACCACTGATCCCAGTTTTTTGGGGCGGTACATGAGTGCCCTTTTCGCGGACGATCTTAA
TCAACTCACGGGCTATCACACAGACTTTTCCAGTGAAATCATCGGGTATCAACTCATGTGTC
AGCCCATTCTGCTCGCTGAGGCTGAGCTGGCAAAGAACGTTAGCTTGATACTTGGGACGGT
GTCTTGGAACCTCAAAAAACAGGGCGATCTTTTTATGAGGATTTTTACGATTGGTACCGTAA
CGCTTAAACAAGGAGAGATTAAGGACGCAACCCCGAGTGACTTTGTCAGGGCGACAGCGAC
CATCCCTATTCAAGCAAGCCTGCCTTTTGGCTGGCTCATAGTCGGGGTCGCTCTGCTTGCTGT
ATTCCAGAGTGCCAGTAAAATCATCACTCTTAAAAAGCGATGGCAGCTGGCCCTTAGTAAG
GGGGTCCATTTCGTCTGCAACCTTCTGCTTTTGTTTGTCACCGTGTACTCTCATTTGCTCCTG
GTGGCCGCTGGACTGGAGGCTCCTTTCCTCTACCTTTACGCCCTTGTTTATTTTCTTCAATCC
ATCAATTTCGTGCGAATTATAATGCGCCTCTGGTTGTGCTGGAAGTGCCGGAGCAAAAATCC
TCTGCTCTACGATGCTAACTACTTTTTGTGTTGGCACACGAATTGCTACGACTACTGCATACC

TTACAATTCCGTGACCTCATCAATTGTGATAACGAGCGGTGACGGAACGACATCACCAATTT
CTGAGCATGACTACCAGATTGGTGGCTACACGGAAAAATGGGAATCTGGCGTCAAGGACTG
TGTGGTCCTGCATTCCTATTTTACGAGCGACTATTATCAGCTTTACTCCACGCAACTTAGTAC
GGACACCGGTGTCGAGCATGTCACGTTTTTTATTTACAATAAGATTGTTGATGAACCTGAAG
AACACGTGCAGATACATACCATTGACGGCTCTTCTGGAGTTGTGAACCCTGTCATGGAGCCT
ATCTACGACGAGCCAACAACTACGACTTCCGTACCTCTGAGAAGAAGCTACTTGTTGTCAGC
CGGGATATTCGGTGCGATCACCGACGTCTTCTATAAGGAGAATAGTTATAAGGTCCCTACA
GATAATTATATTACCACCTATGCGAGGATGGCGGCTCCTAAGGAGATTATATTCTTGGAGGG
GGAAACCCTGTTTGGCGATGACACCGTGATCGAGGTGGCCATTATACTTGCATCATTTTCTG
CCAGTACTCTCTTGGTACAGGCTGATAGTAATGGGACAATAACGGTTGAAGAACTTAAAAA
GCTTCTGGAACAGTGGAACTTGGTCATTGGATTTCTGTTCCTCACGTGGATTTGCCTCTTGCA
ATTCGCTTATGCAAATAGGAATCGGTTTCTTTATATCATCAAGTTGATATTCCTCTGGCTCCT
GTGGCCAGTGACTCTTGCTTGCTTTGTCCTGGCTGCCGTTTACCGAATAAATTGGATAACCG
GTGGTATCGCAATAGCTATGGCCTGTTTGGTGGGTCTGATGTGGTTGTCTTACTTCATAGCA
TCATTCCGCTTGTTCGCTAGAACTAGATCCATGTGGTCCTTCAACCCTGAAACTAATATTCTT
CTGAATGTGCCTCTTCACGGTACAATTTTGACACGACCACTCCTCGAAAGCGAACTTGTAAT
TGGGGCCGTGATCTTGAGGGGCCACCTTAGGATTGCAGGGCACCACTTGGGCAGATGCGAC
ATTAAGGATTTGCCAAAAGAAATAACGGTCGCGACTTCTCGGACATTGAGTTACTACAAAT
TGGGTGCATCCCAACGGGTGGCGGGTGATAGTGGGTTTGCGGCCTACTCTAGGTATCGAAT
CGGAAATTACAAGCTTAACACCGACCATTCAAGTAGTTCTGACAACATAGCTCTTCTGGTTC
AGGGTGGTTCTCTGGGTGGGGGAGGCTCCGGGATTGTCGGGATTGTCGCCGGTCTTGCTGTA
CTTGCCGTGGTGGTAATCGGAGCAGTCGTAGCTACAGTGATGTGCCGCAGAAAGAGTTCTG
GGGGTAAAGGCGGATCTTATAGCCAGGCAGCAAGCAGTGATTCCGCACAAGGATCCGATGT
GAGTCTTACCGCCTGATAA (**SEQ ID RS C4n**)

[000462] The string named "RS C5 2300" (abbreviated RS C5) encodes an ORF having an amino acid length of 756 amino acids, and the nucleotide sequence encoding the ORF is 2268 nucleotides long. The entire string is 2577 nucleotides long and encodes a peptide string that is 859 amino acids long. **Table 12** exemplifies the amino acid sequence and the nucleic acid sequences (not codon optimized) encoding the same. An exemplary codon optimized sequence for string named "RS C5 2300" is:

[000463] ATGCGCGTAATGGCGCCACGAACGTTGATTCTGTTGTTGAGTGGTGCTCTCGCGCT
CACGGAGACGTGGGCCGGATCAGGAGGGAGCGGGGGTGGTGGCTCTGGTGGAAAGGACCT
TTCTCCTCGGTGGTATTTTTACTATCTGGGGACCGGTCCTGAAGCGGGGTTGCCATATGGCG
CCAACAAGGATGGCATTATCTGGGTGGCGACAGAGGGCGCGCTTAATACACCGAAGGACCA
TATAGGAACGAGAAATCCAGCGAACAATGCTGCGATTGTCCTTCAGCTGCCGCAAGGAACG
ACCTTGCCCAAGGGTTTTTACGCCGAGGGCTCTAGGGGGGGCTCCCAAGCATCATCCCGATC

CAGCTCCCGGTCTCGAAATAGCTCCCGGAATAGCACTCCTGGTTCCTCCCGGGGAACGTCCC
CAGCGCGAATGGCAGGTAACGGGGGTGACGCCGCATTGGCTCTTCTCTTGTTGGATAGACT
GAATCAGTTGGAATCAAAGATGAGCGGAAAGGGACAACAACAACAGGGACAAACCGTAAC
TAAAAAAAGCGCTGCTGAGGCGAGTAAAAAACCGAGGCAAAAGCGAACTGCTACAAAAGC
GTATAATGTCACACAAGCCTTTGGTCGCAGAGGTCCAGAGCAGACTCAGGGTAACTTCGGA
GACCAGGAGTTGATCAGACAAGGGACTGATTACAAGCACTGGCCGCAGATCGCGCAATTCG
CTCCCAGCGCGAGTGCCTTCTTCGGAATGTCAAGGATCGGAATGGAGGTCACGCCCTCAGG
CACCTGGCTGACGTACACAGGTGCAATTAAGCTGGACGATAAGGATCCCAACTTTAAGGAT
CAAGTCATCCTTCTTAACAAACACATTGATGCCTATAAAACCTTCCCGCCCACGGAGCCGAA
GAAAGATAAGAAAAAAAAAGCTGATGAGACGCAGGCGCTGCCACAAAGACAGAAGAAGC
AACAAACCGTAACCCTCCTCCCTGCAGCGGACTTGGACGACTTCAGTAAGCAACTCCAGCA
ATCCATGTCCAGTGCGGATAGTACTCAGGCGTTTCGAGCCTGTATGGTTACCAACAACACAT
TCACTCTTAAGGTGCCCCATGTTGGGGAGATCCCCGTGGCGTATAGAAAAGTACTCTTGAAA
ACGATCCAACCTCGCGTGGAGAAATACCTCTTTGACGAATCTGGGGAATTCAAACTTAGCG
AGGTAGGCCCGGAACATTCCCTCGCAGAATACTATATTTTTTTCGCTAGTTTTTACTATAAG
CGATGCTTCCATACGACAGACCCCTCTTTTCTGGGACGGTACATGTCCGCCTTGTTTGCGGA
TGACCTTAACCAATTGACGGGCTACCATACAGACTTTTCATCCGAAATAATCGGTTACCAAC
TCATGTGTCAGCCTATACTCCTCGCCGAAGCCGAGCTGGCAAAAAATGTAAGTCTGATTCTG
GGTACTGTGTCATGGAATCTGAAGAAGCGATATCTCCTTTCTGCCGGTATATTCGGTGCAAT
AACCGACGTCTTTTATAAGGAAAACAGTTACAAAGTACCGACAGACAATTATATAACCACC
TATGCACGCATGGCCGCCCCCAAAGAAATCATTTTCCTTGAGGGTGAAACGTTGTTTGGGGA
TGACACAGTTATAGAGGTGGCGATAATCCTGGCTTCATTCAGTGCTTCTACGCGACGCAGCG
GTGCTGATAGTAATGGCACAATTACTGTAGAAGAGTTGAAAAAACTGCTGGAACAATGGAA
CCTTGTTATAGGCTTTTTGTTTTTGACCTGGATATGTCTCTTGCAGTTTGCGTACGCTAATAG
GAACAGGTTCCTGTACATAATCAAGCTCATCTTCTTGTGGCTGCTTTGGCCAGTAACACTTG
CCTGTTTTGTGCTGGCCGCGGTTTATAGGATCAACTGGATAACTGGCGGGATAGCAATAGCT
ATGGCGTGTCTCGTCGGGTTGATGTGGCTGTCCTATTTTATCGCATCTTTCCGACTTTTTGCA
CGGACCAGAAGCATGTGGTCCTTTAACCCGGAGACTAATATTTTGCTCAATGTACCACTGCA
CGGGACAATACTGACACGCCCCTTGTTGGAATCTGAGTTGGTAATAGGGGCTGTAATTCTCC
GCGGTCACCTTAGGATTGCAGGTCACCACCTGGGACGCTGCGATATAAAGGATCTTCCTAA
GGAAATTACGGTAGCAACGTCACGAACTCTCAGTTATTATAAACTTGGCGCCAGTCAGCGA
GTCGCTGGCGATAGCGGATTCGCCGCGTACTCTAGATACAGAATAGGAAACTACAAATTGA
ACACGGATCACAGCTCTTCATCAGACAATATCGCCCTTCTCGTACAGGGAGGCTCACTGGG
AGGGGGCGGCAGTGGTATAGTTGGTATTGTAGCGGGCTTGGCGGTCCTTGCGGTAGTTGTTA
TAGGTGCCGTCGTCGCCACTGTCATGTGCAGGCGGAAAAGCTCTGGTGGAAAGGGCGGGAG

CTATTCACAAGCCGCGTCCTCTGACTCTGCTCAGGGTTCAGATGTTAGTCTTACAGCATGAT
AA (**SEQ ID: RS C5n**)

[000464] The string named "RS C6 1200" (abbreviated RS C6) encodes an ORF having an amino acid length of 404 amino acids, and the nucleotide sequence encoding the ORF is 1212 nucleotides long. The entire string is 1521 nucleotides long and encodes a peptide string that is 507 amino acids long. **Table 12** exemplifies the amino acid sequence and the nucleic acid sequences (not codon optimized) encoding the same. An exemplary codon optimized sequence for string named "RS C6 1200" is:

[000465] ATGCGCGTGATGGCACCGAGGACGCTTATTCTCTTGCTGTCAGGTGCGCTCGCCCT
CACTGAGACATGGGCAGGGTCTGGAGGTAGTGGCGGCGGTGGGAGCGGAGGAAGAATGGC
TGGGAATGGGGGCGACGCTGCGCTCGCACTCTTGCTGTTGGACCGACTGAATCAGCTCGAG
AGCAAAATGAGTGGTAAGGGGCAACAACAGATGCGCGCGTGTATGGTGACTAACAACACC
TTTACCCTTAAAGTGCCGCATGTTGGTGAAATTCCCGTTGCCTACAGAAAGGTTCTCCTTAA
AACCATTCAGCCGAGAGTCGAAAAATATTTGTTCGACGAGAGTGGTGAATTTAAACTTAGT
GAAGTAGGTCCGGAACACAGTTTGGCTGAGTATAAGATGTGCGGATATAAGCATTGGCCAC
AAATAGCCCAGTTCGCCCCTTCCGCCTCCGCCTTTTTCGGTATGTCCCGGATTGGAATGGAA
GTGACCCCATCAGGAACTTGGCTCACATACACCGGGGCTATCAAACTTGATGATAAAGATC
CAAATTTCAAAGACCAAGTTATCCTGCTGAATAAGCACATCGATGCGTACAAAACGTTCCC
CGCGCGATGCGCCACCACCGATCCCTCCTTTCTTGGTAGATATATGAGCGCGTTGTTTGCCG
ACGACCTGAACCAACTCACAGGGTACCATACGGATTTCTCATCAGAAATCATAGGTTATCA
ACTGATGTGCCAGCCAATCCTGCTGGCGGAGGCCGAGCTCGCCAAGAATGTTTCCCTTATAC
TGGGTACTGTGAGCTGGAACCTGAAAAAACAGGGGTTTGCCTATGCAAACAGGAACAGGTT
CTTGTACATCATAAAGTTGATTTTCCTTTGGTTGCTGTGGCCGGTGACCCTTGCCTGTTTTGT
ACTGGCGGCCGTCTATAGAATCAATTGGATTACCGGAGGGATTGCAATTGCTATGGCGTGTC
TTGTGGGATTGATGTGGCTCAGTTACTTCATCGCCTCATTCCGCTTGTTCTACCGCTCTTACT
TGCTGAGCGCTGGGATTTTTGGAGCAATAACAGACGTTTTCTATAAGGAAAATTCATATAAG
GTCCCAACAGATAATTACATAACCACATACGCGCGGATGGCCGCGCCTAAGGAAATTATAT
TCCTTGAGGGGGAGACGCTTTTTGGCGATGACACCGTTATCGAGGTTTCAATGTTTAATTTG
GGAAGATGTGATATTAAGGACCTTCCCAAGGAGATCACCGTTGCAACCTCACGCACGCTCA
GCTATTATAAACTTGGGGCTAGCCAGCGGGTTGCCGGGGGCAGCTTGGGTGGCGGGGGTAG
TGGTATCGTGGGAATAGTTGCTGGATTGGCCGTACTGGCTGTTGTCGTGATAGGGGCGGTAG
TAGCAACAGTTATGTGTAGACGCAAGTCCTCAGGCGGTAAAGGAGGTTCATACAGCCAGGC
GGCATCATCTGATAGTGCCCAGGGGTCCGATGTCTCACTTACCGCCTAGTAA (**SEQ ID: RS C6n**)

[000466] The string named "RS C7 1500_M_chunks" (abbreviated RS C7) encodes an ORF having an amino acid length of 492 amino acids, and the nucleotide sequence encoding the ORF is 1476 nucleotides

long. The entire string is 1785 nucleotides long and encodes a peptide string that is 595 amino acids long. **Table 12** exemplifies the amino acid sequence and the nucleic acid sequences (not codon optimized) encoding the same. An exemplary codon optimized sequence for string named "RS C7 1500_M_chunks" is:

[000467] ATGCGGGTAATGGCACCACGCACGCTGATCCTTCTTCTCTCCGGTGCACTCGCTCT
GACGGAGACGTGGGCGGGAAGTGGTGGATCAGGGGGTGGGGGGTCTGGAGGCAGTCCCGC
TAGGATGGCAGGAAATGGAGGTGATGCCGCACTGGCCCTTTTGTTGCTCGACCGGCTTAATC
AACTTGAGTCCAAGATGAGCGGCAAAGGTCAACAACAGCAAGGTCAAACTGTTACCAAAA
AGAGCGCGGCAGAAGCAAGTAAGAAGCCCCGACAAAAAAGGACTGCAACGAAGGCGTATA
ACGTAACGCAGGCCTTCGGCCGACGAGGCCCAGAACAGACACAGGGGAACTTTGGGGATC
AGGAGCTGATAAGACAAGGTACTGACTACAAACACTGGCCTCAGATTGCTCAATTCGCTCC
AAGTGCCAGTGCATTCTTCGGAATGAGCCGGATCGGGATGGAGGTAACTCCCAGCGGAACA
TGGTTGACTTACACCGGAGCGATCAAACTGGACGACAAGGACCCTAATTTCAAGGATCAGG
TTATACTGTTGAACAAACATATCGACGCGTACAAGACCTTTCCTCCCACTGAGCCTAAAAAG
GACAAGTTCAAGGCGGCCATGGTAACCAACAACACCTTTACGTTGAAAGTACCCCACGTAG
GTGAAATACCGGTGGCCTATCGAAAGGTCCTTTTGAAGACCATCCAACCCCGCGTTGAAAA
ATACCTCTTTGACGAGTCTGGTGAATTTAAACTCAGCGAAGTCGGTCCTGAGCATAGTTTGG
CGGAATATTATATTTTTTTTGCAAGTTTTTACTATAAAAGAAATGGCTTCGCGTATGCAAAT
AGAAATCGGTTTTTGTACATAATTAAGCTGATATTTCTGTGGCTCTTGTGGCCGGTCACGCT
CGCGTGCTTTGTACTCGCGGCAGTTTACAGGATCAACTGGATTACCGGAGGTATAGCAATA
GCCATGGCTTGCCTTGTTGGCCTCATGTGGCTTTCATATTTCATCGCAAGTTTTAGACTCTTC
TATAATAGTTTTCATACCACAGACCCCAGCTTCTTGGGTAGATACATGTCCGCGCTTTTTGCC
GATGACCTCAACCAGCTTACAGGGTATCACACTGACTTTTCCAGTGAAATAATTGGATATCA
GCTCATGTGTCAGCCCATCCTGCTTGCAGAAGCTGAGCTTGCGAAAAATGTCTCCCTCATCT
TGGGGACGGTTTCCTGGAATCTCAAAAAAAATGGACTGGGTCGGTGCGACATTAAGGATCT
GCCGAAAGAGATCACGGTAGCTACCAGCAGGACCCTGTCTTATTATAAGCTCGGGGCTTCC
CAACGAGTGGCTTATAGGAGTTACTTGCTGAGTGCTGGGATATTTGGTGCAATTACAGATGT
CTTCTATAAGGAGAACTCATACAAAGTACCCACTGATAACTACATAACGACCTACGCAAGA
ATGGCTGCGCCTAAAGAGATTATATTTTTGGAAGGCGAGACGTTGTTCGGTGATGATACTGT
TATAGAAGTAGCTATTATTTTGGCGAGTTTCAGCGCGAGTACTCGACGACGAGGGGGTGGT
TCTCTTGGAGGAGGAGGATCCGGGATAGTAGGCATTGTGGCTGGCTTGGCGGTGCTCGCGG
TGGTAGTAATCGGGGCTGTTGTCGCAACCGTGATGTGTCGCAGAAAATCCTCAGGTGGCAA
GGGTGGCAGCTACTCTCAAGCTGCTAGCAGCGATTCTGCCCAAGGGAGCGACGTTAGTCTT
ACGGCGTAGTAA (**SEQ ID RS C7**n)

[000468] The string named "RS C8 1500_M_epitopes" (abbreviated RS C8) encodes an ORF having an amino acid length of 485 amino acids, and the nucleotide sequence encoding the ORF is 1455 nucleotides long. The entire string is 1764 nucleotides long and encodes a peptide string that is 588 amino acids long. **Table 12** exemplifies the amino acid sequence and the nucleic acid sequences (not codon optimized) encoding the same. An exemplary codon optimized sequence for string named "RS C8 1500_M_epitopes" is:

[000469] ATGAGGGTGATGGCCCCCAGGACCCTCATATTGTTGTTGAGCGGGGCCCTTGCACT
CACTGAAACTTGGGCTGGGAGTGGGGGTAGTGGTGGGGGTGGCAGTGGCGGGTCACCGGCT
CGAATGGCAGGTAACGGCGGGGATGCCGCATTGGCGCTCTTGCTGCTCGACAGGTTGAACC
AGTTGGAATCCAAGATGAGTGGAAAAGGTCAGCAACAACAGGGGCAGACCGTAACGAAGA
AGAGCGCTGCCGAGGCCTCCAAGAAGCCTCGCCAGAAACGAACGGCCACGAAGGCTTATA
ACGTGACCCAGGCATTCGGTAGAAGAGGTCCTGAACAGACACAAGGAAACTTTGGCGACCA
GGAACTCATCAGGCAAGGGACGGACTACAAGCATTGGCCGCAAATAGCGCAGTTCGCGCCC
AGCGCCAGCGCCTTCTTTGGAATGTCAAGAATTGGAATGGAAGTTACGCCGAGTGGGACTT
GGCTTACTTATACGGGCGCTATTAAGCTCGACGACAAGGACCCCAATTTCAAGGACCAAGT
GATATTGCTCAATAAGCACATCGACGCCTACAAGACTTTCCCTCCCACAGAGCCCAAAAAG
GATAAGTTCCGAGCCTGCATGGTAACGAACAATACTTTTACACTTAAGGTGCCCCATGTAGG
AGAGATACCTGTGGCTTATCGAAAAGTGCTGCTTAAGACTATTCAACCTCGCGTCGAAAAA
TACCTCTTTGACGAGAGTGGTGAGTTTAAGCTGTCAGAAGTAGGACCCGAGCATTCATTGGC
GGAGTATTACATATTCTTCGCCAGTTTTTATTATAAAAGGTGCTTCCACACGACTGACCCGT
CTTTTCTTGGTAGGTACATGAGTGCGCTGTTTGCAGACGATCTGAATCAGCTCACCGGTTAT
CACACGGATTTTAGTTCAGAAATCATAGGCTACCAGTTGATGTGCCAACCAATTCTTCTCGC
CGAGGCGGAACTTGCTAAAAATGTTAGTTTGATTTTGGGCACCGTAAGCTGGAACCTTAAA
AAACGATACCTTCTCTCTGCCGGCATATTTGGTGCTATTACTGACGTGTTCTATAAAGAGAA
TTCATATAAAGTTCCAACTGACAACTATATCACCACCTATGCTAGGATGGCGGCACCGAAG
GAAATAATCTTTCTGGAGGGGGAAACTCTGTTTGGTGATGATACCGTAATTGAGGTTGCCAT
AATACTGGCATCATTCTCAGCCAGCACTAGAAGACGCGGGAAGCTTTTGGAACAGTGGAAT
TTGGTTATTGGATTCAACCGAAACAGGTTTTTGTATATAATTAAGCTCATATTTCTTTGGTTG
TTGTGGCCCGTTACCCTTGCATGCTTCGTTCTTGCCGCCGTCTACAGTGAGCTCGTAATTGGG
GCGGTTATTCTGCGAGGACATCTCCGAATCGCTGGTCACCATCTCGGACGCACAGTCGCTAC
AAGTAGGACGCTTTCATACTATAAATTGGGAGCCAGTCAACGAGTTAAACGGTACTCAGGG
TTGATGTGGTTGAGCTATTTCGCAAGGTACGCCGGAGGATCCCTGGGAGGGGGAGGCAGCG
GTATAGTCGGTATCGTGGCAGGCCTTGCGGTGCTCGCGGTTGTAGTCATAGGCGCAGTGGTT
GCTACAGTCATGTGTCGCCGCAAATCCAGTGGAGGTAAGGGGGGTAGCTATTCCCAGGCCG
CTTCATCTGACTCAGCACAAGGATCAGACGTCTCTCTGACTGCATAATAA (**SEQ ID: RS C8n**)

[000470] The sequences as laid out are DNA sequences and can be interchangeably used for interpreting RNA (or mRNA) sequences, as is well known to one of skill in the art.

Example 8: Pharmaceutical composition for the designed SARS COV-2 (2019 SARS-Cov 2) nucleocapsid peptide strings

[000471] Designed strings as exemplified in Example 8, are prepared into a pharmaceutical composition of lipid nanoparticle (LNP) encapsulated mRNA having a sequence delineated in SEQ ID RS C1n, or SEQ ID RS C2n, or SEQ ID RS C3n, or SEQ ID RS C4n, or SEQ ID RS C5n, or SEQ ID RS C6n, or SEQ ID RS C7n, or SEQ ID RS C8n, or any combination thereof, or sequences encoding corresponding amino acids described in **Tables 11 and 12**, having the amino acid sequences disclosed in column 2 of each row of sequences sets RSC1-RSC8 in Tables 11 and 12. An LNP comprise at least a cationic lipid, a non-cationic lipid and/or a PEG modified lipid. The LNP-encapsulated mRNA formulations are lyophilized and stored at a temperature below (-) 20°C, preferable frozen under liquid nitrogen for long term storage. LNP-mRNA compositions can be thawed and reconstituted in aqueous solution for use.

[000472] The LNP-mRNA compositions of the designed strings are administered alone or are co-administered with BNTSpike Vaccine for 2019 SARS CoV-2 infection.

Example 9: Methods for generating string constructs

[000473] Described herein is an exemplary method for generating the string constructs by integration of bioinformatics and molecular biology techniques. Strings are designed to comprise epitopes from 2019 SARS CoV-2 proteins. These epitopes are selected based on ranking in an HLA-binding and prediction algorithm in a computer based program, as well as support from experimental data. In choosing segments of protein, the predicted population coverage based on the population HLA frequencies were taken into account in order to maximize population coverage.

[000474] Briefly the constructs are designed to incorporate from 5'-3' top predicted and immunogenic epitopes and regions of various viral proteins, including the Nucleocapsid, Membrane, ORF3a, ORF9b and ORF1ab of the SARS CoV-2 proteins.

[000475] RNA strings were designed by concatenating sequences from different open reading frames (ORFs) of 2019 SARS-CoV-2. ORF-derived sequences could be the entire ORF; a section of the ORF (ranging in length from 99 to 954 bp – prioritized based on predicted and observed epitope density); or regions constituting or containing CD8+ epitopes that were assembled to optimize for MHC class I cleavability. This last approach was taken for ORF1ab for all string variants; this was also done with the membrane ORF for one string variant (RS C8). MHC class I cleavability was scored using a neural network predictor trained on MHC class I mass spectrometry data, which takes as input a candidate peptide sequence and its context from which it should be cleaved (30 AA on either side). Four AA-long cleavability linkers (selected by testing all potential combinations of amino acids and taking the best scoring by our predictor) were added in between epitopes when efficient cleavage was not otherwise possible, and on the

flanks of each region of assembled epitopes, taking into account the neighboring sequence in the given string variant. The ordering of epitopes was determined by selecting the configuration that allowed for most efficient cleavage while adding as few cleavability linkers as possible. Two string variants used putatively non-immunogenic GSS linkers to separate sequences from different ORFs. One string variant used 2A self-cleaving peptide sequences as linkers to separate sequences from different ORFs. The remaining variants used the designed MHC class I cleavable regions as 'linkers'. The ordering of the ORFs within the strings was driven by proteomics abundance and immunogenicity data. One string variant had the order of ORFs reversed as a control in order to evaluate translation efficiency as a function of distance along the string.

Example 10: Epitope specificity of mRNA vaccine

[000476] An exemplary study is illustrated in this example, demonstrating T cell specificity in vivo upon administration of a BNT mRNA vaccine directed against SARS CoV-2. Study participants received a priming immunization with BNT162b2 on day 1, and a booster immunization on day 22±2. Serum was obtained on days 1 (pre-prime), 8±1 (post-prime), 22±2 (pre-boost), 29±3, 43±4, 50±4 and 85±7 (post-boost). PBMCs were obtained on days 1 (pre-prime) and 29±3 (post-boost).

[000477] In this study, $CD8^+$ T cell responses were characterized on the epitope level in three BNT mRNA vaccinated participants. PBMCs obtained on day 1 (pre-prime) and day 29 (7 days post-boost) of three vaccinated participants (dose cohorts 10 μg, n=1; 30 μg, n=2) were stained with individual pMHC class I multimer cocktails and analysed for T cell epitope specificity **(FIG. 8Ai and 8Aii)** and phenotype (**FIG. 8B**; example from participant 3; YLQPRTFLL) by flow cytometry. In FIGs. 8Ai-8C, peptide sequences above dot plots indicate pMHC class I multimer epitope specificity, numbers above dot plots indicate the amino acids corresponding to the epitope within S protein. FIG. 8**C** shows localization of identified MHC class I-restricted epitopes within S protein. Pre- and post-vaccination PBMCs were stained with individualized peptide/MHC multimer staining cocktails for flow cytometry analysis. Twenty-three (4 for HLA-B*0702, 19 for HLA-A*2402), 14 (HLA-B*3501) and 23 (7 for HLA-B*4401, 16 for HLA-A*0201) diverse peptide/MHC allele pairs were used for participants 1, 2 and 3, respectively, thus probing a selected set of potential reactivities rather than comprehensively capturing the poly-epitopic T cell response. For each participant, de novo induced $CD8^+$ T cell reactivities against multiple epitopes were identified adding up to a total of eight different epitope/MHC pairs spread across the full length of S **(FIGs. 8Ai-8Aii, 8C)**. The magnitude of epitope-specific T cell responses ranged between 0.01-3.09% of peripheral $CD8^+$ T cells, and the most profound expansion was observed for HLA-A*0201 YLQPRTFLL (3.09% $multimer^+$ of $CD8^+$), HLA-A*2402 QYIKWPWYI (1.27% $multimer^+$ of $CD8^+$) and HLA-B*3501 QPTESIVRF (0.17% $multimer^+$ of $CD8^+$). Comparison with the bulk IFNγ+ CD8+ T cell response against full S in these individuals determined by ELISpot and ICS indicated that indicated that pMHC technology may be more useful to assess true extent of the cellular immune response. Phenotyping of the identified pMHC

multimer+ S antigen-experienced CD8+ T cell specificities revealed an early differentiated effector memory phenotype characterized by low expression of CCR7 and CD45RA and high expression of the costimulatory molecules CD28 and CD27. $CD8^+$ T cells also expressed markers associated with cognate activation, such as CD38, HLA-DR and PD-1 (**FIG. 8B**). The data presented herein is the first demonstration of epitopes recognized by COVID-19 vaccine-induced T cells.

[000478] A time-course of detecting activated T cells following vaccine administration was followed in human subjects. In the study depicted in **FIG. 8D**, subjects were administered 10, 20 or 30 micrograms of the mRNA vaccine encoding the spike protein. Activated CD4+ T cells and CD8+ T cells were isolated at time intervals up to 200 days, and IFN gamma release from the cells was detected by ELISPOT. The subjects exhibited a longer persistence of activated both CD4+ and CD8 + T cells determined by IFNg release in a dose dependent manner. The figures also indicate that the cells were responsive to most of the epitopes that the subjects were exposed to, e.g., 7 out of 8 in the 10 microgram group at 200 days in the upper panel, left graph. The same study in an elderly cohort also showed longer persistent vaccinated epitope responsive activated T cells over the course of 200 days (**FIG. 8E**). Incidentally, the unrelated viral pool epitope controls (CEFT or CEF) showed lower response for CD4+ T cells. The respective epitopes, matching HLA and the response in subjects are listed below:

HLA	Epitope	Position in S Protein	Identified in No. Subjects
B35:01	LPFNDGVYF	84-92	1
A03:01	GVYFASTEK	89-97	1
A02:01	YLQPRTFLL	269-277	3
B35:01	QPTESIVRF	321-329	1
A26:01	CVADYSVLY	361-369	1
B15:01	CVADYSVLY	361-369	1
A03:01	KCYGVSPTK	378-386	2
A24:02	NYNYLYRLF	448-456	3
B15:01	FQPTNGVGY	497-505	1
B35:01	IPFAMQMAY	896-904	1
A02:01	RLQSLQTYV	1000-1008	2
A68:01	GTHWFVTQR	1099-1108	1
C04:01	VYDPLQPEL	1137-1145	1
A24:02	QYIKWPWYI	1208-1216	3
A24:02	KWPWYIWLGF	1211-1220	1

Example 11. Peptide/MHC multimer staining

[000479] In order to select MHC-class I epitopes for multimer analysis, a mass spectrometry-based binding and presentation predictor (e.g., as described in Abelin et al., Immunity 46, 315-326 (2017); and Poran et al., Genome Med. 12, 70 (2020)) was applied to 8-12 amino acid long peptide sequences from the Spike glycoprotein derived from the GenBank reference sequence for SARS CoV-2 (accession: NC_045512.2,

https://www.ncbi.nlm.nih.gov/nuccore/NC_045512) and paired with 18 MHC-class-I alleles with >5% frequency in the European population. Top predicted epitopes were identified by setting thresholds to the binding percent-rank (≤1%) and presentation scores (≥10-2.2) and considered for synthesis of peptides of >90% purity. pMHC complexes were refolded with the easYmer technology (easYmer® kit, ImmuneAware Aps), and complex formation was validated in a bead-based flow cytometry assay according to the manufacturer's instructions. Combinatorial labeling was used for dissecting the antigen specificity of T cells utilizing two-color combinations of five different fluorescent labels to enable detection of up to ten different T cell populations per sample. For tetramerisation, streptavidin (SA)-fluorochrome conjugates were added: SA BV421, SA BV711, SA PE, SA PE-Cy7, SA APC (all BD Biosciences). For three BNT162b2 vaccinated participants, individualized pMHC multimer staining cocktails contained up to ten pMHC complexes, with each pMHC complex encoded by a unique two-color combination. PBMCs (2x106) were stained ex vivo for 20 minutes at room temperature with each pMHC multimer cocktail at a final concentration of 4 nM in Brilliant Staining Buffer Plus (BSB Plus [BD Horizon™]). Surface and viability staining was carried out in flow buffer (DPBS [Gibco] with 2% FBS [Biochrom], 2 mM EDTA [Sigma-Aldrich]) supplemented with BSB Plus for 30 minutes at 4 °C (CD3 BUV395, 1:50; CD45RA BUV563, 1:200; CD27 BUV737, 1:200; CD8 BV480, 1:200; CD279 BV650, 1:20; CD197 BV786, 1:15; CD4 BB515, 1:50; CD28 BB700, 1:100; CD38 PE-CF594, 1:600; HLA-DR APC-R700, 1:150; all BD Biosciences; DUMP channel: CD14 APC-eFluor780, 1:100; CD16 APC-eFluor780, 1:100; CD19 APC-eFluor780, 1:100; fixable viability dye eFluor780, 1:1,667; all ThermoFisher Scientific). Cells were fixed for 15 minutes at 4 °C in 1x Stabilization Fixative (BD), acquired on a FACSymphony™ A3 flow cytometer (BD Biosciences) and analyzed with FlowJo software version 10.6.2 (FlowJo LLC, BD Biosciences). CD8+ T cell reactivities were considered positive, when a clustered population was observed that was labelled with only two pMHC multimer colors.

Example 12. T cell manufacturing

[000480] Provided herein is a T cell therapy where T cells primed and responsive against antigenic peptides specific for a viral epitope is administered to the subject. The therapeutic can comprise generating viral epitope specific T cells *ex vivo* by priming T cells with APCs expressing viral T cell epitopes and expanding the activated T cells to obtain viral epitope-specific CD8+ and CD4+ including a population of these cells exhibiting memory phenotype (see, e.g., WO2019094642, incorporated by reference in its entirety). Target viral antigen responsive T cells are generated ex vivo and immunogenicity is validated using an in vitro antigen-specific T cell assay. Mass spectrometry can be used to validate that cells that express the antigen of interest can process and present the peptides on the relevant HLA molecules. Additionally, the ability of these T cells to kill cells presenting the peptide is confirmed using a cytotoxicity assay.

Generation of target tumor cell antigen responsive T cells ex vivo

Materials:

[000481] AIM V media (Invitrogen) Human FLT3L, preclinical CellGenix #1415-050 Stock 50 ng/μL; TNF-α, preclinical CellGenix #1406-050 Stock 10 ng/μL; IL-1β, preclinical CellGenix #1411-050 Stock 10 ng/μL; PGE1 or Alprostadil – Cayman from Czech republic Stock 0.5 μg/μL; R10 media- RPMI 1640 glutamax + 10% Human serum+ 1% PenStrep; 20/80 Media- 18% AIM V + 72% RPMI 1640 glutamax + 10% Human Serum + 1% PenStrep; IL7 Stock 5 ng/μL; IL15 Stock 5 ng/μL.

Procedure:

[000482] Step 1: Plate 5 million PBMCs (or cells of interest) in each well of 24 well plate with FLT3L in 2 mL AIM V media

Step 2: Peptide loading and maturation- in AIMV

1. Mix peptide pool of interest (except for no peptide condition) with PBMCs (or cells of interest) in respective wells.

2. Incubate for 1 hr.

3. Mix Maturation cocktail (including TNF-α, IL-1β, PGE1, and IL-7) to each well after incubation.

Step 3: Add human serum to each well at a final concentration of 10% by volume and mix.

Step 4: Replace the media with fresh RPMI+ 10% HS media supplemented with IL7 + IL15

Step 5: Replace the media with fresh 20/80 media supplemented with IL7 + IL15 during the period of incubation every 1-6 days.

Step 6: Plate 5 million PBMCs (or cells of interest) in each well of new 6-well plate with FLT3L in 2 ml AIM V media

Step 7: Peptide loading and maturation for re-stimulation- (new plates)

1. Mix peptide pool of interest (except for no peptide condition) with PBMCs (or cells of interest) in respective wells

2. Incubate for 1 hr.

3. Mix Maturation cocktail to each well after incubation

Step 8: Re-stimulation:

1. Count first stimulation FLT3L cultures and add 5 million cultured cells to the new Re-stimulation plates.

2. Bring the culture volume to 5 mL (AIM V) and add 500 μL of Human serum (10% by volume)

Step 9: Remove 3ml of the media and add 6ml of RPMI+ 10% HS media supplemented with IL7 + IL15.

Step 10: Replace 75% of the media with fresh 20/80 media supplemented with IL7 + IL15.

Step 11: Repeat re-stimulation if needed.

Analysis of antigen-specific induction

[000483] MHC tetramers are purchased or manufactured on-site according to methods known by one of ordinary skill and are used to measure peptide-specific T cell expansion in the immunogenicity assays. For the assessment, tetramer is added to 1 x 10^5 cells in PBS containing 1% FCS and 0.1% sodium azide (FACS

buffer) according to manufacturer's instructions. Cells are incubated in the dark for 20 minutes at room temperature. Antibodies specific for T cell markers, such as CD8, are then added to a final concentration suggested by the manufacturer, and the cells are incubated in the dark at 4 °C for 20 minutes. Cells are washed with cold FACS buffer and resuspended in buffer containing 1% formaldehyde. Cells are acquired on a LSR Fortessa (Becton Dickinson) instrument and are analyzed by use of FlowJo software (Becton Dickinson). For analysis of tetramer positive cells, the lymphocyte gate is taken from the forward and side-scatter plots. Data are reported as the percentage of cells that were $CD8^+$/$tetramer^+$.

Evaluation of presentation of viral antigens

[000484] The affinity of the viral epitopes for HLA alleles and stability of the viral epitopes with the HLA alleles can be determined. An exemplary detailed description of the protocol utilized to measure the binding affinity of peptides to Class I MHC has been published (Sette et al, Mol. Immunol. 31(11):813-22, 1994). In brief, MHCI complexes were prepared and bound to radiolabeled reference peptides. Peptides were incubated at varying concentrations with these complexes for 2 days, and the amount of remaining radiolabeled peptide bound to MHCI was measured using size exclusion gel-filtration. The lower the concentration of test peptide needed to displace the reference radiolabeled peptide demonstrates a stronger affinity of the test peptide for MHCI. Peptides with affinities to MHCI <50nM are generally considered strong binders while those with affinities <150nM are considered intermediate binders and those <500nM are considered weak binders (Fritsch et al, 2014).

[000485] An exemplary detailed description of the protocol utilized to measure the binding stability of peptides to Class I MHC has been published (Harndahl et al. J Immunol Methods. 374:5-12, 2011). Briefly, synthetic genes encoding biotinylated MHC-I heavy and light chains are expressed in *E. coli* and purified from inclusion bodies using standard methods. The light chain (β2m) is radio-labeled with iodine (125I), and combined with the purified MHC-I heavy chain and peptide of interest at 18°C to initiate pMHC-I complex formation. These reactions are carried out in streptavidin coated microplates to bind the biotinylated MHC-I heavy chains to the surface and allow measurement of radiolabeled light chain to monitor complex formation. Dissociation is initiated by addition of higher concentrations of unlabeled light-chain and incubation at 37°C. Stability is defined as the length of time in hours it takes for half of the complexes to dissociate, as measured by scintillation counts.

[000486] To assess whether antigens could be processed and presented from the larger polypeptide context, peptides eluted from HLA molecules isolated from cells expressing the genes of interest were analyzed by tandem mass spectrometry (MS/MS).

[000487] For analysis of presentation of viral antigens, cell lines are utilized that have been infected with the virus or were lentivirally transduced to express the viral antigens. HLA molecules are either isolated based on the natural expression of the cell lines or the cell lines are lentivirally transduced or transiently transfected to express the HLA of interest. 293T cells are transduced with a lentiviral vector encoding

various regions of a viral polypeptides. Greater than 50 million cells expressing peptides encoded by a viral polypeptide are cultured and peptides were eluted from HLA-peptide complexes using an acid wash. Eluted peptides are then analyzed by targeted MS/MS with parallel reaction monitoring (PRM).

HLA Class I Binding and Stability

[000488] A subset of the peptides used for affinity measurements are also used for stability measurements using the assay described. Less than 50 nM can be considered by the field as a strong binder, 50-150 nM can be considered an intermediate binder, 150-500 nM can be considered a weak binder, and greater than 500 nM can be considered a very weak binder.

[000489] Immunogenicity assays are used to test the ability of each test peptide to expand T cells. Mature professional APCs are prepared for these assays in the following way. Monocytes are enriched from healthy human donor PBMCs using a bead-based kit (Miltenyi). Enriched cells are plated in GM-CSF and IL-4 to induce immature DCs. After 5 days, immature DCs are incubated at 37°C with each peptide for 1 hour before addition of a cytokine maturation cocktail (GM-CSF, IL-1β, IL-4, IL-6, TNFα, PGE1β). Cells are incubated at 37°C to mature DCs.

Assessment of cytotoxic capacity of antigen-specific T cells in vitro

[000490] Cytotoxicity activity can be measured with the detection of cleaved Caspase 3 in target cells by Flow cytometry. Target cancer cells are engineered to express the viral peptide along and the proper MHC-I allele. Mock-transduced target cells (i.e. not expressing the viral peptide) are used as a negative control. The cells are labeled with CFSE to distinguish them from the stimulated PBMCs used as effector cells. The target and effector cells are co-cultured for 6 hours before being harvested. Intracellular staining is performed to detect the cleaved form of Caspase 3 in the CFSE-positive target cells. The percentage of specific lysis is calculated as: Experimental cleavage of Caspase 3/spontaneous cleavage of Caspase 3 (measured in the absence of mutant peptide expression) x 100.

[000491] In some examples, cytotoxicity activity is assessed by co-culturing induced T cells with a population of viral antigen-specific T cells with target cells expressing the corresponding HLA, and by determining the relative growth of the target cells, along with measuring the apoptotic marker Annexin V in the target cells specifically. Target cells are engineered to express the viral peptide or the viral peptide is exogenously loaded. Mock-transduced target cells (i.e. not expressing the viral peptide), target cells loaded with viral peptides, or target cells with no peptide loaded are used as a negative control. The cells are also transduced to stably express GFP allowing the tracking of target cell growth. The GFP signal or Annexin-V signal are measured over time with an IncuCyte S3 apparatus. Annexin V signal originating from effector cells is filtered out by size exclusion. Target cell growth and death is expressed as GFP and Annexin-V area (mm^2) over time, respectively.

[000492] *Enrichment of target antigen activated T cells*

[000493] Viral antigen responsive T cells may be further enriched. In this example, multiple avenues for enrichment of antigen responsive T cells are explored. After the initial stimulation of viral antigen-specific T cells, an enrichment procedure can be used prior to further expansion of these cells. As an example, stimulated cultures and pulsed with the same viral peptides used for the initial stimulation on day 13, and cells upregulating 4-1BB are enriched using Magnetic-Assisted Cell Separation (MACS; Miltenyi). These cells can then be further expanded, for example, using anti-CD3 and anti-CD28 microbeads and low-dose IL-2.

Immunogenicity assays for selected peptides

[000494] After maturation of DCs, PBMCs (either bulk or enriched for T cells) are added to mature dendritic cells with proliferation cytokines. Cultures are monitored for viral peptide-specific T cells using a combination of functional assays and/or tetramer staining. Parallel immunogenicity assays with the viral peptides allowed for comparisons of the relative efficiency with which the peptides expanded peptide-specific T cells. In some embodiments, the peptides elicit an immune response in the T cell culture comprises detecting an expression of a FAS ligand, granzyme, perforins, IFN, TNF, or a combination thereof in the T cell culture.

[000495] Immunogenicity can be measured by a tetramer assay. MHC tetramers are purchased or manufactured on-site, and are used to measure peptide-specific T cell expansion in the immunogenicity assays. For the assessment, tetramer is added to 1x10^5 cells in PBS containing 1% FCS and 0.1% sodium azide (FACS buffer) according to manufacturer's instructions. Cells are incubated in the dark for 20 minutes at room temperature. Antibodies specific for T cell markers, such as CD8, are then added to a final concentration suggested by the manufacturer, and the cells are incubated in the dark at 4 degrees Celsius for 20 minutes. Cells are washed with cold FACS buffer and resuspended in buffer containing 1% formaldehyde. Cells are acquired on a FACS Calibur (Becton Dickinson) instrument, and are analyzed by use of Cellquest software (Becton Dickinson). For analysis of tetramer positive cells, the lymphocyte gate is taken from the forward and side-scatter plots. Data are reported as the percentage of cells that were $CD8^+$/$Tetramer^+$.

[000496] Immunogenicity can be measured by intracellular cytokine staining. In the absence of well-established tetramer staining to identify viral antigen-specific T cell populations, antigen-specificity can be estimated using assessment of cytokine production using well-established flow cytometry assays. Briefly, T cells are stimulated with the viral peptide of interest and compared to a control. After stimulation, production of cytokines by CD4+ T cells (e.g., IFNγ and TNFα) are assessed by intracellular staining. These cytokines, especially IFNγ, used to identify stimulated cells.

[000497] In some embodiments the immunogenicity is measured by measuring a protein or peptide expressed by the T cell, using ELISpot assay. Peptide-specific T cells are functionally enumerated using the ELISpot assay (BD Biosciences), which measures the release of IFNγ from T cells on a single cell

basis. Target cells are pulsed with 10 μM viral peptide for one hour at 37 degrees C, and washed three times. 1x10^5 peptide-pulsed targets are co-cultured in the ELISPOT plate wells with varying concentrations of T cells (5x10^2 to 2x10^3) taken from the immunogenicity culture. Plates are developed according to the manufacturer's protocol, and analyzed on an ELISPOT reader (Cellular Technology Ltd.) with accompanying software. Spots corresponding to the number of IFN gamma-producing T cells are reported as the absolute number of spots per number of T cells plated. T cells expanded on modified peptides are tested not only for their ability to recognize targets pulsed with the modified peptide, but also for their ability to recognize targets pulsed with the parent peptide.

[000498] CD107a and CD107b are expressed on the cell surface of CD8+ T cells following activation with viral peptide. The lytic granules of T cells have a lipid bilayer that contains lysosomal-associated membrane glycoproteins ("LAMPs"), which include the molecules CD107a and b. When cytotoxic T cells are activated through the T cell receptor, the membranes of these lytic granules mobilize and fuse with the plasma membrane of the T cell. The granule contents are released, and this leads to the death of the target cell. As the granule membrane fuses with the plasma membrane, C107a and b are exposed on the cell surface, and therefore are markers of degranulation. Because degranulation as measured by CD107a and b staining is reported on a single cell basis, the assay is used to functionally enumerate viral peptide-specific T cells. To perform the assay, peptide is added to HLA-transfected cells to a final concentration of 20 μM, the cells are incubated for 1 hour at 37 degrees C, and washed three times. 1x10^5 of the peptide-pulsed cells were aliquoted into tubes, and antibodies specific for CD107a and b are added to a final concentration suggested by the manufacturer (Becton Dickinson). Antibodies are added prior to the addition of T cells in order to "capture" the CD107 molecules as they transiently appear on the surface during the course of the assay. 1x10^5 T cells from the immunogenicity culture are added next, and the samples were incubated for 4 hours at 37 degrees C. The T cells are further stained for additional cell surface molecules such as CD8 and acquired on a FACS Calibur instrument (Becton Dickinson). Data is analyzed using the accompanying Cellquest software, and results are reported as the percentage of CD8+ CD107 a and b+ cells.

[000499] Cytotoxic activity is measured using a chromium release assay. Target T2 cells are labeled for 1 hour at 37 degrees C with Na51Cr and washed 5x10^3 target cells are then added to varying numbers of T cells from the immunogenicity culture. Chromium release is measured in supernatant harvested after 4 hours of incubation at 37 degrees C. The percentage of specific lysis is calculated as: Experimental release-spontaneous release/Total release-spontaneous release x 100

[000500] Immunogenicity assays are carried out to assess whether each peptide can elicit a T cell response by viral antigen-specific expansion. A positive result demonstrates that a peptide can induce a T cell response. Several viral peptides are tested for their capacity to elicit CD8+ T cell responses with multimer readouts as described. Each positive result was measured with a second multimer preparation to avoid any

preparation biases. In an exemplary assay, T cells were co-cultured with monocyte-derived dendritic cells loaded with viral epitope for 10 days. CD8+ T cells were analyzed for viral antigen-specificity for viral epitope using multimers (initial: BV421 and PE; validation: APC and BUV396).

[000501] While antigen-specific CD8+ T cell responses are readily assessed using well-established HLA Class I multimer technology, CD4+ T cell responses require a separate assay to evaluate because HLA Class II multimer technology is not well-established. In order to assess CD4+ T cell responses, T cells are re-stimulated with the viral peptide of interest. After stimulation, production of cytokines by CD4+ T cells (e.g., IFNγ and TNFα) are assessed by intracellular staining. These cytokines, especially IFNγ, used to identify stimulated cells.

Cell Expansion and Preparation

[000502] To prepare APCs, the following method is employed (a) obtain of autologous immune cells from the peripheral blood of the patient; enrich monocytes and dendritic cells in culture; load viral peptides and mature DCs.

T cell Induction (Protocol 1)

[000503] First induction: (a) Obtaining autologous T cells from an apheresis bag; (b) Depleting CD25+ cells and CD14+ cells, alternatively, depleting only CD25+ cells; (c) Washing the peptide loaded and mature DC cells, resuspending in the T cell culture media; (d) Incubating T cells with the matured DC. Second induction: (a) Washing T cells, and resuspending in T cell media, and optionally evaluating a small aliquot from the cell culture to determine the cell growth, comparative growth and induction of T cell subtypes and antigen specificity and monitoring loss of cell population; (b) Incubating T cells with mature DC.

[000504] Third induction: (a) Washing T cells, and resuspending in T cell media, and optionally evaluating a small aliquot from the cell culture to determine the cell growth, comparative growth and induction of T cell subtypes and viral antigen specificity and monitoring loss of cell population; (b) Incubating T cells with mature DC.

[000505] To harvest peptide activated t cells and cryopreserve the T cells, the following method can be employed (a) Washing and resuspension of the final formulation comprising the activated T cells which are at an optimum cell number and proportion of cell types that constitutes the desired characteristics of the Drug Substance (DS). The release criteria testing include inter alia, Sterility, Endotoxin, Cell Phenotype, TNC Count, Viability, Cell Concentration, Potency; (b) Filling drug substance in suitable enclosed infusion bags; (c) Preservation until time of use.

Methods of functional characterization of the CD4+ and CD8+ viral antigen-specific T cells.

[000506] T cell manufacturing processes were developed to raise memory and de novo CD4+ and CD8+ T cell responses to viral antigens through multiple rounds of ex-vivo T cell stimulation, generating a viral antigen-reactive T cell product for use in adoptive cell therapy. Detailed characterization of the stimulated

T cell product can be used to test the many potential variables these processes utilize. To probe T cell functionality and/or specificity, an assay was developed to simultaneously detect viral antigen-specific T cell responses and characterize their magnitude and function. This assay employs the following steps. First T cell-APC co-cultures were used to elicit reactivity in viral antigen-specific T cells. Optionally, sample multiplexing using fluorescent cell barcoding is employed. To identify viral antigen-specific CD8+ T cells and to examine T cell functionality, staining of peptide-MHC multimers and multiparameter intracellular and/or cell surface cell marker staining were probed simultaneously using FACS analysis. The results of this streamlined assay demonstrated its application to study T cell responses induced from a healthy donor. Viral antigen-specific T cell responses induced toward peptides are identified in a donor. The magnitude, specificity and functionality of the induced T cell responses are also compared. Briefly, different T cell samples are barcoded with different fluorescent dyes at different concentrations (see, e.g., Example 19). Each sample receives a different concentration of fluorescent dye or combination of multiple dyes at different concentrations. Samples are resuspended in phosphate-buffered saline (PBS) and then fluorophores dissolved in DMSO (typically at 1:50 dilution) are added to a maximum final concentration of 5 μM. After labeling for 5 min at 37 °C, excess fluorescent dye is quenched by the addition of protein-containing medium (e.g. RPMI medium containing 10% pooled human type AB serum). Uniquely barcoded T cell cultures are challenged with autologous APC pulsed with the viral antigen peptides as described above.

[000507] The differentially labeled samples are combined into one FACS tube or well, and pelleted again if the resulting volume is greater than 100 μL. The combined, barcoded sample (typically 100 μL) is stained with surface marker antibodies including fluorochrome conjugated peptide-MHC multimers. After fixation and permeabilization, the sample is additionally stained intracellularly with antibodies targeting TNF-α and IFN-γ.

[000508] The cell marker profile and MHC tetramer staining of the combined, barcoded T cell sample are then analyzed simultaneously by flow cytometry on flow cytometer. Unlike other methods that analyze cell marker profiles and MHC tetramer staining of a T cell sample separately, the simultaneous analysis of the cell marker profile and MHC tetramer staining of a T cell sample described in this example provides information about the percentage of T cells that are both viral antigen specific and that have increased cell marker staining. Other methods that analyze cell marker profiles and MHC tetramer staining of a T cell sample, separately determine the percentage of T cells of a sample that are viral antigen specific, and separately determine the percentage of T cells that have increased cell marker staining, only allowing correlation of these frequencies.

[000509] The simultaneous analysis of the cell marker profile and MHC tetramer staining of a T cell sample described in this example does not rely on correlation of the frequency of viral antigen specific T cells and the frequency of T cells that have increased cell marker staining; rather, it provides a frequency

of T cells that are both viral antigen specific and that have increased cell marker staining. The simultaneous analysis of the cell marker profile and MHC tetramer staining of a T cell sample described in this example allows for determination on a single cell level, those cells that are both viral antigen specific and that have increased cell marker staining.

[000510] To evaluate the success of a given induction process, a recall response assay may be used followed by a multiplexed, multiparameter flow cytometry panel analysis. A sample taken from an induction culture is labeled with a unique two-color fluorescent cell barcode. The labeled cells are incubated on viral antigen-loaded DCs or unloaded DCs overnight to stimulate a functional response in the viral antigen-specific cells. The next day, uniquely labeled cells are combined prior to antibody and multimer staining. Exemplary materials for T cell culture are provided below:

[000511] Materials: AIM V media (Invitrogen)Human FLT3L; preclinical CellGenix #1415-050 Stock 50 ng/μL TNFα; preclinical CellGenix #1406-050 Stock 10 ng/μL; IL-1β, preclinical CellGenix #1411-050 Stock 10 ng/μL; PGE1 or Alprostadil – Cayman from Czech republic Stock 0.5 μg/μL; R10 media- RPMI 1640 glutamax + 10% Human serum+ 1% PenStrep; 20/80 Media- 18% AIM V + 72% RPMI 1640 glutamax + 10% Human Serum + 1% PenStrep; IL7 Stock 5 ng/μL; IL15 Stock 5 ng/μL; DC media (Cellgenix); CD14 microbeads, human, Miltenyi #130-050-201, Cytokines and/or growth factors, T cell media (AIM V + RPMI 1640 glutamax + serum + PenStrep), Peptide stocks - 1 mM per peptide viral peptides).

Example 13. Designing linkers of Orf1ab minimal epitopes

[000512] This example shows that the strings were designed using the MS-based HLA-I cleavage predictor to optimize ordering of Orf1ab epitopes or minimal epitope containing stretches, adding as few linkers as possible while retaining efficient epitope cleavage (**FIG. 9**). The same 18 Orf1ab sequences is included in each string variant, except RS-C6 where two sequences have been removed. However, the ordering of the sets of sequences and designed cleavage linkers differ based on the flanking context. The string RS C8 was especially designed such that the minimal Orf1ab minimal epitope sequences are placed in close proximity with each other, utilizing MS-based cleavage predictor on either side of an epitope and requiring minimal linker sequences.

Table 13 - Exemplary Orf1ab epitopes optimized for cleavage

Peptide	Start	End	Length	Score	Seq_type
YHFF	1	4	4		Linker
HTTDPSFLGRYMSAL	5	19	15	0.376208	epitope
FADDLNQLTGY	20	30	11	2.947135	epitope
HTDFSSEIIGY	31	41	11	2.944603	epitope
QLMCQPILL	42	50	9	1.967348	epitope
AEAELAKNVSL	51	61	11	0.517577	epitope
ILGTVSWNL	62	70	9	0.596325	epitope
KRRY	71	74	4		linker

LLSAGIFGA	75	83	9	0.529516	epitope
ITDVFYKENSY	84	94	11	2.105188	epitope
KVPTDNYITTY	95	105	11	1.134409	epitope
ARMA	106	109	4		linker
APKEIIFLEGETL	110	122	13	1.175399	epitope
FGDDTVIEV	123	131	9	2.679615	epitope
AIILASFSAST	132	142	11	0.747335	epitope
RRMA	143	146	4		linker
MVTNNTFTLK	147	156	10	0.742596	epitope
VPHVGEIPVAYRKVLL	157	172	16	2.066211	epitope
KTIQPRVEK	173	181	9	2.922006	epitope
YLFDESGEFKL	182	192	11	2.269281	epitope
SEVGPEHSLAEY	193	204	12	1.662412	epitope
YIFFASFYY	205	213	9	0.210118	epitope
KRNG	214	218	4		linker

Example 14. Immunogenicity studies in animal model

[000513] This example demonstrates a method of selecting the strings based on immunogenicity and one or more domains may be taken up for development. A model study is described in **FIG. 10A**, for testing the mRNA string vaccines; or comparing the immunogenicities offered by vaccines targeting viral secretory domains (SEC domains) or the cytoplasmic tail TM domains are verified for immunogenic response. In an exemplary assay, each set of 6-8 weeks old female BALB/c mice and HLA-A2 transgenic mice are administered intramuscular injections of one of the four mRNA string construct (5 microgram/mouse), and blood sample is collected at 7, 14, 21 and 28 days post injection. Animals are euthanized on day 14 and on day 28 and organs are harvested.

[000514] In a more elaborate study design as exemplified in **FIG. 10B**, different vaccine strategies are compared: single vaccines: (a) the spike mRNA vaccine alone, or (b) the string vaccine alone, and combinations, (c) the spike vaccine first, followed by the string vaccine; (d) the string vaccine first, followed by the spike vaccine; (e) co-formulation of the spike vaccine and the string vaccine, in a first ratio (e.g., 9:1); (f) co-formulation of the spike vaccine and the string vaccine, in a second ratio (e.g., 3:1); (g) co-formulation of the spike vaccine and the string vaccine, in a third ratio (e.g., 1:1). In one study, about half of the mice of each set are sacrificed on day 14, and the rest on day 28. Samples are analyzed for cytokine and chemokine generation, ELISPOT is performed with the samples collected at day 14 and 21, T cells subsets are tested for antiviral cytokine response, surface marker expression, lineage markers by flow cytometry. Antigen specific responsiveness of T cells is also measured in vitro. Tissue samples are also tested for presence of spike antibody, T cell responses and T cell subsets in spleen, draining lymph nodes and blood.

Example 15. Correlation of RECON prediction with validation from independent studies

[000515] A large body of data derived from T cell immunogenicity studies and mass spectrometry studies is currently available worldwide that strongly correlates with and validates the epitope predictions first reported in this study and provided in epitope sequence of Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B, Table 9, Table 10, Table 11, Table 12, Table 14A, Table 14B, Table 15 or Table 16. Such validation and strong correlation in studies performed worldwide renders high confidence on the reliability of the prediction algorithm. Table 14A and Table 14B exemplify the MS observed validations of the epitopes.

Table 14A - Exemplary epitopes of BNT- Spike Vaccine Construct

Epitope	Allele	Confidence	Literature Mentions	
			Exact	Not Exact
KIADYNYKL	A*02:01	High	Yes	Yes
YLQPRTFLL	A*02:01	High	Yes	Yes
TLDSKTQSL	A*02:01	High	Yes	Yes
ELLHAPATV	A*02:01	High	No	Yes
RLQSLQTYV	A*02:01	High	Yes	Yes
RLNEVAKNL	A*02:01	Moderate	Yes	No
RLITGRLQSL	A*02:01	Moderate	Yes	Yes
KCYGVSPTKL	A*03:01	High	No	Yes
TGSNVFQTR	A*68:01	High	Yes	Yes
FPQSAPHGVVF	B*35:01	High	Yes	Yes
QPTESIVRF	B*35:01	High	Yes	Yes
VASQSIIAY	B*35:01	High	Yes	Yes
TSNQVAVLY	B*35:01	High	Yes	Yes
TEVPVAIHADQL	B*40:01	High	No	No
VEKGIYQT	B*41:02	High	No	Yes
VRDPQTLEI	C*05:01	High	No	No

Table 14B - Exemplary Multi-protein Epitope String Constructs

Epitope	Allele	Confidence	ORF	Literature Mentions	
				Exact	Not Exact

YLFDESGEFKL	A*02:01	High	1ab	Yes	Yes
YLFDESGEF	A*02:01	High	1ab	No	Yes
FGDDTVIEV	A*02:01	High	1ab	Yes	Yes
LLLDRLNQL	A*02:01	High	N	Yes	Yes
QLMCQPILL	A*02:01	Moderate	1ab	Yes	Yes
TTDPSFLGRY	A*01:01	High	1ab	Yes	Yes
PTDNYITTY	A*01:01	High	1ab	Yes	Yes
PSFLGRY	N/A	High	1ab	No	Yes
AEAELAKNV	B*44:03	High	1ab	Yes	Yes
VATSRTLSY	C*16:01	High	M	Yes	Yes
KTIQPRVEK	A11:01	High	1ab	Yes	Yes

[000516] The above data represent 19 studies, covering 1180 class I epitopes, including 881 class I unique epitope sequences. As many as 756 (86%) have exact match to RECON predictions. 872 (98%) sequences have either a superstring or a substring in RECON predictions. These studies indicate high degree of correlation of epitope prediction by RECON with actual T cell immunogenicity observed data.

Example 16. Sequence variability of SARS CoV-2

[000517] In this example, the sequence variability of the SARS CoV-2 is shown, in light of protection that the string vaccines can offer. **FIGs. 11-17** demonstrates detection/identification of variant or mutated amino acid positions along the SARS CoV-2 genome. This was in turn used to assess the sensitivity of string vaccines to variants. The figures highlight the regions covered by the epitopes covered by the strings. As shown at least in these figures, and also combined with information on the string sequences provided elsewhere in the document, multiple epitopes from multiple different viral proteins are included in each string. That is, if one epitope covers a mutant sequence, the other epitopes are at least spared to offer immune response against a viral strain. This design ensures that the not only a wider and more robust immunogenic response can be triggered by the vaccine, it is also important to note that different variants and mutants of the virus are covered by a string vaccine. It follows that the design of the constructs offers a good mechanism of avoiding viral escape variants, as is demonstrated in the analysis in **FIGs. 11-17**. This provides support that the string vaccines can confer protective immunity that is not variant-dependent.

Example 17. Predictions using HLA-peptide presentation prediction algorithm

[000518] An updated run in the machine-learning HLA-peptide presentation prediction algorithm RECON predicted newer epitopes that were predicted with high score, (that is, a score that represents high likelihood that the epitope peptide would actually be presented by the HLA allele). These epitope - HLA pairs are listed below in Table 16. For each pair, the epitope peptide sequence in the left column (column 1 or 3) is predicted to be presented by the HLA in the column immediately to its right (column 2 or column 4 respectively) in the same row.

Table 9: Group 1 Construct-maps

CONSTRUCT Name	Segment NAME	AA SEQUENCE	DNA SEQUENCE	START	END
RS C1 GSS linkers	SP1	MRVMAPRTLILLLSGALALTETWA GS	ATGAGAGTGATGGCCCCCAGAACCCTGATCCTGCTGCTGTCT GGCGCCCTGGCCCTGACAGAGACATGGGCCGGAAGC	1	78
RS C1 GSS linkers	start GSS	GGSGGGGSGG	GGAGGTTCCGGAGGAGGCGGCAGTGGCGGC	79	108
RS C1 GSS linkers	nucleocapsid phosphoprotein	SDNGPQNQRNAPRITFGGPSDSTGS NQNGERSGARSKQRRPQGLPNNTA SWFTALTQHGKEDLKFPRGQGVPI NTNSSPDDQIGYYRRATRRIRGGDG KMKDLSPRWYFYYLGTGPEAGLPY GANKDGIIWVATEGALNTPKDHIGT RNPANNAAIVLQLPQGTTLPKGFYA EGSRGGSQASSRSSSSRSRNSSRNSTP GSSRGTSPARMAGNGGDAALALLL LDRLNQLESKMSGKGQQQQGQTV TKKSAAEASKKPRQKRTATKAYNV TQAFGRRGPEQTQGNFGDQELIRQ GTDYKHWPQIAQFAPSASAFFGMS RIGMEVTPSGTWLTYTGAIKLDDK DPNFKDQVILLNKHIDAYKTFPPTE PKKDKKKKADETQALPQRQKKQQ TVTLLPAADLDDFSKQLQQSMSSA DSTQA	TCTGATAATGGACCCCAAAATCAGCGAAATGCACCCCGCATT ACGTTTGGTGGACCCTCAGATTCAACTGGCAGTAACCAGAAT GGAGAACGCAGTGGGGCGCGATCAAAACAACGTCGGCCCCA AGGTTTACCCAATAATACTGCGTCTTGGTTCACCGCTCTCACT CAACATGGCAAGGAAGACCTTAAATTCCCTCGAGGACAAGGC GTTCCAATTAACACCAATAGCAGTCCAGATGACCAAATTGGC TACTACCGAAGAGCTACCAGACGAATTCGTGGTGGTGACGGT AAAATGAAAGATCTCAGTCCAAGATGGTATTTCTACTACCTA GGAACTGGGCCAGAAGCTGGACTTCCCTATGGTGCTAACAAA GACGGCATCATATGGGTTGCAACTGAGGGAGCCTTGAATACA CCAAAAGATCACATTGGCACCCGCAATCCTGCTAACAATGCT GCAATCGTGCTACAACTTCCTCAAGGAACAACATTGCCAAAA GGCTTCTACGCAGAAGGGAGCAGAGGCGGCAGTCAAGCCTCT TCTCGTTCCTCATCACGTAGTCGCAACAGTTCAAGAAATTCAA CTCCAGGCAGCAGTAGGGGAACTTCTCCTGCTAGAATGGCTG GCAATGGCGGTGATGCTGCTCTTGCTTTGCTGCTGCTTGACAG ATTGAACCAGCTTGAGAGCAAAATGTCTGGTAAAGGCCAACA ACAACAAGGCCAAACTGTCACTAAGAAATCTGCTGCTGAGGC TTCTAAGAAGCCTCGGCAAAAACGTACTGCCACTAAAGCATA CAATGTAACACAAGCTTTCGGCAGACGTGGTCCAGAACAAAC CCAAGGAAATTTTGGGGACCAGGAACTAATCAGACAAGGAA CTGATTACAAACATTGGCCGCAAATTGCACAATTTGCCCCCA GCGCTTCAGCGTTCTTCGGAATGTCGCGCATTGGCATGGAAG TCACACCTTCGGGAACGTGGTTGACCTACACAGGTGCCATCA AATTGGATGACAAAGATCCAAATTTCAAAGATCAAGTCATTT TGCTGAATAAGCATATTGACGCATACAAAACATTCCCACCAA	109	1362

			CAGAGCCTAAAAAGGACAAAAAGAAGAAGGCTGATGAAACT CAAGCCTTACCGCAGAGACAGAAGAAACAGCAAACTGTGAC TCTTCTTCCTGCTGCAGATTTGGATGATTTCTCCAAACAATTG CAACAATCCATGAGCAGTGCTGACTCAACTCAGGCC		
RS C1 GSS linkers	middle GSS	GGSGGGGSGG	GGAGGTTCTGGGGGCGGCGGTTCAGGGGGC	1363	1392
RS C1 GSS linkers	ORF9b protein	DPKISEMHPALRLVDPQIQLAVTRM ENAVGRDQNNVGPKVYPIILRLGSP LSLNMARKTLNSLEDKAFQLTPIAV QMTKLATTEELPDEFVVVTVK	GACCCCAAAATCAGCGAAATGCACCCCGCATTACGTTTGGTG GACCCTCAGATTCAACTGGCAGTAACCAGAATGGAGAACGCA GTGGGGCGCGATCAAAACAACGTCGGCCCCAAGGTTTACCCA ATAATACTGCGTCTTGGTTCACCGCTCTCACTCAACATGGCAA GGAAGACCTTAAATTCCCTCGAGGACAAGGCGTTCCAATTAA CACCAATAGCAGTCCAGATGACCAAATTGGCTACTACCGAAG AGCTACCAGACGAATTCGTGGTGGTGACGGTAAAA	1393	1680
RS C1 GSS linkers	middle GSS	GGSGGGGSGG	GGAGGTTCTGGGGGCGGCGGTTCAGGGGGC	1681	1710
RS C1 GSS linkers	cleavage linker	YHFF	TACCATTTCTTT	1711	1722
RS C1 GSS linkers	ORF1ab NSP3 1636-1650	HTTDPSFLGRYMSAL	CACACAACTGATCCTAGTTTTCTGGGTAGGTACATGTCAGCAT TA	1723	1767
RS C1 GSS linkers	ORF1ab NSP3 1937-1947	FADDLNQLTGY	TTTGCTGATGATTTAAACCAGTTAACTGGTTAT	1768	1800
RS C1 GSS linkers	ORF1ab NSP4 2799-2809	HTDFSSEIIGY	CATACTGACTTTTCAAGTGAAATCATAGGATAC	1801	1833
RS C1 GSS linkers	ORF1ab NSP3 2563-2571	QLMCQPILL	CAGCTTATGTGTCAACCTATACTGTTA	1834	1860

RS C1 GSS linkers	ORF1ab NSP3 2616-2626	AEAELAKNVSL	GCAGAAGCTGAACTTGCAAAGAATGTGTCCTTA	1861	1893
RS C1 GSS linkers	ORF1ab NSP3 1367-1375	ILGTVSWNL	ATTCTTGGAACTGTTTCTTGGAATTTG	1894	1920
RS C1 GSS linkers	cleavage linker	KRRY	AAGCGTCGCTAT	1921	1932
RS C1 GSS linkers	ORF1ab NSP3 1148-1156	LLSAGIFGA	TTATTATCAGCTGGTATTTTTGGTGCT	1933	1959
RS C1 GSS linkers	ORF1ab NSP3 1863-1873	ITDVFYKENSY	ATTACGGATGTTTTCTACAAAGAAAACAGTTAC	1960	1992
RS C1 GSS linkers	ORF1ab NSP3 1319-1329	KVPTDNYITTY	AAAGTGCCAACAGACAATTATATAACCACTTAC	1993	2025
RS C1 GSS linkers	cleavage linker	ARMA	GCGCGGATGGCT	2026	2037
RS C1 GSS linkers	ORF1ab NSP2 735-747	APKEIIFLEGETL	GCCCCAAAAGAAATTATCTTCTTAGAGGGAGAAAACACTT	2038	2076
RS C1 GSS linkers	ORF1ab NSP3 825-833	FGDDTVIEV	TTTGGTGATGACACTGTGATAGAAGTG	2077	2103
RS C1 GSS linkers	ORF1ab NSP2 474-484	AIILASFSAST	GCCATTATTTTGGCATCTTTTTCTGCTTCCACA	2104	2136

RS C1 GSS linkers	cleavage linker	RRMA	CGCCGTATGGCA	2137		2148
RS C1 GSS linkers	ORF1ab NSP2 807-816	MVTNNTFTLK	ATGGTAACAAACAATACCTTCACACTCAAA	2149		2178
RS C1 GSS linkers	ORF1ab NSP1 108-123	VPHVGEIPVAYRKVLL	GTCCCTCATGTGGGCGAAATACCAGTGGCTTACCGCAAGGTT CTTCTT	2179		2226
RS C1 GSS linkers	ORF1ab NSP2 282-290	KTIQPRVEK	AAGACTATTCAACCAAGGGTTGAAAAG	2227		2253
RS C1 GSS linkers	ORF1ab NSP3 906-916	YLFDESGEFKL	TACTTATTTGATGAGTCTGGTGAGTTTAAATTG	2254		2286
RS C1 GSS linkers	ORF1ab NSP2 376-387	SEVGPEHSLAEY	TCAGAAGTAGGACCTGAGCATAGTCTTGCCGAATAC	2287		2322
RS C1 GSS linkers	ORF1ab NSP3 2384-2392	YIFFASFYY	TACATCTTCTTTGCATCATTTTATTAT	2323		2349
RS C1 GSS linkers	cleavage linker	KRNG	AAACGTAACGGG	2350		2361
RS C1 GSS linkers	middle GSS	GGSGGGGSGG	GGAGGTTCTGGGGGCGGCGGTTCAGGGGGC	2362		2391
RS C1 GSS linkers	ORF3a protein	DLFMRIFTIGTVTLKQGEIKDATPSD FVRATATIPIQASLPFGWLIVGVALL AVFQSASKIITLKKRWQLALSKGVH FVCNLLLLFVTVYSHLLLVAAGLEA PFLYLYALVYFLQSINFVRIIMRLWL CWKCRSKNPLLYDANYFLCWHTN CYDYCIPYNSVTSSIVITSGDGTTSPI SEHDYQIGGYTEKWESGVKDCVVL	GATTTGTTTATGAGAATCTTCACAATTGGAACTGTAACTTTGA AGCAAGGTGAAATCAAGGATGCTACTCCTTCAGATTTTGTTC GCGCTACTGCAACGATACCGATACAAGCCTCACTCCCTTTCG GATGGCTTATTGTTGGCGTTGCACTTCTTGCTGTTTTTCAGAG CGCTTCCAAAATCATAACCCTCAAAAAGAGATGGCAACTAGC ACTCTCCAAGGGTGTTCACTTTGTTTGCAACTTGCTGTTGTTG TTTGTAACAGTTTACTCACACCTTTTGCTCGTTGCTGCTGGCCT TGAAGCCCCTTTTCTCTATCTTTATGCTTTAGTCTACTTCTTGC			3213

		HSYFTSDYYQLYSTQLSTDTGVEH VTFFIYNKIVDEPEEHVQIHTIDGSS GVVNPVMEPIYDEPTTTTSVPL	AGAGTATAAACTTTGTAAGAATAATAATGAGGCTTTGGCTTT GCTGGAAATGCCGTTCCAAAAACCCATTACTTTATGATGCCA ACTATTTTCTTTGCTGGCATACTAATTGTTACGACTATTGTAT ACCTTACAATAGTGTAACTTCTTCAATTGTCATTACTTCAGGT GATGGCACAACAAGTCCTATTTCTGAACATGACTACCAGATT GGTGGTTATACTGAAAAATGGGAATCTGGAGTAAAAGACTGT GTTGTATTACACAGTTACTTCACTTCAGACTATTACCAGCTGT ACTCAACTCAATTGAGTACAGACACTGGTGTTGAACATGTTA CCTTCTTCATCTACAATAAAATTGTTGATGAGCCTGAAGAACA TGTCCAAATTCACACAATCGACGGTTCATCCGGAGTTGTTAAT CCAGTAATGGAACCAATTTATGATGAACCGACGACTACT AGCGTGCCTTTG	3214	3243
RS C1 GSS linkers	middle GSS	GGSGGGGSGG	GGAGGTTCTGGGGGCGGCGGTTCAGGGGGC		
RS C1 GSS linkers	membrane glycoprotein	ADSNGTITVEELKKLLEQWNLVIGF LFLTWICLLQFAYANRNRFLYIIKLI FLWLLWPVTLACFVLAAVYRINWI TGGIAIAMACLVGLMWLSYFIASFR LFARTRSMWSFNPETNILLNVPLHG TILTRPLLESELVIGAVILRGHLRIAG HHLGRCDIKDLPKEITVATSRTLSY YKLGASQRVAGDSGFAAYSRYRIG NYKLNTDHSSSSDNIALLVQ	TGTTTGCGCGTACGCGTTCCATGTGGTCATTCAATCCAGAAAC TAACATTCTTCTCAACGTGCCACTCCATGGCACTATTCTGACC AGACCGCTTCTAGAAAGTGAACTCGTAATCGGAGCTGTGATC CTTCGTGGACATCTTCGTATTGCTGGACACCATCTAGGACGCT GTGACATCAAGGACCTGCCTAAAGAAATCACTGTTGCTACAT CACGAACGCTTTCTTATTACAAATTGGGAGCTTCGCAGCGTGT AGCAGGTGACTCAGGTTTTGCTGCATACAGTCGCTACAGGAT TGGCAACTATAAATTAAACACAGACCATTCCAGTAGCAGTGA CAATATTGCTTTGCTTGTACAG	3244	3906
RS C1 GSS linkers	end GSS	GGSLGGGGSG	GGTGGTTCTCTTGGCGGAGGGGGTTCGGGA	3907	3936

		IVGIVAGLAVLAVVVIGAVVATVM	ATCGTGGGAATTGTGGCAGGACTGGCAGTGCTGGCCGTGGTG GTGATCGGAGCCGTGGTGGCTACCGTGATGTGCAGACGGAAG		
RS C1 GSS linkers	MITD	CRRKSSGGKGGSYSQAASSDSAQG SDVSLTA**	TCCAGCGGAGGCAAGGGCGGCAGCTACAGCCAGGCCGCCAG CTCTGATAGCGCCCAGGGCAGCGACGTGTCACTGACAGCCTA GTAA	3937	4107
RS C2 GSS linkers-inverted	SP1	MRVMAPRTLILLLSGALALTETWA GS	ATGAGAGTGATGGCCCCCAGAACCCTGATCCTGCTGCTGTCT GGCGCCCTGGCCCTGACAGAGACATGGGCCGGAAGC	1	78
RS C2 GSS linkers-inverted	start GSS	GGSGGGGSGG	GGAGGTTCCGGAGGAGGCGGCAGTGGCGGC	79	108
		ADSNGTITVEELKKLLEQWNLVIGF LFLTWICLLQFAYANRNRFLYIIKLI FLWLLWPVTLACFVLAAVYRINWI TGGIAIAMACLVGLMWLSYFIASFR LFARTRSMWSFNPETNILLNVPLHG TILTRPLLESELVIGAVILRGHLRIAG HHLGRCDIKDLPKEITVATSRTLSY YKLGASQRVAGDSGFAAYSRYRIG NYKLNTDHSSSSDNIALLVQ	GCAGATTCCAACGGTACTATTACCGTTGAAGAGCTTAAAAAG CTCCTTGAACAATGGAACCTAGTAATAGGTTTCCTATTCCTTA CATGGATTTGTCTTCTACAATTTGCCTATGCCAACAGGAATAG GTTTTTGTATATAATTAAGTTAATTTTCCTCTGGCTGTTATGGC CAGTAACTTTAGCTTGTTTTGTGCTTGCTGTTTACAGAAT AAATTGGATCACCGGTGGAATTGCTATCGCAATGGCTTGTCTT GTAGGCTTGATGTGGCTCAGCTACTTCATTGCTTCTTTCAGAC TGTTTGCGCGTACGCGTTCCATGTGGTCATTCAATCCAGAAAC TAACATTCTTCTCAACGTGCCACTCCATGGCACTATTCTGACC AGACCGCTTCTAGAAAGTGAACTCGTAATCGGAGCTGTGATC CTTCGTGGACATCTTCGTATTGCTGGACACCATCTAGGACGCT GTGACATCAAGGACCTGCCTAAAGAAATCACTGTTGCTACAT CACGAACGCTTTCTTATTACAAATTGGGAGCTTCGCAGCGTGT AGCAGGTGACTCAGGTTTTGCTGCATACAGTCGCTACAGGAT TGGCAACTATAAATTAAACACAGACCATTCCAGTAGCAGTGA CAATATTGCTTTGCTTGTACAG	109	771
RS C2 GSS linkers-inverted	membrane glycoprotein				
RS C2 GSS linkers-inverted	middle GSS	GGSGGGGSGG	GGAGGTTCTGGGGGCGGCGGTTCAGGGGGC	772	801
RS C2 GSS linkers-inverted	ORF3a protein	DLFMRIFTIGTVTLKQGEIKDATPSD FVRATATIPIQASLPFGWLIVGVALL AVFQSASKIITLKKRWQLALSKGVH	GATTTGTTTATGAGAATCTTCACAATTGGAACTGTAACTTTGA AGCAAGGTGAAATCAAGGATGCTACTCCTTCAGATTTTGTTC GCGCTACTGCAACGATACCGATACAAGCCTCACTCCCTTTCG	802	1623

		FVCNLLLLFVTVYSHLLLVAAGLEA PFLYLYALVYFLQSINFVRIIMRLWL CWKCRSKNPLLYDANYFLCWHTN CYDYCIPYNSVTSSIVITSGDGTTSPI SEHDYQIGGYTEKWESGVKDCVVL HSYFTSDYYQLYSTQLSTDTGVEH VTFFIYNKIVDEPEEHVQIHTIDGSS GVVNPVMEPIYDEPTTTTSVPL	GATGGCTTATTGTTGGCGTTGCACTTCTTGCTGTTTTTCAGAG CGCTTCCAAAATCATAACCCTCAAAAAGAGATGGCAACTAGC ACTCTCCAAGGGTGTTCACTTTGTTTGCAACTTGCTGTTGTTG TTTGTAACAGTTTACTCACACCTTTTGCTCGTTGCTGCTGGCCT TGAAGCCCCTTTTCTCTATCTTTATGCTTTAGTCTACTTCTTGC AGAGTATAAACTTTGTAAGAATAATAATGAGGCTTTGGCTTT GCTGGAAATGCCGTTCCAAAAACCCATTACTTTATGATGCCA ACTATTTTCTTTGCTGGCATACTAATTGTTACGACTATTGTAT ACCTTACAATAGTGTAACTTCTTCAATTGTCATTACTTCAGGT GATGGCACAACAAGTCCTATTTCTGAACATGACTACCAGATT GGTGGTTATACTGAAAAATGGGAATCTGGAGTAAAAGACTGT GTTGTATTACACAGTTACTTCACTTCAGACTATTACCAGCTGT ACTCAACTCAATTGAGTACAGACACTGGTGTTGAACATGTTA CCTTCTTCATCTACAATAAAATTGTTGATGAGCCTGAAGAACA TGTCCAAATTCACACAATCGACGGTTCATCCGGAGTTGTTAAT CCAGTAATGGAACCAATTTATGATGAACCGACGACTACT AGCGTGCCTTTG	1624	1653
RS C2 GSS linkers-inverted	middle GSS	GGSGGGGSGG	GGAGGTTCTGGGGGCGGCGGTTCAGGGGGC	1654	1665
RS C2 GSS linkers-inverted	cleavage linker	YHFF	TACCATTTCTTT	1666	1710
RS C2 GSS linkers-inverted	ORF1ab NSP3 1636-1650	HTTDPSFLGRYMSAL	CACACAACTGATCCTAGTTTTCTGGGTAGGTACATGTCAGCAT TA	1711	1743
RS C2 GSS linkers-inverted	ORF1ab NSP3 1937-1947	FADDLNQLTGY	TTTGCTGATGATTTAAACCAGTTAACTGGTTAT		

RS C2 GSS linkers-inverted	ORF1ab NSP4 2799-2809	HTIDFSSEIIGY	CATACTGACTTTTCAAGTGAAATCATAGGATAC	1744	1776
RS C2 GSS linkers-inverted	ORF1ab NSP3 2563-2571	QLMCQPILL	CAGCTTATGTGTCAACCTATACTGTTA	1777	1803
RS C2 GSS linkers-inverted	ORF1ab NSP3 2616-2626	AEAELAKNVSL	GCAGAAGCTGAACTTGCAAAGAATGTGTCCTTA	1804	1836
RS C2 GSS linkers-inverted	ORF1ab NSP3 1367-1375	ILGTVSWNL	ATTCTTGGAACTGTTTCTTGGAATTTG	1837	1863
RS C2 GSS linkers-inverted	cleavage linker	KRRY	AAGCGTCGCTAT	1864	1875
RS C2 GSS linkers-inverted	ORF1ab NSP3 1148-1156	LLSAGIFGA	TTATTATCAGCTGGTATTTTTGGTGCT	1876	1902
RS C2 GSS linkers-inverted	ORF1ab NSP3 1863-1873	ITDVFYKENSY	ATTACGGATGTTTTCTACAAAGAAAACAGTTAC	1903	1935
RS C2 GSS linkers-inverted	ORF1ab NSP3 1319-1329	KVPTDNYITTY	AAAGTGCCAACAGACAATTATATAACCACTTAC	1936	1968

RS C2 GSS linkers-inverted	cleavage linker	ARMA	GCGCGGATGGCT	1969	1980
RS C2 GSS linkers-inverted	ORF1ab NSP2 735-747	APKEIIFLEGETL	GCCCCAAAAGAAATTATCTTCTTAGAGGGAGAAACACTT	1981	2019
RS C2 GSS linkers-inverted	ORF1ab NSP3 825-833	FGDDTVIEV	TTTGGTGATGACACTGTGATAGAAGTG	2020	2046
RS C2 GSS linkers-inverted	ORF1ab NSP2 474-484	AIILASFSAST	GCCATTATTTTGGCATCTTTTTCTGCTTCCACA	2047	2079
RS C2 GSS linkers-inverted	cleavage linker	RRMA	CGCCGTATGGCA	2080	2091
RS C2 GSS linkers-inverted	ORF1ab NSP2 807-816	MVTNNTFTLK	ATGGTAACAAACAATACCTTCACACTCAAA	2092	2121
RS C2 GSS linkers-inverted	ORF1ab NSP1 108-123	VPHVGEIPVAYRKVLL	GTCCCTCATGTGGGCGAAATACCAGTGGCTTACCGCAAGGTT CTTCTT	2122	2169
RS C2 GSS linkers-inverted	ORF1ab NSP2 282-290	KTIQPRVEK	AAGACTATTCAACCAAGGGTTGAAAAG	2170	2196
RS C2 GSS linkers-inverted	ORF1ab NSP3 906-916	YLFDESGEFKL	TACTTATTTGATGAGTCTGGTGAGTTTAAATTG	2197	2229
RS C2 GSS linkers-inverted	ORF1ab NSP2 376-387	SEVGPEHSLAEY	TCAGAAGTAGGACCTGAGCATAGTCTTGCCGAATAC	2230	2265
RS C2 GSS linkers-inverted	ORF1ab NSP3	YIFFASFYY	TACATCTTCTTTGCATCATTTTATTAT	2266	2292

	2384-2392				
RS C2 GSS linkers-inverted	cleavage linker	KRNG	AAACGTAACGGG	2293	2304
RS C2 GSS linkers-inverted	middle GSS	GGSGGGGSGG	GGAGGTTCTGGGGGCGGCGGTTCAGGGGGC	2305	2334
RS C2 GSS linkers-inverted	ORF9b protein	DPKISEMHPALRLVDPQIQLAVTRM ENAVGRDQNNVGPKVYPIILRLGSP LSLNMARKTLNSLEDKAFQLTPIAV QMTKLATTEELPDEFVVVTVK	GACCCCAAAATCAGCGAAATGCACCCCGCATTACGTTTGGTG GACCCTCAGATTCAACTGGCAGTAACCAGAATGGAGAACGCA GTGGGGCGCGATCAAAACAACGTCGGCCCCAAGGTTTACCCA ATAATACTGCGTCTTGGTTCACCGCTCTCACTCAACATGGCAA GGAAGACCTTAAATTCCCTCGAGGACAAGGCGTTCCAATTAA CACCAATAGCAGTCCAGATGACCAAATTGGCTACTACCGAAG AGCTACCAGACGAATTCGTGGTGGTGACGGTAAAA	2335	2622
RS C2 GSS linkers-inverted	middle GSS	GGSGGGGSGG	GGAGGTTCTGGGGGCGGCGGTTCAGGGGGC	2623	2652
RS C2 GSS linkers-inverted	nucleocapsid phosphoprotein	SDNGPQNQRNAPRITFGGPSDSTGS NQNGERSGARSKQRRPQGLPNNTA SWFTALTQHGKEDLKFPRGQGVPI NTNSSPDDQIGYYRRATRRIRGGDG KMKDLSPRWYFYYLGTGPEAGLPY GANKDGIIWVATEGALNTPKDHIGT RNPANNAAIVLQLPQGTTLPKGFYA EGSRGGSQASSRSSSRSRNSSRNSTP GSSRGTSPARMAGNGGDAALALLL LDRLNQLESKMSGKGQQQQGQTV TKKSAAEASKKPRQKRTATKAYNV TQAFGRRGPEQTQGNFGDQELIRQ GTDYKHWPQIAQFAPSASAFFGMS RIGMEVTPSGTWLTYTGAIKLDDK DPNFKDQVILLNKHIDAYKTFPPTE	GGAGGTTCTGGGGGCGGCGGTTCAGGGGGC ACGTTTGGTGGACCCTCAGATTCAACTGGCAGTAACCAGAAT GGAGAACGCAGTGGGGCGCGATCAAAACAACGTCGGCCCCA AGGTTTACCCAATAATACTGCGTCTTGGTTCACCGCTCTCACT CAACATGGCAAGGAAGACCTTAAATTCCCTCGAGGACAAGGC GTTCCAATTAACACCAATAGCAGTCCAGATGACCAAATTGGC TACTACCGAAGAGCTACCAGACGAATTCGTGGTGGTGACGGT AAAATGAAAGATCTCAGTCCAAGATGGTATTTCTACTACCTA GGAACTGGGCCAGAAGCTGGACTTCCCTATGGTGCTAACAAA GACGGCATCATATGGGTTGCAACTGAGGGAGCCTTGAATACA CCAAAAGATCACATTGGCACCCGCAATCCTGCTAACAATGCT GCAATCGTGCTACAACTTCCTCAAGGAACAACATTGCCAAAA GGCTTCTACGCAGAAGGGAGCAGAGGCGGCAGTCAAGCCTCT TCTCGTTCCTCATCACGTAGTCGCAACAGTTCAAGAAATTCAA CTCCAGGCAGCAGTAGGGGAACTTCTCCTGCTAGAATGGCTG	2653	3906

		PKKDKKKKADETQALPQRQKKQQ TVTLLPAADLDDFSKQLQQSMSSA DSTQA	GCAATGGCGGTGATGCTGCTCTTGCTTTGCTGCTGCTTGACAG ATTGAACCAGCTTGAGAGCAAAATGTCTGGTAAAGGCCAACA ACAACAAGGCCAAACTGTCACTAAGAAATCTGCTGCTGAGGC TTCTAAGAAGCCTCGGCAAAAACGTACTGCCACTAAAGCATA CAATGTAACACAAGCTTTCGGCAGACGTGGTCCAGAACAAAC CCAAGGAAATTTTGGGGACCAGGAACTAATCAGACAAGGAA CTGATTACAAACATTGGCCGCAAATTGCACAATTTGCCCCCA GCGCTTCAGCGTTCTTCGGAATGTCGCGCATTGGCATGGAAG TCACACCTTCGGGAACGTGGTTGACCTACACAGGTGCCATCA AATTGGATGACAAAGATCCAAATTTCAAAGATCAAGTCATTT TGCTGAATAAGCATATTGACGCATACAAAACATTCCCACCAA CAGAGCCTAAAAAGGACAAAAGAAGAAGGCTGATGAAACT CAAGCCTTACCGCAGAGACAGAAGAAACAGCAAACTGTGAC TCTTCTTCCTGCTGCAGATTTGGATGATTTCTCCAAACAATTG CAACAATCCATGAGCAGTGCTGACTCAACTCAGGCC		
RS C2 GSS linkers-inverted	end GSS	GGSLGGGGSG	GGTGGTTCTCTTGGCGGAGGGGGTTCGGGA	3907	3936
RS C2 GSS linkers-inverted	MITD	IVGIVAGLAVLAVVVIGAVVATVM CRRKSSGGKGGSYSQAASSDSAQG SDVSLTA**	ATCGTGGGAATTGTGGCAGGACTGGCAGTGCTGGCCGTGGTG GTGATCGGAGCCGTGGTGGCTACCGTGATGTGCAGACGGAAG TCCAGCGGAGGCAAGGGCGGCAGCTACAGCCAGGCCGCCAG CTCTGATAGCGCCCAGGGCAGCGACGTGTCACTGACAGCCTA GTAA	3937	4107
RS C3 2A linkers	SP1	MRVMAPRTLILLLSGALALTETWA GS	ATGAGAGTGATGGCCCCCAGAACCCTGATCCTGCTGTCT GGCGCCCTGGCCCTGACAGAGACATGGGCCGGAAGC	1	78
RS C3 2A linkers	start GSS	GGSGGGGSGG	GGAGGTTCCGGAGGAGGCGGCAGTGGCGGC	79	108
RS C3 2A linkers	nucleoca psid phosphop rotein	SDNGPQNQRNAPRITFGGPSDSTGS NQNGERSGARSKQRRPQGLPNNTA SWFTALTQHGKEDLKFPRGQGVPI NTNSSPDDQIGYYRRATRRIRGGDG KMKDLSPRWYFYYLGTGPEAGLPY GANKDGIIWVATEGALNTPKDHIGT	TCTGATAATGGACCCCAAAATCAGCGAAATGCACCCCGCATT ACGTTTGGTGGACCCTCAGATTCAACTGGCAGTAACCAGAAT GGAGAACGCAGTGGGGCGCGATCAAAACAACGTCGGCCCCA AGGTTTACCCAATAATACTGCGTCTTGGTTCACCGCTCTCACT CAACATGGCAAGGAAGACCTTAAATTCCCTCGAGGACAAGGC GTTCCAATTAACACCAATAGCAGTCCAGATGACCAAATTGGC	109	1362

		RNPANNAAIVLQLPQGTTLPKGFYA	TACTACCGAAGAGCTACCAGACGAATTCGTGGTGGTGACGGT			
		EGSRGGSQASSRSSSRSRNSSRNSTP	AAAATGAAAGATCTCAGTCCAAGATGGTATTTCTACTACCTA			
		GSSRGTSPARMAGNGGDAALALLL	GGAACTGGGCCAGAAGCTGGACTTCCCTATGGTGCTAACAAA			
		LDRLNQLESKMSGKGQQQQGQTV	GACGGCATCATATGGGTTGCAACTGAGGGAGCCTTGAATACA			
		TKKSAAEASKKPRQKRTATKAYNV	CCAAAAGATCACATTGGCACCCGCAATCCTGCTAACAATGCT			
		TQAFGRRGPEQTQGNFGDQELIRQ	GCAATCGTGCTACAACTTCCTCAAGGAACAACATTGCCAAAA			
		GTDYKHWPQIAQFAPSASAFFGMS	GGCTTCTACGCAGAAGGGAGCAGAGGCGGCAGTCAAGCCTCT			
		RIGMEVTPSGTWLTYTGAIKLDDK	TCTCGTTCCTCATCACGTAGTCGCAACAGTTCAAGAAATTCAA			
		DPNFKDQVILLNKHIDAYKTFPPTE	CTCCAGGCAGCAGTAGGGGAACTTCTCCTGCTAGAATGGCTG			
		PKKDKKKADETQALPQRQKKQQ	GCAATGGCGGTGATGCTGCTCTTGCTTTGCTGCTGCTTGACAG			
		TVTLLPAADLDDFSKQLQQSMSSA	ATTGAACCAGCTTGAGAGCAAAATGTCTGGTAAAGGCCAACA			
		DSTQA	ACAACAAGGCCAAACTGTCACTAAGAAATCTGCTGCTGCTGAGGC			
			TTCTAAGAAGCCTCGGCAAAAACGTACTGCCACTAAAGCATA			
			CAATGTAACACAAGCTTTCGGCAGACGTGGTCCAGAACAAAC			
			CCAAGGAAATTTTGGGGACCAGGAACTAATCAGACAAGGAA			
			CTGATTACAAACATTGGCCGCAAATTGCACAATTTGCCCCCA			
			GCGCTTCAGCGTTCTTCGGAATGTCGCGCATTGGCATGGAAG			
			TCACACCTTCGGGAACGTGGTTGACCTACACAGGTGCCATCA			
			AATTGGATGACAAAGATCCAAATTTCAAAGATCAAGTCATTT			
			TGCTGAATAAGCATATTGACGCATACAAAACATTCCCACCAA			
			CAGAGCCTAAAAAGGACAAAAAGAAGGCTGATGAAACT			
			CAAGCCTTACCGCAGAGACAGAAGAAACAGCAAACTGTGAC			
			TCTTCTTCCTGCTGCAGATTTGGATGATTTCTCCAAACAATTG			
			CAACAATCCATGAGCAGTGCTGACTCAACTCAGGCC			
RS C3 2A linkers	1 GSG T2A	GSGGSGEGRGSLLTCGDVEENPGP	GGCAGCGGCGGCTCCGGCGAGGGCAGGGGAAGTCTTCTAAC	1363	1434	
			ATGCGGGGACGTGGAGGAAAATCCCGGCCCA			
			GACCCCAAAATCAGCGAAATGCACCCCGCATTACGTTTGGTG			
			GACCCTCAGATTCAACTGGCAGTAACCAGAATGGAGAACGCA			
		DPKISEMHPALRLVDPQIQLAVTRM	GTGGGGCGCGATCAAAACAACGTCGGCCCCAAGGTTTACCCA			
		ENAVGRDQNNVGPKVYPIILRLGSP	ATAATACTGCGTCTTGGTTCACCGCTCTCACTCAACATGGCAA			
RS C3 2A linkers	ORF9b protein	LSLNMARKTLNSLEDKAFQLTPIAV	GGAAGACCTTAAATTCCCTCGAGGACAAGGCGTTCCAATTAA			
		QMTKLATTEELPDEFVVVTVK	CACCAATAGCAGTCCAGATGACCAAATTGGCTACTACCGAAG			
			AGCTACCAGACGAATTCGTGGTGGTGACGGTAAAA	1435	1722	

RS C3 2A linkers	2 GSG P2A	GSGGSGATNFSLLKQAGDVEENPG P	GGCAGCGGCGGCAGCGGCGCCACAAACTTCTCTCTGCTAAAG CAAGCAGGTGATGTTGAAGAAAACCCCGGGCCT	1723	1797
RS C3 2A linkers	cleavage linker	YHFF	TACCATTTCTTT	1798	1809
RS C3 2A linkers	ORF1ab NSP3 1636-1650	HTTDPSFLGRYMSAL	CACACAACTGATCCTAGTTTTCTGGGTAGGTACATGTCAGCAT TA	1810	1854
RS C3 2A linkers	ORF1ab NSP3 1937-1947	FADDLNQLTGY	TTTGCTGATGATTTAAACCAGTTAACTGGTTAT	1855	1887
RS C3 2A linkers	ORF1ab NSP4 2799-2809	HTDFSSEIIGY	CATACTGACTTTTCAAGTGAAATCATAGGATAC	1888	1920
RS C3 2A linkers	ORF1ab NSP3 2563-2571	QLMCQPILL	CAGCTTATGTGTCAACCTATACTGTTA	1921	1947
RS C3 2A linkers	ORF1ab NSP3 2616-2626	AEAELAKNVSL	GCAGAAGCTGAACTTGCAAAGAATGTGTCCTTA	1948	1980
RS C3 2A linkers	ORF1ab NSP3 1367-1375	ILGTVSWNL	ATTCTTGGAACTGTTTCTTGGAATTTG	1981	2007
RS C3 2A linkers	cleavage linker	KRRY	AAGCGTCGCTAT	2008	2019
RS C3 2A linkers	ORF1ab NSP3	LLSAGIFGA	TTATTATCAGCTGGTATTTTTTGGTGCT	2020	2046

	1148-1156				
RS C3 2A linkers	ORF1ab NSP3 1863-1873	ITDVFYKENSY	ATTACGGATGTTTTCTACAAAGAAAACAGTTAC	2047	2079
RS C3 2A linkers	ORF1ab NSP3 1319-1329	KVPTDNYITTY	AAAGTGCCAACAGACAATTATATAACCACTTAC	2080	2112
RS C3 2A linkers	cleavage linker	ARMA	GCGCGGATGGCT	2113	2124
RS C3 2A linkers	ORF1ab NSP2 735-747	APKEIIFLEGETL	GCCCCAAAAGAAATTATCTTCTTAGAGGGAGAAACACTT	2125	2163
RS C3 2A linkers	ORF1ab NSP3 825-833	FGDDTVIEV	TTTGGTGATGACACTGTGATAGAAGTG	2164	2190
RS C3 2A linkers	ORF1ab NSP2 474-484	AIILASFSAST	GCCATTATTTTGGCATCTTTTTCTGCTTCCACA	2191	2223
RS C3 2A linkers	cleavage linker	RRMA	CGCCGTATGGCA	2224	2235
RS C3 2A linkers	ORF1ab NSP2 807-816	MVTNNTFTLK	ATGGTAACAAACAATACCTTCACACTCAAA	2236	2265
RS C3 2A linkers	ORF1ab NSP1 108-123	VPHVGEIPVAYRKVLL	GTCCCTCATGTGGGCGAAATACCAGTGGCTTACCGCAAGGTT CTTCTT	2266	2313
RS C3 2A linkers	ORF1ab NSP2 282-290	KTIQPRVEK	AAGACTATTCAACCAAGGGTTGAAAAG	2314	2340

RS C3 2A linkers	ORF1ab NSP3 906-916	YLFDESGEFKL	TACTTATTTGATGAGTCTGGTGAGTTTAAATTG	2341	2373
RS C3 2A linkers	ORF1ab NSP2 376-387	SEVGPEHSLAEY	TCAGAAGTAGGACCTGAGCATAGTCTTGCCGAATAC	2374	2409
RS C3 2A linkers	ORF1ab NSP3 2384-2392	YIFFASFYY	TACATCTTCTTTGCATCATTTTATTAT	2410	2436
RS C3 2A linkers	cleavage linker	KRNG	AAACGTAACGGG	2437	2448
RS C3 2A linkers	3 GSG F2A	GSGVKQTLNFDLLKLAGDVESNPG P	GGCAGCGGCGTGAAACAGACTTTGAATTTTGACCTTCTCAAG TTGGCGGGAGACGTGGAGTCCAACCCTGGACCT	2449	2523
RS C3 2A linkers	ORF3a protein	DLFMRIFTIGTVTLKQGEIKDATPSD FVRATATIPIQASLPFGWLIVGVALL AVFQSASKIITLKKRWQLALSKGVH FVCNLLLLFVTVYSHLLLVAAGLEA PFLYLYALVYFLQSINFVRIIMRLWL CWKCRSKNPLLYDANYFLCWHTN CYDYCIPYNSVTSSIVITSGDGTTSPI SEHDYQIGGYTEKWESGVKDCVVL HSYFTSDYYQLYSTQLSTDTGVEH GVVNPVMEPIYDEPTTTSVPL	GATTTGTTTATGAGAATCTTCACAATTGGAACTGTAACTTTGA AGCAAGGTGAAATCAAGGATGCTACTCCTTCAGATTTTGTTC GCGCTACTGCAACGATACCGATACAAGCCTCACTCCCTTTCG GATGGCTTATTGTTGGCGTTGCACTTCTTGCTGTTTTTCAGAG CGCTTCCAAAATCATAACCCTCAAAAAGAGATGGCAACTAGC ACTCTCCAAGGGTGTTCACTTTGTTTGCAACTTGCTGTTGTTG TTTGTAACAGTTTACTCACACCTTTTGCTCGTTGCTGCTGGCCT TGAAGCCCCTTTTCTCTATCTTTATGCTTTAGTCTACTTCTTGC AGAGTATAAACTTTGTAAGAATAATAATGAGGCTTTGGCTTT GCTGGAAATGCCGTTCCAAAAACCCATTACTTTATGATGCCA ACTATTTTCTTTGCTGGCATACTAATTGTTACGACTATTGTAT ACCTTACAATAGTGTAACTTCTTCAATTGTCATTACTTCAGGT GATGGCACAACAAGTCCTATTTCTGAACATGACTACCAGATT GGTGGTTATACTGAAAAAATGGGAATCTGGAGTAAAAGACTGT GTTGTATTACACAGTTACTTCACTTCAGACTATTACCAGCTGT ACTCAACTCAATTGAGTACAGACACTGGTGTTGAACATGTTA CCTTCTTCATCTACAATAAATTGTTGATGAGCCTGAAGAACA TGTCCAAATTCACACAATCGACGGTTCATCCGGAGTTGTTAAT	2524	3345

				CCAGTAATGGAACCAATTTATGATGAACCGACGACGACTACT AGCGTGCCTTTG		
RS C3 2A linkers	4 GSG E2A	GSGGSGQCTNYALLKLAGDVESNP GP		GGCAGCGGCGGCTCGGGCCAGTGTACTAATTATGCTCTCTTG AAATTGGCTGGAGATGTTGAGAGCAACCCAGGTCCC	3346	3423
				GCAGATTCCAACGGTACTATTACCGTTGAAGAGCTTAAAAAG		
				CTCCTTGAACAATGGAACCTAGTAATAGGTTTCCTATTCCTTA		
				CATGGATTTGTCTTCTACAATTTGCCTATGCCAACAGGAATAG		
				GTTTTTGTATATAATTAAGTTAATTTTCCTCTGGCTGTTATGGC		
				CAGTAACTTTAGCTTGTTTTGTGCTTGCTGCTGTTTACAGAAT		
				AAATTGGATCACCGGTGGAATTGCTATCGCAATGGCTTGTCTT		
			ADSNGTITVEELKKLLEQWNLVIGF	GTAGGCTTGATGTGGCTCAGCTACTTCATTGCTTCTTTCAGAC		
			LFLTWICLLQFAYANRNRFLYIIKLI	TGTTTGCGCGTACGCGTTCCATGTGGTCATTCAATCCAGAAAC		
			FLWLLWPVTLACFVLAAVYRINWI	TAACATTCTTCTCAACGTGCCACTCCATGGCACTATTCTGACC		
			TGGIAIAMACLVGLMWLSYFIASFR	AGACCGCTTCTAGAAAGTGAACTCGTAATCGGAGCTGTGATC		
			LFARTRSMWSFNPETNILLNVPLHG	CTTCGTGGACATCTTCGTATTGCTGGACACCATCTAGGACGCT		
	membrane	glycoprotein	TILTRPLLESELVIGAVILRGHLRIAG	GTGACATCAAGGACCTGCCTAAAGAAATCACTGTTGCTACAT		
RS C3 2A linkers			HHLGRCDIKDLPKEITVATSRTLSY	CACGAACGCTTTCTTATTACAAATTGGGAGCTTCGCAGCGTGT		
			YKLGASQRVAGDSGFAAYSRYRIG	AGCAGGTGACTCAGGTTTTGCTGCATACAGTCGCTACAGGAT		
			NYKLNTDHSSSSDNIALLVQ	TGGCAACTATAAATTAAACACAGACCATTCCAGTAGCAGTGA		
				CAATATTGCTTTGCTTGTACAG	3424	4086
RS C3 2A linkers	end GSS	GGSLGGGGSG		GGTGGTTCTCTTGGCGGAGGGGGTTCGGGA	4087	4116
				ATCGTGGGAATTGTGGCAGGACTGGCAGTGCTGGCCGTGGTG		
				GTGATCGGAGCCGTGGTGGCTACCGTGATGTGCAGACGGAAG		
			IVGIVAGLAVLAVVVIGAVVATVM	TCCAGCGGAGGCAAGGGCGGCAGCTACAGCCAGGCCGCCAG		
RS C3 2A linkers	MITD	CRRKSSGGKGGSYSQAASSDSAQG SDVSLTA**		CTCTGATAGCGCCCAGGGCAGCGACGTGTCACTGACAGCCTA GTAA	4117	4287
RS C4 ORF1ab as linkers	SP1	MRVMAPRTLILLLSGALALTETWA GS		ATGAGAGTGATGGCCCCCAGAACCCTGATCCTGCTGCTGTCT GGCGCCCTGGCCCTGACAGAGACATGGGCCGGAAGC	1	78
RS C4 ORF1ab as linkers	start GSS	GGSGGGGSGG		GGAGGTTCCGGAGGAGGCGGCAGTGGCGGC	79	108

		TCTGATAATGGACCCCAAAATCAGCGAAATGCACCCCGCATT		
		ACGTTTGGTGGACCCTCAGATTCAACTGGCAGTAACCAGAAT		
		GGAGAACGCAGTGGGGCGCGATCAAAACAACGTCGGCCCCA		
		AGGTTTACCCAATAATACTGCGTCTTGGTTCACCGCTCTCACT		
		CAACATGGCAAGGAAGACCTTAAATTCCCTCGAGGACAAGGC		
		GTTCCAATTAACACCAATAGCAGTCCAGATGACCAAATTGGC		
		TACTACCGAAGAGCTACCAGACGAATTCGTGGTGGTGACGGT		
		AAAATGAAAGATCTCAGTCCAAGATGGTATTTCTACTACCTA		
		GGAACTGGGCCAGAAGCTGGACTTCCCTATGGTGCTAACAAA		
		GACGGCATCATATGGGTTGCAACTGAGGGAGCCTTGAATACA		
		CCAAAAGATCACATTGGCACCCGCAATCCTGCTAACAATGCT		
		GCAATCGTGCTACAACTTCCTCAAGGAACAACATTGCCAAAA		
	SDNGPQNQRNAPRITFGGPSDSTGS	GGCTTCTACGCAGAAGGGAGCAGAGGCGGCAGTCAAGCCTCT		
	NQNGERSGARSKQRRPQGLPNNTA	TCTCGTTCCTCATCACGTAGTCGCAACAGTTCAAGAAATTCAA		
	SWFTALTQHGKEDLKFPRGQGVPI	CTCCAGGCAGCAGTAGGGGAACTTCTCCTGCTAGAATGGCTG		
	NTNSSPDDQIGYYRRATRRIRGGDG	GCAATGGCGGTGATGCTGCTCTTGCTTTGCTGCTGCTTGACAG		
	KMKDLSPRWYFYYLGTGPEAGLPY	ATTGAACCAGCTTGAGAGCAAAATGTCTGGTAAAGGCCAACA		
	GANKDGIIWVATEGALNTPKDHIGT	ACAACAAGGCCAAACTGTCACTAAGAAATCTGCTGCTGAGGC		
	RNPANNAAIVLQLPQGTTLPKGFYA	TTCTAAGAAGCCTCGGCAAAAACGTACTGCCACTAAAGCATA		
	EGSRGGSQASSRSSSRSRNSSRNSTP	CAATGTAACACAAGCTTTCGGCAGACGTGGTCCAGAACAAAC		
	GSSRGTSPARMAGNGGDAALALLL	CCAAGGAAATTTTGGGGACCAGGAACTAATCAGACAAGGAA		
	LDRLNQLESKMSGKGQQQQGQTV	CTGATTACAAACATTGGCCGCAAATTGCACAATTTGCCCCCA		
	TKKSAAEASKKPRQKRTATKAYNV	GCGCTTCAGCGTTCTTCGGAATGTCGCGCATTGGCATGGAAG		
	TQAFGRRGPEQTQGNFGDQELIRQ	TCACACCTTCGGGAACGTGGTTGACCTACACAGGTGCCATCA		
	GTDYKHWPQIAQFAPSASAFFGMS	AATTTGGATGACAAAGATCCAAATTTCAAAGATCAAGTCATTT		
	RIGMEVTPSGTWLTYTGAIKLDDK	TGCTGAATAAGCATATTGACGCATACAAAACATTCCCACCAA		
	DPNFKDQVILLNKHIDAYKTFPPTE	CAGAGCCTAAAAAGGACAAAAAGAAGAAGGCTGATGAAACT		
	PKKDKKKKADETQALPQRQKKQQ	CAAGCCTTACCGCAGAGACAGAAGAAACAGCAAACTGTGAC		
	TVTLLPAADLDDFSKQLQQSMSSA	TCTTCTTCCTGCTGCAGATTTGGATGATTTCTCCAAACAATTG		
	DSTQA	CAACAATCCATGAGCAGTGCTGACTCAACTCAGGCC	109	1362
RS C4 ORF1ab as linkers	nucleocapsid phosphoprotein cleavage linker			
	FRAC	TTCAGGGCTTGC	1363	1374

RS C4 ORF1ab linkers	ORF1ab NSP2 807-816	MVTNNTFTLK	ATGGTAACAAACAATACCTTCACACTCAAA	1375	1404
RS C4 ORF1ab linkers	ORF1ab NSP1 108-123	VPHVGEIPVAYRKVLL	GTCCCTCATGTGGGCGAAATACCAGTGGCTTACCGCAAGGTT CTTCTT	1405	1452
RS C4 ORF1ab linkers	ORF1ab NSP2 282-290	KTIQPRVEK	AAGACTATTCAACCAAGGGTTGAAAAG	1453	1479
RS C4 ORF1ab linkers	ORF1ab NSP3 906-916	YLFDESGEFKL	TACTTATTTGATGAGTCTGGTGAGTTTAAATTG	1480	1512
RS C4 ORF1ab linkers	ORF1ab NSP2 376-387	SEVGPEHSLAEY	TCAGAAGTAGGACCTGAGCATAGTCTTGCCGAATAC	1513	1548
RS C4 ORF1ab linkers	ORF1ab NSP3 2384-2392	YIFFASFYY	TACATCTTCTTTGCATCATTTTATTAT	1549	1575
RS C4 ORF1ab linkers	cleavage linker	KRNG	AAAAGAAATGGC	1576	1587
RS C4 ORF1ab linkers	ORF9b protein	DPKISEMHPALRLVDPQIQLAVTRM ENAVGRDQNNVGPKVYPIILRLGSP LSLNMARKTLNSLEDKAFQLTPIAV QMTKLATTEELPDEFVVVTVK	GACCCCAAAATCAGCGAAATGCACCCCGCATTACGTTTGGTG GACCCTCAGATTCAACTGGCAGTAACCAGAATGGAGAACGCA GTGGGGCGCGATCAAAACAACGTCGGCCCCAAGGTTTACCCA ATAATACTGCGTCTTGGTTCACCGCTCTCACTCAACATGGCAA GGAAGACCTTAAATTCCCTCGAGGACAAGGCGTTCCAATTAA CACCAATAGCAGTCCAGATGACCAAATTGGCTACTACCGAAG AGCTACCAGACGAATTCGTGGTGGTGACGGTAAAA	1588	1875
RS C4 ORF1ab linkers	cleavage linker	FNSF	TTCAACTCTTTT	1876	1887

RS C4 ORF1ab as linkers	ORF1ab NSP3 1636-1650	HTTDPSFLGRYMSAL	CACACAACTGATCCTAGTTTTCTGGGTAGGTACATGTCAGCAT TA	1888	1932
RS C4 ORF1ab as linkers	ORF1ab NSP3 1937-1947	FADDLNQLTGY	TTTGCTGATGATTTAAACCAGTTAACTGGTTAT	1933	1965
RS C4 ORF1ab as linkers	ORF1ab NSP4 2799-2809	HTDFSSEIIGY	CATACTGACTTTTCAAGTGAAATCATAGGATAC	1966	1998
RS C4 ORF1ab as linkers	ORF1ab NSP3 2563-2571	QLMCQPILL	CAGCTTATGTGTCAACCTATACTGTTA	1999	2025
RS C4 ORF1ab as linkers	ORF1ab NSP3 2616-2626	AEAELAKNVSL	GCAGAAGCTGAACTTGCAAAGAATGTGTCCTTA	2026	2058
RS C4 ORF1ab as linkers	ORF1ab NSP3 1367-1375	ILGTVSWNL	ATTCTTGGAACTGTTTCTTGGAATTTG	2059	2085
RS C4 ORF1ab as linkers	cleavage linker	KKQG	AAAAAACAGGGC	2086	2097
RS C4 ORF1ab as linkers	ORF3a protein	DLFMRIFTIGTVTLKQGEIKDATPSD FVRATATIPIQASLPFGWLIVGVALL AVFQSASKIITLKKRWQLALSKGVH FVCNLLLLFVTVYSHLLLVAAGLEA PFLYLYALVYFLQSINFVRIIMRLWL CWKCRSKNPLLYDANYFLCWHTN	GATTTGTTTATGAGAATCTTCACAATTGGAACTGTAACTTTGA AGCAAGGTGAAATCAAGGATGCTACTCCTTCAGATTTTGTTC GCGCTACTGCAACGATACCGATACAAGCCTCACTCCCTTTCG GATGGCTTATTGTTGGCGTTGCACTTCTTGCTGTTTTTCAGAG CGCTTCCAAAATCATAACCCTCAAAAAGAGATGGCAACTAGC ACTCTCCAAGGGTGTTCACTTTGTTTGCAACTTGCTGTTGTTG	2098	2919

		CYDYCIPYNSVTSSIVITSGDGTTSPI SEHDYQIGGYTEKWESGVKDCVVL HSYFTSDYYQLYSTQLSTDTGVEH VTFFIYNKIVDEPEEHVQIHTIDGSS GVVNPVMEPIYDEPTTTTSVPL	TTTGTAACAGTTTACTCACACCTTTTGCTCGTTGCTGCTGGCCT TGAAGCCCCTTTTCTCTATCTTTATGCTTTAGTCTACTTCTTGC AGAGTATAAACTTTGTAAGAATAATAATGAGGCTTTGGCTTT GCTGGAAATGCCCGTTCCAAAAACCCATTACTTTATGATGCCA ACTATTTTCTTTGCTGGCATACTAATTGTTACGACTATTGTAT ACCTTACAATAGTGTAACTTCTTCAATTGTCATTACTTCAGGT GATGGCACAACAAGTCCTATTTCTGAACATGACTACCAGATT GGTGGTTATACTGAAAAATGGGAATCTGGAGTAAAAGACTGT GTTGTATTACACAGTTACTTCACTTCAGACTATTACCAGCTGT ACTCAACTCAATTGAGTACAGACACTGGTGTTGAACATGTTA CCTTCTTCATCTACAATAAAATTGTTGATGAGCCTGAAGAACA TGTCCAAATTCACACAATCGACGGTTCATCCGGAGTTGTTAAT CCAGTAATGGAACCAATTTATGATGAACCGACGACGACTACT AGCGTGCCTTTG	2920	2931
RS C4 ORF1ab as linkers	cleavage linker	RRSY	CGCCGGAGTTAC	2932	2958
RS C4 ORF1ab as linkers	ORF1ab NSP3 1148-1156	LLSAGIFGA	TTATTATCAGCTGGTATTTTTGGTGCT	2959	2991
RS C4 ORF1ab as linkers	ORF1ab NSP3 1863-1873	ITDVFYKENSY	ATTACGGATGTTTTCTACAAAGAAAACAGTTAC	2992	3024
RS C4 ORF1ab as linkers	ORF1ab NSP3 1319-1329	KVPTDNYITTY	AAAGTGCCAACAGACAATTATATAACCACTTAC	3025	3036
RS C4 ORF1ab as linkers	cleavage linker	ARMA	GCGCGAATGGCG		

RS C4 ORF1ab as linkers	ORF1ab NSP2 735-747	APKEIIFLEGETL	GCCCCAAAAGAAATTATCTTCTTAGAGGGAGAAACACTT	3037	3075
RS C4 ORF1ab as linkers	ORF1ab NSP3 825-833	FGDDTVIEV	TTTGGTGATGACACTGTGATAGAAGTG	3076	3102
RS C4 ORF1ab as linkers	ORF1ab NSP2 474-484	AIILASFSAST	GCCATTATTTTGGCATCTTTTTCTGCTTCCACA	3103	3135
RS C4 ORF1ab as linkers	cleavage linker	LLVQ	CTGCTGGTCCAG	3136	3147
			GCAGATTCCAACGGTACTATTACCGTTGAAGAGCTTAAAAAG		
			CTCCTTGAACAATGGAACCTAGTAATAGGTTTCCTATTCCTTA		
			CATGGATTTGTCTTCTACAATTTGCCTATGCCAACAGGAATAG		
			GTTTTTGTATATAATTAAGTTAATTTTCCTCTGGCTGTTATGGC		
			CAGTAACTTTAGCTTGTTTTGTGCTTGCTGCTGTTTACAGAAT		
			AAATTGGATCACCGGTGGAATTGCTATCGCAATGGCTTGTCTT		
			GTAGGCTTGATGTGGCTCAGCTACTTCATTGCTTCTTTCAGAC		
		ADSNGTITVEELKKLLEQWNLVIGF	TGTTTGCGCGTACGCGTTCCATGTGGTCATTCAATCCAGAAAC		
		LFLTWICLLQFAYANRNRFLYIIKLI	TAACATTCTTCTCAACGTGCCACTCCATGGCACTATTCTGACC		
		FLWLLWPVTLACFVLAAVYRINWI	AGACCGCTTCTAGAAAGTGAACTCGTAATCGGAGCTGTGATC		
		TGGIAIAMACLVGLMWLSYFIASFR	CTTCGTGGACATCTTCGTATTGCTGGACACCATCTAGGACGCT		
		LFARTRSMWSFNPETNILLNVPLHG	GTGACATCAAGGACCTGCCTAAAGAAATCACTGTTGCTACAT		
	membran	TILTRPLLESELVIGAVILRGHLRIAG	CACGAACGCTTTCTTATTACAAATTGGGAGCTTCGGCAGCGTGT		
RS C4	e	HHLGRCDIKDLPKEITVATSRTLSY	AGCAGGTGACTCAGGTTTTGCTGCATACAGTCGCTACAGGAT		
ORF1ab as linkers	glycoprot ein	YKLGASQRVAGDSGFAAYSRYRIG	TGGCAACTATAAATTAAACACAGACCATTCCAGTAGCAGTGA		
		NYKLNTDHSSSSDNIALLVQ	CAATATTGCTTTGCTTGTACAG	3148	3810
RS C4 ORF1ab as linkers	end GSS	GGSLGGGGSG	GGTGGTTCTCTTGGCGGAGGGGGTTCGGGA	3811	3840

RS C4 ORF1ab as linkers	MITD	IVGIVAGLAVLAVVVIGAVVATVM CRRKSSGGKGGSYSQAASSDSAQG SDVSLTA**	ATCGTGGGAATTGTGGCAGGACTGGCAGTGCTGGCCGTGGTG GTGATCGGAGCCGTGGTGGCTACCGTGATGTGCAGACGGAAG TCCAGCGGAGGCAAGGGCGGCAGCTACAGCCAGGCCGCCAG CTCTGATAGCGCCCAGGGCAGCGACGTGTCACTGACAGCCTA GTAA	3841	4011

Table 10. Group 2 Construct-maps

CONSTRUCT Name	Segment NAME	AA SEQUENCE	DNA SEQUENCE	START	END
RS C5 2300	SP1	MRVMAPRTLILLLSGALALTETWAG S	ATGAGAGTGATGGCCCCCAGAACCCTGATCCTGCTGCTGTC TGGCGCCCTGGCCCTGACAGAGACATGGGCCGGAAGC	1	78
RS C5 2300	start GSS	GGSGGGGSGG	GGAGGTTCCGGAGGAGGCGGCAGTGGCGGC	79	108
RS C5 2300	N without Orf9b	KDLSPRWYFYYLGTGPEAGLPYGA NKDGIIWVATEGALNTPKDHIGTRN PANNAAIVLQLPQGTTLPKGFYAEG SRGGSQASSRSSSRSRNSSRNSTPGSS RGTSPARMAGNGGDAALALLLLDR LNQLESKMSGKGQQQQGQTVTKKS AAEASKKPRQKRTATKAYNVTQAF GRRGPEQTQGNFGDQELIRQGTDYK HWPQIAQFAPSASAFFGMSRIGMEV TPSGTWLTYTGAIKLDDKDPNFKDQ VILLNKHIDAYKTFPPTEPKKDKKKK ADETQALPQRQKKQQTVTLLPAADL DDFSKQLQQSMSSADSTQA	AAAGATCTCAGTCCAAGATGGTATTTCTACTACCTAGGAAC TGGGCCAGAAGCTGGACTTCCCTATGGTGCTAACAAAGACG GCATCATATGGGTTGCAACTGAGGGAGCCTTGAATACACCA AAAGATCACATTGGCACCCGCAATCCTGCTAACAATGCTGC AATCGTGCTACAACTTCCTCAAGGAACAACATTGCCAAAAG GCTTCTACGCAGAAGGGAGCAGAGGCGGCAGTCAAGCCTCT TCTCGTTCCTCATCACGTAGTCGCAACAGTTCAAGAAATTCA ACTCCAGGCAGCAGTAGGGGAACTTCTCCTGCTAGAATGGC TGGCAATGGCGGTGATGCTGCTCTTGCTTTGCTGCTGCTTGA CAGATTGAACCAGCTTGAGAGCAAAATGTCTGGTAAAGGCC AACAACAACAAGGCCAAACTGTCACTAAGAAATCTGCTGCT GAGGCTTCTAAGAAGCCTCGGCAAAAACGTACTGCCACTAA AGCATACAATGTAACACAAGCTTTCGGCAGACGTGGTCCAG AACAAACCCAAGGAAATTTTGGGGACCAGGAACTAATCAG ACAAGGAACTGATTACAAACATTGGCCGCAAATTGCACAAT TTGCCCCCAGCGCTTCAGCGTTCTTCGGAATGTCGCGCATTG GCATGGAAGTCACACCTTCGGGAACGTGGTTGACCTACACA GGTGCCATCAAATTGGATGACAAAGATCCAAATTTCAAAGA	109	1062

			TCAAGTCATTTTGCTGAATAAGCATATTGACGCATACAAAA CATTCCCACCAACAGAGCCTAAAAAGGACAAAAAGAAGAA GGCTGATGAAACTCAAGCCTTACCGCAGAGACAGAAGAAA CAGCAAACTGTGACTCTTCTTCCTGCTGCAGATTTGGATGAT TTCTCCAAACAATTGCAACAATCCATGAGCAGTGCTGACTC AACTCAGGCC		
RS C5 2300	cleavage linker	FRAC	TTCCGCGCGTGC	1063	1074
RS C5 2300	ORF1ab NSP2 807-816	MVTNNTFTLK	ATGGTAACAAACAATACCTTCACACTCAAA	1075	1104
RS C5 2300	ORF1ab NSP1 108-123	VPHVGEIPVAYRKVLL	GTCCCTCATGTGGGCGAAATACCAGTGGCTTACCGCAAGGT TCTTCTT	1105	1152
RS C5 2300	ORF1ab NSP2 282-290	KTIQPRVEK	AAGACTATTCAACCAAGGGTTGAAAAG	1153	1179
RS C5 2300	ORF1ab NSP3 906-916	YLFDESGEFKL	TACTTATTTGATGAGTCTGGTGAGTTTAAATTG	1180	1212
RS C5 2300	ORF1ab NSP2 376-387	SEVGPEHSLAEY	TCAGAAGTAGGACCTGAGCATAGTCTTGCCGAATAC	1213	1248
RS C5 2300	ORF1ab NSP3 2384-2392	YIFFASFYY	TACATCTTCTTTGCATCATTTTATTAT	1249	1275
RS C5 2300	cleavage linker	KRCF	AAAAGATGTTTT	1276	1287
RS C5 2300	ORF1ab NSP3 1636-1650	HTTDPSFLGRYMSAL	CACACAACTGATCCTAGTTTTCTGGGTAGGTACATGTCAGC ATTA	1288	1332

RS C5 2300	ORF1ab NSP3 1937-1947	FADDLNQLTGY	TTTGCTGATGATTTAAACCAGTTAACTGGTTAT	1333	1365
RS C5 2300	ORF1ab NSP4 2799-2809	HTDFSSEIIGY	CATACTGACTTTTCAAGTGAAATCATAGGATAC	1366	1398
RS C5 2300	ORF1ab NSP3 2563-2571	QLMCQPILL	CAGCTTATGTGTCAACCTATACTGTTA	1399	1425
RS C5 2300	ORF1ab NSP3 2616-2626	AEAELAKNVSL	GCAGAAGCTGAACTTGCAAAGAATGTGTCCTTA	1426	1458
RS C5 2300	ORF1ab NSP3 1367-1375	ILGTVSWNL	ATTCTTGGAACTGTTTCTTGGAATTTG	1459	1485
RS C5 2300	cleavage linker	KKRY	AAAAAGCGTTAT	1486	1497
RS C5 2300	ORF1ab NSP3 1148-1156	LLSAGIFGA	TTATTATCAGCTGGTATTTTTGGTGCT	1498	1524
RS C5 2300	ORF1ab NSP3 1863-1873	ITDVFYKENSY	ATTACGGATGTTTTCTACAAAGAAAACAGTTAC	1525	1557
RS C5 2300	ORF1ab NSP3	KVPTDNYITTY	AAAGTGCCAACAGACAATTATATAACCACTTAC	1558	1590

	1319-1329				
RS C5 2300	cleavage linker	ARMA	GCCCGAATGGCT	1591	1602
RS C5 2300	ORF1ab NSP2 735-747	APKEIIFLEGETL	GCCCCAAAAGAAATTATCTTCTTAGAGGGAGAAACACTT	1603	1641
RS C5 2300	ORF1ab NSP3 825-833	FGDDTVIEV	TTTGGTGATGACACTGTGATAGAAGTG	1642	1668
RS C5 2300	ORF1ab NSP2 474-484	AIILASFSAST	GCCATTATTTTGGCATCTTTTTCTGCTTCCACA	1669	1701
RS C5 2300	cleavage linker	RRSG	AGGAGGTCTGGA	1702	1713
		ADSNGTITVEELKKLLEQWNLVIGFL	GCAGATTCCAACGGTACTATTACCGTTGAAGAGCTTAAAAA		
		FLTWICLLQFAYANRNRFLYIIKLIFL	GCTCCTTGAACAATGGAACCTAGTAATAGGTTTCCTATTCCT		
		WLLWPVTLACFVLAAVYRINWITG	TACATGGATTTGTCTTCTACAATTTGCCTATGCCAACAGGAA		
		GIAIAMACLVGLMWLSYFIASFRLFA	TAGGTTTTTGTATATAATTAAGTTAATTTTCCTCTGGCTGTT		
		RTRSMWSFNPETNILLNVPLHGTILT	ATGGCCAGTAACTTTAGCTTGTTTTGTGCTTGCTGCTGTTTA		
		RPLLESELVIGAVILRGHLRIAGHHL	CAGAATAAATTGGATCACCGGTGGAATTGCTATCGCAATGG		
	membrane glycoprotein	GRCDIKDLPKEITVATSRTLSYYKLG	CTTGTCTTGTAGGCTTGATGTGGCTCAGCTACTTCATTGCTT		
		ASQRVAGDSGFAAYSRYRIGNYKLN	CTTTCAGACTGTTTGCGCGTACGCGTTCCATGTGGTCATTCA		
RS C5 2300		TDHSSSSDNIALLVQ	ATCCAGAAACTAACATTCTTCTCAACGTGCCACTCCATGGC	1714	2376
RS C5 2300	end GSS	GGSLGGGGSG	ACTATTCTGACCAGACCGCTTCTAGAAAGTGAACTCGTAAT	2377	2406
			CGGAGCTGTGATCCTTCGTGGACATCTTCGTATTGCTGGACA		
			CCATCTAGGACGCTGTGACATCAAGGACCTGCCTAAAGAAA		
			TCACTGTTGCTACATCACGAACGCTTTCTTATTACAAATTGG		
			GAGCTTCGCAGCGTGTAGCAGGTGACTCAGGTTTTGCTGCA		
			TACAGTCGCTACAGGATTGGCAACTATAAATTAAACACAGA		
			CCATTCCAGTAGCAGTGACAATATTGCTTTGTCTTGTACAG		
			GGTGGTTCTCTTGGCGGAGGGGGTTCGGGA		

		IVGIVAGLAVLAVVVIGAVVATVMC RRKSSGGKGGSYSQAASSDSAQGSD	ATCGTGGGAATTGTGGCAGGACTGGCAGTGCTGGCCGTGGT GGTGATCGGAGCCGTGGTGGCTACCGTGATGTGCAGACGGA AGTCCAGCGGAGGCAAGGGCGGCAGCTACAGCCAGGCCGC CAGCTCTGATAGCGCCCAGGGCAGCGACGTGTCACTGACAG	2407	
RS C5 2300	MITD	VSLTA**	CCTAGTAA		2577
		MRVMAPRTLILLLSGALALTETWAG	ATGAGAGTGATGGCCCCCAGAACCCTGATCCTGCTGCTGTC		
RS C6 1200	SP1	S	TGGCGCCCTGGCCCTGACAGAGACATGGGCCGGAAGC	1	78
RS C6 1200	start GSS	GGSGGGGSGG	GGAGGTTCCGGAGGAGGCGGCAGTGGCGGC	79	108
		RMAGNGGDAALALLLLDRLNQLES	AGAATGGCTGGCAATGGCGGTGATGCTGCTCTTGCTTTGCT GCTGCTTGACAGATTGAACCAGCTTGAGAGCAAAATGTCTG		
RS C6 1200	N 99	KMSGKGQQQ	GTAAAGGCCAACAACAA	109	207
RS C6 1200	cleavage linker	MRAC	ATGAGAGCGTGC	208	219
RS C6 1200	ORF1ab NSP2 807-816	MVTNNTFTLK	ATGGTAACAAACAATACCTTCACACTCAAA	220	249
	ORF1ab NSP1		GTCCCTCATGTGGGCGAAATACCAGTGGCTTACCGCAAGGT		
RS C6 1200	108-123	VPHVGEIPVAYRKVLL	TCTTCTT	250	297
RS C6 1200	ORF1ab NSP2 282-290	KTIQPRVEK	AAGACTATTCAACCAAGGGTTGAAAAG	298	324
RS C6 1200	ORF1ab NSP3 906-916	YLFDESGEFKL	TACTTATTTGATGAGTCTGGTGAGTTTAAATTG	325	357
RS C6 1200	ORF1ab NSP2 376-387	SEVGPEHSLAEY	TCAGAAGTAGGACCTGAGCATAGTCTTGCCGAATAC	358	393
RS C6 1200	cleavage linker	KMCG	AAAATGTGCGGA	394	405
		YKHWPQIAQFAPSASAFFGMSRIGM	TACAAACATTGGCCGCAAATTGCACAATTTGCCCCCAGCGC		
RS C6 1200	N 201	EVTPSGTWLTYTGAIKLDDKDPNFK DQVILLNKHIDAYKTFP	TTCAGCGTTCTTCGGAATGTCGCGCATTGGCATGGAAGTCA CACCTTCGGGAACGTGGTTGACCTACACAGGTGCCATCAAA	406	606

			TTGGATGACAAAGATCCAAATTTCAAAGATCAAGTCATTTT GCTGAATAAGCATATTGACGCATACAAAACATTCCCA		
RS C6 1200	cleavage linker	ARCA	GCTCGGTGTGCA	607	618
RS C6 1200	ORF1ab NSP3 1635-1650	TTDPSFLGRYMSAL	ACAACTGATCCTAGTTTTCTGGGTAGGTACATGTCAGCATTA	619	660
RS C6 1200	ORF1ab NSP3 1937-1947	FADDLNQLTGY	TTTGCTGATGATTTAAACCAGTTAACTGGTTAT	661	693
RS C6 1200	ORF1ab NSP4 2799-2809	HTDFSSEIIGY	CATACTGACTTTTCAAGTGAAATCATAGGATAC	694	726
RS C6 1200	ORF1ab NSP3 2563-2571	QLMCQPILL	CAGCTTATGTGTCAACCTATACTGTTA	727	753
RS C6 1200	ORF1ab NSP3 2616-2626	AEAELAKNVSL	GCAGAAGCTGAACTTGCAAAGAATGTGTCCTTA	754	786
RS C6 1200	ORF1ab NSP3 1367-1375	ILGTVSWNL	ATTCTTGGAACTGTTTCTTGGAATTTG	787	813
RS C6 1200	cleavage linker	KKQG	AAAAAACAAGGT	814	825
RS C6 1200	M 201	FAYANRNRFLYIIKLIFLWLLWPVTL ACFVLAAVYRINWITGGIAIAMACL VGLMWLSYFIASFRLF	TTTGCCTATGCCAACAGGAATAGGTTTTTGTATATAATTAAG TTAATTTCCTCTGGCTGTTATGGCCAGTAACTTTAGCTTGT TTTGTGCTTGCTGCTGTTTACAGAATAAATTGGATCACCGGT	826	1026

			GGAATTGCTATCGCAATGGCTTGTCTTGTAGGCTTGATGTGG CTCAGCTACTTCATTGCTTCTTTCAGACTGTTT		
RS C6 1200	cleavage linker	YRSY	TACCGCTCCTCTAT	1027	1038
RS C6 1200	ORF1ab NSP3 1148-1156	LLSAGIFGA	TTATTATCAGCTGGTATTTTTGGTGCT	1039	1065
RS C6 1200	ORF1ab NSP3 1863-1873	ITDVFYKENSY	ATTACGGATGTTTTCTACAAAGAAAACAGTTAC	1066	1098
RS C6 1200	ORF1ab NSP3 1319-1329	KVPTDNYITTY	AAAGTGCCAACAGACAATTATATAACCACTTAC	1099	1131
RS C6 1200	cleavage linker	ARMA	GCTCGGATGGCT	1132	1143
RS C6 1200	ORF1ab NSP2 735-747	APKEIIFLEGETL	GCCCCAAAAGAAATTATCTCTTCTTAGAGGGAGAAAACACTT	1144	1182
RS C6 1200	ORF1ab NSP3 825-833	FGDDTVIEV	TTTGGTGATGACACTGTGATAGAAGTG	1183	1209
RS C6 1200	cleavage linker	SMFN	TCTATGTTTAAC	1210	1221
RS C6 1200	M 99	LGRCDIKDLPKEITVATSRTLSYYKL GASQRVA	CTAGGACGCTGTGACATCAAGGACCTGCCTAAAGAAATCAC TGTTGCTACATCACGAACGCTTTCTTATTACAAATTGGGAGC TTCGCAGCGTGTAGCA	1222	1320
RS C6 1200	end GSS	GGSLGGGGSG	GGTGGTTCTCTTGGCGGAGGGGGGTTCGGGA	1321	1350
RS C6 1200	MITD	IVGIVAGLAVLAVVVIGAVVATVMC RRKSSGGKGGSYSQAASSDSAQGSD VSLTA**	ATCGTGGGAATTGTGGCAGGACTGGCAGTGCTGGCCGTGGT GGTGATCGGAGCCGTGGTGGCTACCGTGATGTGCAGACGGA AGTCCAGCGGAGGCAAGGGCGGCAGCTACAGCCAGGCCGC	1351	1521

			CAGCTCTGATAGCGCCCAGGGCAGCGACGTGTCACTGACAG CCTAGTAA		
RS C7 1500 M chunks	SP1	MRVMAPRTLILLLSGALALTETWAG S	ATGAGAGTGATGGCCCCCAGAACCCTGATCCTGCTGCTGTC TGGCGCCCTGGCCCTGACAGAGACATGGGCCGGAAGC	1	78
RS C7 1500 M chunks	start GSS	GGSGGGGSGG	GGAGGTTCCGGAGGAGGCGGCAGTGGCGGC	79	108
RS C7 1500 M chunks	N 501	SPARMAGNGGDAALALLLLDRLNQ LESKMSGKGQQQQGQTVTKKSAAE ASKKPRQKRTATKAYNVTQAFGRR GPEQTQGNFGDQELIRQGTDYKHWP QIAQFAPSASAFFGMSRIGMEVTPSG TWLTYTGAIKLDDKDPNFKDQVILL NKHIDAYKTFPPTEPKKDK	TCTCCTGCTAGAATGGCTGGCAATGGCGGTGATGCTGCTCTT GCTTTGCTGCTGCTTGACAGATTGAACCAGCTTGAGAGCAA AATGTCTGGTAAAGGCCAACAACAACAAGGCCAAACTGTC ACTAAGAAATCTGCTGCTGAGGCTTCTAAGAAGCCTCGGCA AAAACGTACTGCCACTAAAGCATACAATGTAACACAAGCTT TCGGCAGACGTGGTCCAGAACAAACCCAAGGAAATTTTGGG GACCAGGAACTAATCAGACAAGGAACTGATTACAAACATT GGCCGCAAATTGCACAATTTGCCCCCAGCGCTTCAGCGTTC TTCGGAATGTCGCGCATTGGCATGGAAGTCACACCTTCGGG AACGTGGTTGACCTACACAGGTGCCATCAAATTGGATGACA AAGATCCAAATTTCAAAGATCAAGTCATTTTGCTGAATAAG CATATTGACGCATACAAAACATTCCCACCAACAGAGCCTAA AAAGGACAAA	109	609
RS C7 1500 M chunks	cleavage linker	FKAA	TTCAAAGCCGCA	610	621
RS C7 1500 M chunks	ORF1ab NSP2 807-816	MVTNNTFTLK	ATGGTAACAAACAATACCTTCACACTCAAA	622	651
RS C7 1500 M chunks	ORF1ab NSP1 108-123	VPHVGEIPVAYRKVLL	GTCCCTCATGTGGGCGAAATACCAGTGGCTTACCGCAAGGT TCTTCTT	652	699
RS C7 1500 M chunks	ORF1ab NSP2 282-290	KTIQPRVEK	AAGACTATTCAACCAAGGGTTGAAAAG	700	726
RS C7 1500 M chunks	ORF1ab NSP3 906-916	YLFDESGEFKL	TACTTATTTGATGAGTCTGGTGAGTTTAAATTG	727	759

RS C7 1500 M chunks	ORF1ab NSP2 376-387	SEVGPEHSLAEY	TCAGAAGTAGGACCTGAGCATAGTCTTGCCGAATAC	760	795
RS C7 1500 M chunks	ORF1ab NSP3 2384-2392	YIFFASFYY	TACATCTTCTTTGCATCATTTTATTAT	796	822
RS C7 1500 M chunks	cleavage linker	KRNG	AAGAGGAAATGGT	823	834
RS C7 1500 M chunks	M 201	FAYANRNRFLYIIKLIFLWLLLWPVTL ACFVLAAVYRINWITGGIAIAMACL VGLMWLSYFIASFRLF	TTTGCCTATGCCAACAGGAATAGGTTTTTGTATATAATTAAG TTAATTTTCCTCTGGCTGTTATGGCCAGTAACTTTAGCTTGT TTTGTGCTTGCTGCTGTTTACAGAATAAATTGGATCACCGGT GGAATTGCTATCGCAATGGCTTGTCTTGTAGGCTTGATGTGG CTCAGCTACTTCATTGCTTCTTTCAGACTGTTT	835	1035
RS C7 1500 M chunks	cleavage linker	YNSF	TACAATTCTTTC	1036	1047
RS C7 1500 M chunks	ORF1ab NSP3 1636-1650	HTTDPSFLGRYMSAL	CACACAACTGATCCTAGTTTTCTGGGTAGGTACATGTCAGC ATTA	1048	1092
RS C7 1500 M chunks	ORF1ab NSP3 1937-1947	FADDLNQLTGY	TTTGCTGATGATTTAAACCAGTTAACTGGTTAT	1093	1125
RS C7 1500 M chunks	ORF1ab NSP4 2799-2809	HTDFSSEIIGY	CATACTGACTTTTCAAGTGAAATCATAGGATAC	1126	1158
RS C7 1500 M chunks	ORF1ab NSP3 2563-2571	QLMCQPILL	CAGCTTATGTGTCAACCTATACTGTTA	1159	1185

RS C7 1500 M chunks	ORF1ab NSP3 2616-2626	AEAELAKNVSL	GCAGAAGCTGAACTTGCAAAGAATGTGTCCTTA	1186	1218
RS C7 1500 M chunks	ORF1ab NSP3 1367-1375	ILGTVSWNL	ATTCTTGGAACTGTTTCTTGGAATTTG	1219	1245
RS C7 1500 M chunks	cleavage linker	KKNG	AAGAAAAACGGA	1246	1257
RS C7 1500 M chunks	M 99	LGRCDIKDLPKEITVATSRTLSYYKL GASQRVA	CTAGGACGCTGTGACATCAAGGACCTGCCTAAAGAAATCAC TGTTGCTACATCACCGAACGCTTTCTTATTACAAATTGGGAGC TTCGCAGCGTGTAGCA	1258	1356
RS C7 1500 M chunks	cleavage linker	YRSY	TACCGATCCTAC	1357	1368
RS C7 1500 M chunks	ORF1ab NSP3 1148-1156	LLSAGIFGA	TTATTATCAGCTGGTATTTTTGGTGCT	1369	1395
RS C7 1500 M chunks	ORF1ab NSP3 1863-1873	ITDVFYKENSY	ATTACGGATGTTTTCTACAAAGAAAACAGTTAC	1396	1428
RS C7 1500 M chunks	ORF1ab NSP3 1319-1329	KVPTDNYITTY	AAAGTGCCAACAGACAATTATATAACCACTTAC	1429	1461
RS C7 1500 M chunks	cleavage linker	ARMA	GCTCGGATGGCG	1462	1473
RS C7 1500 M chunks	ORF1ab NSP2 735-747	APKEIIFLEGETL	GCCCCAAAAGAAATTATCTTCTTAGAGGGAGAAACACTT	1474	1512

RS C7 1500	ORF1ab NSP3				
M chunks	825-833	FGDDTVIEV	TTTGGTGATGACACTGTGATAGAAGTG	1513	1539
RS C7 1500	ORF1ab NSP2				
M chunks	474-484	AIILASFSAST	GCCATTATTTTGGCATCTTTTTCTGCTTCCACA	1540	1572
RS C7 1500	cleavage				
M chunks	linker	RRRG	AGGCGACGGGGT	1573	1584
RS C7 1500					
M chunks	end GSS	GGSLGGGGSG	GGTGGTTCTCTTGGCGGAGGGGGTTCGGGA	1585	1614
			ATCGTGGGAATTGTGGCAGGACTGGCAGTGCTGGCCGTGGT		
			GGTGATCGGAGCCGTGGTGGCTACCGTGATGTGCAGACGGA		
		IVGIVAGLAVLAVVVIGAVVATVMC	AGTCCAGCGGAGGCAAGGGCGGCAGCTACAGCCAGGCCGC		
RS C7 1500		RRKSSGGKGGSYSQAASSDSAQGSD	CAGCTCTGATAGCGCCCAGGGCAGCGACGTGTCACTGACAG		
M chunks	MITD	VSLTA**	CCTAGTAA	1615	1785
RS C8 1500		MRVMAPRTLILLLSGALALTETWAG	ATGAGAGTGATGGCCCCCAGAACCCTGATCCTGCTGCTGTC		
M epitopes	SP1	S	TGGCGCCCTGGCCCTGACAGAGACATGGGCCGGAAGC	1	78
RS C8 1500					
M epitopes	start GSS	GGSGGGGSGG	GGAGGTTCCGGAGGAGGCGGCAGTGGCGGC	79	108
			TCTCCTGCTAGAATGGCTGGCAATGGCGGTGATGCTGCTCTT		
			GCTTTGCTGCTGCTTGACAGATTGAACCAGCTTGAGAGCAA		
			AATGTCTGGTAAAGGCCAACAACAACAAGGCCAAACTGTC		
			ACTAAGAAATCTGCTGCTGAGGCTTCTAAGAAGCCTCGGCA		
			AAAACGTACTGCCACTAAAGCATACAATGTAACACAAGCTT		
		SPARMAGNGGDAALALLLLDRLNQ	TCGGCAGACGTGGTCCAGAACAAACCCAAGGAAATTTTGGG		
		LESKMSGKGQQQQGQTVTKKSAAE	GACCAGGAACTAATCAGACAAGGAACTGATTACAAACATT		
		ASKKPRQKRTATKAYNVTQAFGRR	GGCCGCAAATTGCACAATTTGCCCCCAGCGCTTCAGCGTTC		
		GPEQTQGNFGDQELIRQGTDYKHWP	TTCGGAATGTCGCGCATTGGCATGGAAGTCACACCTTCGGG		
		QIAQFAPSASAFFGMSRIGMEVTPSG	AACGTGGTTGACCTACACAGGTGCCATCAAATTGGATGACA		
		TWLTYTGAIKLDDKDPNFKDQVILL	AAGATCCAAATTTCAAAGATCAAGTCATTTTGCTGAATAAG		
RS C8 1500			CATATTGACGCATACAAAACATTCCCACCAACAGAGCCTAA		
M epitopes	N 501	NKHIDAYKTFPPTEPKKDK	AAAGGACAAA	109	609

RS C8 1500 M epitopes	cleavage linker	FRAC	TTTCGTGCGTGC	610	621
RS C8 1500 M epitopes	ORF1ab NSP2 807-816	MVTNNTFTLK	ATGGTAACAAACAATACCTTCACACTCAAA	622	651
RS C8 1500 M epitopes	ORF1ab NSP1 108-123	VPHVGEIPVAYRKVLL	GTCCCTCATGTGGGCGAAATACCAGTGGCTTACCGCAAGGT TCTTCTT	652	699
RS C8 1500 M epitopes	ORF1ab NSP2 282-290	KTIQPRVEK	AAGACTATTCAACCAAGGGTTGAAAAG	700	726
RS C8 1500 M epitopes	ORF1ab NSP3 906-916	YLFDESGEFKL	TACTTATTTGATGAGTCTGGTGAGTTTAAATTG	727	759
RS C8 1500 M epitopes	ORF1ab NSP2 376-387	SEVGPEHSLAEY	TCAGAAGTAGGACCTGAGCATAGTCTTGCCGAATAC	760	795
RS C8 1500 M epitopes	ORF1ab NSP3 2384-2392	YIFFASFYY	TACATCTTCTTTGCATCATTTTATTAT	796	822
RS C8 1500 M epitopes	cleavage linker	KRCF	AAGCGCTGTTTT	823	834
RS C8 1500 M epitopes	ORF1ab NSP3 1636-1650	HTTDPSFLGRYMSAL	CACACAACTGATCCTAGTTTTCTGGGTAGGTACATGTCAGC ATTA	835	879
RS C8 1500 M epitopes	ORF1ab NSP3 1937-1947	FADDLNQLTGY	TTTGCTGATGATTTAAACCAGTTAACTGGTTAT	880	912
RS C8 1500 M epitopes	ORF1ab NSP4	HTDFSSEIIGY	CATACTGACTTTTCAAGTGAAATCATAGGATAC	913	945

	2799-2809				
RS C8 1500 M epitopes	ORF1ab NSP3 2563-2571	QLMCQPILL	CAGCTTATGTGTCAACCTATACTGTTA	946	972
RS C8 1500 M epitopes	ORF1ab NSP3 2616-2626	AEAELAKNVSL	GCAGAAGCTGAACTTGCAAAGAATGTGTCCTTA	973	1005
RS C8 1500 M epitopes	ORF1ab NSP3 1367-1375	ILGTVSWNL	ATTCTTGGAACTGTTTCTTGGAATTTG	1006	1032
RS C8 1500 M epitopes	cleavage linker	KKRY	AAAAAACGTTAC	1033	1044
RS C8 1500 M epitopes	ORF1ab NSP3 1148-1156	LLSAGIFGA	TTATTATCAGCTGGTATTTTTGGTGCT	1045	1071
RS C8 1500 M epitopes	ORF1ab NSP3 1863-1873	ITDVFYKENSY	ATTACGGATGTTTTCTACAAAGAAAACAGTTAC	1072	1104
RS C8 1500 M epitopes	ORF1ab NSP3 1319-1329	KVPTDNYITTY	AAAGTGCCAACAGACAATTATATAACCACTTAC	1105	1137
RS C8 1500 M epitopes	cleavage linker	ARMA	GCGCGAATGGCA	1138	1149
RS C8 1500 M epitopes	ORF1ab NSP2 735-747	APKEIIFLEGETL	GCCCCAAAAGAAATTATCTTCTTAGAGGGAGAAACACTT	1150	1188

RS C8 1500 M epitopes	ORF1ab NSP3 825-833	FGDDTVIEV	TTTGGTGATGACACTGTGATAGAAGTG	1189	1215
RS C8 1500 M epitopes	ORF1ab NSP2 474-484	AIILASFSAST	GCCATTATTTTGGCATCTTTTTCTGCTTCCACA	1216	1248
RS C8 1500 M epitopes	cleavage linker	RRRG	CGCAGGCGCGGA	1249	1260
RS C8 1500 M epitopes	M 15-26	KLLEQWNLVIGF	AAGCTCCTTGAACAATGGAACCTAGTAATAGGTTTC	1261	1296
RS C8 1500 M epitopes	M 41-71	NRNRFLYIIKLIFLWLLWPVTLACFV LAAVY	AACAGGAATAGGTTTTTGTATATAATTAAGTTAATTTTCCTC TGGCTGTTATGGCCAGTAACTTTAGCTTGTTTTGTGCTTGCT GCTGTTTAC	1297	1389
RS C8 1500 M epitopes	M 136-158	SELVIGAVILRGHLRIAGHHLGR	AGTGAACTCGTAATCGGAGCTGTGATCCTTCGTGGACATCT TCGTATTGCTGGACACCATCTAGGACGC	1390	1458
RS C8 1500 M epitopes	M 169-187	TVATSRTLSYYKLGASQRV	ACTGTTGCTACATCACGAACGCTTTCTTATTACAAATTGGGA GCTTCGCAGCGTGTA	1459	1515
RS C8 1500 M epitopes	cleavage linker	KRYS	AAACGCTACAGT	1516	1527
RS C8 1500 M epitopes	M 89-96	GLMWLSYF	GGCTTGATGTGGCTCAGCTACTTC	1528	1551
RS C8 1500 M epitopes	cleavage linker	ARYA	GCGCGTTATGCC	1552	1563
RS C8 1500 M epitopes	end GSS	GGSLGGGGSG	GGTGGTTCTCTTGGCGGAGGGGGTTCGGGA	1564	1593
RS C8 1500 M epitopes	MITD	IVGIVAGLAVLAVVVIGAVVATVMC RRKSSGGKGGSYSQAASSDSAQGSD VSLTA**	ATCGTGGGAATTGTGGCAGGACTGGCAGTGCTGGCCGTGGT GGTGATCGGAGCCGTGGTGGCTACCGTGATGTGCAGACGGA AGTCCAGCGGAGGCAAGGGCGGCAGCTACAGCCAGGCCGC CAGCTCTGATAGCGCCCAGGGCAGCGACGTGTCACTGACAG CCTAGTAA	1594	1764

Table 11. String sequences Group 1

NAME	AA SEQUENCE	DNA SEQUENCE	AA LENGTH	DNA LENGTH
RS C1-GSS Linker	**NAMED SEGMENTS**			
	SP1-start GSS-nucleocapsid phosphoprotein-middle GSS-ORF9b protein-middle GSS-Orf1ab GSS-middle GSS-ORF3a protein-middle GSS-membrane glycoprotein-end GSS-MITD			
RS C1 GSS linkers	MRVMAPRTLILLLSGALALTETWAGSG	ATGAGAGTGATGGCCCCCAGAACCCTGATCCTGCTGCTG	1369	4107
	GSGGGGSGGSDNGPQNQRNAPRITFGG	TCTGGCGCCCTGGCCCTGACAGAGACATGGGCCGGAAGC		
	PSDSTGSNQNGERSGARSKQRRPQGLP	GGCGGATCGGGGGGGGGCGGCTCGGGAGGATCTGATAA		
	NNTASWFTALTQHGKEDLKFPRGQGVP	TGGACCCCAAAATCAGCGAAATGCACCCCGCATTACGTT		
	INTNSSPDDQIGYYRRATRRIRGGDGKM	TGGTGGACCCTCAGATTCAACTGGCAGTAACCAGAATGG		
	KDLSPRWYFYYLGTGPEAGLPYGANKD	AGAACGCAGTGGGGCGCGATCAAAACAACGTCGGCCCC		
	GIIWVATEGALNTPKDHIGTRNPANNAA	AAGGTTTACCCAATAATACTGCGTCTTGGTTCACCGCTCT		
	IVLQLPQGTTLPKGFYAEGSRGGSQASS	CACTCAACATGGCAAGGAAGACCTTAAATTCCCTCGAGG		
	RSSSRSRNSSRNSTPGSSRGTSPARMAG	ACAAGGCGTTCCAATTAACACCAATAGCAGTCCAGATGA		
	NGGDAALALLLLDRLNQLESKMSGKG	CCAAATTGGCTACTACCGAAGAGCTACCAGACGAATTCG		
	QQQGQTVTKKSAAEASKKPRQKRTAT	TGGTGGTGACGGTAAAATGAAAGATCTCAGTCCAAGATG		
	KAYNVTQAFGRRGPEQTQGNFGDQELI	GTATTTCTACTACCTAGGAACTGGGCCAGAAGCTGGACT		
	RQGTDYKHWPQIAQFAPSASAFFGMSRI	TCCCTATGGTGCTAACAAAGACGGCATCATATGGGTTGC		
	GMEVTPSGTWLTYTGAIKLDDKDPNFK	AACTGAGGGAGCCTTGAATACACCAAAAGATCACATTG		
	DQVILLNKHIDAYKTFPPTEPKKDKKKK	GCACCCGCAATCCTGCTAACAATGCTGCAATCGTGCTAC		
	ADETQALPQRQKKQQTVTLLPAADLDD	AACTTCCTCAAGGAACAACATTGCCAAAAGGCTTCTACG		
	FSKQLQQSMSSADSTQAGGSGGGGSGG	CAGAAGGGAGCAGAGGCGGCAGTCAAGCCTCTTCTCGTT		
	DPKISEMHPALRLVDPQIQLAVTRMENA	CCTCATCACGTAGTCGCAACAGTTCAAGAAATTCAACTC		
	VGRDQNNVGPKVYPIILRLGSPLSLNMA	CAGGCAGCAGTAGGGGAACTTCTCCTGCTAGAATGGCTG		
	RKTLNSLEDKAFQLTPIAVQMTKLATTE	GCAATGGCGGTGATGCTGCTCTTGCTTTGCTGCTGCTTGA		
	ELPDEFVVVTVKGGSGGGGSGGYHFFH	CAGATTGAACCAGCTTGAGAGCAAAATGTCTGGTAAAGG		
	TTDPSFLGRYMSALFADDLNQLTGYHT	CCAACAACAACAAGGCCAAACTGTCACTAAGAAATCTG		
	DFSSEIIGYQLMCQPILLAEAELAKNVSL	CTGCTGAGGCTTCTAAGAAGCCTCGGCAAAAACGTACTG		
	ILGTVSWNLKRRYLLSAGIFGAITDVFY	CCACTAAAGCATACAATGTAACACAAGCTTTCGGCAGAC		
	KENSYKVPTDNYITTYARMAAPKEIIFL	GTGGTCCAGAACAAACCCAAGGAAATTTTGGGGACCAG		
	EGETLFGDDTVIEVAIILASFSASTRRMA	GAACTAATCAGACAAGGAACTGATTACAAACATTGGCC		
	MVTNNTFTLKVPHVGEIPVAYRKVLLK	GCAAATTGCACAATTTGCCCCCAGCGCTTCAGCGTTCTTC		
	TIQPRVEKYLFDESGEFKLSEVGPEHSLA	GGAATGTCGCGCATTGGCATGGAAGTCACACCTTCGGGA		

	EYYIFFASFYYKRNGGGSGGGGSGGDL	ACGTGGTTGACCTACACAGGTGCCATCAAATTGGATGAC		
	FMRIFTIGTVTLKQGEIKDATPSDFVRAT	AAAGATCCAAATTTCAAAGATCAAGTCATTTTGCTGAAT		
	ATIPIQASLPFGWLIVGVALLAVFQSASK	AAGCATATTGACGCATACAAAACATTCCCACCAACAGAG		
	IITLKKRWQLALSKGVHFVCNLLLLFVT	CCTAAAAAGGACAAAAAGAAGAAGGCTGATGAAACTCA		
	VYSHLLLVAAGLEAPFLYLYALVYFLQ	AGCCTTACCGCAGAGACAGAAGAAACAGCAAACTGTGA		
	SINFVRIIMRLWLCWKCRSKNPLLYDAN	CTCTTCTTCCTGCTGCAGATTTGGATGATTTCTCCAAACA		
	YFLCWHTNCYDYCIPYNSVTSSIVITSG	ATTGCAACAATCCATGAGCAGTGCTGACTCAACTCAGGC		
	DGTTSPISEHDYQIGGYTEKWESGVKDC	CGGGGGAAGTGGAGGAGGGGGATCTGGAGGGGACCCCA		
	VVLHSYFTSDYYQLYSTQLSTDTGVEH	AAATCAGCGAAATGCACCCCGCATTACGTTTGGTGGACC		
	VTFFIYNKIVDEPEEHVQIHTIDGSSGVV	CTCAGATTCAACTGGCAGTAACCAGAATGGAGAACGCA		
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	GADSNGTITVEELKKLLEQWNLVIGFLF	CCAATAATACTGCGTCTTGGTTCACCGCTCTCACTCAACA		
	LTWICLLQFAYANRNRFLYIIKLIFLWLL	TGGCAAGGAAGACCTTAAATTCCCTCGAGGACAAGGCGT		
	WPVTLACFVLAAVYRINWITGGIAIAM	TCCAATTAACACCAATAGCAGTCCAGATGACCAAATTGG		
	ACLVGLMWLSYFIASFRLFARTRSMWS	CTACTACCGAAGAGCTACCAGACGAATTCGTGGTGGTGA		
	FNPETNILLNVPLHGTILTRPLLESELVIG	CGGTAAAAGGGGGAAGTGGAGGAGGGGATCTGGAGGG		
	AVILRGHLRIAGHHLGRCDIKDLPKEITV	TATCATTTCTTTCACACAACTGATCCTAGTTTTCTGGGTA		
	ATSRTLSYYKLGASQRVAGDSGFAAYS	GGTACATGTCAGCATTATTTGCTGATGATTTAAACCAGTT		
	RYRIGNYKLNTDHSSSSDNIALLVQGGS	AACTGGTTATCATACTGACTTTTCAAGTGAAATCATAGG		
	LGGGGSGIVGIVAGLAVLAVVVIGAVV	ATACCAGCTTATGTGTCAACCTATACTGTTAGCAGAAGC		
	ATVMCRRKSSGGKGGSYSQAASSDSAQ	TGAACTTGCAAAGAATGTGTCCTTAATTCTTGGAACTGTT		
	GSDVSLTA** **(SEQ ID NO: RS C1p1full)**	TCTTGGAATTTGAAGCGCCGTTATTTATTATCAGCTGGTA		
		TTTTTGGTGCTATTACGGATGTTTTCTACAAAGAAAACAG		
		TTACAAAGTGCCAACAGACAATTATATAACCACTTACGC		
		CCGAATGGCGGCCCCAAAAGAAATTATCTTCTTAGAGGG		
		AGAAACACTTTTTGGTGATGACACTGTGATAGAAGTGGC		
		CATTATTTTGGCATCTTTTTCTGCTTCCACACGAAGAATG		
		GCCATGGTAACAAACAATACCTTCACACTCAAGTCCCT		
		CATGTGGGCGAAATACCAGTGGCTTACCGCAAGGTTCTT		
		CTTAAGACTATTCAACCAAGGGTTGAAAAGTACTTATTT		
		GATGAGTCTGGTGAGTTTAAATTGTCAGAAGTAGGACCT		
		GAGCATAGTCTTGCCGAATACTACATCTTCTTTGCATCAT		
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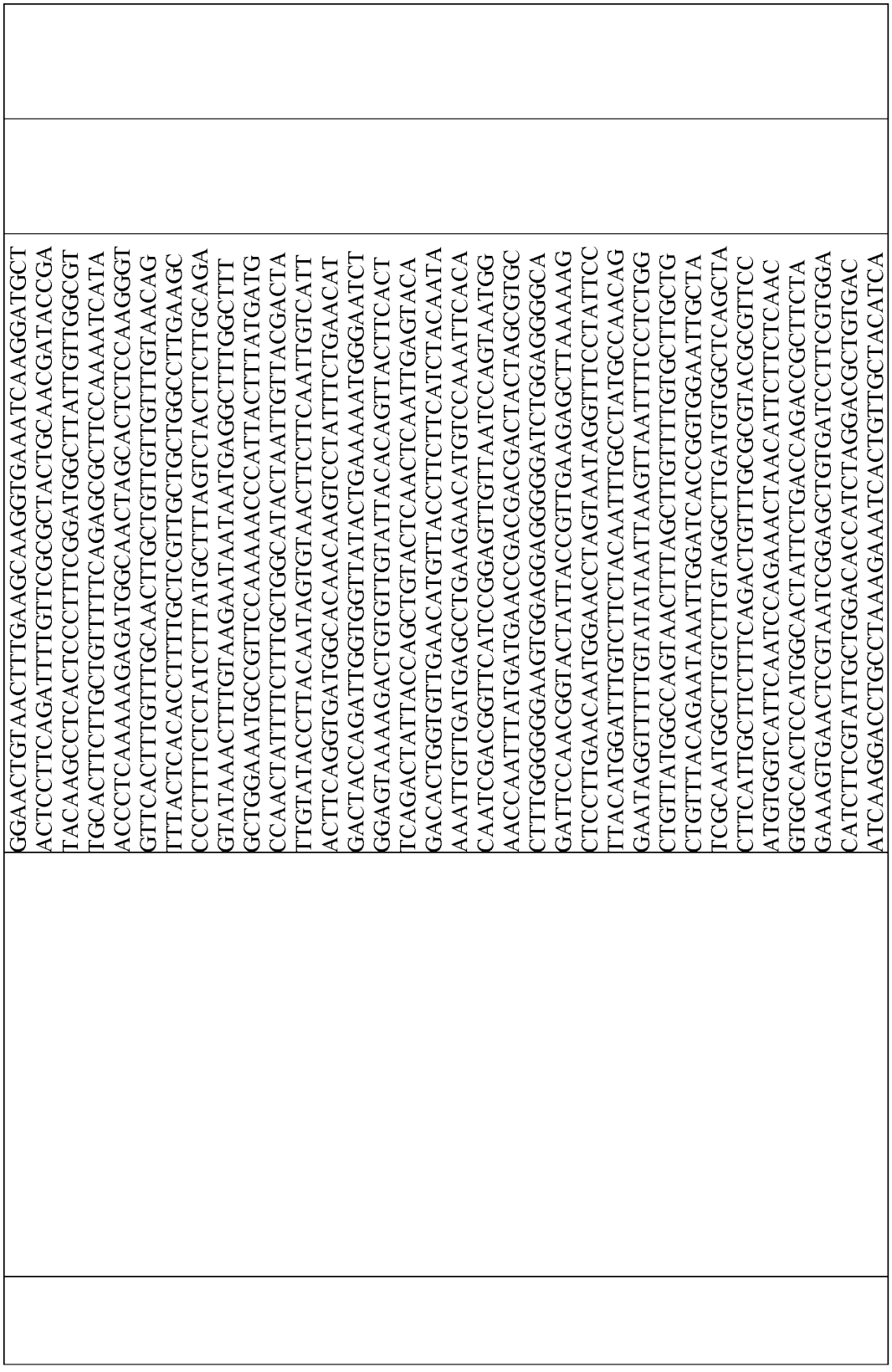
		GGATCTGGAGGGGATTTGTTTATGAGAATCTTCACAATT		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		CGAACGCTTTCTTATTACAAATTGGGAGCTTCGCAGCGT GTAGCAGGTGACTCAGGTTTTGCTGCATACAGTCGCTAC AGGATTGGCAACTATAAATTAAACACAGACCATTCCAGT AGCAGTGACAATATTGCTTTGCTTGTACAGGGAGGGAGC CTGGGTGGGGGCGCAGTGGGATCGTGGGAATTGTGGC AGGACTGGCAGTGCTGGCCGTGGTGGTGATCGGAGCCGT GGTGGCTACCGTGATGTGCAGACGGAAGTCCAGCGGAG GCAAGGGCGGCAGCTACAGCCAGGCCGCCAGCTCTGAT AGCGCCCAGGGCAGCGACGTGTCACTGACAGCCTAGTA A **(SEQ ID NO: RS C1n1)**		
RS C2 GSS linkers inverted	**NAMED SEGMENTS** SP1-start GSS-membrane glycoprotein-middle GSS-ORF3a protein-middle GSS-Orf1ab GSS-middle GSS-ORF9b protein-middle GSS-nucleocapsid phosphoprotein-end GSS-MITD			
	MRVMAPRTLILLLSGALALTETWAGSG GSGGGGSGGADSNGTITVEELKKLLEQ WNLVIGFLFLTWICLLQFAYANRNRFLY IIKLIFLWLLWPVTLACFVLAAVYRINWI TGGIAIAMACLVGLMWLSYFIASFRLFA RTRSMWSFNPETNILLNVPLHGTILTRPL LESELVIGAVILRGHLRIAGHHLGRCDIK DLPKEITVATSRTLSYYKLGASQRVAGD SGFAAYSRYRIGNYKLNTDHSSSSDNIA LLVQGGSGGGGSGGDLFMRIFTIGTVTL KQGEIKDATPSDFVRATATIPIQASLPFG WLIVGVALLAVFQSASKIITLKKRWQLA LSKGVHFVCNLLLLFVTVYSHLLLVAA GLEAPFLYLYALVYFLQSINFVRIIMRL WLCWKCRSKNPLLYDANYFLCWHTNC YDYCIPYNSVTSSIVITSGDGTTSPISEHD YQIGGYTEKWESGVKDCVVLHSYFTSD YYQLYSTQLSTDTGVEHVTFFIYNKIVD EPEEHVQIHTIDGSSGVVNPVMEPIYDEP	ATGAGAGTGATGGCCCCCAGAACCCTGATCCTGCTGCTG TCTGGCGCCCTGGCCCTGACACAGAGACATGGGCCCGGAAGC GGCGGATCGGGGGGGGGGCGGCTCGGGAGGAGCAGATTC CAACGGTACTATTACCGTTGAAGAGCTTAAAAAGCTCCT TGAACAATGGAACCTAGTAATAGGTTTCCTATTCCTTAC ATGGATTTGTCTTCTACAATTTGCCTATGCCAACAGGAAT AGGTTTTTGTATATAATTAAGTTAATTTTCCTCTGGCTGT TATGGCCAGTAACTTTAGCTTGTTTTGTGCTTGCTGCTGT TTACAGAATAAATTGGATCACCGGTGGAATTGCTATCGC AATGGCTTGTCTTGTAGGCTTGATGTGGCTCAGCTACTTC ATTGCTTCTTTCAGACTGTTTGCGCGTACGCGTTCCATGT GGTCATTCAATCCAGAAACTAACATTCTTCTCAACGTGC CACTCCATGGCACTATTCTGACCAGACCGCTTCTAGAAA GTGAACTCGTAATCGGAGCTGTGATCCTTCGTGGACATC TTCGTATTGCTGCTGGACACCATCTAGGACGCTGTGACATCA AGGACCTGCCTAAAGAAATCACTGTTGCTACATCACGAA CGCTTTCTTATTACAAATTGGGAGCTTCGCAGCGTGTAGC AGGTGACTCAGGTTTTGCTGCATACAGTCGCTACAGGAT TGGCAACTATAAATTAAACACAGACCATTCCAGTAGCAG	1369	4107

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FGMSRIGMEVTPSGTWLTYTGAIKLDD	GGTACATGTCAGCATTATTTGCTGATGATTTAAACCAGTT
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SDVSLTA** (SEQ ID NO: RS C2p1full)	TTACAAAGTGCCAACAGACAATTATATAACCACTTACGC
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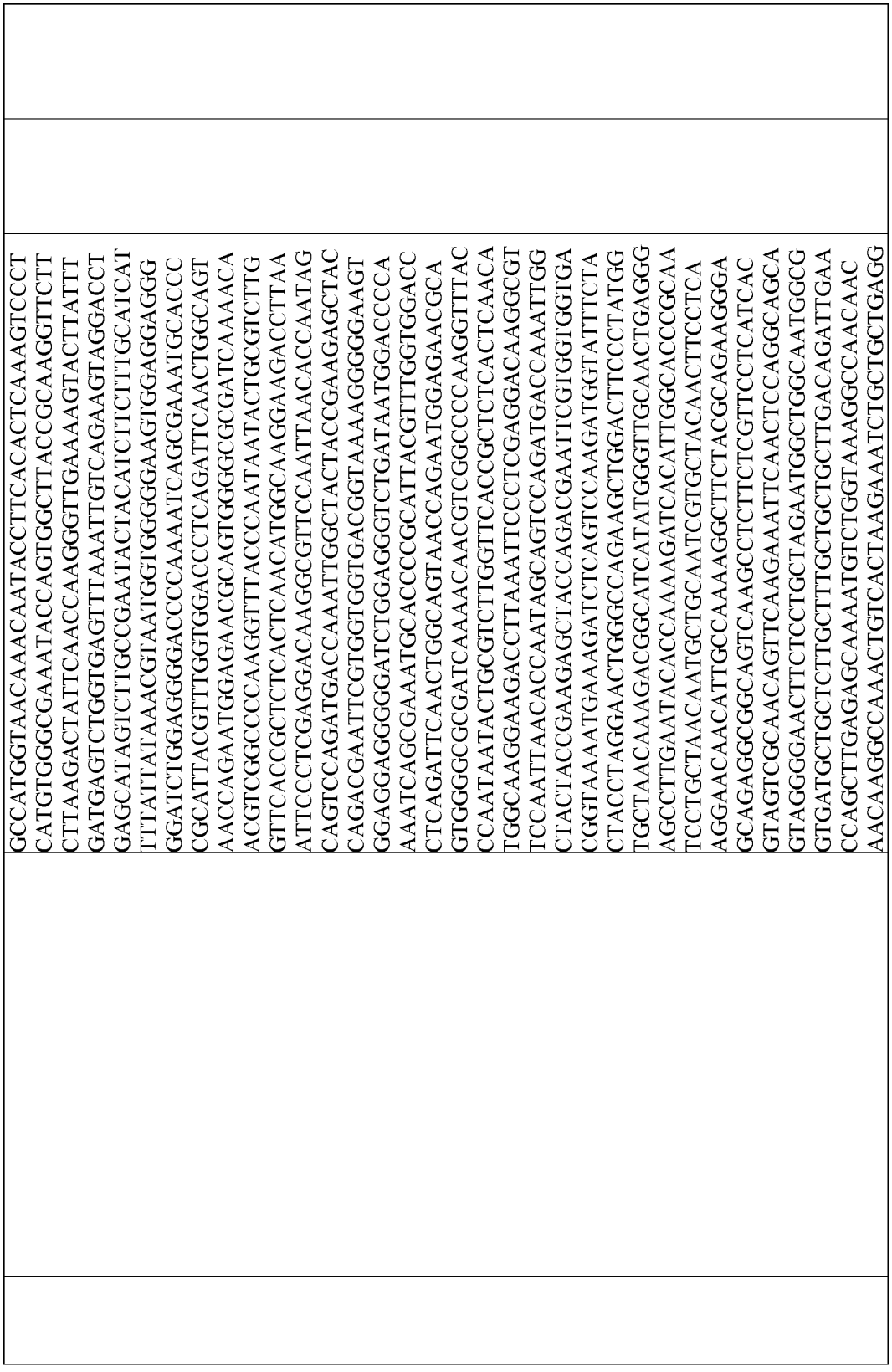
	AGAAACACTTTTTGGTGATGACACTGTGATAGAAGTGGC
	CATTATTTTGGCATCTTTTTCTGCTTCCACACGAAGAATG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RS C3 2A linkers	**NAMED SEGMENTS** SP1-start GSS-nucleocapsid phosphoprotein-1 GSG T2A-ORF9b protein-2 GSG P2A-Orf1ab GSS-3 GSG F2A-ORF3a protein-4 GSG E2A-membrane glycoprotein-end GSS-MITD			
	MRVMAPRTLILLLSGALALTETWAGSG	ATGAGAGTGATGGCCCCCAGAACCCTGATCCTGCTGCTG		
	GSGGGGSGGSDNGPQNQRNAPRITFGG	TCTGGCGCCCTGGCCCTGACAGAGACATGGGCCGGAAGC		
	PSDSTGSNQNGERSGARSKQRRPQGLP	GGCGGATCCGGGGGGGGCGGCTCGGGAGGATCTGATAA		
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	INTNSSPDDQIGYYRRATRRIRGGDGKM	TGGTGGACCCTCAGATTCAACTGGCAGTAACCAGAATGG		
	KDLSPRWYFYYLGTGPEAGLPYGANKD	AGAACGCAGTGGGGCGCGATCAAAACAACGTCGGCCCC		
	GIIWVATEGALNTPKDHIGTRNPANNAA	AAGGTTTACCCAATAATACTGCGTCTTGGTTCACCGCTCT		
RS C3 2A linkers	IVLQLPQGTTLPKGFYAEGSRGGSQASS	CACTCAACATGGCAAGGAAGACCTTAAATTCCCTCGAGG		
	RSSSRSRNSSRNSTPGSSRGTSPARMAG	ACAAGGCGTTCCAATTAACACCAATAGCAGTCCAGATGA		
	NGGDAALALLLLDRLNQLESKMSGKG	CCAAATTGGCTACTACCGAAGAGCTACCAGACGAATTCG		
	QQQGQTVTKKSAAEASKKPRQKRTAT	TGGTGGTGACGGTAAAATGAAAGATCTCAGTCCAAGATG	1429	4287

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	GMEVTPSGTWLTYTGAIKLDDKDPNFK	AACTGAGGGAGCCTTGAATACACCAAAAGATCACATTG		
	DQVILLNKHIDAYKTFPPTEPKKDKKKK	GCACCCGCAATCCTGCTAACAATGCTGCAATCGTGCTAC		
	ADETQALPQRQKQQTVTLLPAADLDD	AACTTCCTCAAGGAACAACATTGCCAAAAGGCTTCTACG		
	FSKQLQQSMSSADSTQAGSGGSGEGRG	CAGAAGGGAGCAGAGGCGGCAGTCAAGCCTCTTCTCGTT		
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	GLEAPFLYLYALVYFLQSINFVRIIMRL	ATTGCAACAATCCATGAGCAGTGCTGACTCAACTCAGGC		
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	FLWLLWPVTLACFVLAAVYRINWITGGI	AATTGGCTACTACCGAAGAGCTACCAGACGAATTCGTGG		
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	MWSFNPETNILLNVPLHGTILTRPLLESE LVIGAVILRGHLRIAGHHLGRCDIKDLP KEITVATSRTLSYYKLGASQRVAGDSGF AAYSRYRIGNYKLNTDHSSSSDNIALLV QGGSLGGGGSGIVGIVAGLAVLAVVVI GAVVATVMCRRKSSGGKGGSYSQAAS SDSAQGSDVSLTA** (**SEQ ID NO: RS C3p1full**)	AACTTCTCTCTGCTAAAGCAAGCAGGTGATGTTGAAGAA AACCCCGGGCCTTATCATTTCTTTCACACAACTGATCCTA GTTTTCTGGGTAGGTACATGTCAGCATTATTTGCTGATGA TTTAAACCAGTTAACTGGTTATCATACTGACTTTTCAAGT GAAATCATAGGATACCAGCTTATGTGTCAACCTATACTG TTAGCAGAAGCTGAACTTGCAAAGAATGTGTCCTTAATT CTTGGAACTGTTTCTTGGAATTTGAAGCGCCGTTATTTAT TATCAGCTGGTATTTTTGGTGCTATTACGGATGTTTTCTA CAAAGAAAACAGTTACAAAGTGCCAACAGACAATTATA TAACCACTTACGCCCGAATGGCGGCCCCAAAAGAAATTA TCTTCTTAGAGGGAGAAACACTTTTTGGTGATGACACTG TGATAGAAGTGGCCATTATTTTGGCATCTTTTTCTGCTTC CACACGAAGAATGGCCATGGTAACAAACAATACCTTCAC ACTCAAAGTCCCTCATGTGGGCGAAATACCAGTGGCTTA CCGCAAGGTTCTTCTTAAGACTATTCAACCAAGGGTTGA AAAGTACTTATTTGATGAGTCTGGTGAGTTTAAATTGTCA GAAGTAGGACCTGAGCATAGTCTTGCCGAATACTACATC TTCTTTGCATCATTTTATTATAAACGTAATGGTGGCAGCG GCGTGAAACAGACTTTGAATTTTGACCTTCTCAAGTTGG CGGGAGACGTGGAGTCCAACCCTGGACCTGATTTGTTTA TGAGAATCTTCACAATTGGAACTGTAACTTTGAAGCAAG GTGAAATCAAGGATGCTACTCCTTCAGATTTTGTTCGCGC TACTGCAACGATACCGATACAAGCCTCACTCCCTTTCGG ATGGCTTATTGTTGGCGTTGCACTTCTTGCTGTTTTTCAG AGCGCTTCCAAAATCATAACCCTCAAAAAGAGATGGCA ACTAGCACTCTCCAAGGGTGTTCACTTTGTTTGCAACTTG CTGTTGTTGTTTGTAACAGTTTACTCACACCTTTTGCTCG TTGCTGCTGGCCTTGAAGCCCCTTTTCTCTATCTTTATGCT TTAGTCTACTTCTTGCAGAGTATAAACTTTGTAAGAATAA TAATGAGGCTTTGGCTTTGCTGGAAATGCCGTTCCAAAA ACCCATTACTTTATGATGCCAACTATTTTCTTTGCTGGCA TACTAATTGTTACGACTATTGTATACCTTACAATAGTGTA ACTTCTTCAATTGTCATTACTTCAGGTGATGGCACAACAA GTCCTATTTCTGAACATGACTACCAGATTGGTGGTTATAC		

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		NAMED SEGMENTS RS C4 SP1-start GSS-nucleocapsid phosphoprotein-Orf1ab linker 1-ORF9b protein-Orf1ab linker 2-ORF3a protein-ORF1ab Orf1ab linker 3-membrane glycoprotein-end GSS-MITD		

as linkers				
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ORF1ab as linkers	SKGVHFVCNLLLLFVTVYSHLLLVAAG	ACGTGGTTGACCTACACAGGTGCCATCAAATTGGATGAC		
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	CWKCRSKNPLLYDANYFLCWHTNCYD	AAGCATATTGACGCATACAAAACATTCCCACCAACAGAG		
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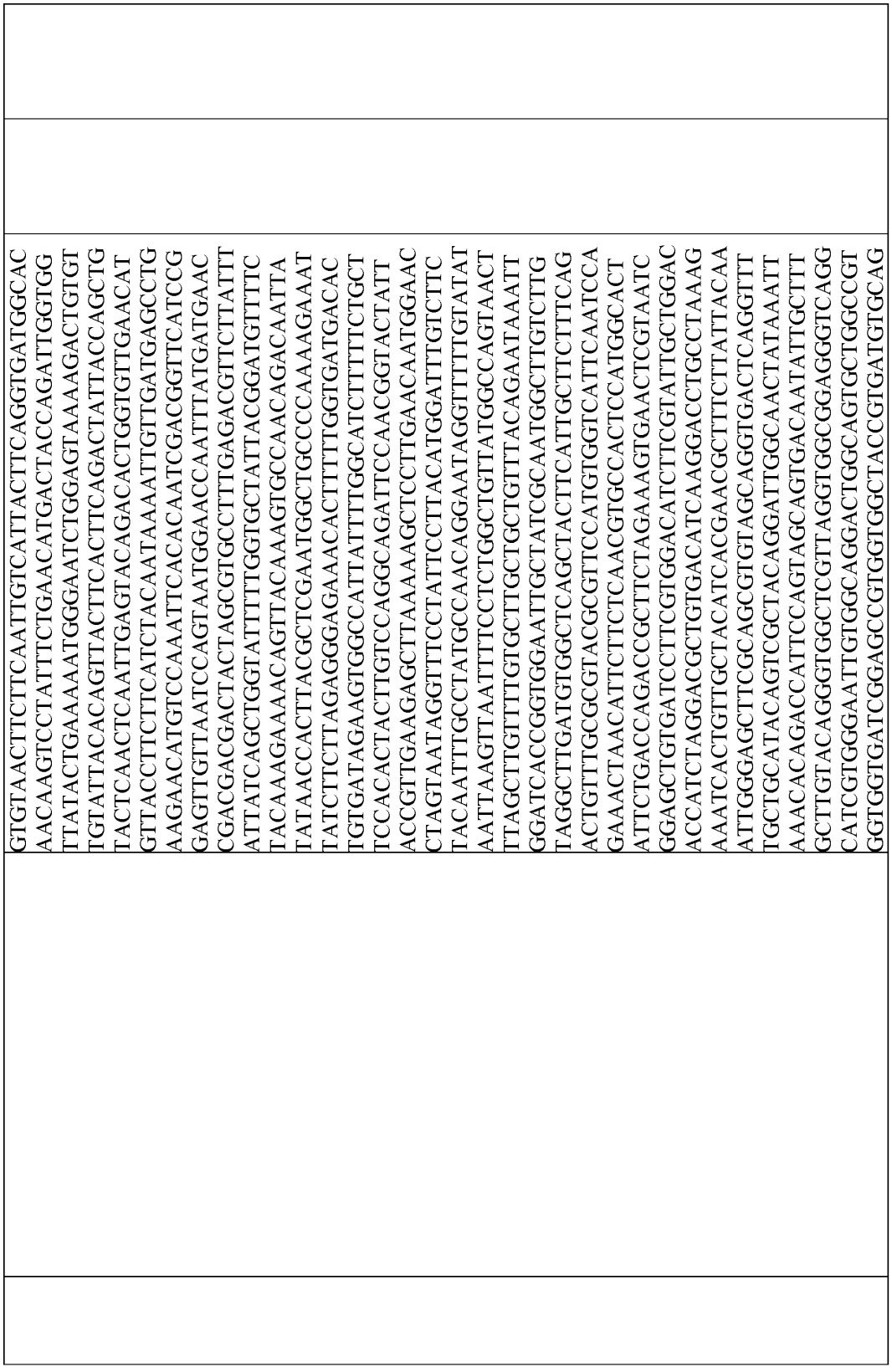
	QLYSTQLSTDTGVEHVTFFIYNKIVDEPE	CTCTTCTTCCTGCTGCAGATTTGGATGATTTCTCCAAACA	
	EHVQIHTIDGSSGVVNPVMEPIYDEPTTT	ATTGCAACAATCCATGAGCAGTGCTGACTCAACTCAGGC	
	TSVPLRRSYLLSAGIFGAITDVFYKENSY	CTTTCGGGCCTGCATGGTAACAAACAATACCTTCACACT	
	KVPTDNYITTYARMAAPKEIIFLEGETLF	CAAAGTCCCTCATGTGGGCGAAATACCAGTGGCTTACCG	
	GDDTVIEVAIILASFSASTLLVQADSNGT	CAAGGTTCTTCTTAAGACTATTCAACCAAGGGTTGAAAA	
	ITVEELKKLLEQWNLVIGFLFLTWICLL	GTACTTATTTGATGAGTCTGGTGAGTTTAAATTGTCAGAA	
	QFAYANRNRFLYIIKLIFLWLLWPVTLA	GTAGGACCTGAGCATAGTCTTGCCGAATACTACATCTTC	
	CFVLAAVYRINWITGGIAIAMACLVGL	TTTGCATCATTTTATTATAAGCGGCGAACGGCGACCCCAAA	
	MWLSYFIASFRLFARTRSMWSFNPETNI	ATCAGCGAAATGCACCCCGCATTACGTTTGGTGGACCCT	
	LLNVPLHGTILTRPLLESELVIGAVILRG	CAGATTCAACTGGCAGTAACCAGAATGGAGAACGCAGT	
	HLRIAGHHLGRCDIKDLPKEITVATSRTL	GGGGCGCGATCAAAACAACGTCGGCCCCAAGGTTTACCC	
	SYYKLGASQRVAGDSGFAAYSRYRIGN	AATAATACTGCGTCTTGGTTCACCGCTCTCACTCAACATG	
	YKLNTDHSSSSDNIALLVQGGSLGGGGS	GCAAGGAAGACCTTAAATTCCCTCGAGGACAAGGCGTTC	
	GIVGIVAGLAVLAVVVIGAVVATVMCR	CAATTAACACCAATAGCAGTCCAGATGACCAAATTGGCT	
	RKSSGGKGGSYSQAASSDSAQGSDVSL	ACTACCGAAGAGCTACCAGACGAATTCGTGGTGGTGACG	
	TA** **(SEQ ID NO: RS C4p1full)**	GTAAAATTTAACTCTTTTCACACAACTGATCCTAGTTTTC	
		TGGGTAGGTACATGTCAGCATTATTTGCTGATGATTTAA	
		ACCAGTTAACTGGTTATCATACTGACTTTTCAAGTGAAAT	
		CATAGGATACCAGCTTATGTGTCAACCTATACTGTTAGC	
		AGAAGCTGAACTTGCAAAGAATGTGTCCTTAATTCTTGG	
		AACTGTTTCTTGGAATTTGAAAAAGCAAGGAGATTTGTT	
		TATGAGAATCTTCACAATTGGAACTGTAACTTTGAAGCA	
		AGGTGAAATCAAGGATGCTACTCCTTCAGATTTTGTTCG	
		CGCTACTGCAACGATACCGATACAAGCCTCACTCCCTTT	
		CGGATGGCTTATTGTTGGCGTTGCACTTCTTGCTGTTTTT	
		CAGAGCGCTTCCAAAATCATAACCCTCAAAAAGAGATG	
		GCAACTAGCACTCTCCAAGGGTGTTCACTTTGTTTGCAA	
		CTTGCTGTTGTTGTTTGTAACAGTTTACTCACACCTTTTG	
		CTCGTTGCTGCTGGCCTTGAAGCCCCTTTTCTCTATCTTT	
		ATGCTTTAGTCTACTTCTTGCAGAGTATAAACTTTGTAAG	
		AATAATAATGAGGCTTTGGCTTTGCTGGAAATGCCGTTC	
		CAAAAACCCATTACTTTATGATGCCAACTATTTTCTTTGC	
		TGGCATACTAATTGTTACGACTATTGTATACCTTACAATA	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TTATACTGAAAAATGGGAATCTGGAGTAAAAGACTGTGT
TGTATTACACAGTTACTTCACTTCAGACTATTACCAGCTG
TACTCAACTCAATTGAGTACAGACACTGGTGTTGAACAT
GTTACCTTCTTCATCTACAATAAAATTGTTGATGAGCCTG
AAGAACATGTCCAAATTCACACAATCGACGGTTCATCCG
GAGTTGTTAATCCAGTAATGGAACCAATTTATGATGAAC
CGACGACGACTACTAGCGTGCCTTTGAGACGTTCTTATTT
ATTATCAGCTGGTATTTTTGGTGCTATTACGGATGTTTTC
TACAAAGAAAACAGTTACAAAGTGCCAACAGACAATTA
TATAACCACTTACGCTCGAATGGCTGCCCCAAAAGAAAT
TATCTTCTTAGAGGGAGAAACACTTTTTGGTGATGACAC
TGTGATAGAAGTGGCCATTATTTTGGCATCTTTTTCTGCT
TCCACACTACTTGTCCAGGCAGATTCCAACGGTACTATT
ACCGTTGAAGAGCTTAAAAAGCTCCTTGAACAATGGAAC
CTAGTAATAGGTTTCCTATTCCTTACATGGATTTGTCTTC
TACAATTTGCCTATGCCAACAGGAATAGGTTTTTGTATAT
AATTAAGTTAATTTTCCTCTGGCTGTTATGGCCAGTAACT
TTAGCTTGTTTTGTGCTTGCTGCTGTTTACAGAATAAATT
GGATCACCGGTGGAATTGCTATCGCAATGGCTTGTCTTG
TAGGCTTGATGTGGCTCAGCTACTTCATTGCTTCTTTCAG
ACTGTTTGCGCGTACGCGTTCCATGTGGTCATTCAATCCA
GAAACTAACATTCTTCTCAACCGTGCCACTCCATGGCACT
ATTCTGACCAGACCGCTTCTAGAAAGTGAACTCGTAATC
GGAGCTGTGATCCTTCGTGGACATCTTCGTATTGCTGGAC
ACCATCTAGGACGCTGTGACATCAAGGACCTGCCTAAAG
AAATCACTGTTGCTACATCACGAACGCTTTCTTATTACAA
ATTGGGAGCTTCGCAGCGTGTAGCAGGTGACTCAGGTTT
TGCTGCATACAGTCGCTACAGGATTGGCAACTATAAATT
AAACACAGACCATTCCAGTAGCAGTGACAATATTGCTTT
GCTTGTACAGGGTGGCTCGTTAGGTGGCGGAGGGTCAGG
CATCGTGGGAAATTGTGGCAGGACTGGCAGTGCTGGCCGT
GGTGGTGATCGGAGCCGTGGTGGCTACCGTGATGTGCAG

	ACGGAAGTCCAGCGGAGGCAAGGGCGGCAGCTACAGCC AGGCCGCCAGCTCTGATAGCGCCCAGGGCAGCGACGTGT CACTGACAGCCTAGTAA **(SEQ ID NO: RS C4n1)**		

Table 12. String Sequences Group 2

NAME	AA SEQUENCE	DNA SEQUENCE	AA LENGTH	DNA LENGTH
RS C5	Named Segments: SP1-start GSS-N without Orf9b-Orf1ab 2300-membrane glycoprotein-end GSS-MITD			
RS C5 2300	MRVMAPRTLILLLLSGALALTETWAGSG	ATGAGAGTGATGGCCCCCAGAACCCTGATCCTGCTGCT		
	GSGGGGSGGKDLSPRWYFYYLGTGPEA	GTCTGGCGCCCTGGCCCTGACAGAGACATGGGCCGGAA		
	GLPYGANKDGIIWVATEGALNTPKDHI	GCGGAGGTTCCGGAGGAGGCGGCAGTGGCGGCAAAGA		
	GTRNPANNAAIVLQLPQGTTLPKGFYA	TCTCAGTCCAAGATGGTATTTCTACTACCTAGGAACTGG		
	EGSRGGSQASSRSSSRSRNSSRNSTPGSS	GCCAGAAGCTGGACTTCCCTATGGTGCTAACAAAGACG		
	RGTSPARMAGNGGDAALALLLLDRLN	GCATCATATGGGTTGCAACTGAGGGAGCCTTGAATACA		
	QLESKMSGKGQQQQGQTVTKKSAAEA	CCAAAAGATCACATTGGCACCCGCAATCCTGCTAACAA		
	SKKPRQKRTATKAYNVTQAFGRRGPEQ	TGCTGCAATCGTGCTACAACTTCCTCAAGGAACAACATT		
	TQGNFGDQELIRQGTDYKHWPQIAQFA	GCCAAAAGGCTTCTACGCAGAAGGGAGCAGAGGCGGC		
	PSASAFFGMSRIGMEVTPSGTWLTYTG	AGTCAAGCCTCTCTTCTCGTTCCTCATCACGTAGTCGCAAC		
	AIKLDDKDPNFKDQVILLNKHIDAYKTF	AGTTCAAGAAATTCAACTCCAGGCAGCAGTAGGGGAAC		
	PPTEPKKDKKKKADETQALPQRQKKQQ	TTCTCCTGCTAGAATGGCTGGCAATGGCGGTGATGCTGC		
	TVTLLPAADLDDFSKQLQQSMSSADST	TCTTGCTTTGCTGCTTGACAGATTGAACCAGCTTGA		
	QAFRACMVTNNTFTLKVPHVGEIPVAY	GAGCAAAATGTCTGGTAAAGGCCAACAACAACAAGGCC		
	RKVLLKTIQPRVEKYLFDESGEFKLSEV	AAACTGTCACTAAGAAATCTGCTGCTGAGGCTTCTAAG		
	GPEHSLAEYYIFFASFYYKRCFHTTDPSF	AAGCCTCGGCAAAAACGTACTGCCACTAAAGCATACAA		
	LGRYMSALFADDLNQLTGYHTDFSSEII	TGTAACACAAGCTTTCGGCAGACGTGGTCCAGAACAAA		
	GYQLMCQPILLAEAELAKNVSLILGTVS	CCCAAGGAAATTTTGGGGACCAGGAACTAATCAGACAA		
	WNLKKRYLLSAGIFGAITDVFYKENSY	GGAACTGATTACAAACATTGGCCGCAAATTGCACAATT		
	KVPTDNYITTYARMAAPKEIIFLEGETLF	TGCCCCCAGCGCTTCAGCGTTCTTCGGAATGTCGCGCAT		
	GDDTVIEVAIILASFSASTRRSGADSNGT	TGGCATGGAAGTCACACCTTCGGGAACGTGGTTGACCT		
	ITVEELKKLLEQWNLVIGFLFLTWICLL	ACACAGGTGCCATCAAATTGGATGACAAAGATCCAAAT		
	QFAYANRNRFLYIIKLIFLWLLWPVTLA	TTCAAAGATCAAGTCATTTTGCTGAATAAGCATATTGAC	859	2577

	CFVLAAVYRINWITGGIAIAMACLVGL	GCATACAAAACATTCCCACCAACAGAGCCTAAAAAGGA	
	MWLSYFIASFRLFARTRSMWSFNPETNI	CAAAAAGAAGAAGGCTGATGAAACTCAAGCCTTACCGC	
	LLNVPLHGTILTRPLLESELVIGAVILRG	AGAGACAGAAGAAACAGCAAACTGTGACTCTTCTTCCT	
	HLRIAGHHLGRCDIKDLPKEITVATSRT	GCTGCAGATTTGGATGATTTCTCCAAACAATTGCAACAA	
	LSYYKLGASQRVAGDSGFAAYSRYRIG	TCCATGAGCAGTGCTGACTCAACTCAGGCCTTCCGCGCG	
	NYKLNTDHSSSSDNIALLVQGGSLGGG	TGCATGGTAACAAACAATACCTTCACACTCAAAGTCCCT	
	GSGIVGIVAGLAVLAVVVIGAVVATVM	CATGTGGGCGAAATACCAGTGGCTTACCGCAAGGTTCT	
	CRRKSSGGKGGSYSQAASSDSAQGSDV	TCTTAAGACTATTCAACCAAGGGTTGAAAGTACTTATT	
	SLTA **(SEQ ID NO: RS C5p1full)**	TGATGAGTCTGGTGAGTTTAAATTGTCAGAAGTAGGAC	
		CTGAGCATAGTCTTGCCGAATACTACATCTTCTTTGCAT	
		CATTTTATTATAAAAGATGTTTTCACACAACTGATCCTA	
		GTTTTCTGGGTAGGTACATGTCAGCATTATTTGCTGATG	
		ATTTAAACCAGTTAACTGGTTATCATACTGACTTTTCAA	
		GTGAAATCATAGGATACCAGCTTATGTGTCAACCTATAC	
		TGTTAGCAGAAGCTGAACTTGCAAAGAATGTGTCCTTA	
		ATTCTTGGAACTGTTTCTTGGAATTTGAAAAAGCGTTAT	
		TTATTATCAGCTGGTATTTTTGGTGCTATTACGGATGTTT	
		TCTACAAAGAAAACAGTTACAAAGTGCCAACAGACAAT	
		TATATAACCACTTACGCCCGAATGGCTGCCCCAAAAGA	
		AATTATCTTCTTAGAGGGAGAAACACTTTTTGGTGATGA	
		CACTGTGATAGAAGTGGCCATTATTTTGGCATCTTTTTC	
		TGCTTCCACAAGGAGGTCTGGAGCAGATTCCAACGGTA	
		CTATTACCGTTGAAGAGCTTAAAAAGCTCCTTGAACAAT	
		GGAACCTAGTAATAGGTTTCCTATTCCTTACATGGATTT	
		GTCTTCTACAATTTGCCTATGCCAACAGGAATAGGTTTT	
		TGTATATAATTAAGTTAATTTTCCTCTGGCTGTTATGGC	
		CAGTAACTTTAGCTTGTTTTGTGCTTGCTGCTGTTTACAG	
		AATAAATTGGATCACCGGTGGAATTGCTATCGCAAT	
		GGCTTGTCTTGTAGGCTTGATGTGGCTCAGCTACTTCAT	
		TGCTTCTTTCAGACTGTTTGCGCGTACGCGTTCCATGTG	
		GTCATTCAATCCAGAAACTAACATTCTTCTCAACGTGCC	
		ACTCCATGGCACTATTCTGACCAGACCGCTTCTAGAAAG	
		TGAACTCGTAATCGGAGCTGTGATCCTTCGTGGACATCT	
		TCGTATTGCTGGACACCATCTAGGACGCTGTGACATCAA	

		GGACCTGCCTAAAGAAATCACTGTTGCTACATCACGAA CGCTTTCTTATTACAAATTGGGAGCTTCGCAGCGTGTAG CAGGTGACTCAGGTTTTGCTGCATACAGTCGCTACAGG ATTGGCAACTATAAATTAAACACAGACCATTCCAGTAG CAGTGACAATATTGCTTTGCTTGTACAGGGTGGTTCTCT TGGCGGAGGGGGTTCGGGAATCGTGGGAATTGTGGCAG GACTGGCAGTGCTGGCCGTGGTGGTGATCGGAGCCGTG GTGGCTACCGTGATGTGCAGACGGAAGTCCAGCGGAGG CAAGGGCGGCAGCTACAGCCAGGCCGCCAGCTCTGATA GCGCCCAGGGCAGCGACGTGTCACTGACAGCCTAGTAA **(SEQ ID NO: RS C5n1)**		
RS C6 1200	Named Segments: SP1-start GSS-N 99-Orf1ab linker1 1200-N 201-Orf1ab linker2 1200-M 201-Orf1ab linker3 1200-M 99-end GSS-MITD			
RS C6 1200	MRVMAPRTLILLLSGALALTETWAGSG GSGGGGSGGRMAGNGGDAALALLLLD RLNQLESKMSGKGQQQMRACMVTNNT FTLKVPHVGEIPVAYRKVLLKTIQPRVE KYLFDESGEFKLSEVGPEHSLAEYKMC GYKHWPQIAQFAPSASAFFGMSRIGME VTPSGTWLTYTGAIKLDDKDPNFKDQV ILLNKHIDAYKTFPARCATTDPSFLGRY MSALFADDLNQLTGYHTDFSSEIIGYQL MCQPILLAEAELAKNVSLILGTVSWNLK KQGFAYANRNRFLYIIKLIFLWLLWPVT LACFVLAAVYRINWITGGIAIAMACLVG LMWLSYFIASFRLFYRSYLLSAGIFGAIT DVFYKENSYKVPTDNYITTYARMAAPK EIIFLEGETLFGDDTVIEVSMFNLGRCDI KDLPKEITVATSRTLSYYKLGASQRVAG GSLGGGGSGIVGIVAGLAVLAVVVIGA VVATVMCRRKSSGGKGGSYSQAASSDS AQGSDVSLTA **(SEQ ID NO: RS C6p1full)**	ATGAGAGTGATGGCCCCCAGAACCCTGATCCTGCTGCT GTCTGGCGCCCTGGCCCTGACAGAGACATGGGCCGGAA GCGGAGGTTCCGGAGGAGGCGGCAGTGGCGGCAGAAT GGCTGGCAATGGCGGTGATGCTGCTCTTGCTTTGCTGCT GCTTGACAGATTGAACCAGCTTGAGAGCAAAATGTCTG GTAAAGGCCAACAACAAATGAGAGCGTGCATGGTAACA AACAATACCTTCACACTCAAAGTCCCTCATGTGGGCGA AATACCAGTGGCTTACCGCAAGGTTCTTCTTAAGACTAT TCAACCAAGGGTTGAAAAGTACTTATTTGATGAGTCTG GTGAGTTTAAATTGTCAGAAGTAGGACCTGAGCATAGT CTTGCCGAATACAAAATGTGCGGATACAAACATTGGCC GCAAATTGCACAATTTGCCCCCAGCGCTTCAGCGTTCTT CGGAATGTCGCGCATTGGCATGGAAGTCACACCTTCGG GAACGTGGTTGACCTACACAGGTGCCATCAAATTGGAT GACAAAGATCCAAATTTCAAAGATCAAGTCATTTTGCT GAATAAGCATATTGACGCATACAAAACATTCCCAGCTC GGTGTGCAACAACTGATCCTAGTTTTCTGGGTAGGTACA TGTCAGCATTATTTGCTGATGATTTAAACCAGTTAACTG GTTATCATACTGACTTTTCAAGTGAAATCATAGGATACC AGCTTATGTGTCAACCTATACTGTTAGCAGAAGCTGAAC	507	1521

		TTGCAAAGAATGTGTCCTTAATTCTTGGAACTGTTTCTT GGAATTTGAAAAAACAAGGTTTTGCCTATGCCAACAGG AATAGGTTTTTGTATATAATTAAGTTAATTTCCTCTGG CTGTTATGGCCAGTAACTTTAGCTTGTTTTGTGCTTGCTG CTGTTTACAGAATAAATTGGATCACCGGTGGAATTGCTA TCGCAATGGCTTGTCTTGTAGGCTTGATGTGGCTCAGCT ACTTCATTGCTTCTTTCAGACTGTTTTACCGCTCCTATTT ATTATCAGCTGGTATTTTTGGTGCTATTACGGATGTTTTC TACAAAGAAAACAGTTACAAAGTGCCAACAGACAATTA TATAACCACTTACGCTCGGATGGCTGCCCCAAAGAAA TTATCTTCTTAGAGGGAGAAACACTTTTTGGTGATGACA CTGTGATAGAAGTGTCTATGTTTAACCTAGGACGCTGTG ACATCAAGGACCTGCCTAAAGAAATCACTGTTGCTACA TCACGAACGCTTTCTTATTACAAATTGGGAGCTTCGCAG CGTGTAGCAGGTGGTTCTCTTGGCGGAGGGGGTTCGGG AATCGTGGGAATTGTGGCAGGACTGGCAGTGCTGGCCG TGGTGGTGATCGGAGCCGTGGTGGCTACCGTGATGTGC AGACGGAAGTCCAGCGGAGGCAAGGGCGGCAGCTACA GCCAGGCCGCCAGCTCTGATAGCGCCCAGGGCAGCGAC GTGTCACTGACAGCCTAGTAA **(SEQ ID NO: RS C6n1)**		
RS C7 1500 M chunks	Named Segments: SP1-start GSS-N 501-Orf1ab linker1 1500-M 201-Orf1ab linker2 1500-M 99-Orf1ab linker3 1500-end GSS-MITD			
RS C7 1500 M chunks	MRVMAPRTLILLLSGALALTETWAGSG GSGGGGSGGSPARMAGNGGDAALALL LLDRLNQLESKMSGKGQQQQGQTVTK KSAAEASKKPRQKRTATKAYNVTQAFG RRGPEQTQGNFGDQELIRQGTDYKHWP QIAQFAPSASAFFGMSRIGMEVTPSGTW LTYTGAIKLDDKDPNFKDQVILLNKHID AYKTFPPTEPKKDKFKAAMVTNNTFTL KVPHVGEIPVAYRKVLLKTIQPRVEKYL FDESGEFKLSEVGPEHSLAEYYIFFASFY	ATGAGAGTGATGGCCCCCAGAACCCTGATCCTGCTGCT GTCTGGCGCCCTGGCCCTGACAGAGACATGGGCCGGAA GCGGAGGGTTCCGGAGGAGGCGGCAGTGGCGGCTCTCCT GCTAGAATGGCTGGCAATGGCGGTGATGCTGCTCTTGCT TTGCTGCTGCTTGACAGATTGAACCAGCTTGAGAGCAA AATGTCTGGTAAAGGCCAACAACAACAAGGCCAAACTG TCACTAAGAAATCTGCTGCTGAGGCTTCTAAGAAGCCTC GGCAAAAAACGTACTGCCACTAAAGCATACAATGTAACA CAAGCTTTCGGCAGACGTGGTCCAGAACAAACCCAAGG AAATTTTGGGGACCAGGAACTAATCAGACAAGGAACTG	595	1785

	YKRNGFAYANRNRFLYIIKLIFLWLLWP VTLACFVLAAVYRINWITGGIAIAMACL VGLMWLSYFIASFRLFYNSFHTTDPSFL GRYMSALFADDLNQLTGYHTDFSSEIIG YQLMCQPILLAEAELAKNVSLILGTVSW NLKKNGLGRCDIKDLPKEITVATSRTLS YYKLGASQRVAYRSYLLSAGIFGAITDV FYKENSYKVPTDNYITTYARMAAPKEII FLEGETLFGDDTVIEVAIILASFSASTRR RGGGSLGGGGSGIVGIVAGLAVLAVVV IGAVVATVMCRRKSSGGKGGSYSQAAS SDSAQGSDVSLTA **(SEQ ID NO: RS C7p1full)**	ATTACAAACATTGGCCGCAAATTGCACAATTTGCCCCCA GCGCTTCAGCGTTCTTCGGAATGTCGCGCATTGGCATGG AAGTCACACCTTCGGGAACGTGGTTGACCTACACAGGT GCCATCAAATTGGATGACAAAGATCCAAATTTCAAAGA TCAAGTCATTTTGCTGAATAAGCATATTGACGCATACAA AACATTCCCACCAACAGAGCCTAAAAAGGACAAATTCA AAGCCGCAATGGTAACAAACAATACCTTCACACTCAAA GTCCCTCATGTGGGCGAAATACCAGTGGCTTACCGCAA GGTTCTTCTTAAGACTATTCAACCAAGGGTTGAAAAGTA CTTATTTGATGAGTCTGGTGAGTTTAAATTGTCAGAAGT AGGACCTGAGCATAGTCTTGCCGAATACTACATCTTCTT TGCATCATTTTATTATAAGAGGAATGGTTTTGCCTATGC CAACAGGAATAGGTTTTTGTATATAATTAAGTTAATTTT CCTCTGGCTGTTATGGCCAGTAACTTTAGCTTGTTTTGT GCTTGCTGCTGTTTACAGAATAAATTGGATCACCGGTGG AATTGCTATCGCAATGGCTTGTCTTGTAGGCTTGATGTG GCTCAGCTACTTCATTGCTTCTTTCAGACTGTTTTTACAAT TCTTTCCACACAACTGATCCTAGTTTTCTGGGTAGGTAC ATGTCAGCATTATTTGCTGATGATTTAAACCAGTTAACT GGTTATCATACTGACTTTTCAAGTGAAATCATAGGATAC CAGCTTATGTGTCAACCTATACTGTTAGCAGAAGCTGAA CTTGCAAAGAATGTGTCCTTAATTCTTGGAACTGTTTCT TGGAATTTGAAGAAAAACGGACTAGGACGCTGTGACAT CAAGGACCTGCCTAAAGAAATCACTGTTGCTACATCAC GAACGCTTTCTTATTACAAATTGGGAGCTTCGCAGCGTG TAGCATACCGATCCTACTTATTATCAGCTGGTATTTTTG GTGCTATTACGGATGTTTTCTACAAAGAAAACAGTTACA AAGTGCCAACAGACAATTATATAACCACTTACGCTCGG ATGGCGGCCCCAAAAGAAATTATCTTCTTAGAGGGAGA AACACTTTTTGGTGATGACACTGTGATAGAAGTGGCCAT TATTTTGGCATCTTTTTCTGCTTCCACAAGGCGACGGGG TGGTGGTTCTCTTGGCGGAGGGGGTTCGGGAATCGTGG GAATTGTGGCAGGACTGGCAGTGCTGGCCGTGGTGGTG ATCGGAGCCGTGGTGGCTACCGTGATGTGCAGACGGAA		

		GTCCAGCGGAGGCAAGGGCGGCAGCTACAGCCAGGCC GCCAGCTCTGATAGCGCCCAGGGCAGCGACGTGTCACT GACAGCCTAGTAA **(SEQ ID NO: RS C7n1)**		
RS C8 1500 M epitopes	Named Segments: SP1-start GSS-N 501-Orf1ab 1500 M epitopes-end GSS-MITD			
RS C8 1500 M epitopes	MRVMAPRTLILLLSGALALTETWAGSG GSGGGGSGGSPARMAGNGGDAALALL LLDRLNQLESKMSGKGQQQQGQTVTK KSAAEASKKPRQKRTATKAYNVTQAFG RRGPEQTQGNFGDQELIRQGTDYKHWP QIAQFAPSASAFFGMSRIGMEVTPSGTW LTYTGAIKLDDKDPNFKDQVILLNKHID AYKTFPPTEPKKDKFRACMVTNNTFTL KVPHVGEIPVAYRKVLLKTIQPRVEKYL FDESGEFKLSEVGPEHSLAEYYIFFASFY YKRCFHTTDPSFLGRYMSALFADDLNQ LTGYHTDFSSEIIGYQLMCQPILLAEAEL AKNVSLILGTVSWNLKKRYLLSAGIFGA ITDVFYKENSYKVPTDNYITTYARMAA PKEIIFLEGETLFGDDTVIEVAIILASFSAS TRRRGKLLEQWNLVIGFNRNRFLYIIKLI FLWLLWPVTLACFVLAAVYSELVIGAVI LRGHLRIAGHHLGRTVATSRTLSYYKL GASQRVKRYSGLMWLSYFARYAGGSL GGGGSGIVGIVAGLAVLAVVVIGAVVA TVMCRRKSSGGKGGSYSQAASSDSAQG SDVSLTA **(SEQ ID NO: RS C8p1full)**	ATGAGAGTGATGGCCCCCAGAACCCTGATCCTGCTGCT GTCTGGCGCCCTGGCCCTGACAGAGACATGGGCCGGAA GCGGAGGTTCCGGAGGAGGCGGCAGTGGCGGCTCTCCT GCTAGAATGGCTGGCAATGGCGGTGATGCTGCTCTTGCT TTGCTGCTGCTTGACAGATTGAACCAGCTTGAGAGCAA AATGTCTGGTAAAGGCCAACAACAACAAGGCCAAACTG TCACTAAGAAATCTGCTGCTGAGGCTTCTAAGAAGCCTC GGCAAAAACGTACTGCCACTAAAGCATACAATGTAACA CAAGCTTTCGGCAGACGTGGTCCAGAACAAACCCAAGG AAATTTTGGGGACCAGGAACTAATCAGACAAGGAACTG ATTACAAACATTGGCCGCAAATTGCACAATTTGCCCCCA GCGCTTCAGCGTTCTTCGGAATGTCGCGCATTGGCATGG AAGTCACACCTTCGGGAACGTGGTTGACCTACACAGGT GCCATCAAATTGGATGACAAAGATCCAAATTTCAAAGA TCAAGTCATTTTGCTGAATAAGCATATTGACGCATACAA AACATTCCCACCAACAGAGCCTAAAAAGGACAAATTTC GTGCGTGCATGGTAACAAACAATACCTTCACACTCAAA GTCCCTCATGTGGGCGAAATACCAGTGGCTTACCGCAA GGTTCTTCTTAAGACTATTCAACCAAGGGTTGAAAAGTA CTTATTTGATGAGTCTGGTGAGTTTAAATTGTCAGAAGT AGGACCTGAGCATAGTCTTGCCGAATACTACATCATCTTCTT TGCATCATTTTATTATAAGCGCTGTTTTCACACAACTGA TCCTAGTTTTTCTGGGTAGGTACATGTCAGCATTATTTGC TGATGATTTAAACCAGTTAACTGGTTATCATACTGACTT TTCAAGTGAAATCATAGGATACCAGCTTATGTGTCAACC TATACTGTTAGCAGAAGCTGAACTTGCAAAGAATGTGT CCTTAATTCTTGGAACTGTTTCTTGGAATTTGAAAAAAC	588	1764

	GTTACTTATTATCAGCTGGTATTTTTGGTGCTATTACGG ATGTTTTCTACAAAGAAAACAGTTACAAAGTGCCAACA GACAATTATATAACCACTTACGCGCGAATGGCAGCCCC AAAAGAAATTATCTTCTTAGAGGGAGAAACACTTTTTG GTGATGACACTGTGATAGAAGTGGCCATTATTTTGGCAT CTTTTCTGCTTCCACACGCAGGCGCGGAAAGCTCCTTG AACAATGGAACCTAGTAATAGGTTTCAACAGGAATAGG TTTTTGTATATAATTAAGTTAATTTTCCTCTGGCTGTTAT GGCCAGTAACTTTAGCTTGTTTTGTGCTTGCTGCTGTTTA CAGTGAACTCGTAATCGGAGCTGTGATCCTTCGTGGAC ATCTTCGTATTGCTGGACACCATCTAGGACGCACTGTTG CTACATCACGAACGCTTTCTTATTACAAATTGGGAGCTT CGCAGCGTGTAAAACGCTACAGTGGCTTGATGTGGCTC AGCTACTTCGCGCGTTATGCCGGTGGTTCTCTTGGCGGA GGGGGTTCGGGAATCGTGGGAATTGTGGCAGGACTGGC AGTGCTGGCCGTGGTGGTGATCGGAGCCGTGGTGGCTA CCGTGATGTGCAGACGGAAGTCCAGCGGAGGCAAGGGC GGCAGCTACAGCCAGGCCGCCAGCTCTGATAGCGCCCA GGGCAGCGACGTGTCACTGACAGCCTAGTAA **(SEQ ID NO: RS C8n1)**		

Table 15. Modified String Sequences Group 2

Construct name	Name	Amino Acid sequence	Nucleotide sequence
RS-C5	dEarI-hAg		ATTCTTCTGGTCCCCACAGACTCAGAGAGAACCC
RS-C5	Kozak		GCCACC
RS-C5	SEC	MFVFLVLLPLVSSQCVNLT	ATGTTTGTTTTTCTTGTTTTACTTCCTTTAGTCTCTTCTCAGTGTGTCAAT TTGACA
RS-C5	RS-C5	GGSGGGGSGGKDLSPRWYFYYLGT GPEAGLPYGANKDGIIWVATEGALN TPKDHIGTRNPANNAAIVLQLPQGT	GGCGGCTCTGGAGGAGGCGGCTCCGGAGGCAAAGATCTGAGCCCAAG ATGGTACTTTTACTACCTGGGAACAGGACCTGAAGCTGGACTGCCTTA TGGAGCAAATAAAGATGGAATCATCTGGGTGGCAACAGAAGGAGCAC

	TLPKGFYAEGSRGGSQASSRSSSRSR	TGAATACACCAAAAGATCACATTGGAACCAGAAATCCAGCAAATAAT
	NSSRNSTPGSSRGTSPARMAGNGGD	GCAGCAATCGTGCTGCAGCTGCCACAGGGAACAACACTGCCAAAAGG
	AALALLLLDRLNQLESKMSGKGQQ	ATTTTACGCAGAAGGAAGCAGAGGAGGAAGCCAGGCAAGCAGCAGAA
	QQGQTVTKKSAAEASKKPRQKRTA	GCAGCAGCAGAAGCAGAAATAGCAGCACACACCTGGAAGC
	TKAYNVTQAFGRRGPEQTQGNFGD	AGCAGAGGAACAAGCCCTGCAAGAATGGCAGGAAATGGAGGAGATGC
	QELIRQGTDYKHWPQIAQFAPSASA	AGCACTGGCACTGCTGCTGGATAGACTGAATCAGCTGGAAAGCAA
	FFGMSRIGMEVTPSGTWLTYTGAIK	AATGAGCGGAAAAGGACAGCAGCAGGGACAGACAGTGACAAAG
	LDDKDPNFKDQVILLNKHIDAYKTF	AAAAGCGCTGCTGAAGCTTCCAAGAAACCAAGACAGAAAAGAACAGC
	PPTEPKKDKKKKADETQALPQRQK	AACAAAAGCATACAATGTGACACAGGCATTTGGAAGGAGAGGACCTG
	KQQTVTLLPAADLDDFSKQLQQSMS	AACAGACCCAGGGAAATTTTGGAGATCAGGAACTGATCAGACAGGGA
	SADSTQAFRACMVTNNTFTLKVPHV	ACCGATTACAAACACTGGCCTCAGATTGCTCAGTTTGCTCCTTCTGCTT
	GEIPVAYRKVLLKTIQPRVEKYLFDE	CTGCTTTCTTTGGAATGTCCAGAATTGGAAGTGACACCTTCTGG
	SGEFKLSEVGPEHSLAEYYIFFASFY	AACATGGCTGACATACACAGGAGCAATCAAACTGGATGATAAAGATC
	YKRCFHTTDPSFLGRYMSALFADDL	CAAATTTTAAAGATCAGGTGATTCTGCTGAATAAACACATTGATGCTT
	NQLTGYHTDFSSEIIGYQLMCQPILL	ACAAAACATTTCCACCAACAGAACCAAAGAAAGATAAAAAGAAGAAA
	AEAELAKNVSLILGTVSWNLKKRYL	GCTGATGAAACACACAGGCTCTGCCTCAGAGACAGAAGAAACAGCAGAC
	LSAGIFGAITDVFYKENSYKVPTDNY	AGTGACACTGCTGCCTGCTGCTGATCTGGATGATTTTTCCAAACAGCTG
	ITTYARMAAPKEIIFLEGETLFGDDT	CAGCAGTCCATGTCCTCCGCTGATTCCACACAGGCTTTTAGAGCTTGCA
	VIEVAIILASFSASTRRSGADSNGTIT	TGGTGACAAACAACACATTTACACTGAAAGTGCCTCATGTGGGAGAAA
	VEELKKLLEQWNLVIGFLFLTWICLL	TTCCTGTGGCTTACAGAAAAGTGCTGCTGAAAACAATTCAACCAAGAG
	QFAYANRNRFLYIIKLIFLWLLWPVT	TGGAAAAATACCTGTTTGATGAATCTGGAGAATTTAAACTTTCTGAAG
	LACFVLAAVYRINWITGGIAIAMAC	TGGGACCTGAACACTCTCTTGCTGAATACTACATTTTCTTTGCTTCTTTT
	LVGLMWLSYFIASFRLFARTRSMWS	TACTATAAAAGATGTTTTCACACAACTGATCCATCTTTTCTGGGAAGAT
	FNPETNILLNVPLHGTILTRPLLESEL	ACATGTCTGCTCTTTTTGCTGATGATTTAAATCAGTTAACAGGATATCA
	VIGAVILRGHLRIAGHHLGRCDIKDL	CACAGATTTTTCTTCTGAAATCATTGGATACCAGTTGATGTGTCAACCA
	PKEITVATSRTLSYYKLGASQRVAG	ATTTTGTTGGCTGAAGCTGAATTGGCAAAAAACGTGTCTTTGATTCTTG
	DSGFAAYSRYRIGNYKLNTDHSSSS	GAACAGTTTCTTGGAATCTTAAAAAGAGATACTTATTATCTGCTGGAAT
	DNIALLVQGGSGGGGSGG (**SEQ ID**	TTTTGGAGCTATCACAGATGTGTTTTACAAAGAAAACTCATACAAAGT
	NO: RS C5p2)	GCCAACAGACAATTACATAACAACATACGCCAGAATGGCTGCTCCAAA
		AGAAATCATCTTCCTTGAAGGAGAAACACTTTTTGGAGATGATACAGT
		GATTGAAGTGGCAATTATTCTGGCATCTTTTTCTGCATCCACAAGAAGA
		TCTGGAGCTGATTCCAATGGAACAATTACAGTGGAAGAACTGAAAAAG
		CTGCTGGAACAGTGGAATCTGGTGATTGGATTTCTGTTTCTGACATGGA
		TTTGTCTGCTGCAGTTTGCTTACGCTAATAGAAATAGATTTCTGTACAT

			TATTAAACTGATTTTTCTGTGGCTGCTGTGGCCTGTGACACTGGCTTGC
			TTTGTGCTGGCTGCTGTGTACAGAATTAATTGGATTACAGGAGGAATT
			GCAATTGCAATGGCATGCCTGGTGGGACTGATGTGGCTGTCTTACTTTA
			TTGCTTCTTTTAGACTGTTTGCAAGAACAAGATCTATGTGGTCTTTTAA
			TCCTGAAACAAATATTCTGCTGAATGTGCCTCTGCACGGAACAATTCTG
			ACAAGACCTCTGCTGGAATCTGAACTGGTGATTGGAGCTGTGATTCTG
			AGAGGACACCTGAGAATTGCTGGACACCACCTGGGAAGATGCGATATT
			AAAGATCTGCCAAAAGAAATTACAGTGGCAACAAGCAGAACACTGAG
			CTACTACAAACTGGGAGCTTCCCAAAGAGTGGCTGGAGATAGCGGATT
			TGCTGCTTACAGCAGATACAGAATTGGAAATTACAAACTGAATACCGA
			TCACAGCTCATCTTCTGATAATATTGCTCTGCTGGTGCAGGGAGGATCC
			GGTGGTGGCGGCAGCGGCGGC (**SEQ ID NO: RS C5n2**)
			GAACAGTACATTAAATGGCCTTGGTACATTTGGCTTGGATTTATTGCAG
		EQYIKWPWYIWLGFIAGLIAIVMVTI	GATTAATTGCAATTGTGATGGTGACAATTATGTTATGTTGTATGACATC
		MLCCMTSCCSCLKGCCSCGSCCKFD	ATGTTGTTCTTGTTTAAAAGGATGTTGTTCTTGTGGAAGCTGTTGTAAA
		EDDSEPVLKGVKLHYT**	TTTGATGAAGATGATTCTGAACCTGTGTTAAAAGGAGTGAAATTGCAT
RS-C5	TM		TACACATGATGA
RS-C5			CTCGAG
			CTGGTACTGCATGCACGCAATGCTAGCTGCCCCTTTCCCGTCCTGGGTA
			CCCCGAGTCTCCCCCGACCTCGGGTCCCAGGTATGCTCCCACCTCCACC
RS-C5	F element		TGCCCCACTCACCACCTCTGCTAGTTCCAGACACCTCC
			CAAGCACGCAGCAATGCAGCTCAAAACGCTTAGCCTAGCCACACCCCC
			ACGGGAAACAGCAGTGATTAACCTTTAGCAATAAACGAAAGTTTAACT
RS-C5	I element		AAGCTATACTAACCCCAGGGTTGGTCAATTTCGTGCCAGCCACACC
RS-C5			CTGGAGCTAGC
			AAAAAAAAAAAAAAAAAAAAAAAAAAAAGCATATGACTAAAAAA
			AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
RS-C5	PolyA		AAAAAAAAAAAAAAAAAAAAA
		MFVFLVLLPLVSSQCVNLTGGSGGG	ATTCTTCTGGTCCCCACAGACTCAGAGAGAACCCGCGCCACCATGTTTGTT
		GSGGKDLSPRWYFYYLGTGPEAGLP	TTTCTTGTTTTTACTTCCTTTAGTCTCTTCTCAGTGTGTCAATTTGACAGG
		YGANKDGIIWVATEGALNTPKDHIG	CGGCTCTGGAGGAGGCGGCTCCGGAGGCAAAGATCTGAGCCCAAGAT
	Full	TRNPANNAAIVLQLPQGTTLPKGFY	GGTACTTTTACTACCTGGGAACAGGACCTGAAGCTGGACTGCCTTATG
RS-C5	Sequence	AEGSRGGSQASSRSSSRSRNSSRNST	GAGCAAATAAAGATGGAATCATCTGGGTGGCAACAGAAGGAGCACTG

	PGSSRGTSPARMAGNGGDAALALLL	AATACACCAAAAGATCACATTGGAACCAGAAATCCAGCAAATAATGC
	LDRLNQLESKMSGKGQQQQGQTVT	AGCAATCGTGCTGCAGCTGCCACAGGGAACAACACTGCCAAAAGGATT
	KKSAAEASKKPRQKRTATKAYNVT	TTACGCAGAAGGAAGCAGAGGAGGAAGCCAGGCAAGCAGCAGAAGC
	QAFGRRGPEQTQGNFGDQELIRQGT	AGCAGCAGAAGCAGAAATAGCAGCAGAAATAGCACACCTGGAAGCAG
	DYKHWPQIAQFAPSASAFFGMSRIG	CAGAGGAACAAGCCCTGCAAGAATGGCAGGAAATGGAGGAGATGCAG
	MEVTPSGTWLTYTGAIKLDDKDPNF	CACTGGCACTGCTGCTGGATAGACTGAATCAGCTGGAAAGCAAAA
	KDQVILLNKHIDAYKTFPPTEPKKD	TGAGCGGAAAAGGACAGCAGCAGGGACAGACAGTGACAAAGAA
	KKKKADETQALPQRQKKQQTVTLL	AAGCGCTGCTGAAGCTTCCAAGAAACCAAGACAGAAAAGAACAGCAA
	PAADLDDFSKQLQQSMSSADSTQAF	CAAAAGCATACAATGTGACACAGGCATTTGGAAGGAGAGGACCTGAA
	RACMVTNNTFTLKVPHVGEIPVAYR	CAGACCCAGGGAAATTTTGGAGATCAGGAACTGATCAGACAGGGAAC
	KVLLKTIQPRVEKYLFDESGEFKLSE	CGATTACAAACACTGGCCTCAGATTGCTCAGTTTGCTCCTTCTGCTTCT
	VGPEHSLAEYYIFFASFYYKRCFHTT	GCTTTCTTTGGAATGTCCAGAATTGGAATGGAAGTGACACCTTCTGGA
	DPSFLGRYMSALFADDLNQLTGYHT	ACATGGCTGACATACACAGGAGCAATCAAACTGGATGATAAAGATCC
	DFSSEIIGYQLMCQPILLAEAELAKN	AAATTTTAAAGATCAGGTGATTCTGCTGAATAAACACATTGATGCTTA
	VSLILGTVSWNLKKRYLLSAGIFGAI	CAAAACATTTCCACCAACAGAACCAAAGAAAGATAAAAAGAAGAAAG
	TDVFYKENSYKVPTDNYITTYARMA	CTGATGAAACACAGGCTCTGCCTCAGAGACAGAAGAAACAGCAGACA
	APKEIIFLEGETLFGDDTVIEVAIILAS	GTGACACTGCTGCCTGCTGATCTGGATGATTTTTCCAAACAGCTGC
	FSASTRRSGADSNGTITVEELKKLLE	AGCAGTCCATGTCCTCCGCTGATTCCACACAGGCTTTTAGAGCTTGCAT
	QWNLVIGFLFLTWICLLQFAYANRN	GGTGACAAACAACACATTTACACTGAAAGTGCCTCATGTGGGAGAAAT
	RFLYIIKLIFLWLLWPVTLACFVLAA	TCCTGTGGCTTACAGAAAAGTGCTGCTGAAAACAATTCAACCAAGAGT
	VYRINWITGGIAIAMACLVGLMWLS	GGAAAAATACCTGTTTGATGAATCTGGAGAATTTAAACTTTCTGAAGT
	YFIASFRLFARTRSMWSFNPETNILL	GGGACCTGAACACTCTCTTGCTGAATACTACATTTTCTTTGCTTCTTTTT
	NVPLHGTILTRPLLESELVIGAVILRG	ACTATAAAAGATGTTTTTCACACAACTGATCCATCTTTTCTGGGAAGATA
	HLRIAGHHLGRCDIKDLPKEITVATS	CATGTCTGCTCTTTTTGCTGATGATTTAAATCAGTTAACAGGATATCAC
	RTLSYYKLGASQRVAGDSGFAAYSR	ACAGATTTTTCTTCTGAAATCATTGGATACCAGTTGATGTGTCAACCAA
	YRIGNYKLNTDHSSSSDNIALLVQG	TTTTGTTGGCTGAAGCTGAATTGGCAAAAAACCGTGTCTTTGATTCTTGG
	GSGGGGSGGEQYIKWPWYIWLGFIA	AACAGTTTCTTGGAATCTTAAAAGAGATACTTATTATCTGCTGGAATT
	GLIAIVMVTIMLCCMTSCCSCLKGC	TTTGGAGCTATCACAGATGTGTTTTACAAAGAAAACTCATACAAAGTG
	CSCGSCCKFDEDDSEPVLKGVKLHY	CCAACAGACAATTACATAACAACATACGCCAGAATGGCTGCTCCAAAA
	T** **(SEQ ID NO: RS C5p2full)**	GAAATCATCTTCCTTGAAGGAGAAACACTTTTTGGAGATGATACAGTG
		ATTGAAGTGGCAATTATTCTGGCATCTTTTTCTGCATCCACACAAGAAGAT
		CTGGAGCTGATTCCAATGGAACAATTACAGTGGAAGAACTGAAAAAG
		CTGCTGGAACAGTGGAATCTGGTGATTGGATTTCTGTTTCTGACATGGA
		TTTGTCTGCTGCAGTTTGCTTACGCTAATAGAAATAGATTTCTGTACAT

			TATTAAACTGATTTTTCTGTGGCTGCTGTGGCCTGTGACACTGGCTTGC TTTGTGCTGGCTGCTGTGTACAGAATTAATTGGATTACAGGAGGAATT GCAATTGCAATGGCATGCCTGGTGGGACTGATGTGGCTGTCTTACTTTA TTGCTTCTTTTAGACTGTTTGCAAGAACAAGATCTATGTGGTCTTTTAA TCCTGAAACAAATATTCTGCTGAATGTGCCTCTGCACGGAACAATTCTG ACAAGACCTCTGCTGGAATCTGAACTGGTGATTGGAGCTGTGATTCTG AGAGGACACCTGAGAATTGCTGGACACCACCTGTGGGAAGATGCGATATT AAAGATCTGCCAAAAGAAATTACAGTGGCAACAAGCAGAACACTGAG CTACTACAAACTGGGAGCTTCCCAAAGAGTGGCTGGAGATAGCGGATT TGCTGCTTACAGCAGATACAGAATTGGAAATTACAAACTGAATACCGA TCACAGCTCATCTTCTGATAATATTGCTCTGCTGGTGCAGGGAGGATCC GGTGGTGGCGGCAGCGGCGGCGAACAGTACATTAAATGGCCTTGGTAC ATTTGGCTTGGATTTATTGCAGGATTAATTGCAATTGTGATGGTGACAA TTATGTTATGTTGTATGACATCATGTTGTTCTTGTTTAAAAGGATGTTGT TCTTGTGGAAGCTGTTGTAAATTTGATGAAGATGATTCTGAACCTGTGT TAAAAGGAGTGAAATTGCATTACACATGATGACTCGAGCTGGTACTGC ATGCACGCAATGCTAGCTGCCCCTTTCCCGTCCTGGGTACCCCGAGTCT CCCCCGACCTCGGGTCCCAGGTATGCTCCCACCTCCACCTGCCCCACTC ACCACCTCTGCTAGTTCCAGACACCTCCCAAGCACGCAGCAATGCAGC TCAAAACGCTTAGCCTAGCCACACCCCCACGGGAAACAGCAGTGATTA ACCTTTAGCAATAAACGAAAGTTTAACTAAGCTATACTAACCCCAGGG TTGGTCAATTTCGTGCCAGCCACACCCTGGAGCTAGCAAAAAAAAAAA AAAAAAAAAAAAAAAAAAAAGCATATGACTAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA AAAAAAAA (**SEQ ID NO: RS C5n2full**)
RS-C6	dEarI-hAg		ATTCTTCTGGTCCCCACAGACTCAGAGAGAACCC
RS-C6	Kozak		GCCACC
RS-C6	SEC	MFVFLVLLPLVSSQCVNLT	ATGTTTGTTTTTCTTGTTTTACTTCCTTTAGTCTCTTCTCAGTGTGTCAAT TTGACA
RS-C6	RS-C6	GGSGGGGSGGRMAGNGGDAALAL LLLDRLNQLESKMSGKGQQQMRAC MVTNNTFTLKVPHVGEIPVAYRKVL	GGCGGCTCTGGAGGAGGCGGCTCCGGAGGCAGAATGGCTGGAAATGG AGGAGATGCTGCTCTGGCTCTGCTGCTGGATAGACTGAATCAGCT GGAATCAAAAATGTCTGGAAAAGGACAGCAACAGATGAGAGCTTGCA

		LKTIQPRVEKYLFDESGEFKLSEVGP	TGGTGACAAACAACACATTTACACTGAAAGTGCCTCATGTGGGAGAAA
		EHSLAEYKMCGYKHWPQIAQFAPS	TTCCTGTGGCTTACAGAAAAGTGCTGCTGAAAACAATTCAACCAAGAG
		ASAFFGMSRIGMEVTPSGTWLTYTG	TGGAAAAATACCTGTTTGATGAATCTGGAGAATTTAAACTTTCTGAAG
		AIKLDDKDPNFKDQVILLNKHIDAY	TGGGACCTGAACACTCTCTTGCTGAATACAAAATGTGCGGATACAAAC
		KTFPARCATTDPSFLGRYMSALFAD	ACTGGCCTCAGATTGCTCAGTTTGCTCCTTCTGCTTTCTTTGGA
		DLNQLTGYHTDFSSEIIGYQLMCQPI	ATGAGCAGAATTGGAATGGAAGTGACACCTTCTGGAACATGGCTGACA
		LLAEAELAKNVSLILGTVSWNLKKQ	TACACAGGAGCAATCAAACTGGATGATAAAGATCCAAACTTTAAAGAT
		GFAYANRNRFLYIIKLIFLWLLWPVT	CAGGTGATTCTGCTGAACAAACACATTGATGCTTACAAAACATTTCCT
		LACFVLAAVYRINWITGGIAIAMAC	GCTAGATGTGCTACAACTGATCCTTCTTTTCTGGGAAGATACATGTCTG
		LVGLMWLSYFIASFRLFYRSYLLSA	CTCTTTTTGCTGATGATTTAAATCAGTTAACAGGATATCACACAGATTT
		GIFGAITDVFYKENSYKVPTDNYITT	TTCTTCTCTGAAATCATTGGATACCAGTTGATGTGTCAACCAATTTTGTTG
		YARMAAPKEIIFLEGETLFGDDTVIE	GCTGAAGCTGAATTGGCAAAAAACGTGTCTTTGATTCTTGGAACAGTT
		VSMFNLGRCDIKDLPKEITVATSRTL	TCTTGGAATCTTAAAAAACAAGGATTTGCATACGCAAATAGAAATAGA
		SYYKLGASQRVAGGSGGGGSGG	TTTCTGTACATTATTAAACTGATTTTTCTGTGGCTGCTGTGGCCTGTGAC
		(SEQ ID NO: RS C6p2)	ACTGGCTTGCTTTGTGCTGGCTGCTGTGTACAGAATAAATTGGATACA
			GGAGGAATTGCAATTGCAATGGCATGCTTGGTGGGATTGATGTGGTTG
			TCTTACTTTATTGCTTCTTTTAGACTGTTTTACAGATCCTACTTATTATC
			TGCTGGAATTTTTGGAGCTATCACAGATGTGTTTTACAAAGAAAACTC
			ATACAAAGTGCCAACAGACAATTACATAACAACATACGCTAGAATGGC
			TGCTCCAAAAGAAATCATCTTCCTTGAAGGAGAAAACACTTTTTGGAGA
			TGATACAGTGATTGAAGTGTCCATGTTTAATCTGGGAAGATGCGATAT
			TAAAGATCTGCCAAAAGAAATTACAGTGGCAACAAGCAGAACACTGA
			GCTACTACAAACTGGGAGCAAGCCAGAGAGTGGCAGGAGGATCCGGT
			GGTGGCGGCAGCGGCGGC (**SEQ ID NO: RS C6n2**)
RS-C6	TM	EQYIKWPWYIWLGFIAGLIAIVMVTI MLCCMTSCCSCLKGCCSCGSCCKFD EDDSEPVLKGVKLHYT**	GAACAGTACATTAAATGGCCTTGGTACATTTGGCTTGGATTTATTGCAG GATTAATTGCAATTGTGATGGTGACAATTATGTTATGTTGTATGACATC ATGTTGTTCTTGTTTAAAAGGATGTTGTTCTTGTGGAAGCTGTTGTAAA TTTGATGAAGATGATTCTGAACCTGTGTTAAAAGGAGTGAAATTGCAT TACACATGATGA
RS-C6			CTCGAG
RS-C6	F element		CTGGTACTGCATGCACGCAATGCTAGCTGCCCCTTTCCCGTCCTGGGTA CCCCGAGTCTCCCCCGACCTCGGGTCCCAGGTATGCTCCCACCTCCACC TGCCCCACTCACCACCTCTGCTAGTTCCAGACACCTCC

			CAAGCACGCAGCAATGCAGCTCAAAACGCTTAGCCTAGCCACACCCCC
			ACGGGAAACAGCAGTGATTAACCTTTAGCAATAAACGAAAGTTTAACT
RS-C6	I element		AAGCTATACTAACCCCAGGGTTGGTCAATTTCGTGCCAGCCACACC
RS-C6			CTGGAGCTAGC
			AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGCATATGACTAAAAAA
			AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
RS-C6	PolyA		AAAAAAAAAAAAAAAAAAAAA
			ATTCTTCTGGTCCCCACAGACTCAGAGAGAACCCGCCACCATGTTTGTT
			TTTCTTGTTTTACTTCCTTTAGTCTCTTCTCAGTGTGTCAATTTGACAGG
			CGGCTCTGGAGGAGGCGGCTCCGGAGGCAGAATGGCTGGAAATGGAG
			GAGATGCTGCTCTGGCTCTGCTGCTGGATAGACTGAATCAGCTGG
		MFVFLVLLPLVSSQCVNLTGGSGGG	AATCAAAAATGTCTGGAAAAGGACAGCAACAGATGAGAGCTTGCATG
		GSGGRMAGNGGDAALALLLLDRLN	GTGACAAACAACACATTTACACTGAAAGTGCCTCATGTGGGAGAAATT
		QLESKMSGKGQQQMRACMVTNNT	CCTGTGGCTTACAGAAAAGTGCTGCTGAAAACAATTCAACCAAGAGTG
		FTLKVPHVGEIPVAYRKVLLKTIQPR	GAAAAATACCTGTTTGATGAATCTGGAGAATTTAAACTTTCTGAAGTG
		VEKYLFDESGEFKLSEVGPEHSLAE	GGACCTGAACACTCTCTTGCTGAATACAAAATGTGCGGATACAAACAC
		YKMCGYKHWPQIAQFAPSASAFFG	TGGCCTCAGATTGCTCAGTTTGCTCCTTCTGCTTTCTTTGGAAT
		MSRIGMEVTPSGTWLTYTGAIKLDD	GAGCAGAATTGGAATGGAAGTGACACCTTCTGGAACATGGCTGACATA
		KDPNFKDQVILLNKHIDAYKTFPAR	CACAGGAGCAATCAAACTGGATGATAAAGATCCAAACTTTAAAGATCA
		CATTDPSFLGRYMSALFADDLNQLT	GGTGATTCTGCTGAACAAACACATTGATGCTTACAAAACATTTCCTGCT
		GYHTDFSSEIIGYQLMCQPILLAEAE	AGATGTGCTACAACTGATCCTTCTTTCTGGGAAGATACATGTCTGCTC
		LAKNVSLILGTVSWNLKKQGFAYA	TTTTTGCTGATGATTTAAATCAGTTAACAGGATATCACACAGATTTTTC
		NRNRFLYIIKLIFLWLLWPVTLACFV	TTCTGAAATCATTGGATACCAGTTGATGTGTCAACCAATTTTGTTGGCT
		LAAVYRINWITGGIAIAMACLVGLM	GAAGCTGAATTGGCAAAAAACGTGTCTTTGATTCTTGGAACAGTTTCTT
		WLSYFIASFRLFYRSYLLSAGIFGAIT	GGAATCTTAAAAAACAAGGATTTGCATACGCAAATAGAAATAGATTTC
		DVFYKENSYKVPTDNYIITTYARMA	TGTACATTATTAAACTGATTTTTCTGTGGCTGCTGTGGCCTGTGACACT
		APKEIIFLEGETLFGDDTVIEVSMFNL	GGCTTGCTTTGTGCTGGCTGTGTGTACAGAATAAATTGGATAACAGG
		GRCDIKDLPKEITVATSRTLSYYKLG	AGGAATTGCAATTGCAATGGCATGCTTGGTGGGATTGATGTGGTTGTC
		ASQRVAGGSGGGSGGEQYIKWPW	TTACTTTATTGCTTCTTTTAGACTGTTTTACAGATCCTACTTATTATCTG
		YIWLGFIAGLIAIVMVTIMLCCMTSC	CTGGAATTTTTGGAGCTATCACAGATGTGTTTTACAAAGAAAACTCAT
		CSCLKGCCSCGSCCKFDEDDSEPVL	ACAAAGTGCCAACAGACAATTACATAACAACATACGCTAGAATGGCTG
		KGVKLHYT** (**SEQ ID NO: RS**	CTCCAAAAGAAATCATCTTCCTTGAAGGAGAAACACTTTTTGGAGATG
RS-C6	FullSeq	**C6p2full)**	ATACAGTGATTGAAGTGTCCATGTTTAATCTGGGAAGATGCGATATTA

			AAGATCTGCCAAAAGAAATTACAGTGGCAACAAGCAGAACACTGAGC
			TACTACAAACTGGGAGCAAGCCAGAGAGTGGCAGGAGGATCCGGTGG
			TGGCGGCAGCGGCGGCGAACAGTACATTAAATGGCCTTGGTACATTTG
			GCTTGGATTTATTGCAGGATTAATTGCAATTGTGATGGTGACAATTATG
			TTATGTTGTATGACATCATGTTGTTCTTGTTTAAAGGATGTTGTTCTTG
			TGGAAGCTGTTGTAAATTTGATGAAGATGATTCTGAACCTGTGTTAAA
			AGGAGTGAAATTGCATTACACATGATGACTCGAGCTGGTACTGCATGC
			ACGCAATGCTAGCTGCCCCTTTCCCGTCCTGGGTACCCCGAGTCTCCCC
			CGACCTCGGGTCCCAGGTATGCTCCCACCTCCACCTGCCCCACTCACCA
			CCTCTGCTAGTTCCAGACACCTCCCAAGCACGCAGCAATGCAGCTCAA
			AACGCTTAGCCTAGCCACACCCCCACGGGAAACAGCAGTGATTAACCT
			TTAGCAATAAACGAAAGTTTAACTAAGCTATACTAACCCCAGGGTTGG
			TCAATTTCGTGCCAGCCACACCCTGGAGCTAGCAAAAAAAAAAAAAAA
			AAAAAAAAAAAAAAAAAGCATATGACTAAAAAAAAAAAAAAAAAAAA
			AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
			AAAAA **(SEQ ID NO: RS C6n2full)**
RS-C7	dEarI-hAg		ATTCTTCTGGTCCCCACAGACTCAGAGAGAACCC
RS-C7	Kozak		GCCACC
RS-C7	SEC	MFVFLVLLPLVSSQCVNLT	ATGTTTGTTTTTCTTGTTTTACTTCCTTTAGTCTCTTCTCAGTGTGTCAAT TTGACA
		GGSGGGGSGGSPARMAGNGGDAAL	GGCGGCTCTGGAGGAGGCGGCTCCGGAGGCTCTCCTGCCAGAATGGCT
		ALLLLDRLNQLESKMSGKGQQQQG	GGAAATGGAGGAGATGCTGCTCTGGCTCTGCTGCTGGATAGACTG
		QTVTKKSAAEASKKPRQKRTATKA	AATCAGCTGGAAAGCAAAATGAGCGGAAAAGGACAGCAGCAGGG
		YNVTQAFGRRGPEQTQGNFGDQELI	ACAAACAGTGACAAAGAAATCTGCTGCTGAAGCCAGCAAGAAACCAA
		RQGTDYKHWPQIAQFAPSASAFFGM	GACAGAAAAGAACAGCCACAAAAGCCTACAATGTGACACAGGCCTTT
		SRIGMEVTPSGTWLTYTGAIKLDDK	GGAAGAAGGGGACCTGAACAGACACAGGGAAATTTTGGAGATCAGGA
		DPNFKDQVILLNKHIDAYKTFPPTEP	ACTGATCAGACAGGGAACAGATTACAAAACACTGGCCTCAGATCGCCCA
		KKDKFKAAMVTNNTFTLKVPHVGE	GTTTGCCCCATCTGCCTCTGCCTTCTTTGGAATGAGCAGAAATTGGAATG
		IPVAYRKVLLKTIQPRVEKYLFDESG	GAAGTGACACCTTCTGGAACATGGCTGACATACACAGGAGCCATCAAA
		EFKLSEVGPEHSLAEYYIFFASFYYK	CTGGATGATAAAGATCCAAATTTTAAAGATCAGGTGATTCTGCTGAAT
RS-C7	RS-C7	RNGFAYANRNRFLYIIKLIFLWLLWP VTLACFVLAAVYRINWITGGIAIAM	AAACACATTGATGCCTACAAAACATTTCCACCAACAGAACCAAAGAAA GATAAATTCAAAGCTGCTATGGTGACAAACAACACATTTACACTGAAA

	ACLVGLMWLSYFIASFRLFYNSFHT	GTGCCTCATGTGGGAGAAATTCCTGTGGCTTACAGAAAGTGCTGCTG
	TDPSFLGRYMSALFADDLNQLTGYH	AAAACAATTCAACCAAGAGTGGAAAAATACCTGTTTGATGAATCTGGA
	TDFSSEIIGYQLMCQPILLAEAELAK	GAATTTAAACTTTCTGAAGTGGGACCTGAACACTCTCTTGCTGAATACT
	NVSLILGTVSWNLKKNGLGRCDIKD	ACATTTTCTTTGCTTCTTTTTACTATAAGAGGAATGGATTTGCATACGC
	LPKEITVATSRTLSYYKLGASQRVA	AAATAGAAATAGATTTCTGTACATTATTAAACTGATTTTTCTGTGGCTG
	YRSYLLSAGIFGAITDVFYKENSYKV	CTGTGGCCTGTGACACTGGCTTGCTTTGTGTGCTGGCTGCTGTGTACAGAA
	PTDNYITTYARMAAPKEIIFLEGETL	TAAATTGGATAACAGGAGGAATTGCAATTGCAATGGCATGCTTGGTGG
	FGDDTVIEVAIILASFSASTRRRGGGS	GATTGATGTGGTTGTCTTACTTTATTGCTTCTTTTAGACTGTTTTACAAC
	GGGGSGG **(SEQ ID NO: RS C7p2)**	TCTTTTCACACAACTGATCCATCTTTTCTGGGAAGATACATGTCTGCTC
		TTTTTGCTGATGATTTAAATCAGTTAACAGGATATCACACAGATTTTTC
		TTCTGAAATCATTGGATACCAGTTGATGTGTCAACCAATTTTGTTGGCT
		GAAGCTGAATTGGCAAAAAACGTGTCTTTGATTCTTGGAACAGTTTCTT
		GGAATCTTAAGAAAAACGGACTGGGAAGATGCGATATTAAAGATCTG
		CCAAAAGAAATTACAGTGGCAACAAGCAGAACACTGAGCTACTACAA
		ACTGGGAGCAAGCCAGAGAGTGGCATACAGATCCTACTTATTATCTGC
		TGGAATTTTTTGGAGCTATCACAGATGTGTTTTACAAAGAAAACTCATA
		CAAAGTGCCAACAGACAATTACATAACAACATACGCTAGAATGGCTGC
		TCCAAAAGAAATCATCTTCCTTGAAGGAGAAACACTTTTTGGAGATGA
		TACAGTGATTGAAGTGGCAATTATTCTGGCATCTTTTTTCTGCATCCACA
		AGAAGAAGGGGAGGAGGATCCGGTGGTGGCGGCAGCGGCGGC **(SEQ ID NO: RS C7n2)**
		GAACAGTACATTAAATGGCCTTGGTACATTTGGCTTGGATTTATTGCAG
	EQYIKWPWYIWLGFIAGLIAIVMVTI	GATTAATTGCAATTGTGATGGTGACAATTATGTTATGTTGTATGACATC
	MLCCMTSCCSCLKGCCSCGSCCKFD	ATGTTGTTCTTGTTTAAAAGGATGTTGTTCTTGTGGAAGCTGTTGTAAA
RS-C7 TM	EDDSEPVLKGVKLHYT**	TTTGATGAAGATGATTCTGAACCTGTGTTAAAAGGAGTGAAATTGCAT
RS-C7		TACACATGATGA
		CTCGAG
		CTGGTACTGCATGCACGCAATGCTAGCTGCCCCTTTCCCGTCCTGGGTA
		CCCCGAGTCTCCCCCGACCTCGGGTCCCAGGTATGCTCCCACCTCCACC
RS-C7 F element		TGCCCCACTCACCACCTCTGCTAGTTCCAGACACCTCC
		CAAGCACGCAGCAATGCAGCTCAAAACGCTTAGCCTAGCCACACCCCC
		ACGGGAAACAGCAGTGATTAACCTTTAGCAATAAACGAAAGTTTAACT
RS-C7 I element		AAGCTATACTAACCCCAGGGTTGGTCAATTTCGTGCCAGCCACACC

RS-C7			CTGGAGCTAGC
RS-C7	PolyA		AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGCATATGACTAAAAAA AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAAA
RS-C7	FullSeq	MFVFLVLLPLVSSQCVNLTGGSGGG GSGGSPARMAGNGGDAALALLLLD RLNQLESKMSGKGQQQQGQTVTKK SAAEASKKPRQKRTATKAYNVTQA FGRRGPEQTQGNFGDQELIRQGTDY KHWPQIAQFAPSASAFFGMSRIGME VTPSGTWLTYTGAIKLDDKDPNFKD QVILLNKHIDAYKTFPPTEPKKDKFK AAMVTNNTFTLKVPHVGEIPVAYRK VLLKTIQPRVEKYLFDESGEFKLSEV GPEHSLAEYYIFFASFYYKRNGFAY ANRNRFLYIIKLIFLWLLWPVTLACF VLAAVYRINWITGGIAIAMACLVGL MWLSYFIASFRLFYNSFHTTDPSFLG RYMSALFADDLNQLTGYHTDFSSEII GYQLMCQPILLAEAELAKNVSLILG TVSWNLKKNGLGRCDIKDLPKEITV ATSRTLSYYKLGASQRVAYRSYLLS AGIFGAITDVFYKENSYKVPTDNYIT TYARMAAPKEIIFLEGETLFGDDTVI EVAIILASFSASTRRRGGGSGGGGSG GEQYIKWPWYIWLGFIAGLIAIVMV TIMLCCMTSCCSCLKGCCSCGSCCK FDEDDSEPVLKGVKLHYT** **(SEQ ID NO: RS C7p2full)**	ATTCTTCTGGTCCCCACAGACTCAGAGAGAACCCGCCACCATGTTTGTT TTTCTTGTTTTACTTCCTTTAGTCTCTTCTCAGTGTGTCAATTTGACAGG CGGCTCTGGAGGAGGCGGCTCCGGAGGCTCTCCTGCCAGAATGGCTGG AAATGGAGGAGATGCTGCTCTGGCTCTGCTGCTGCTGGATAGACTGAA TCAGCTGGAAAGCAAAATGAGCGGAAAAGGACAGCAGCAGCAGGGAC AAACAGTGACAAAGAAATCTGCTGCTGAAGCCAGCAAGAAACCAAGA CAGAAAAGAACAGCCACAAAAGCCTACAATGTGACACAGGCCTTTGG AAGAAGGGGACCTGAACAGACACAGGGAAATTTTGGAGATCAGGAAC TGATCAGACAGGGAACAGATTACAAACACTGGCCTCAGATCGCCCAGT TTGCCCCATCTGCCTCTGCCTTCTTTGGAATGAGCAGAATTGGAATGGA AGTGACACCTTCTGGAACATGGCTGACATACACAGGAGCCATCAAACT GGATGATAAAGATCCAAATTTTAAAGATCAGGTGATTCTGCTGAATAA ACACATTGATGCCTACAAAACATTTCCACCAACAGAACCAAAGAAAGA TAAATTCAAAGCTGCTATGGTGACAAACAACACATTTACACTGAAAGT GCCTCATGTGGGAGAAATTCCTGTGGCTTACAGAAAAGTGCTGCTGAA AACAATTCAACCAAGAGTGGAAAAATACCTGTTTGATGAATCTGGAGA ATTTAAACTTTCTGAAGTGGGACCTGAACACTCTCTTGCTGAATACTAC ATTTTCTTTGCTTCTTTTTACTATAAGAGGAATGGATTTGCATACGCAA ATAGAAATAGATTTCTGTACATTATTAAACTGATTTTTCTGTGGCTGCT GTGGCCTGTGACACTGGCTTGCTTTGTGCTGGCTGCTGTGTACAGAATA AATTGGATAACAGGAGGAATTGCAATTGCAATGGCATGCTTGGTGGGA TTGATGTGGTTGTCTTACTTTATTGCTTCTTTTAGACTGTTTTACAACTC TTTTCACACAACTGATCCATCTTTTCTGGGAAGATACATGTCTGCTCTT TTTGCTGATGATTTAAATCAGTTAACAGGATATCACACAGATTTTTCTT CTGAAATCATTGGATACCAGTTGATGTGTCAACCAATTTTGTTGGCTGA AGCTGAATTGGCAAAAAACGTGTCTTTGATTCTTGGAACAGTTTCTTGG AATCTTAAGAAAAACGGACTGGGAAGATGCGATATTAAAGATCTGCCA AAAGAAATTACAGTGGCAACAAGCAGAACACTGAGCTACTACAAACT GGGAGCAAGCCAGAGAGTGGCATACAGATCCTACTTATTATCTGCTGG

			AATTTTTGGAGCTATCACAGATGTGTTTTACAAAGAAAACTCATACAA
			AGTGCCAACAGACAATTACATAACAACATACGCTAGAATGGCTGCTCC
			AAAAGAAATCATCTTCCTTGAAGGAGAAACACTTTTTGGAGATGATAC
			AGTGATTGAAGTGGCAATTATTCTGGCATCTTTTTTCTGCATCCACAAGA
			AGAAGGGGAGGAGGATCCGGTGGTGGCGGCAGCGGCGGCGAACAGTA
			CATTAAATGGCCTTGGTACATTTGGCTTGGATTTATTGCAGGATTAATT
			GCAATTGTGATGGTGACAAATTATGTTATGTTGTATGACATCATGTTGTT
			CTTGTTTAAAAGGATGTTGTTCTTGTGGAAGCTGTTGTAAATTTGATGA
			AGATGATTCTGAACCTGTGTTAAAAGGAGTGAAATTGCATTACACATG
			ATGACTCGAGCTGGTACTGCATGCACGCAATGCTAGCTGCCCCTTTCCC
			GTCCTGGGTACCCCGAGTCTCCCCCGACCTCGGGTCCCAGGTATGCTCC
			CACCTCCACCTGCCCCACTCACCACCTCTGCTAGTTCCAGACACCTCCC
			AAGCACCGCAGCAATGCAGCTCAAAACGCTTAGCCTAGCCACACCCCCA
			CGGGAAACAGCAGTGATTAACCTTTAGCAATAAACGAAAGTTTAACTA
			AGCTATACTAACCCCAGGGTTGGTCAATTTCGTGCCAGCCACACCCTG
			GAGCTAGCAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGCATATGA
			CTAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
			AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA **(SEQ ID NO: RS C7n2full)**
RS-C8	dEarI-hAg		ATTCTTCTGGTCCCCACAGACTCAGAGAGAACCC
RS-C8	Kozak		GCCACC
RS-C8	SEC	MFVFLVLLPLVSSQCVNLT	ATGTTTGTTTTTCTTGTTTTACTTCCTTTAGTCTCTTCTCAGTGTGTCAAT TTGACA
RS-C8	RS-C8	GGSGGGGSGGSPARMAGNGGDAAL ALLLLDRLNQLESKMSGKGQQQQG QTVTKKSAAEASKKPRQKRTATKA YNVTQAFGRRGPEQTQGNFGDQELI RQGTDYKHWPQIAQFAPSASAFFGM SRIGMEVTPSGTWLTYTGAIKLDDK DPNFKDQVILLNKHIDAYKTFPPTEP KKDKFRACMVTNNTFTLKVPHVGEI PVAYRKVLLKTIQPRVEKYLFDESG EFKLSEVGPEHSLAEYYIFFASFYYK	GGCGGCTCTGGAGGAGGCGGCTCCGGAGGCTCTCCTGCCAGAATGGCT GGAAATGGAGGAGATGCTGCTCTGGCTCTGCTGCTGGATAGACTG AATCAGCTGGAAAGCAAAATGAGCGGAAAAGGACAGCAGCAGCAGGG ACAAACAGTGACAAAGAAATCTGCTGCTGAAGCCAGCAAGAACCAA GACAGAAAAGAACAGCCACAAAAGCCTACAATGTGACACAGGACCTTT GGAAGAAGGGGACCTGAACAGACACAGGGAAATTTTGGAGATCAGGA ACTGATCAGACAGGGAACAGATTACAAACACTGGCCTCAGATCGCCCA GTTTGCCCCATCTGCCTTCTTTGGAATGAGCAGAATTGGAATG GAAGTGACACCTTCTGGAACATACACAGGAGCCATCAAA CTGGATGATAAAGATCCAAATTTTAAAGATCAGGTGATTCTGCTGAAT

		RCFHTTDPSFLGRYMSALFADDLNQ LTGYHTDFSSEIIGYQLMCQPILLAE AELAKNVSLILGTVSWNLKKRYLLS AGIFGAITDVFYKENSYKVPTDNYIT TYARMAAPKEIIFLEGETLFGDDTVI EVAIILASFSASTRRRGKLLEQWNLV IGFNRNRFLYIIKLIFLWLLWPVTLA CFVLAAVYSELVIGAVILRGHLRIAG HHLGRTVATSRTLSYYKLGASQRVK RYSGLMWLSYFARYAGGSGGGGSG G **(SEQ ID NO: RS C8p2)**	AAACACATTGATGCCTACAAAACATTTCCACCAACAGAACCAAAGAAA GATAAATTTAGAGCTTGCATGGTGACAAACAACACACATTTACACTGAAA GTGCCTCATGTGGGAGAAATTCCTGTGGCTTACAGAAAAGTGCTGCTG AAAACAATTCAACCAAGAGTGGAAAAATACCTGTTTGATGAATCTGGA GAATTTAAACTTTCTGAAGTGGGACCTGAACACTCTCTTGCTGAATACT ACATTTTCTTTGCTTCTTTTTACTATAAAAGATGTTTTCACACAACTGAT CCATCTTTTTCTGGGAAGATACATGTCTGCTCTTTTTGCTGATGATTTAA ATCAGTTAACAGGATATCACACAGATTTTTCTTCTGAAATCATTGGATA CCAGTTGATGTGTCAACCAATTTTGTTGGCTGAAGCTGAATTGGCAAA AAACGTGTCTTTGATTCTTGGAACAGTTTCTTGGAATCTTAAAAAGAGA TACTTATTATCTGCTGGAATTTTTTGGAGCTATCACAGATGTGTTTTACA AAGAAAACTCATACAAAGTGCCAACAGACAATTACATAACAACATAC GCCAGAATGGCTGCTCCAAAAGAAATCATCTTCCTTGAAGGAGAAACA CTTTTTGGAGATGATACAGTGATTGAAGTGGCAATTATTCTGGCATCTT TTTCTGCATCCACAAGAAGAGGGAAAACTGCTGGAACAGTGGAATC TTGTGATTGGATTTAATAGAAATAGATTTCTTTACATTATTAAATTGAT TTTTCTTTGGCTTCTTTGGCCTGTGACACTTGCTTGCTTTGTGCTTGCTG CTGTGTACTCTGAACTGGTGATTGGAGCTGTGATTCTGAGAGGACACC TGAGAATTGCTGGACACCACCTGGGAAGAACAGTGGCAACATCAAGA ACACTTTCTTACTACAAACTGGGAGCTTCTCAGAGAGTGAAAAGATAC TCTGGCCTGATGTGGCTGAGCTACTTTGCTAGATATGCTGGAGGATCCG GTGGTGGCGGCAGCGGCGGC **(SEQ ID NO: RS C8n2)**
RS-C8	TM	EQYIKWPWYIWLGFIAGLIAIVMVTI MLCCMTSCCSCLKGCCSCGSCCKFD EDDSEPVLKGVKLHYT**	GAACAGTACATTAAATGGCCTTGGTACATTTGGCTTGGATTTATTGCAG GATTAATTGCAATTGTGATGGTGACAATTATGTTATGTTGTATGACATC ATGTTGTTCTTGTTTAAAAGGATGTTGTTCTTGTGGAAGCTGTTGTAAA TTTGATGAAGATGATTCTGAACCTGTGTTAAAAGGAGTGAAATTGCAT TACACATGATGA
RS-C8			CTCGAG
RS-C8	F element		CTGGTACTGCATGCACGCAATGCTAGCTGCCCTTTCCCGTCCTGGGTA CCCCGAGTCTCCCCCGACCTCGGGTCCCAGGTATGCTCCCACCTCCACC TGCCCCACTCACCACCTCTGCTAGTTCCAGACACCTCC

RS-C8	I element		CAAGCACGCAGCAATGCAGCTCAAAACGCTTAGCCTAGCCACACCCCC ACGGGAAACAGCAGTGATTAACCTTTAGCAATAAACGAAAGTTTAACT AAGCTATACTAACCCCAGGGTTGGTCAATTTCGTGCCAGCCACACC
RS-C8			CTGGAGCTAGC
RS-C8	PolyA		AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGCATATGACTAAAAAA AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAAAA
RS-C8	FullSeq	**C8p2full)**	ATTCTTCTGGTCCCCACAGACTCAGAGAGAACCCGCCACCATGTTTGTT TTTCTTGTTTTACTTCCTTTAGTCTCTTCTCAGTGTGTCAATTTGACAGG CGGCTCTGGAGGAGGCGGCTCCGGAGGCTCTCCTGCCAGAATGGCTGG AAATGGAGGAGATGCTGCTCTGGCTCTGCTGCTGCTGGATAGACTGAA TCAGCTGGAAAGCAAAATGAGCGGAAAGGACAGCAGCAGCAGGGAC AAACAGTGACAAAGAAATCTGCTGCTGAAGCCAGCAAGAAACCAAGA CAGAAAAGAACAGCCACACAAAAGCCTACAATGTGACACAGGCCTTTGG AAGAAGGGGACCTGAACAGACACAGGAAATTTTGGAGATCAGGAAC TGATCAGACAGGGAACAGATTACAAACACTGGCCTCAGATCGCCCAGT TTGCCCCATCTGCCTCTGCCTTCTTTGGAATGAGCAGAATTGGAATGGA AGTGACACCTTCTGGAACATGGCTGACATACACAGGAGCCATCAAACT GGATGATAAAGATCCAAATTTTAAAGATCAGGTGATTCTGCTGAATAA ACACATTGATGCCTACAAAACATTTCCACCAACAGAACCAAAGAAAGA TAAATTTAGAGCTTGCATGGTGACAAACAACACATTTACACTGAAAGT GCCTCATGTGGGAGAAATTCCTGTGGCTTACAGAAAAGTGCTGCTGAA AACAATTCAACCAAGAGTGGAAAAATACCTGTTTGATGAATCTGGAGA ATTTAAACTTTCTGAAGTGGGACCTGAACACTCTCTTGCTGAATACTAC ATTTTCTTTGCTTCTTTTACTATAAAAGATGTTTTCACACAACTGATCC ATCTTTTCTGGGAAGATACATGTCTGCTCTTTTTGCTGATGATTTAAAT CAGTTAACAGGATATCACACAGATTTTTCTTCTGAAATCATTGGATACC AGTTGATGTGTCAACCAATTTTGTTGGCTGAAGCTGAATTGGCAAAAA ACGTGTCTTTGATTCTTGGAACAGTTTCTTGGAATCTTAAAAAGAGATA CTTATTATCTGCTGGAATTTTTGGAGCTATCACAGATGTGTTTTACAAA GAAAACTCATACAAAGTGCCAACAGACAATTACATAACAACATACGCC AGAATGGCTGCTCCAAAAGAAATCATCTTCCTTGAAGGAGAAACACTT TTTGGAGATGATACAGTGATTGAAGTGGCAATTATTCTGGCATCTTTTT
		MFVFLVLLPLVSSQCVNLTGGSGGG	
		GSGGSPARMAGNGGDAALALLLLD	
		RLNQLESKMSGKGQQQGQTVTKK	
		SAAEASKKPRQKRTATKAYNVTQA	
		FGRRGPEQTQGNFGDQELIRQGTDY	
		KHWPQIAQFAPSASAFFGMSRIGME	
		VTPSGTWLTYTGAIKLDDKDPNFKD	
		QVILLNKHIDAYKTFPPTEPKKDKFR	
		ACMVTNNTFTLKVPHVGEIPVAYRK	
		VLLKTIQPRVEKYLFDESGEFKLSEV	
		GPEHSLAEYYIFFASFYYKRCFHTTD	
		PSFLGRYMSALFADDLNQLTGYHTD	
		FSSEIIGYQLMCQPILLAEAELAKNV	
		SLILGTVSWNLKKRYLLSAGIFGAIT	
		DVFYKENSYKVPTDNYIITTYARMA	
		APKEIIFLEGETLFGDDTVIEVAIILAS	
		FSASTRRRGKLLEQWNLVIGFNRNR	
		FLYIIKLIFLWLLWPVTLACFVLAAV	
		YSELVIGAVILRGHLRIAGHHLGRTV	
		ATSRTLSYYKLGASQRVKRYSGLM	
		WLSYFARYAGGSGGGSGGGEQYIK	
		WPWYIWLGFIAGLIAIVMVTIMLCC	
		MTSCCSCLKGCCSCGSCCKFDEDDS	
		EPVLKGVKLHYT** (**SEQ ID NO: RS**	

		CTGCATCCACAAGAAGAAGGGGAAAACTGCTGGAACAGTGGAATCTT
		GTGATTGGATTTAATAGAAATAGATTTCTTTACATTATTAAATTGATTT
		TTCTTTGGCTTCTTTGGCCTGTGACACTTGCTTGCTTTGTGCTTGCTGCT
		GTGTACTCTGAACTGGTGATTGGAGCTGTGATTCTGAGAGGACACCTG
		AGAATTGCTGGACACCACCTGGGAAGAACAGTGGCAACATCAAGAAC
		ACTTTCTTACTACAAACTGGGAGCTTCTCAGAGAGTGAAAAGATACTC
		TGGCCTGATGTGGCTGAGCTACTTTGCTAGATATGCTGGAGGATCCGG
		TGGTGGCGGCAGCGGCGGCGAACAGTACATTAAATGGCCTTGGTACAT
		TTGGCTTGGATTTATTGCAGGATTAATTGCAATTGTGATGGTGACAATT
		ATGTTATGTTGTATGACATCATGTTGTTCTTGTTTAAAAGGATGTTGTT
		CTTGTGGAAGCTGTTGTAAATTTGATGAAGATGATTCTGAACCTGTGTT
		AAAAGGAGTGAAATTGCATTACACATGATGACTCGAGCTGGTACTGCA
		TGCACGCAATGCTAGCTGCCCCTTTCCCGTCCTGGGTACCCCGAGTCTC
		CCCCGACCTCGGGTCCCAGGTATGCTCCCACCTCCACCTGCCCCACTCA
		CCACCTCTGCTAGTTCCAGACACCTCCCAAGCACGCAGCAATGCAGCT
		CAAAACGCTTAGCCTAGCCACACCCCCACGGGAAACAGCAGTGATTAA
		CCTTTAGCAATAAACGAAAGTTTAACTAAGCTATACTAACCCCAGGGT
		TGGTCAATTTCGTGCCAGCCACACCCTGGAGCTAGCAAAAAAAAAAAAA
		AAAAAAAAAAAAAAAAAAAAGCATATGACTAAAAAAAAAAAAAAAAAA
		AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
		AAAAAAA **(SEQ ID NO: RS C8n2full)**

Table 16. Highly predicted epitopes within the string sequences of RS C5 - RS C8 strings.

Peptide (1)	Alleles (1)	Peptide (2)	Alleles (2)
AADLDDFS	HLA-A01:01	LLNVPLHGTI	HLA-B51:01
AADLDDFSKQ	HLA-A01:01	LLNVPLHGTIL	HLA-A02:07
AAEASKKPRQK	HLA-C02:02	LLPAADLDDF	HLA-B13:01
AGDSGFAA	HLA-C08:02	LLQFAYANRNR	HLA-A31:01;HLA-A74:01
AGDSGFAAYS	HLA-B46:01	LLWPVTLACFV	HLA-A02:01;HLA-A02:04;HLA-A02:07;HLA-A02:11
AGLPYGANKDG	HLA-C07:01	LLWPVTLACFVL	HLA-B48:01
AGNGGDAALAL	HLA-C01:02;HLA-C03:02;HLA-C07:04;HLA-C12:03	LMWLSYFIASF	HLA-B35:01
AIILASFSAS	HLA-C17:01	LNVPLHGTI	HLA-B14:02
AIKLDDKD	HLA-E01:01	LNVPLHGTIL	HLA-C15:02;HLA-G01:01;HLA-G01:04
AIKLDDKDPNF	HLA-E01:01	LPKEITVATS	HLA-B54:01;HLA-B55:01;HLA-B55:02;HLA-B56:01
AIVLQLPQGTTL	HLA-B15:09	LPKEITVATSR	HLA-A33:03;HLA-A34:01
ALNTPKDHI	HLA-A02:02;HLA-B13:01;HLA-B13:02	LPQGTTLP	HLA-A25:01
AMACLVGLMW	HLA-A32:01	LPQGTTLPK	HLA-A30:01;HLA-A34:02
APKEIIFLEGET	HLA-B81:01	LPQGTTLPKG	HLA-B55:01
APSASAFFG	HLA-B35:02	LPQRQKKQQTV	HLA-B07:04;HLA-B42:01
ARMAGNGGDA	HLA-C07:01	LPYGANKDGII	HLA-B51:01;HLA-B55:01;HLA-B81:01;HLA-C02:02
ARMAGNGGDAA	HLA-B39:06	LPYGANKDGIIW	HLA-B35:01;HLA-B35:07;HLA-B51:01;HLA-B53:01
ARMAGNGGDAAL	HLA-B15:09;HLA-B27:05	LQLPQGTTLPK	HLA-A03:01;HLA-A11:01;HLA-A11:02
ASAFFGMSRI	HLA-B49:01	LQQSMSSA	HLA-B39:06
ASKKPRQKRTA	HLA-E01:01	LSYFIASFRL	HLA-A03:01;HLA-A68:02;HLA-B15:17;HLA-B57:01;HLA-B58:02;HLA-C15:02
ASKKPRQKRTAT	HLA-E01:01	LSYYKLGASQR	HLA-A31:01
ASQRVAGDSGF	HLA-B57:03	LTRPLLESEL	HLA-B57:01;HLA-B57:03
ATKAYNVTQAF	HLA-B57:01;HLA-B57:03;HLA-B58:02	LTYTGAIK	HLA-A03:01;HLA-A34:02
ATSRTLSYYKL	HLA-B57:03	LWPVTLACFV	HLA-C04:01
AVILRGHLRIA	HLA-B08:01	LWPVTLACFVL	HLA-A23:01;HLA-A24:07;HLA-C04:01
AVYRINWIT	HLA-B48:01	MAGNGGDAALAL	HLA-B35:02

AYKTFPPTEP	HLA-C18:01	MEVTPSGTWLT	HLA-B40:06
AYKTFPPTEPK	HLA-A31:01;HLA-A33:03	MWLSYFIASFR	HLA-A31:01;HLA-A33:03
AYKTFPPTEPKK	HLA-A30:01	MWSFNPETNI	HLA-A24:02
AYNVTQAFGRR	HLA-A31:01	MWSFNPETNIL	HLA-A24:02
AYSRYRIGNYK	HLA-A30:01	MWSFNPETNILL	HLA-A24:02
DAYKTFPPTE	HLA-B51:01	NFKDQVILLN	HLA-A24:07
DDFSKQLQQSM	HLA-A33:01	NFKDQVILLNK	HLA-A30:01;HLA-A33:01;HLA-A33:03
DDKDPNFKD	HLA-B35:02	NLVIGFLFLTW	HLA-B44:02;HLA-B44:03
DDKDPNFKDQV	HLA-A33:01	NPANNAAIVLQL	HLA-B35:01
DDKDPNFKDQVI	HLA-B14:01	NPETNILLNVPL	HLA-B81:01
DHIGTRNP	HLA-B39:06	NRFLYIIKLIFL	HLA-B27:05;HLA-C18:01
DHSSSSDNIA	HLA-B39:06	NSSRNSTPG	HLA-B58:01
DIKDLPKEITVA	HLA-A26:01	NTDHSSSSDNI	HLA-A01:01
DKDPNFKDQVI	HLA-B38:02	NVPLHGTI	HLA-B14:02;HLA-B51:01;HLA-C01:02
DKKKKADE	HLA-E01:01	NWITGGIAIA	HLA-B39:06
DLPKEITVATSR	HLA-A68:01	PARMAGNGGD	HLA-E01:01
DLSPRWYF	HLA-B50:01	PETNILLNVPL	HLA-C06:02
DLSPRWYFYYL	HLA-A02:04;HLA-A33:01	PHVGEIPV	HLA-B15:09
DPSFLGRYMSA	HLA-B54:01	PKDHIGTR	HLA-A33:01
DSGFAAYSRY	HLA-A01:01;HLA-A25:01;HLA-A26:01	PKEIIFLE	HLA-A33:01;HLA-B57:03
DSGFAAYSRYR	HLA-A33:01;HLA-A66:01;HLA-A68:01	PKKDKKKKA	HLA-C01:02
DSNGTITVEEL	HLA-C04:03	PKKDKKKKADE	HLA-C07:01
DYKHWPQI	HLA-A23:01	PLLESELVIG	HLA-A26:01
DYKHWPQIA	HLA-A33:01	PPTEPKKD	HLA-B14:01
DYKHWPQIAQ	HLA-A33:03	PPTEPKKDK	HLA-B81:01
EAGLPYGAN	HLA-A34:01	PQGTTLPK	HLA-A11:02
EIPVAYRKVLL	HLA-B14:02;HLA-G01:01;HLA-G01:03;HLA-G01:04	PQIAQFAPSASA	HLA-B39:06
EITVATSRTLSY	HLA-A36:01	PSFLGRYMSAL	HLA-C03:02
ELIRQGTDYK	HLA-A34:01	PTEPKKDK	HLA-A11:02

EPKKDKKKKADE	HLA-E01:01	PTEPKKDKK	HLA-B49:01
EQWNLVIGFLF	HLA-A24:02;HLA-B27:05	PVAYRKVL	HLA-B07:04;HLA-B42:01;HLA-B46:01
EQWNLVIGFLFL	HLA-A68:02	PYGANKDGIIW	HLA-A24:02;HLA-A24:07
ESELVIGAVIL	HLA-A01:01	QASSRSSSRSR	HLA-A33:01
ESELVIGAVILR	HLA-A68:01	QGNFGDQELI	HLA-B44:02
ETNILLNVPLH	HLA-A26:01	QGTTLPKGF	HLA-B44:02
ETQALPQRQKK	HLA-A33:03;HLA-A34:02	QLMCQPIL	HLA-B08:01
EVGPEHSLAE	HLA-C07:04	QQGQTVTKK	HLA-A11:02;HLA-A30:02
EVTPSGTWLT	HLA-A68:02	QQQGQTVTKK	HLA-A11:02
FAAYSRYRIGNY	HLA-A26:01	QQQQGQTVTKK	HLA-A11:02
FAPSASAFFGM	HLA-A02:07;HLA-C02:02;HLA-C03:03;HLA-C03:04;HLA-C16:01	QRQKKQQTVTL	HLA-C18:01
FARTRSMW	HLA-B53:01	QRVAGDSGFAAY	HLA-B27:05
FDESGEFK	HLA-A11:02	QTVTLLPAA	HLA-A02:05;HLA-A02:06
FGMSRIGM	HLA-C12:03;HLA-C16:01	QVILLNKHIDAY	HLA-A26:01
FLWLLWPVTLA	HLA-A02:01;HLA-A02:04;HLA-A02:07;HLA-A02:11;HLA-B54:01	RCDIKDLPK	HLA-A36:01
FLYIIKLIFLWL	HLA-C17:01	RFLYIIKLIFLW	HLA-A24:07;HLA-B44:03;HLA-B57:01
FPPTEPKKDKKK	HLA-C07:01	RGHLRIAGHHL	HLA-B48:01
FRLFARTRSM	HLA-B14:01	RGPEQTQGNF	HLA-B37:01
FVLAAVYRINW	HLA-B57:01;HLA-B57:03	RIGMEVTPSGTW	HLA-A32:01
FYYLGTGPEAG	HLA-C14:02	RINWITGGIA	HLA-B54:01
FYYLGTGPEAGL	HLA-C03:03;HLA-C07:02;HLA-C14:02;HLA-C14:03;HLA-C18:01	RINWITGGIAI	HLA-B13:02;HLA-B27:05;HLA-B44:02;HLA-B55:02
GANKDGIIWVA	HLA-B40:06;HLA-B54:01	RINWITGGIAIA	HLA-B55:02;HLA-B56:01
GDAALALLLL	HLA-B40:02	RLFARTRSMWSF	HLA-A32:01;HLA-B37:01;HLA-B48:01
GDSGFAAY	HLA-A36:01	RMAGNGGDAA	HLA-A02:02
GFLFLTWICL	HLA-G01:04	RMAGNGGDAAL	HLA-A02:02;HLA-A32:01;HLA-B13:01;HLA-B15:01;HLA-B48:01
GGDAALALLLL	HLA-B14:01	RNPANNAAIVL	HLA-A03:01;HLA-B07:04;HLA-G01:01;HLA-G01:03;HLA-G01:04

GHHLGRCD	HLA-B15:10	RNRFLYIIKLI	HLA-B14:01
GIAIAMACL	HLA-G01:03	RNRFLYIIKLIF	HLA-B14:01
GLPYGANK	HLA-A03:01;HLA-A11:02	RPLLESELVI	HLA-B55:01;HLA-B81:01
GLPYGANKDGI	HLA-B13:01	RPLLESELVIGA	HLA-B55:01;HLA-B55:02
GNGGDAALAL	HLA-G01:01	RQKKQQTVTLL	HLA-B13:02;HLA-B15:01;HLA-B48:01;HLA-B52:01
GNGGDAALALLL	HLA-G01:04	RQKRTATKAYNV	HLA-B13:02
GRCDIKDLPKE	HLA-B14:01	RSMWSFNPETNI	HLA-B58:02
GSRGGSQASSR	HLA-A31:01	RSSSRSRNSSR	HLA-A31:01
GSSRGTSPAR	HLA-A68:02	SAAEASKKPRQK	HLA-A11:02;HLA-B15:02
GTILTRPLLE	HLA-A68:02	SAFFGMSRIGM	HLA-C12:03
GTITVEELKKL	HLA-B57:01	SAFFGMSRIGME	HLA-C12:03
GTRNPANNAA	HLA-A30:01	SELVIGAVILR	HLA-A34:01;HLA-B44:02
HGTILTRP	HLA-A02:02;HLA-A02:07;HLA-B35:03	SEVGPEHSLAE	HLA-C07:04
HGTILTRPL	HLA-B15:09;HLA-B15:10;HLA-B35:03	SMWSFNPET	HLA-A02:01;HLA-A02:04;HLA-A02:11
HGTILTRPLL	HLA-B14:02;HLA-B15:09;HLA-G01:04	SMWSFNPETNI	HLA-A02:01;HLA-A02:04;HLA-A02:11
HHLGRCDI	HLA-B38:01;HLA-B38:02	SSRGTSPARM	HLA-A30:01;HLA-C02:02
HIDAYKTFPP	HLA-B41:01	SSRNSTPGS	HLA-A30:01
HLRIAGHHLGR	HLA-A33:03	SSRNSTPGSSR	HLA-A33:03;HLA-A66:01
HSSSSDNI	HLA-B38:02	SYFIASFRLFAR	HLA-A31:01;HLA-A33:01
HSSSSDNIALL	HLA-A68:02;HLA-B38:01;HLA-B38:02;HLA-B57:03;HLA-C05:01	TATKAYNVTQA	HLA-B54:01
HTTDPSFLGRYM	HLA-B57:01	TDHSSSSDNIAL	HLA-B35:02
HVGEIPVAYRK	HLA-A03:01;HLA-A11:01;HLA-A11:02;HLA-A31:01;HLA-A34:02;HLA-A68:01	TDPSFLGR	HLA-A34:02;HLA-A36:01;HLA-A66:01
HVGEIPVAYRKV	HLA-A68:02	TDPSFLGRYM	HLA-A36:01
IAQFAPSASA	HLA-B54:01;HLA-B55:02;HLA-B56:01	TDVFYKENSY	HLA-B18:01
IAQFAPSASAF	HLA-B46:01;HLA-C02:02;HLA-C03:02;HLA-C03:03;HLA-C03:04;HLA-C07:04;HLA-C12:02;HLA-C14:02;HLA-C16:01	TEGALNTPK	HLA-A11:02;HLA-A30:02;HLA-A36:01

IASFRLFA	HLA-C16:01	TEPKKDKKK	HLA-A34:02
IGMEVTPSGTW	HLA-A24:02;HLA-A32:01;HLA-B44:02;HLA-B53:01;HLA-B57:01;HLA-B58:01	TGAIKLDD	HLA-B14:01
IIKLIFLWLL	HLA-A33:01	TGGIAIAM	HLA-C07:04
IIKLIFLWLLW	HLA-B44:02;HLA-B57:01	TGPEAGLPYGA	HLA-A02:07
IIWVATEGA	HLA-A02:11	TILTRPLL	HLA-A30:01;HLA-B08:01;HLA-B14:02;HLA-B50:01;HLA-C03:02;HLA-C06:02;HLA-G01:01;HLA-G01:03;HLA-G01:04
IIWVATEGAL	HLA-C08:01	TILTRPLLE	HLA-C03:02
IKDLPKEITV	HLA-B18:01	TIQPRVEK	HLA-A23:01;HLA-A30:01
IKDLPKEITVA	HLA-C04:03	TITVEELKKLLE	HLA-B14:01
ILLNVPLHGTI	HLA-A02:07;HLA-B51:01	TKAYNVTQAF	HLA-B15:03
ILTRPLLESEL	HLA-A02:02;HLA-B27:05	TLACFVLAAVYR	HLA-A68:01
ITGGIAIAMA	HLA-A02:05;HLA-A68:02	TLLPAADLDDF	HLA-B38:02
ITVATSRTLSYY	HLA-A36:01	TLPKGFYA	HLA-A02:11
ITVEELKKLLE	HLA-B08:01	TLSYYKLGA	HLA-A02:03
IVLQLPQGTTL	HLA-A02:11;HLA-B38:01	TNILLNVPL	HLA-B15:09;HLA-G01:03
KAYNVTQAFGRR	HLA-A03:01;HLA-A31:01	TPGSSRGTSPA	HLA-B07:02;HLA-B55:01;HLA-B55:02;HLA-B56:01
KDGIIWVAT	HLA-B37:01	TPKDHIGTRNP	HLA-B55:01;HLA-B55:02
KDHIGTRNP	HLA-B41:01	TQALPQRQKK	HLA-A03:01;HLA-A11:02
KDLPKEITVA	HLA-B40:06	TRNPANNA	HLA-B39:06
KDLSPRWYFYY	HLA-A30:02	TRNPANNAAIVL	HLA-B15:09;HLA-B38:01
KEIIFLEGET	HLA-B40:06;HLA-B49:01	TSRTLSYYKL	HLA-B58:02;HLA-G01:04
KEITVATSRT	HLA-B40:02;HLA-E01:01	TSRTLSYYKLG	HLA-A02:01
KHWPQIAQFA	HLA-B39:06	TTDPSFLGRYMS	HLA-A01:01
KHWPQIAQFAP	HLA-B39:06	TTLPKGFYA	HLA-A02:06
KKDKKKKAD	HLA-E01:01	TVATSRTLS	HLA-B46:01
KKKADETQA	HLA-B15:03	VATEGALNTPK	HLA-A11:01;HLA-A34:02
KKKKADETQAL	HLA-B48:01	VEELKKLLEQW	HLA-B44:02

KLDDKDPNFKD	HLA-A02:07	VGEIPVAY	HLA-A33:01;HLA-A36:01;HLA-B15:03;HLA-B58:02
KLIFLWLLWPV	HLA-A02:04;HLA-A02:11	VGEIPVAYRK	HLA-A11:01
KPRQKRTATKA	HLA-B07:04;HLA-B55:01;HLA-B55:02;HLA-B56:01	VGLMWLSY	HLA-B46:01
KSAAEASKKPR	HLA-A74:01	VIGAVILRGHL	HLA-C04:03
KTFPPTEPKKD	HLA-B58:02	VILLNKHID	HLA-E01:01
KTFPPTEPKKDK	HLA-A11:01;HLA-A68:02	VLAAVYRINW	HLA-A32:01;HLA-B57:01
KVPTDNYI	HLA-B38:02	VPLHGTILTR	HLA-A33:01
KVPTDNYIT	HLA-G01:01	VTKKSAAEA	HLA-A02:05
LDDKDPNF	HLA-B37:01	VTLLPAADLD	HLA-A68:02
LDDKDPNFK	HLA-A11:02	VTQAFGRR	HLA-A66:01
LDRLNQLE	HLA-B14:01	WPVTLACF	HLA-B35:07
LESELVIGAV	HLA-B08:01;HLA-B49:01	WSFNPETNILL	HLA-B35:01;HLA-B50:01
LESELVIGAVIL	HLA-B40:01;HLA-B44:02;HLA-B44:03	YAEGSRGGSQA	HLA-A26:01
LFARTRSMW	HLA-A24:07;HLA-A32:01;HLA-B58:01	YANRNRFLYII	HLA-B51:01
LFARTRSMWSF	HLA-A24:07	YFYYLGTGPEA	HLA-B54:01;HLA-C14:02;HLA-C14:03
LGTGPEAGL	HLA-B15:09	YGANKDGII	HLA-C02:02
LHGTILTRP	HLA-B15:09;HLA-B15:10	YGANKDGIIW	HLA-B53:01;HLA-B57:01;HLA-B58:01
LHGTILTRPL	HLA-B15:09;HLA-B15:10	YIIKLIFLWLL	HLA-A02:01;HLA-A02:02;HLA-A02:04;HLA-A02:07;HLA-A02:11;HLA-A29:02;HLA-B13:02
LHGTILTRPLL	HLA-B15:09	YKLGASQRV	HLA-B15:03
LIFLWLLW	HLA-B57:01	YLGTGPEA	HLA-A02:01;HLA-B55:01;HLA-C03:03
LIFLWLLWPV	HLA-A02:04	YLGTGPEAG	HLA-A02:03
LIRQGTDYK	HLA-A30:01	YLGTGPEAGLPY	HLA-A01:01;HLA-A29:02;HLA-B46:01
LIRQGTDYKHW	HLA-A25:01;HLA-B57:01	YRINWITGGI	HLA-B27:05
LLESELVIGAV	HLA-A02:07	YRINWITGGIAI	HLA-B27:05
LLNKHIDAYKT	HLA-B58:02	YSRYRIGNYK	HLA-A30:01
LLNKHIDAYKTF	HLA-B48:01	YYKLGASQRV	HLA-C18:01

CLAIMS

WHAT IS CLAIMED IS:

1. A composition comprising:
   (i) a polypeptide comprising at least two of the following (a) a sequence comprising an epitope sequence from ORF1ab, (b) a sequence comprising an epitope sequence from membrane glycoprotein (M) and (c) a sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N);
   (ii) a polynucleotide encoding a polypeptide, wherein the polypeptide comprises at least two of the following (a) a sequence comprising an epitope sequence from ORF1ab, (b) a sequence comprising an epitope sequence from membrane glycoprotein (M) and (c) a sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N);
   (iii) a T cell receptor (TCR) or a T cell comprising the TCR, wherein the TCR binds to an epitope sequence of the polypeptide in complex with a corresponding HLA class I or class II molecule;
   (iv) an antigen presenting cell comprising (i) or (ii); or
   (v) an antibody or B cell comprising the antibody, wherein the antibody binds to an epitope sequence of the polypeptide; and
   a pharmaceutically acceptable excipient.
2. The composition of claim 1, wherein the polypeptide comprises (a) a sequence comprising an epitope sequence from ORF1ab, (b) a sequence comprising an epitope sequence from membrane glycoprotein (M) and (c) a sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N).
3. The composition of claim 1, wherein the sequence comprising an epitope sequence from ORF1ab is C-terminal to the sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N).
4. The composition of claim 1, wherein the sequence comprising an epitope sequence from ORF1ab is N-terminal to the sequence comprising an epitope sequence from membrane glycoprotein (M).
5. The composition of claim 1, wherein the sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N) is N-terminal to the sequence comprising an epitope sequence from membrane glycoprotein (M).
6. The composition of claim 1, wherein the polypeptide comprises (a) 2, 3, 4, 5, 6, 7, 8, 9 or 10 or more epitope sequences from ORF1ab, (b) a sequence comprising an epitope sequence from membrane glycoprotein (M) and (c) a sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N).
7. The composition of claim 1, wherein the epitope sequence from ORF1ab is an epitope sequence from a non-structural protein (NSP).

8. The composition of claim 7, wherein the non-structural protein (NSP) is selected from the group consisting of NSP1, NSP2, NSP3, NSP4 and combinations thereof.
9. The composition of claim 1, wherein the polypeptide comprises a sequence comprising an epitope sequence from NSP1, a sequence comprising an epitope sequence from NSP2, a sequence comprising an epitope sequence from NSP3 and a sequence comprising an epitope sequence from NSP4.
10. The composition of claim 1, wherein the epitope sequence from ORF1ab is selected from the group consisting of YLFDESGEFKL, YLFDESGEF, FGDDTVIEV, QLMCQPILL, TTDPSFLGRY, PTDNYITTY, PSFLGRY, AEAELAKNV, KTIQPRVEK and any combination thereof.
11. The composition of claim 1, wherein the epitope sequence from nucleocapsid glycoprotein (N) is LLLDRLNQL.
12. The composition of claim 1, wherein the epitope sequence from membrane phosphoprotein (M) is VATSRTLSY.
13. The composition of claim 1, wherein the polypeptide comprises an epitope sequence from nucleocapsid glycoprotein (N) that is LLLDRLNQL and an epitope sequence from membrane phosphoprotein (M) that is VATSRTLSY.
14. The composition of claim 1, wherein the polypeptide comprises (a) each of the following epitope sequences from ORF1ab: YLFDESGEFKL, YLFDESGEF, FGDDTVIEV, QLMCQPILL, TTDPSFLGRY, PTDNYITTY, PSFLGRY, AEAELAKNV, KTIQPRVEK; (b) an epitope sequence from nucleocapsid glycoprotein (N) that is LLLDRLNQL; and (c) an epitope sequence from membrane phosphoprotein (M) that is VATSRTLSY.
15. The composition of claim 1, wherein the sequence comprising an epitope sequence from ORF1ab is selected from the group consisting of the following sequences or fragments thereof:
MVTNNTFTLKVPHVGEIPVAYRKVLLKTIQPRVEKYLFDESGEFKLSEVGPEHSLAEYYIFF ASFYY;
MVTNNTFTLKVPHVGEIPVAYRKVLLKTIQPRVEKYLFDESGEFKLSEVGPEHSLAEY;
APKEIIFLEGETLFGDDTVIEVAIILASFSAST;
APKEIIFLEGETLFGDDTVIEV;
HTTDPSFLGRYMSALFADDLNQLTGYHTDFSSEIIGYQLMCQPILLAEAELAKNVSLILGTV SWNL;
TTDPSFLGRYMSALFADDLNQLTGYHTDFSSEIIGYQLMCQPILLAEAELAKNVSLILGTVS WNL;
LLSAGIFGAITDVFYKENSYKVPTDNYITTY; and combinations thereof.
16. The composition of claim 1, wherein the sequence comprising an epitope sequence from membrane glycoprotein (M) is selected from the group consisting of the following sequences or fragments

thereof:
ADSNGTITVEELKKLLEQWNLVIGFLFLTWICLLQFAYANRNRFLYIIKLIFLWLLWPVTLA
CFVLAAVYRINWITGGIAIAMACLVGLMWLSYFIASFRLFARTRSMWSFNPETNILLNVPL
HGTILTRPLLESELVIGAVILRGHLRIAGHHLGRCDIKDLPKEITVATSRTLSYYKLGASQRV
AGDSGFAAYSRYRIGNYKLNTDHSSSSDNIALLVQ;
FAYANRNRFLYIIKLIFLWLLWPVTLACFVLAAVYRINWITGGIAIAMACLVGLMWLSYFI
ASFRLF;
LGRCDIKDLPKEITVATSRTLSYYKLGASQRVA;
KLLEQWNLVIGF;
NRNRFLYIIKLIFLWLLWPVTLACFVLAAVY;
SELVIGAVILRGHLRIAGHHLGR;
VATSRTLSYYKLGASQRV;
GLMWLSYF; and combinations thereof.

17. The composition of claim 1, wherein the sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N) is selected from the group consisting of the following sequences or fragments thereof:
KDLSPRWYFYYLGTGPEAGLPYGANKDGIIWVATEGALNTPKDHIGTRNPANNAAIVLQL
PQGTTLPKGFYAEGSRGGSQASSRSSSRSRNSSRNSTPGSSRGTSPARMAGNGGDAALALL
LLDRLNQLESKMSGKGQQQQGQTVTKKSAAEASKKPRQKRTATKAYNVTQAFGRRGPE
QTQGNFGDQELIRQGTDYKHWPQIAQFAPSASAFFGMSRIGMEVTPSGTWLTYTGAIKLD
DKDPNFKDQVILLNKHIDAYKTFPPTEPKKDKKKKADETQALPQRQKKQQTVTLLPAADL
DDFSKQLQQSMSSADSTQA;
RMAGNGGDAALALLLLDRLNQLESKMSGKGQQQ;
YKHWPQIAQFAPSASAFFGMSRIGMEVTPSGTWLTYTGAIKLDDKDPNFKDQVILLNKHID
AYKTFP;
SPARMAGNGGDAALALLLLDRLNQLESKMSGKGQQQQGQTVTKKSAAEASKKPRQKRT
ATKAYNVTQAFGRRGPEQTQGNFGDQELIRQGTDYKHWPQIAQFAPSASAFFGMSRIGME
VTPSGTWLTYTGAIKLDDKDPNFKDQVILLNKHIDAYKTFPPTEPKKDK and combinations thereof.

18. The composition of claim 1, wherein the polypeptide comprises one or more linker sequences.

19. The composition of claim 18, wherein the one or more linker sequences are selected from the group consisting of GGSGGGGSGG, GGSLGGGGSG.

20. The composition of claim 18, wherein the one or more linker sequences comprise cleavage sequences.

21. The composition of claim 20, wherein the one or more cleavage sequences are selected from the group consisting of FRAC, KRCF, KKRY, ARMA, RRSG, MRAC, KMCG, ARCA, KKQG, YRSY, SFMN, FKAA, KRNG, YNSF, KKNG, RRRG, KRYS, and ARYA.
22. The composition of claim 1, wherein the polypeptide comprises a transmembrane domain sequence.
23. The composition of claim 22, wherein the transmembrane domain sequence is C-terminal to the sequence comprising an epitope sequence from ORF1ab, the sequence comprising an epitope sequence from membrane glycoprotein (M) and the sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N).
24. The composition of claim 22, wherein the transmembrane domain sequence is EQYIKWPWYIWLGFIAGLIAIVMVTIMLCCMTSCCSCLKGCCSCGSCCKFDEDDSEPVLKG VKLHYT.
25. The composition of claim 1, wherein the polypeptide comprises an SEC sequence.
26. The composition of claim 25, wherein the SEC sequence is N-terminal to the sequence comprising an epitope sequence from ORF1ab, the sequence comprising an epitope sequence from membrane glycoprotein (M) and the sequence comprising an epitope sequence from nucleocapsid phosphoprotein (N).
27. The composition of claim 25, wherein the SEC sequence is MFVFLVLLPLVSSQCVNLT.
28. The composition of claim 1, wherein the composition comprises the polynucleotide encoding the polypeptide.
29. The composition of claim 28, wherein the polynucleotide is an mRNA.
30. The composition of claim 28, wherein the polynucleotide comprises a codon optimized sequence for expression in a human.
31. The composition of claim 28, wherein the polynucleotide comprises a dEarI-hAg sequence.
32. The composition of claim 31, wherein the dEarI-hAg sequence is ATTCTTCTGGTCCCCACAGACTCAGAGAGAACCC, optionally wherein each T is a U.
33. The composition of claim 28, wherein the polynucleotide comprises a Kozak sequence.
34. The composition of claim 33, wherein the a Kozak sequences is GCCACC.
35. The composition of claim 28, wherein the polynucleotide comprises an F element sequence.
36. The composition of claim 35, wherein the F element sequence is a 3 UTR of amino-terminal enhancer of split (AES).
37. The composition of claim 35, wherein the F element sequence is CTGGTACTGCATGCACGCAATGCTAGCTGCCCCTTTCCCGTCCTGGGTACCCCGAGTCT CCCCCGACCTCGGGTCCCAGGTATGCTCCCACCTCCACCTGCCCCACTCACCACCTCTG CTAGTTCCAGACACCTCC, optionally wherein each T is a U.

38. The composition of claim 28, wherein the polynucleotide comprises an I element sequence.
39. The composition of claim 38, wherein the I element sequence is a 3' UTR of mitochondrially encoded 12S rRNA (mtRNR1).
40. The composition of claim 38, wherein the I element sequence is CAAGCACGCAGCAATGCAGCTCAAAACGCTTAGCCTAGCCACACCCCCACGGGAAAC AGCAGTGATTAACCTTTAGCAATAAACGAAAGTTTAACTAAGCTATACTAACCCCAGG GTTGGTCAATTTCGTGCCAGCCACACC, optionally wherein each T is a U.
41. The composition of claim 28, wherein the polynucleotide comprises a poly A sequence.
42. The composition of claim 41, wherein the poly A sequence is AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAGCATATGACTAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA, optionally wherein each T is a U.
43. The composition of claim 1, wherein each of the epitope sequences from the ORF1ab, the membrane glycoprotein, and the nucleocapsid phosphoprotein are from 2019 SARS-CoV-2.
44. The composition of claim 1, wherein one or more or each epitope elicits a T cell response.
45. The composition of claim 1, wherein one or more or each epitope has been observed by mass spectrometry as being presented by an HLA molecule.
46. The composition of claim 1, wherein the composition comprises (i) a polypeptide with at least 70%, 80%, 90% or 100% sequence identity to a sequence selected from the group consisting of RS C1p1full, RS C2p1full, RS C3p1full, RS C4p1full, RS C5p1, RS C5p2, RS C5p2full, RS C6p1, RS C6p2, RS C6p2full, RS C7p1, RS C7p2, RS C7p2full, RS C8p1, RS C8p2 and RS C8p2full; (ii) a polynucleotide encoding a polypeptide with at least 70%, 80%, 90% or 100% sequence identity to a sequence selected from the group consisting of RS C1p1full, RS C2p1full, RS C3p1full, RS C4p1full, RS C5p1, RS C5p2, RS C5p2full, RS C6p1, RS C6p2, RS C6p2full, RS C7p1, RS C7p2, RS C7p2full, RS C8p1, RS C8p2 and RS C8p2full; or (iii) a polynucleotide with at least 70%, 80%, 90% or 100% sequence identity to a sequence selected from the group consisting of SEQ ID NOs: RS C1n1, RS C2n1, RS C3n1, RS C4n1, RS C5n1, RS C6n1, RS C7n1, RS C8n1, RS C5n2, RS C6n2, RS C7n2, RS C8n2, RS C5n2full, RS C6n2full, RS C7n2full and RS C8n2full.
47. A pharmaceutical composition comprising the composition of any one of claims 1-46.
48. A pharmaceutical composition comprising:
    (i) a polypeptide comprising an epitope sequence of Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B and/or Table 16;
    (ii) a polynucleotide encoding the polypeptide comprising an epitope sequence of Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B and/or Table 16;

(iii) a T cell receptor (TCR) or a T cell comprising the TCR, wherein the TCR binds to the epitope sequence in complex with a corresponding HLA class I or class II molecule;

(iv) an antigen presenting cell comprising (i) or (ii); or

(v) an antibody or B cell comprising the antibody, wherein the antibody binds to the epitope sequence; and

a pharmaceutically acceptable excipient.

49. The pharmaceutical composition of claim 48, wherein the epitope sequence comprises one or more or each of the following: YLFDESGEFKL, YLFDESGEF, FGDDTVIEV, LLLDRLNQL, QLMCQPILL, TTDPSFLGRY, PTDNYITTY, PSFLGRY, AEAELAKNV, VATSRTLSY and KTIQPRVEK.

50. The pharmaceutical composition of claim 48, wherein the epitope sequence comprises one or more or each of the following: SAPPAQYEL, AVASKILGL, EYADVFHLY, DEFTPFDVV, VRIQPGQTF, SFRLFARTR, KFLPFQQF, VVQEGVLTA, RLDKVEAEV, FGADPIHSL, NYNYLYRLF, KYIKWPWYI, KWPWYIWLGF, LPFNDGVYF, QPTESIVRF, IPFAMQMAY, YLQPRTFLL and RLQSLQTYV.

51. The pharmaceutical composition of claim 48, wherein the epitope sequence is from an orf1ab protein.

52. The pharmaceutical composition of claim 48, wherein the epitope sequence is from an orf1a protein

53. The pharmaceutical composition of claim 48, wherein the epitope sequence is from a surface glycoprotein (S) or a shifted reading frame thereof.

54. The pharmaceutical composition of claim 48, wherein the epitope sequence is from a nucleocapsid phosphoprotein (N).

55. The pharmaceutical composition of claim 48, wherein the epitope sequence is from an ORF3a protein.

56. The pharmaceutical composition of claim 48, wherein the epitope sequence is from a membrane glycoprotein (M).

57. The pharmaceutical composition of claim 48, wherein the epitope sequence is from an ORF7a protein.

58. The pharmaceutical composition of claim 48, wherein the epitope sequence is from an ORF8 protein.

59. The pharmaceutical composition of claim 48, wherein the epitope sequence is from an envelope protein (E).

60. The pharmaceutical composition of claim 48, wherein the epitope sequence is from an ORF6 protein.

61. The pharmaceutical composition of claim 48, wherein the epitope sequence is from an ORF7b protein.
62. The pharmaceutical composition of claim 48, wherein the epitope sequence is from an ORF10 protein.
63. The pharmaceutical composition of claim 48, wherein the epitope sequence is from an ORF9b protein.
64. A pharmaceutical composition comprising: a polypeptide having an amino acid sequence with at least 70%, 80%, 90% or 100% sequence identity to a sequence of any one of the sequences depicted in column 2 of Table 11, column 2 of Table 12 or column 3 of Table 15; or a recombinant polynucleotide encoding a polypeptide having an amino acid sequence with at least 70%, 80%, 90% or 100% sequence identity to a sequence of any one of the sequences depicted in column 2 of Table 11, column 2 of Table 12 or column 3 of Table 15.
65. The pharmaceutical composition of claim 64, wherein the pharmaceutical composition comprises a polypeptide with at least 70%, 80%, 90% or 100% sequence identity to a sequence selected from the group consisting of RS C1p1full, RS C2p1full, RS C3p1full, RS C4p1full, RS C5p1, RS C5p2, RS C5p2full, RS C6p1, RS C6p2, RS C6p2full, RS C7p1, RS C7p2, RS C7p2full, RS C8p1, RS C8p2 and RS C8p2full; or a polynucleotide encoding a polypeptide with at least 70%, 80%, 90% or 100% sequence identity to a sequence selected from the group consisting of RS C1p1full, RS C2p1full, RS C3p1full, RS C4p1full, RS C5p1, RS C5p2, RS C5p2full, RS C6p1, RS C6p2, RS C6p2full, RS C7p1, RS C7p2, RS C7p2full, RS C8p1, RS C8p2 and RS C8p2full.
66. The pharmaceutical composition of claim 64, wherein the pharmaceutical composition comprises a polynucleotide with at least 70%, 80%, 90% or 100% sequence identity to a sequence selected from the group consisting of SEQ ID NOs: RS C1n1, RS C2n1, RS C3n1, RS C4n1, RS C5n1, RS C6n1, RS C7n1, RS C8n1, RS C5n2, RS C6n2, RS C7n2, RS C8n2, RS C5n2full, RS C6n2full, RS C7n2full and RS C8n2full.
67. The pharmaceutical composition of any one of the claims 47, 48 or 64, wherein the polynucleotide is an mRNA.
68. The pharmaceutical composition of any one of the claims 47, 48 or 64, further comprising one or more lipid components.
69. The pharmaceutical composition of claim 68, wherein the one or more lipids comprise a lipid nanoparticle (LNP).
70. The pharmaceutical composition of claim 69, wherein the LNP encapsulates the recombinant polynucleotide construct.
71. The pharmaceutical composition of any one of the claims 47, 48 or 64, wherein the polypeptide is synthetic.

72. The pharmaceutical composition of any one of the claims 47, 48 or 64, wherein the polypeptide is recombinant.
73. The pharmaceutical composition of any one of the claims 47, 48 or 64, wherein the polypeptide is from 8-1000 amino acids in length.
74. The pharmaceutical composition of any one of the claims 47, 48 or 64, wherein the epitope sequence binds to or is predicted to bind to an HLA class I or class II molecule with a K_D of 1000 nM or less.
75. The pharmaceutical composition of any one of the claims 47, 48 or 64, wherein the epitope sequence binds to or is predicted to bind to an HLA class I or class II molecule with a K_D of 500 nM or less.
76. The pharmaceutical composition of any one of the claims 47, 48 or 64, wherein the epitope sequence comprises a sequence of a viral protein expressed by a virus-infected cell of a subject.
77. The pharmaceutical composition of claim 76, wherein the virus is 2019 SARS-CoV 2.
78. A method of treating or preventing a infection by a virus or treating a respiratory disease or condition associated with an infection by a virus comprising administering to a subject in need thereof the pharmaceutical composition of any one of the claims 47, 48 or 64.
79. The method of claim 78, wherein the virus is a coronavirus.
80. The method of claim 78, wherein the virus is 2019 SARS-CoV 2.
81. The method of claim 78, wherein an HLA molecule expressed by the subject is unknown at the time of administration.
82. The method of claim 78, wherein the ability of the virus to avoid escape of recognition by an immune system of the subject is less compared to the ability of the virus to avoid escape of recognition by an immune system of a subject administered a pharmaceutical composition containing an epitope from a single protein or epitopes from fewer proteins than in the pharmaceutical composition of any one of the claims 47, 48 or 64.
83. The method of claim 78, wherein the subject expresses an HLA molecule encoded by an HLA allele of any one of Table 1A, Table 1B, Table 1C, Table 2Ai, Table 2Aii, Table 2B and Table 16 and the epitope sequence is an HLA allele-matched epitope sequence.
84. The method of claim 78, wherein the epitope sequence comprises one or more or each of the following: SAPPAQYEL, AVASKILGL, EYADVFHLY, DEFTPFDVV, VRIQPGQTF, SFRLFARTR, KFLPFQQF, VVQEGVLTA, RLDKVEAEV and FGADPIHSL.
85. A method of treating or preventing a 2019 SARS-CoV 2 infection in a subject in need thereof, comprising administering to the subject a pharmaceutical composition of any one of the claims 47, 48 or 64.

86. The method of claim 85, wherein the pharmaceutical composition is administered in addition to one or more therapeutics for the 2019 SARS-CoV 2 viral infection in the subject.
87. The method of claim 85, wherein the pharmaceutical composition is administered in combination with (a) a polypeptide having an amino acid sequence of a 2019 SARS-CoV 2 spike protein or fragment thereof; (b) a recombinant polynucleotide encoding a 2019 SARS-CoV 2 spike protein or fragment thereof; or a 2019 SARS-CoV 2 spike protein pharmaceutical composition comprising (a) or (b).
88. The method of claim 85, wherein the 2019 SARS-CoV 2 spike protein or fragment thereof is a SARS-CoV-2 spike protein or a fragment thereof.
89. The method of claim 85, wherein the pharmaceutical composition is administered 1-10 weeks after a first administration of the 2019 SARS-CoV 2 spike protein pharmaceutical composition.
90. The method of claim 85, wherein the pharmaceutical composition is administered 1-6 weeks, 1-6 months or 1-2 years or later after a first administration of the 2019 SARS-CoV 2 spike protein pharmaceutical composition.
91. The method of claim 85, wherein the pharmaceutical composition is administered on the same day or simultaneously with an administration of the 2019 SARS-CoV 2 spike protein pharmaceutical composition.
92. The method of claim 91, wherein the pharmaceutical composition is co-formulated with the polypeptide having an amino acid sequence of a 2019 SARS-CoV 2 spike protein or fragment thereof or the recombinant polynucleotide encoding a 2019 SARS-CoV 2 spike protein or fragment thereof.
93. The method of claim 85, wherein the pharmaceutical composition is administered before an administration of the 2019 SARS-CoV 2 spike protein pharmaceutical composition, such as 2-10 weeks before an administration of the 2019 SARS-CoV 2 spike protein pharmaceutical composition.
94. The method of claim 85, wherein the pharmaceutical composition is administered prophylactically.
95. The method of claim 85, wherein the pharmaceutical composition is administered once every 1, 2, 3, 4, 5, 6 or more weeks; or once every 1-7, 7-14, 14-21, 21-28, or 28-35 days; or once every 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, or 35 days.
96. Use of the composition of any one of the claims 1-46 for preparing a therapeutic for treating or preventing a respiratory viral infection caused by 2019 SARS CoV-2 virus.
97. A composition according to any one of claims 1-46 or a pharmaceutical composition according to any one of claims 47, 48 and 64 for use as a medicament.

98. A composition according to any one of claims 1-46 or a pharmaceutical composition according to any one of claims 47, 48 and 64 for use in the treatment or prevention of a respiratory viral infection caused by 2019 SARS CoV-2 virus.