

Compound for the prevention or treatment of autoantibody-mediated conditions

The field of present invention relates to the therapy of autoantibody-mediated conditions such as Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS), postural orthostatic tachycardia syndrome (POTS), Autoimmune Autonomic Ganglionopathy (AAG), Idiopathic Dilated Cardiomyopathy (IDC), and Chronic Chagas heart disease (cChHD) and other neurological, neuromuscular and neuropsychiatric disorders.

Neuronal receptors represent a special class of targets for disease-causing autoantibodies in neurological autoimmune diseases. In the context with diseases that affect the peripheral autonomic nervous system, these autoepitopes have gained special attention in the context with a variety of neuroimmunological conditions. Comprehensive reviews about autoantibodies against structures of the neuromuscular junction, against peripheral and central neuroreceptors, and against receptors of the autonomic nervous system or against channel proteins, causing channel dysfunction called channelopathies with an autoimmune cause, were published (Vincent 2020; Golden et al, 2019 and Kim, 2014). Importantly, there is growing awareness about the pathogenic significance of this class of disease-causing antibodies against neuroreceptors in the periphery. At the same time, a rich spectrum of disease-associated autoantigens on neuronal surfaces and synapses of the central and the peripheral nerve system is emerging (Zong et al, 2017; Meyer et al, 2018).

Antibodies interfering with the autonomic nervous system are associated with many neuroimmunological conditions including e.g. autoimmune encephalitis, neurodegenerative diseases, multiple sclerosis but also paraneoplastic syndromes or even heart failure. Antibodies and autoantibodies can also target channel proteins (that is, cause channelopathies). Although there is still no complete functional and mechanistic understanding for the role of this type of autoantibodies, a growing body of evidence supports that their therapeutic removal is a useful and promising treatment strategy. Several different types of autoantibodies, typically against components of the autonomic nervous system, were shown to be associated with

autonomic dysfunction (or Dysautonomia), which describes a general malfunction of autonomic functions. Dysautonomia is a complex and heterogeneous clinical picture involving several major organ systems such as the heart, intestines, bladder, brain, blood vessels, pupils, glands, and others (Thornton et al, 2017). It is also reviewed by Low & Engstrom, 2017.

Dysautonomia is also found in paraneoplastic syndromes with associated clinical conditions such as autoimmune autonomic ganglionopathy (Nakane et al, 2018), Lambert-Eaton myasthenic syndrome (Vincent 2020), limbic encephalitis or Morvan syndrome (Masood 2021), autonomic neuropathies, encephalitides, and various other manifestations of dysautonomias (reviewed by Golden et al, 2019 and Kaur et al, 2021). McKeon (McKeon et al, 2016) describes the role of autoantibodies and autoimmune autonomic disorders (including autoimmune autonomic ganglionopathy, paraneoplastic autonomic neuropathy, and acute autonomic and sensory neuropathy).

The focus of the present invention is mainly on a subgroup of dysautonomia-related conditions that are in particular associated with autoantibodies against the peripheral autonomic nervous system.

One of the most relevant diseases that involve the peripheral autonomic nervous system is the Chronic fatigue syndrome / Myalgic encephalopathy (CFS/ME, also designated "ME/CFS"); see Sotzny et al, 2018, or Cortes Rivera et al, 2019.

ME/CFS is a complex multisystemic condition where patients typically lose the ability to follow their daily activities because of severe fatigue, sleeping problem and stress intolerance, which has strong impact on their social life and their professional activity. Excessive exhaustibility and severe fatigue are typically combined with cognitive impairment and many other symptoms. It is thought that immunological, genetic, and infectious factors might contribute to a multicausal pathogenesis. To date, neither standardized diagnostics, nor well validated biomarkers, nor appropriate therapies or medications exist. The treatment of ME/CFS is essentially limited to symptomatic therapies. Numerous studies support that autoantibodies against the autonomic nervous system may play a

causative role in ME/CFS (reviewed by Sotzny et al, 2018). Remarkably, general removal of antibodies by extracorporeal immunoapheresis could also deplete anti-neuroreceptor antibodies and this could be correlated with clinical improvement of the condition (Scheibenbogen et al, 2018). The association between clinical symptoms and the presence of anti-adrenergic and anti-cholinergic autoantibodies in ME/CFS patients was further corroborated by Bynke et al, 2020.

Importantly, the postural orthostatic tachycardia syndrome (POTS) is a related condition [Zhao et al, 2020, Ruzieh et al, 2017]. As ME/CFS, it is associated, among others, with anti-adrenergic- and muscarinic receptor autoantibodies (Gunning et al, 2019). POTS typically manifests with chronic orthostatic intolerance and a variety of other co-morbidities. The hallmark is typically a strong increase of the heart rate upon standing, often combined with blurred vision, mental clouding, chest discomfort and other heterogeneous autonomic abnormalities (see f. ex. Jacob et al, 2020, and citations therein). Mechanistic evidence for the causative role of autoantibodies against neuroreceptors of the autonomic nervous system was provided by in vitro functional blocking of the M3 AChR with patient serum containing autoantibodies against the receptor protein [Palma et al, 2020]. Other examples of a causative role for this type of anti-neuronal autoantibodies were also found in chronic heart failure (Nagatomo et al, 2014).

Complex Regional Pain Syndrome (CRPS) is a pain condition after injury or surgery to a limb and associated with autoantibodies against autonomous neuroreceptors. Again, anti-GPCR antibodies were also functionally assigned to autonomic dysfunction in the autoimmune disease Sjogren's syndrome (reviewed in Shoenfeld et al, 2020). The role of autoantibodies in autoimmune autonomic ganglionopathy was described (Nakane et al, 2018).

Evidence that Ganglionic Acetylcholine Receptor Antibodies play a role in several rheumatic autoimmune diseases (including Sjögren's syndrome, systemic sclerosis, rheumatoid arthritis, and systemic lupus erythematosus) was published (Imamura et al, 2020).

Idiopathic dilated cardiomyopathy (IDC) is typically regarded as a primary myocardial disease characterized by left ventricular or biventricular dilatation and impaired myocardial contractility. Wallukat and Müller (Wallukat et al, 2002; Müller et al, 2000) provided clinical evidence, whereby autoantibodies against beta-1 adrenergic receptor could be non-selectively removed in patients with IDC. Schimke et al, 2005, showed immunoadsorption of anti-beta-1 adrenoreceptor autoantibodies by immunoapheresis in patients with IDC, leading to a reduction in oxidative stress and an improvement in cardiac performance. Matsui et al., 1997, showed that peptides derived from G-protein-coupled receptors can induce morphological cardiomyopathic changes in immunized rabbits. Bornholz et al., 2014, provide a discussion of using beta-1 adrenergic autoantibodies for diagnostic and biomarker purpose.

Chronic Chagas heart disease (cChHD) typically is a chronic manifestation of the *Trypanosoma cruzi* infection, usually characterized by high antibody levels against the C-terminal region of the ribosomal P proteins. Labovsky et al., 2007, showed autoantibodies against beta-1-adrenergic receptor in patients with cChHD.

Düngen et al., 2020 provide an overview of the relation of beta-1 adrenoreceptor autoantibodies with heart disease.

The pathogenic role for these autoantibodies is supported by results from B-cell depletion or other immunosuppressive therapies including immunoapheresis, where clinical improvement in ME/CFS patients could be observed (Scheibenbogen et al, 2018; Kim et al, 2020). Furthermore, plasma exchange therapy was performed in POTS (Wells et al, 2020), and several Ig depleting approaches, including IVIG therapy, plasma exchange and rituximab treatment supported a causative role for the autoantibodies in these diseases.

However, general immunosuppression or non-selective antibody depletion e.g. by B-cell depletion or immunoapheresis is inconvenient and stressful, and associated with a multitude of undesired side-effects and high cost

It is thus an object of the present invention to provide compounds and methods for the therapy of autoantibody-mediated

conditions, preferably selected from ME/CFS, POTS, AAG, IDC, and cChHD, which address one or more of the shortcomings of existing therapies described above and/or which lead to improved treatment outcome.

The present invention provides a compound (typically for the sequestration, or depletion, of antibodies, in particular antibodies associated with autoantibody-mediated conditions, preferably selected from ME/CFS, POTS, AAG, IDC, and cChHD or other conditions mentioned herein, present in a human individual) comprising a biopolymer scaffold and at least two peptides with a sequence length of 6-13 amino acids, wherein each of the peptides independently comprises a 6-amino-acid fragment, preferably a 7-, more preferably an 8-, even more preferably a 9-, even more preferably a 10-, even more preferably an 11-, yet even more preferably a 12-, most preferably a 13-amino-acid fragment, of an amino-acid sequence (preferably of a (preferably human) neuroreceptor), identified by a UniProt accession code selected from the group consisting of:

P02708, P07510, P07550, P08172, P08173, P08588, P08908, P08912, P08913, P11229, P11230, P13945, P17787, P18089, P18825, P20309, P25098, P25100, P30532, P30926, P32297, P35348, P35368, P35626, P36544, P43681, Q04844, Q05901, Q07001, Q15822, Q15825, Q9GZZ6, Q9UGM1, A0A0G2JKS1, A5X5Y0, A6NL88, A8MPY1, B4DS77, B8ZZ34, O00222, O00591, O14490, O14764, O15303, O15399, O43424, O43653, O60359, O60391, O60403, O60404, O60936, O75311, O75916, O76027, O94772, O95264, O95502, O95868, O95886, P01579, P05026, P05067, P06850, P07196, P07384, P0C7T3, P0C8F1, P0DP57, P0DP58, P12931, P13500, P14416, P14867, P15382, P16066, P17342, P18505, P18507, P19634, P20594, P21452, P21728, P21917, P21918, P23415, P23416, P24046, P24387, P25021, P25101, P28221, P28222, P28223, P28335, P28472, P28476, P28566, P29274, P29275, P29323, P30411, P30542, P30556, P30939, P31644, P32418, P34903, P34969, P35367, P35372, P35462, P35609, P37288, P39086, P41594, P41595, P41597, P42261, P42262, P42263, P43119, P46098, P47869, P47870, P47898, P47901, P47972, P48058, P48067, P48167, P48169, P48549, P49354, P50052, P50406, P53355, P55000, P62955, P63252, P78334, P78352, P78509, Q00535, Q05586, Q06413, Q07699, Q12879, Q12959, Q13002, Q13003, Q13224, Q13255, Q13387, Q13639, Q13702, Q13936, Q13972,

Q14289, Q14416, Q14500, Q14571, Q14573, Q14643, Q14831, Q14832, Q14833, Q14957, Q15700, Q15818, Q16099, Q16445, Q16478, Q16553, Q16602, Q401N2, Q494W8, Q5SQ64, Q6PI25, Q6TFL4, Q6UXU4, Q6ZSJ9, Q70Z44, Q86Y78, Q86YM7, Q8N1C3, Q8N2G4, Q8N2Q7, Q8N4C8, Q8NC67, Q8NFZ4, Q8NG75, Q8NGA5, Q8NGA6, Q8NGC8, Q8NGC9, Q8NGG2, Q8NGG3, Q8NGH5, Q8NGH8, Q8NGN1, Q8NGS4, Q8NGY7, Q8NHC4, Q8NI32, Q8TBE1, Q8TCU5, Q8TDF5, Q8WXA2, Q8WXA8, Q8WXS5, Q92736, Q92796, Q96G91, Q96NW7, Q96P66, Q99928, Q99996, Q9BUH8, Q9BXM7, Q9BYB0, Q9GZV3, Q9H3N8, Q9NPA1, Q9NZ94, Q9P1A6, Q9UBK2, Q9UBN1, Q9UBS5, Q9UF02, Q9ULK0, Q9UN88, Q9UPX8, Q9Y2H0, Q9Y4A9, Q9Y566, Q9Y5N1, Q9Y691, Q9Y698, P37088, P51168, P51170, P51172, O94759, Q16515, O60741, Q9NZQ8, P78348, Q8TDD5, Q9NY37, Q13002, P39086, P48664, A6NGN9, O00305, O00555, O15146, O43448, O43497, O43525, O43526, O60840, O75096, O95180, O95259, O95970, P06213, P16389, P16473, P17658, P22001, P22459, P22460, P24530, P42658, P43146, P48547, P49418, P51787, P54284, P54289, P56696, Q00975, Q01668, Q02246, Q02641, Q03721, Q05329, Q06432, Q08289, Q09470, Q12809, Q13018, Q13303, Q13698, Q14003, Q14721, Q14722, Q15878, Q6PIL6, Q6PIU1, Q6X4W1, Q7Z3S7, Q7Z429, Q8IZS8, Q8NCM2, Q8TAE7, Q8TDN1, Q8TDN2, Q8WWG9, Q92953, Q96KK3, Q96L42, Q96PR1, Q96RP8, Q9BQ31, Q9BXT2, Q9H252, Q9H3M0, Q9NR82, Q9NS40, Q9NS61, Q9NSA2, Q9NY47, Q9NZI2, Q9NZV8, Q9POX4, Q9UHC6, Q9UIX4, Q9UJ90, Q9UJ96, Q9UK17, Q9ULD8, Q9ULS6, Q9UQ05, Q9Y2W7, Q9Y6H6, Q9Y6J6, P48058, P55087, Q9BPU6, P52799, P15328, Q05329, Q16653, Q9Y4C0, Q5F0I5, Q99719, P17600, Q13148, P01266, P07202, and Q9Y6A1, (preferably identified by an UniProt accession code selected from Table 1, Table 2 or Table 3 below, in particular Table 1 or Table 3),

optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

Furthermore, the present invention provides a pharmaceutical composition comprising the compound according to the invention and at least one pharmaceutically acceptable excipient.

In an aspect, this pharmaceutical composition is for use in prevention or treatment of autoantibody-mediated conditions, preferably selected from ME/CFS, POTS, AAG, IDC, cChHD, encephalitis such as limbic encephalitis or paraneoplastic striatal encephalitis or Anti-mGluR1 encephalitis or Anti-mGluR5 encephalitis or acute disseminated encephalomyelitis (ADEM) or

NMDAR encephalitis, paraneoplastic syndrome, stiff man syndrome, autoimmune channelopathies, neuromyelitis optica, neuromyotonia, Morvan's syndrome, neuropathic pain, myelitis, optic neuritis, retinitis, parkinsonism, chorea, psychosis, dystonia, mutism, movement disorders, confusion, hallucinations, prodromal diarrhoea, memory loss, hyperexcitability, encephalitis psychiatric syndrome, narcolepsy, autism spectrum disorders, seizures, status epilepticus, chronic epilepsy, myoclonus, encephalomyelitis, myoclonus, parasomnia, sleep apnoea, cognitive impairment, gait abnormalities, faciobrachial dystonic seizures, paraneoplastic syndrome, cerebellar ataxia, dysautonomia, Tourette, ADHD, cerebellar ataxia, oscillopsia, amyotrophic lateral sclerosis (ALS), thyroid disorder and headache with neurological deficits and lymphocytosis (HaNDL), in an individual, preferably a human individual.

As described herein above, there are numerous studies supporting that autoantibodies against neuroreceptors or membrane channel proteins play a causative role in ME/CFS, POTS, AAG, IDC, and cChHD. For instance, Bynke et al. found that there exists a general pattern of increased antibody levels to adrenergic and muscarinic receptors in ME/CFS patients (Bynke et al., 2020). In particular, significant increases in autoantibody levels directed against beta-1 and beta-2 adrenergic receptors as well as M3 and M4 muscarinic acetylcholine receptors were observed. Scheibenbogen et al. also observed elevated autoantibodies, in particular against beta-2 adrenergic receptors, and M3 and M4 muscarinic acetylcholine receptors in ME/CFS patients (Scheibenbogen et al., 2020). General antibody depletion by immunoadsorption was shown to be effective in removing autoantibodies and lead to clinical improvement in ME/CFS patients.

However, prior to the present invention, there were no selective approaches to specifically target disease-causing antibodies. Non-specific antibody depletion or immunosuppression are highly inconvenient and come with a multitude of undesired side effects.

In the course of the present invention, a compound was developed which is able to deplete (or sequester) such antibodies against neuroreceptors in vivo and is therefore

suitable for use in the prevention or treatment of autoantibody-mediated conditions, such as ME/CFS, POTS, AAG, IDC, and cChHD and other conditions mentioned herein.

Further, it was surprisingly found that the approach which is also used in the invention is particularly effective in reducing titres of undesired antibodies in an individual. In particular, the compound achieved especially good results with regard to selectivity, duration of titre reduction and/or level of titre reduction in an in vivo model (see experimental examples). Moreover it was found that the approach allowed antibody sequestration within less than 24 hours.

The detailed description given below relates to all of the above aspects of the invention unless explicitly excluded.

In general, antibodies are essential components of the humoral immune system, offering protection from infections by foreign organisms including bacteria, viruses, fungi or parasites. However, under certain circumstances - including autoimmune diseases, organ transplantation, blood transfusion or upon administration of biomolecular drugs or gene delivery vectors - antibodies can target the patient's own body (or the foreign tissue or cells or the biomolecular drug or vector just administered), thereby turning into harmful or disease-causing entities. Certain antibodies can also interfere with probes for diagnostic imaging. In the following, such antibodies are generally referred to as "undesired antibodies" or "undesirable antibodies".

With few exceptions, selective removal of undesired antibodies has not reached clinical practice. It is presently restricted to very few indications: One of the known techniques for selective antibody removal (although not widely established) is immunoapheresis. In contrast to immunoapheresis (which removes immunoglobulin), selective immunoapheresis involves the filtration of plasma through an extracorporeal, selective antibody-adsorber cartridge that will deplete the undesired antibody based on selective binding to its antigen binding site. Selective immunoapheresis has for instance been used for removing anti-A or anti-B antibodies from the blood prior to ABO-incompatible transplantation or with respect to indications

in transfusion medicine (Teschner et al). Selective apheresis was also experimentally applied in other indications, such as neuroimmunological indications (Tetala et al) or myasthenia gravis (Lazaridis et al), but is not yet established in the clinical routine. One reason that selective immunoapheresis is only hesitantly applied is the fact that it is a cost intensive and cumbersome intervention procedure that requires specialized medical care. Moreover, it is not known in the prior art how to deplete undesired antibodies rapidly and efficiently.

Unrelated to apheresis, Morimoto et al. discloses dextran as a generally applicable multivalent scaffold for improving immunoglobulin-binding affinities of peptide and peptidomimetic ligands such as the FLAG peptide. WO 2011/130324 A1 relates to compounds for prevention of cell injury. EP 3 059 244 A1 relates to a C-met protein agonist.

As mentioned, apheresis is applied extracorporeally. By contrast, also several approaches to deplete undesirable antibodies intracorporeally were proposed in the prior art, mostly in connection with certain autoimmune diseases involving autoantibodies or anti-drug antibodies:

Lorentz et al discloses a technique whereby erythrocytes are charged in situ with a tolerogenic payload driving the deletion of antigen-specific T cells. This is supposed to ultimately lead to reduction of the undesired humoral response against a model antigen. A similar approach is proposed in Pishesha et al. In this approach, erythrocytes are loaded ex vivo with a peptide-antigen construct that is covalently bound to the surface and reinjected into the animal model for general immunotolerance induction.

WO 92/13558 A1 relates to conjugates of stable nonimmunogenic polymers and analogs of immunogens that possess the specific B cell binding ability of the immunogen and which, when introduced into individuals, induce humoral anergy to the immunogen. Accordingly, these conjugates are disclosed to be useful for treating antibody-mediated pathologies that are caused by foreign- or self-immunogens. In this connection, see also EP 0 498 658 A2.

Taddeo et al discloses selectively depleting antibody producing plasma cells using anti-CD138 antibody derivatives fused to an ovalbumin model antigen thereby inducing receptor crosslinking and cell suicide in vitro selectively in those cells that express the antibody against the model antigen.

Apitope International NV (Belgium) is presently developing soluble tolerogenic T-cell epitope peptides which may lead to expression of low levels of co-stimulatory molecules from antigen presenting cells inducing tolerance, thereby suppressing antibody response (see e.g. Jansson et al). These products are currently under preclinical and early clinical evaluation, e.g. in multiple sclerosis, Grave's disease, intermediate uveitis, and other autoimmune conditions as well as Factor VIII intolerance.

Similarly, Selecta Biosciences, Inc. (USA) is currently pursuing strategies of tolerance induction by so-called Synthetic Vaccine Particles (SVPs). SVP-Rapamycin is supposed to induce tolerance by preventing undesired antibody production via selectively inducing regulatory T cells (see Mazor et al).

Mingozzi et al discloses decoy adeno-associated virus (AAV) capsids that adsorb antibodies but cannot enter a target cell.

WO 2015/136027 A1 discloses carbohydrate ligands presenting the minimal Human Natural Killer-1 (HNK-1) epitope that bind to anti-MAG (myelin-associated glycoprotein) IgM antibodies, and their use in diagnosis as well as for the treatment of anti-MAG neuropathy. WO 2017/046172 A1 discloses further carbohydrate ligands and moieties, respectively, mimicking glycoepitopes comprised by glycosphingolipids of the nervous system which are bound by anti-glycan antibodies associated with neurological diseases. The document further relates to the use of these carbohydrate ligands/moieties in diagnosis as well as for the treatment of neurological diseases associated with anti-glycan antibodies.

US 2004/0258683 A1 discloses methods for treating systemic lupus erythematosus (SLE) including renal SLE and methods of reducing risk of renal flare in individuals with SLE, and methods of monitoring such treatment. One disclosed method of treating SLE including renal SLE and reducing risk of renal

flare in an individual with SLE involves the administration of an effective amount of an agent for reducing the level of anti-double-stranded DNA (dsDNA) antibody, such as a dsDNA epitope as in the form of an epitope-presenting carrier or an epitope-presenting valency platform molecule, to the individual.

US patent no. 5,637,454 relates to assays and treatments of autoimmune diseases. Agents used for treatment might include peptides homologous to the identified antigenic, molecular mimicry sequences. It is disclosed that these peptides could be delivered to a patient in order to decrease the amount of circulating antibody with a particular specificity.

US 2007/0026396 A1 relates to peptides directed against antibodies, which cause cold-intolerance, and the use thereof. It is taught that by using the disclosed peptides, in vivo or ex vivo neutralization of undesired autoantibodies is possible. A comparable approach is disclosed in WO 1992/014150 A1 or in WO 1998/030586 A2.

WO 2018/102668 A1 discloses a fusion protein for selective degradation of disease-causing or otherwise undesired antibodies. The fusion protein (termed "Seldeg") includes a targeting component that specifically binds to a cell surface receptor or other cell surface molecule at near-neutral pH, and an antigen component fused directly or indirectly to the targeting component. Also disclosed is a method of depleting a target antigen-specific antibody from a patient by administering to the patient a Seldeg having an antigen component configured to specifically bind the target antigen-specific antibody.

WO 2015/181393 A1 concerns peptides grafted into sunflower-trypsin-inhibitor- (SFTI-) and cyclotide-based scaffolds. These peptides are disclosed to be effective in autoimmune disease, for instance citrullinated fibrinogen sequences that are grafted into the SFTI scaffold have been shown to block autoantibodies in rheumatoid arthritis and inhibit inflammation and pain. These scaffolds are disclosed to be non-immunogenic.

Erlandsson et al discloses in vivo clearing of idiotypic antibodies with anti-idiotypic antibodies and their derivatives.

Berlin Cures Holding AG (Germany) has proposed an intravenous broad spectrum neutralizer DNA aptamer (see e.g. WO

2016/020377 A1 and WO 2012/000889 A1) for the treatment of dilated cardiomyopathy and other GPCR-autoantibody related diseases that in high dosage is supposed to block autoantibodies by competitive binding to the antigen binding regions of autoantibodies. In general, aptamers did not yet achieve a breakthrough and are still in a preliminary stage of clinical development. The major concerns are still biostability and bioavailability, constraints such as nuclease sensitivity, toxicity, small size and renal clearance. A particular problem with respect to their use as selective antibody antagonists are their propensity to stimulate the innate immune response.

WO 00/33887 A2 discloses methods for reducing circulating levels of antibodies, particularly disease-associated antibodies. The methods entail administering effective amounts of epitope-presenting carriers to an individual. In addition, ex vivo methods for reducing circulating levels of antibodies are disclosed which employ epitope-presenting carriers.

US 6,022,544 A relates to a method for reducing an undesired antibody response in a mammal by administering to the mammal a non-immunogenic construct which is free of high molecular weight immunostimulatory molecules. The construct is disclosed to contain at least two copies of a B cell membrane immunoglobulin receptor epitope bound to a pharmaceutically acceptable non-immunogenic carrier.

However, the approaches to deplete undesirable antibodies intracorporeally disclosed in the prior art have many shortcomings. In particular, neither of them has been approved for regular clinical use.

With respect to the compound of the present invention, it is preferred that said neurotransmitter is a neuroreceptor of the autonomic nervous system, more preferably a neuroreceptor selected from the group consisting of muscarinic, and nicotinic cholinergic receptors, alpha- and beta- adrenergic receptors, serotonin receptors, angiotensin- and endothelin receptors; most preferably a neuroreceptor selected from the group consisting of beta-1 adrenergic receptor, beta-2 adrenergic receptor, M3 muscarinic acetylcholine receptor, and M4 muscarinic

acetylcholine receptor. In all instances, it is preferred that the neuroreceptor is a human neuroreceptor.

In a preference, each of the at least two peptides (comprised by the inventive compound), independently comprises a 6-, 7-, 8-, 9-, 10-, 11-, 12-, 13-amino acid fragment (in increasing order of preference) of an amino acid sequence (preferably of a neuroreceptor of the autonomic nervous system) identified by a UniProt accession code selected from the group consisting of: P02708, P07510, P07550, P08172, P08173, P08588, P08908, P08912, P08913, P11229, P11230, P13945, P17787, P18089, P18825, P20309, P25098, P25100, P30532, P30926, P32297, P35348, P35368, P35626, P36544, P43681, Q04844, Q05901, Q07001, Q15822, Q15825, Q9GZZ6, Q9UGM1; P37088, P51168, P51170, P51172, Q94759, Q16515, Q60741, Q9NZQ8, P78348, Q8TDD5, Q9NY37, Q13002, P39086, and P48664.

It is even more preferred, if said amino acid sequence is an amino acid sequence of a neuroreceptor selected from the group consisting of muscarinic, and nicotinic cholinergic receptors, alpha- and beta- adrenergic receptors, serotonin receptors, angiotensin- and endothelin receptors.

In a particular preference, said amino acid sequence is an amino acid sequence (preferably of a neuroreceptor selected from the group consisting of beta-1 adrenergic receptor, beta-2 adrenergic receptor, M3 muscarinic acetylcholine receptor, and M4 muscarinic acetylcholine receptor) identified by a UniProt accession code selected from the group consisting of: P08588, P07550, P20309, and P08173.

The definitions of preferred amino acid sequences (with respect to neurotransmitters and/or UniProt accession numbers) disclosed in the preceding paragraphs, as well as in the summary of the invention disclosed herein above, equally apply as preferred embodiments to all definitions of peptides comprised in the inventive compound (designated herein below e.g. as P, P₁, P₂, P_{a-j}).

It is well established that many neurological, neuromuscular and neuropsychiatric disorders are associated with or caused by autoantibodies. Since the discovery of the disease-causing effect of autoantibodies that target the neuromuscular junction

(e.g. antibodies to the nicotinic acetylcholine receptor in myasthenia gravis), several paradigms with similar pathogenetic features were described. In many cases correlations and associations were shown in the clinic, for some of these cases functional proof of concepts was established by using animal models in which the pathogenic effects of human autoantibodies (either from autoimmune sera, or from cloned antibodies, or directly induced by active immunization) were demonstrated, as reviewed for example by Giannoccaro et al., 2020.

In the course of the present invention, sera from human donors (including ME/CFS patients) were screened for peptides that are able to bind to the paratopes of autoantibodies against human proteins, in particular receptors and ion channels or other membrane channels, involved in neurological, neuromuscular and neuropsychiatric disorders (see in particular Example 12 and Table 1 below, as well as e.g. Table 2). The found peptides or fragments thereof are suitable to deplete disease-causing autoantibodies in a patient when administered in the form of the inventive compound.

Several neurological or neuropsychiatric disease conditions or syndromes can be associated with one or several common autoantibody targets (i.e. autoantigens). Autoantigens do not necessarily need to be located in the extracellular space, such as is the case with neuroreceptors and membrane channels (related to autoimmune channelopathies) - many autoantibodies are in fact associated with intracellular antigens, as listed below. Importantly, the association of neuroimmunological symptoms is found in a variety of conditions such as tumors, neurodegenerative diseases or autoimmune diseases. The present invention provides a solution of removing such autoantibodies regardless of whether the corresponding autoantigens are located in the extracellular or intracellular space. The peptides derived from neuroreceptors and other proteins disclosed herein provide binding moieties for autoantibodies regardless of whether the peptides have been derived from an extra- or intracellular portion of a protein chain. Furthermore, the peptide identification strategy provided in the present invention may yield peptide hits which only represent a partial epitope structure, and not an entire, "natural" epitope

structure - it is not required that the linear or cyclic peptides of the present invention should mimic an entire epitope per se (in fact, representing only a partial epitope is preferred in order to further reduce any potential immunogenicity of the compounds of the present invention). In other words, a purpose of the peptides of the present invention is to bind to undesired and disease-causing antibodies such as the type of autoantibodies involved in neurological or neuropsychiatric diseases (see in particular Tables 1-3 below).

Table 1

Results of a microarray screen for peptides which bind autoantibodies present in sera from human donors (including ME/CFS patients). The peptides were based on human proteins, the respective protein on which a peptide is based on is identified with its UniProt accession number.

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1	45	GQPGAQRMYKQ	X	X	X	O00555
2	46	HLPDDDKTPMS	X	X	X	O00555
3	47	PGAQRMYKQSM	X	X	X	O00555
4	48	PPLNHTVVQVN	X	X	X	O00555
5	49	QILTGEDWNEV	X	X	X	O00555
6	50	RSHRASERSLG	X	X	X	O00555
7	51	SSPAPLGGQET	X	X	X	O43497
8	52	EKKRRNLMLDDVIA	X	X	X	O43497
9	53	LNCITIAMERPKID	X	X	X	O43497
10	54	RRLEKRRNLMLDD	X	X	X	O43497
11	55	CNYSETGPPEPPYS	X	X	X	O43525
12	56	LSSFLVYLVEKDVP	X	X	X	O43525
13	57	VVVEGSGRVADVIA	X	X	X	O94759
14	58	ASAGGAKILGVLRV	X	X	X	O95180
15	59	ELGADEEQRVYPYA	X	X	X	O95180
16	60	SGDPPLGDQKP	X	X	X	O95180
17	61	FEPLDLGVPSGDPF	X	X	X	O95180
18	62	LINVDEVNQIVTTN	X	X	X	P02708
19	63	SLRSPHTHSMA	X	X	X	P07510
20	64	GRTGHGLRRSS	X	X	X	P07550
21	65	LGPVVCDLWLALDY	X	X	X	P08172
22	66	VSPSLVQGRIVKPN	X	X	X	P08172
23	67	YWPLGPVVCDLWLA	X	X	X	P08172
24	68	IKVNRQLQTVN	X	X	X	P08173
25	69	DPKCCDFVTNR	X	X	X	P08588
26	70	KCCDFVTNRAY	X	X	X	P08588
27	71	MSLASADLVMG	X	X	X	P08588
28	72	EFSAEETEETF	X	X	X	P08912

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
29	73	PGEEFSAEETEETF	X	X	X	P08912
30	74	SPGEEFSAEETEET	X	X	X	P08912
31	75	EETEETF	X	X	X	P08912
32	76	PGEEFSAEETEET	X	X	X	P08912
33	77	NLYTTYL	X	X	X	P11229
34	78	EKLFSGY	X	X	X	P11230
35	79	FYLPLLVMFLV	X	X	X	P13945
36	80	HSKGLQLGQTLKA	X	X	X	P16389
37	81	QVWLLFEYPSSGP	X	X	X	P16389
38	82	VLITSLAILVF	X	X	X	P17787
39	83	AKLPALASVASARE	X	X	X	P18089
40	84	ALPNSGQGQKE	X	X	X	P18089
41	85	WAALPNSGQGQKEG	X	X	X	P18089
42	86	ALPNSGQGQKEGV	X	X	X	P18089
43	87	GQGQKEG	X	X	X	P18089
44	88	AVTGVNKIPLQFS	X	X	X	P18505
45	89	ATLVMFPFSLANELM	X	X	X	P18825
46	90	VMPFSLANELMAYW	X	X	X	P18825
47	91	CNKTRFTTFKM	X	X	X	P20309
48	92	SSDSWNNNDAA	X	X	X	P20309
49	93	APQSLLTMEEI	X	X	X	P25098
50	94	GEAPQSLLTME	X	X	X	P25098
51	95	TISERWQQEVA	X	X	X	P25098
52	96	APQSLLTMEEIQS	X	X	X	P25098
53	97	EGEAPQSLLTMEE	X	X	X	P25098
54	98	GEAPQSLLTMEEI	X	X	X	P25098
55	99	PQSLLTMEEIQSV	X	X	X	P25098
56	100	QSLLTMEEIQSVE	X	X	X	P25098
57	101	SLLTMEEIQSVEE	X	X	X	P25098
58	102	GVGVFLAAFILMA	X	X	X	P25100
59	103	LLRCQCRRRRRRR	X	X	X	P25100
60	104	VGVRHSL	X	X	X	P25100
61	105	YTIMTAHFHLKRKI	X	X	X	P31644
62	106	GSARITVSKDQ	X	X	X	P35348
63	107	GMASAKTKTHFSV	X	X	X	P35348
64	108	LKSGLKTDKSDSE	X	X	X	P35348
65	109	CRGRGRRRRRRRR	X	X	X	P35368
66	110	CQCRGRGRRRRRR	X	X	X	P35368
67	111	CRGRGRRRRRRRR	X	X	X	P35368
68	112	GRGRRRRRRRRRL	X	X	X	P35368
69	113	QCRGRGRRRRRRR	X	X	X	P35368
70	114	RGRGRRRRRRRRR	X	X	X	P35368
71	115	RGRRRRRRRRRRLG	X	X	X	P35368
72	116	CTPCKENEYVFDEY	X	X	X	P41594
73	117	NTQNFKPAPATNTQ	X	X	X	P42263
74	118	TTRSITDPTDPVDY	X	X	X	P43146
75	119	DQLDFWESGEW	X	X	X	P43681

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
76	120	ELPPPDQSPSPC	X	X	X	P43681
77	121	PPPDQSPSPCKC	X	X	X	P43681
78	122	SVKEDWKYVAMVID	X	X	X	P43681
79	123	AELPPPDQSPSPCK	X	X	X	P43681
80	124	HSAELPPPDQSPSP	X	X	X	P43681
81	125	PDQSPSPC	X	X	X	P43681
82	126	PPDQSPSP	X	X	X	P43681
83	127	SAELPPPDQSPSPC	X	X	X	P43681
84	128	LPSTCLQKVEEQPE	X	X	X	Q00975
85	129	SAKPLTRYMPQ	X	X	X	Q00975
86	130	IVLALEQHLPDGDGK	X	X	X	Q00975
87	131	AMDILNMVFTGVFT	X	X	X	Q01668
88	132	KAAQTMSTSAP	X	X	X	Q01668
89	133	KHDREPQRRSS	X	X	X	Q01668
90	134	QAKAAQTMSTS	X	X	X	Q01668
91	135	IYIPFEDDSNSTN	X	X	X	Q01668
92	136	QHSPEAACPPPTAGT	X	X	X	Q03721
93	137	ASPPRRASSVG	X	X	X	Q04844
94	138	PEVRCCVDAVN	X	X	X	Q04844
95	139	PRLRHVLLELL	X	X	X	Q04844
96	140	FIWDSAVLEFEASQ	X	X	X	Q05586
97	141	LFLQKLPKLLC	X	X	X	Q05901
98	142	SIIVTVFVINV	X	X	X	Q05901
99	143	TLSIIVTVFVI	X	X	X	Q05901
100	144	LFENADGRFEGSL	X	X	X	Q05901
101	145	GVYNQPPPQFPDGD	X	X	X	Q07001
102	146	LEEDREAVRREAER	X	X	X	Q08289
103	147	KFKTTHAPPGDTLV	X	X	X	Q12809
104	148	AGESTFANNKSSVP	X	X	X	Q13224
105	149	EMSAGESTFANNKS	X	X	X	Q13224
106	150	GNIEGNAAKRRKQQ	X	X	X	Q13224
107	151	LGAAMALSLITFIC	X	X	X	Q13224
108	152	SKHSQLSDLYGKFS	X	X	X	Q13224
109	153	IGTDIVATVENEPP	X	X	X	Q13698
110	154	CYFIGTDIVATVEN	X	X	X	Q13698
111	155	FGKFCPHRVACKRL	X	X	X	Q13698
112	156	AGYPSTVSTVE	X	X	X	Q13936
113	157	FAQDPKFIEVT	X	X	X	Q13936
114	158	GQFAQDPKFIE	X	X	X	Q13936
115	159	PQPVPTLRLEGVES	X	X	X	Q13936
116	160	QGSTTATRPPR	X	X	X	Q13936
117	161	SSNRERHVPMCEDL	X	X	X	Q13936
118	162	ALAHEDCPAIDQPA	X	X	X	Q14003
119	163	GAAHVHGIVFEDNV	X	X	X	Q14957
120	164	HVHGIVFEDNVDTE	X	X	X	Q14957
121	165	PHMQKALEGVHYIA	X	X	X	Q15822
122	166	EVAITQLANVDEVN	X	X	X	Q15825

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
123	167	HCHKSNELATS	X	X	X	Q15825
124	168	VDMNDFWENSE	X	X	X	Q15825
125	169	WTYDKAEIDLL	X	X	X	Q15825
126	170	LGRSNTIGSAP	X	X	X	Q15878
127	171	MEPSSLPQEII	X	X	X	Q15878
128	172	LFPVAFAGFNLVYW	X	X	X	Q16445
129	173	RPGFGGAVTEVKTD	X	X	X	Q16445
130	174	GAVMNKLLTMG	X	X	X	Q8IZS8
131	175	RLTIKQTVSS	X	X	X	Q8IZS8
132	176	DMNFDLIVGDG	X	X	X	Q8TCU5
133	177	IEHPFVFTREVDDE	X	X	X	Q8TCU5
134	178	YEWKSPFGLTPKGR	X	X	X	Q8TCU5
135	179	ITIIFNKFSHFYRR	X	X	X	Q96KK3
136	180	DDEDLAAKRLGIED	X	X	X	Q96PR1
137	181	LSPPPRAAPLSPGP	X	X	X	Q96PR1
138	182	ESEGEKENSTNDPE	X	X	X	Q9NS40
139	183	ESLCSIRRASSVHD	X	X	X	Q9NS40
140	184	LSFESEGEKENSTN	X	X	X	Q9NS40
141	185	RSRESLCSIRRASS	X	X	X	Q9NS40
142	186	SPTKESCPSEADD	X	X	X	Q9NS40
143	187	TLSDDDYVNVASFN	X	X	X	Q9NY47
144	188	DEEGRGGAGGGGAG	X	X	X	Q9P0X4
145	189	GGAGGGGDTEGGLC	X	X	X	Q9P0X4
146	190	GRGGAGGGGAG	X	X	X	Q9P0X4
147	191	RSPSWAADRSKDPP	X	X	X	Q9P0X4
148	192	WGRSAAWASRR	X	X	X	Q9P0X4
149	193	ASPSRDVSPMG	X	X	X	Q9UBN1
150	194	GSWTYNGNQVD	X	X	X	Q9UGM1
151	195	TDKVLNVTLQITLS	X	X	X	Q9UGM1
152	196	VLFFVDVGESCLS	X	X	X	Q9UGM1
153	197	FSRSYSELKEQQQR	X	X	X	Q9UJ96
154	198	FQATWAVNNGIDTT	X	X	X	Q9ULD8
155	199	KFFKNALNLDLMS	X	X	X	Q9ULS6
156	200	PRRHRRPRRVIARY	X	X	X	Q9UN88
157	201	SRDASPVGIKFNT	X	X	X	Q9Y698
158	202	ILYAGNDRWTSDPR		X	X	A6NGN9
159	203	SWGSKIAPVYQEE		X	X	O00222
160	204	FEQGKKSVTAPKFI		X	X	O00222
161	205	GKKSVTAPKFISPA		X	X	O00222
162	206	SVTAPKFISPASQL		X	X	O00222
163	207	ALMAHESGLKE		X	X	O00555
164	208	ARKPDHTTVDI		X	X	O00555
165	209	ASVAYENALRVFNI		X	X	O00555
166	210	DCRGKYLLEYKNEV		X	X	O00555
167	211	GADKQQMDAEL		X	X	O00555
168	212	GKYLLEYKNEV		X	X	O00555
169	213	GSYLRNGWNVM		X	X	O00555

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
170	214	HHGYRGSDDYD		X	X	O00555
171	215	LFIVVFALLGM		X	X	O00555
172	216	LGMQLFGGQFN		X	X	O00555
173	217	LRLLRIFKVTKYWA		X	X	O00555
174	218	LSGEFAKERER		X	X	O00555
175	219	MAHESGLKESP		X	X	O00555
176	220	NPDPLPKKEEE		X	X	O00555
177	221	NYTLLNVFLAIAVD		X	X	O00555
178	222	QGGQPGAQRMY		X	X	O00555
179	223	REALYNEMDPD		X	X	O00555
180	224	RPHVSYSPIR		X	X	O00555
181	225	RTPLMFQRMEP		X	X	O00555
182	226	SAAPHGSLGHA		X	X	O00555
183	227	SGILTRECGNE		X	X	O00555
184	228	SLKNVFNILIV		X	X	O00555
185	229	TPRPHVSYSPIV		X	X	O00555
186	230	TVFQILTGEDWNEV		X	X	O00555
187	231	VILAEDETDE		X	X	O00555
188	232	YLTRDSSILGP		X	X	O00555
189	233	GGALMAHESGLKES		X	X	O00555
190	234	AAFMIQEEYVDTVS		X	X	O15399
191	235	APTSRSLEDLSSCP		X	X	O15399
192	236	PLWSRYGRFLQPVD		X	X	O15399
193	237	PQPLPSPAYPAPRP		X	X	O15399
194	238	QLQVIFEVLEEYDW		X	X	O15399
195	239	VIFEVLEEYDWTSE		X	X	O15399
196	240	YTANLAAAFMIQEEY		X	X	O15399
197	241	ESQPLLPGGAGGAG		X	X	O15399
198	242	DPQIPLAEMEALSL		X	X	O43497
199	243	FIFISILGMHLFG		X	X	O43497
200	244	KGAINFDNIGY		X	X	O43497
201	245	NHNPWMMLLYFISFL		X	X	O43497
202	246	PCEGLGRHATFRNF		X	X	O43497
203	247	PWMMLLYFISFLLIV		X	X	O43497
204	248	PYCARAGAGEV		X	X	O43497
205	249	SPSLDGDGDRKKCL		X	X	O43497
206	250	VHHLVHHHHHHHHH		X	X	O43497
207	251	VRFLSNASTLA		X	X	O43497
208	252	CGLDYEAYNSSSNT		X	X	O43497
209	253	GAAGGGDGGGGGGG		X	X	O43525
210	254	GGGGDGGGGGGGAA		X	X	O43525
211	255	KARRAAGAAGGGGD		X	X	O43525
212	256	RAAGAAGGGGDGGG		X	X	O43525
213	257	YGDKTPKTWEGRLL		X	X	O43525
214	258	FARLPPYRYRFRRR		X	X	O60359
215	259	DFELYLVGDGKYGA		X	X	O60391
216	260	TGRLLMNLWAIFCL		X	X	O60391

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
217	261	KEETAEEPSGPEV		X	X	O60391
218	262	EKRLGTPPGGGGAG		X	X	O60741
219	263	FWIIHPYSDFRFYW		X	X	O60741
220	264	LGTPPGGGGAGAKE		X	X	O60741
221	265	LLQDFPPDCWVSLN		X	X	O60741
222	266	LPADMRQKIHDYYE		X	X	O60741
223	267	MVGNLVIIPVGITF		X	X	O60741
224	268	PSAILSPCSYTTAV		X	X	O60741
225	269	TNLTREVRPLSASQ		X	X	O60741
226	270	TPQPSAILSPCSYT		X	X	O60741
227	271	YEHRYQGKIFDEEN		X	X	O60741
228	272	IQHGVAGVITKSSK		X	X	O60741
229	273	CGGILETTLVE		X	X	O60840
230	274	EEEEEEEEEEE		X	X	O60840
231	275	EEEEEEEEEEEEEE		X	X	O60840
232	276	GADMEEEEEEEEEE		X	X	O60840
233	277	HHGQPVWLTQIQEY		X	X	O60840
234	278	HSSAISVVKILRVL		X	X	O60840
235	279	IVAYGLVLHPS		X	X	O60840
236	280	IVDIATVEVNN		X	X	O60840
237	281	LGMQLFGGKFNFQD		X	X	O60840
238	282	LPASDTGSMTE		X	X	O60840
239	283	LYSDEESILSRFDE		X	X	O60840
240	284	MEEDLRGYLDWITQ		X	X	O60840
241	285	MEEEEEEEEEEEEEE		X	X	O60840
242	286	PHQYRVWATVN		X	X	O60840
243	287	QENEGLVPGVEKEE		X	X	O60840
244	288	SAMMALFTVSTFEG		X	X	O60840
245	289	SHASLPASDTG		X	X	O60840
246	290	TCDEEEEEEEG		X	X	O60840
247	291	EGSGRVADVIAQVA		X	X	O94759
248	292	AESLDPRPLRP		X	X	O95180
249	293	ASVRTRKHTFGQRC		X	X	O95180
250	294	ATFCTLLMLFIF		X	X	O95180
251	295	DNVATFCTLLMLFI		X	X	O95180
252	296	DPYEKIPHVGEHG		X	X	O95180
253	297	DTGDTVPRKN		X	X	O95180
254	298	GVPSPGDPFLDG		X	X	O95180
255	299	HAYLQSSWNLLDGL		X	X	O95180
256	300	KRRGLYLTVPQCPL		X	X	O95180
257	301	PGSPQRRQQR		X	X	O95180
258	302	AEPALGARRKKKMS		X	X	O95180
259	303	GADEEQRPYPALA		X	X	O95180
260	304	AGLVLGSEHETRLV		X	X	P02708
261	305	DEVNQIVTTNV		X	X	P02708
262	306	GLQLIQLINVDEVN		X	X	P02708
263	307	IQLINVDEVNQ		X	X	P02708

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
264	308	YCEIIVTHFPF		X	X	P02708
265	309	HSEENKAPESSEELE		X	X	P06213
266	310	PAKMILLDPAAPAE		X	X	P07510
267	311	ILIVVNA		X	X	P07510
268	312	SHFDNGNEEWFLV		X	X	P07510
269	313	AINCYANETCCDF		X	X	P07550
270	314	DNIDSQGRNCSTND		X	X	P07550
271	315	DSQGRNCSTND		X	X	P07550
272	316	HDVTQERDEVW		X	X	P07550
273	317	AITSPFKYQSLLT		X	X	P07550
274	318	IDSQGRNCSTNDS		X	X	P07550
275	319	KYQSLLT		X	X	P07550
276	320	NIDSQGRNCSTND		X	X	P07550
277	321	DLIIGVFSMNL		X	X	P08172
278	322	IGVFSMNLTYLTV		X	X	P08172
279	323	IVGVRTVEDGE		X	X	P08172
280	324	KSDSCTPTNTTVEV		X	X	P08172
281	325	MNNSTNSSNNS		X	X	P08172
282	326	TSLGHSKDENSQKT		X	X	P08172
283	327	MNNSTNS		X	X	P08172
284	328	MNNSTNSSNNSLA		X	X	P08172
285	329	NNSTNSSNNSLAL		X	X	P08172
286	330	TQDENTVSTSLGH		X	X	P08172
287	331	KEKKAKTLAFL		X	X	P08173
288	332	PATELSTTEAT		X	X	P08173
289	333	GSATQNT		X	X	P08173
290	334	YTVYIIKGYWPLG		X	X	P08173
291	335	APAPPPGPPRP		X	X	P08588
292	336	ERRFLGGPARP		X	X	P08588
293	337	NGGAAADSDDLDE		X	X	P08588
294	338	YNDPKCCDFVT		X	X	P08588
295	339	AITSPFRYQSLLT		X	X	P08588
296	340	RYQSLLT		X	X	P08588
297	341	DYVASNASVMNLLV		X	X	P08912
298	342	EETEETFVKA		X	X	P08912
299	343	GEEFSAEETEE		X	X	P08912
300	344	LVGKRTVPLDE		X	X	P08912
301	345	AEETEET		X	X	P08912
302	346	AEETEETFVKAET		X	X	P08912
303	347	CSSYPSEDEDKP		X	X	P08912
304	348	EETEETFVKAETE		X	X	P08912
305	349	GEEFSAEETEETF		X	X	P08912
306	350	LFRSLRCRPTL		X	X	P08912
307	351	LGYWLCYVNSTVN		X	X	P08912
308	352	SAEETEE		X	X	P08912
309	353	TKAEKRKPAHRAL		X	X	P08912
310	354	YPSEDEDKPATD		X	X	P08912

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
311	355	IYLALDVLFACT		X	X	P08913
312	356	VATLVIPFSLANEV		X	X	P08913
313	357	AALQGSETPGKGGG		X	X	P11229
314	358	ETENRARELAALQG		X	X	P11229
315	359	LVLISFKVNTE		X	X	P11229
316	360	PRSSPNTVKRP		X	X	P11229
317	361	QKPRGKEQLAK		X	X	P11229
318	362	PTKKGRD		X	X	P11229
319	363	PGALLML		X	X	P11230
320	364	WTFIIFTSVGTIV		X	X	P11230
321	365	VLVWVVSAAVS		X	X	P13945
322	366	YGALVTK		X	X	P13945
323	367	GKTRTSLKTSRRK		X	X	P14416
324	368	DIVAIIPYFILTGT		X	X	P16389
325	369	ENEFQRQVWLLFEY		X	X	P16389
326	370	EYPESSGPARIIAI		X	X	P16389
327	371	IGVILFSSAVYFAE		X	X	P16389
328	372	QSTSFTDPFFIVET		X	X	P16389
329	373	QEGVNNSNEDFREE		X	X	P16389
330	374	TWTLKKLPLSLSFL		X	X	P16473
331	375	NNGGVSRVSPVSRG		X	X	P17658
332	376	FRSWTYDRTEIDLIV		X	X	P17787
333	377	LDDFTPSGEWDIVA		X	X	P17787
334	378	LPPAIYKSACK		X	X	P17787
335	379	NVWLTQEWEDY		X	X	P17787
336	380	RHHCARQRLRLRRR		X	X	P17787
337	381	WTYDRTEIDLIV		X	X	P17787
338	382	AEEEEEEEEEE		X	X	P18089
339	383	ASVASAREVNG		X	X	P18089
340	384	DEAEEEEEEEE		X	X	P18089
341	385	DEAEEEEEEEEEE		X	X	P18089
342	386	EAEEEEEEEEE		X	X	P18089
343	387	EDEAEEEEEEE		X	X	P18089
344	388	EEECEPQAVPV		X	X	P18089
345	389	EEEEEEEEEECE		X	X	P18089
346	390	EEEEEEEEEEEC		X	X	P18089
347	391	EEEEEEEEEEECE		X	X	P18089
348	392	GQGQKEGVCGA		X	X	P18089
349	393	LPNSGQGQKEG		X	X	P18089
350	394	PNSGQGQKEGV		X	X	P18089
351	395	SGQGQKEGVCG		X	X	P18089
352	396	SPEDEAEEEEEEE		X	X	P18089
353	397	AALPNSGQGQKEG		X	X	P18089
354	398	CIILTVWLIAAVI		X	X	P18089
355	399	LPNSGQGQKEGVC		X	X	P18089
356	400	PNSGQGQKEGVCG		X	X	P18089
357	401	QGQKEGV		X	X	P18089

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
358	402	SGQGQKE		X	X	P18089
359	403	STGEKEE		X	X	P18089
360	404	ACMMDLRRYPLDEQ		X	X	P18505
361	405	EIRNETSGSEVLTS		X	X	P18505
362	406	AQAREKRFTFV		X	X	P18825
363	407	AAALAVA		X	X	P18825
364	408	AVLTSRA		X	X	P18825
365	409	RRSFKHILFRRRR		X	X	P18825
366	410	RSFKHILFRRRRR		X	X	P18825
367	411	DSWNNND		X	X	P20309
368	412	LQQQSMKRSNRRK		X	X	P20309
369	413	VVPGDHLLEPEVAD		X	X	P22001
370	414	EEEEEEEEEEGRFY		X	X	P22459
371	415	ESLCAKEEKQCGKG		X	X	P22459
372	416	HCSDLMPGSEEKI		X	X	P22459
373	417	KKQIWLLEFYPESS		X	X	P22459
374	418	SSSLGDKSEYLEME		X	X	P22459
375	419	HD PQSSRGSRRRRR		X	X	P22459
376	420	QSSRGSRRRRRQRS		X	X	P22459
377	421	GPKEPAPKGRGAQR		X	X	P22460
378	422	LRYFDPLRNEYFFD		X	X	P22460
379	423	LYALCLDTSRETDL		X	X	P22460
380	424	MAVCLLFVFSALLE		X	X	P23415
381	425	FTMTLYLRHYWKDE		X	X	P24046
382	426	GVDVQVESLDSISE		X	X	P24046
383	427	WKDERLSFPSTNNL		X	X	P24046
384	428	APQSLLTMEEIQSV		X	X	P25098
385	429	EARPLVEFYEE		X	X	P25098
386	430	EGEAPQSLLTMEEI		X	X	P25098
387	431	EIQSVEETQIKERK		X	X	P25098
388	432	FCLNHLEEARPLVE		X	X	P25098
389	433	LEEARPLVEFY		X	X	P25098
390	434	LLLKIRGGKQFILQ		X	X	P25098
391	435	NHLEEARPLVEFYE		X	X	P25098
392	436	QKYPPPLIPPRGEV		X	X	P25098
393	437	QSLLTMEEIQS		X	X	P25098
394	438	QVPPDLFQPYIEEI		X	X	P25098
395	439	SDKFTRFCQWK		X	X	P25098
396	440	SLLTMEEIQSVEET		X	X	P25098
397	441	TVFDTINAETDRLE		X	X	P25098
398	442	AMEKSKA		X	X	P25098
399	443	EAPQSLLTMEEIQ		X	X	P25098
400	444	EIQSVEETQIKER		X	X	P25098
401	445	ETQIKER		X	X	P25098
402	446	GEGEAPQSLLTME		X	X	P25098
403	447	QSLLTME		X	X	P25098
404	448	RGEGEAPQSLLTM		X	X	P25098

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
405	449	SLLTMEE		X	X	P25098
406	450	VHRIIGRGGFGEV		X	X	P25098
407	451	WRGEGEAPQSLLT		X	X	P25098
408	452	IMTERKAAAILALL		X	X	P25100
409	453	LLKFSREKKAATL		X	X	P25100
410	454	LLRCQCRRRRR		X	X	P25100
411	455	LLSVSFEGPRPDSS		X	X	P25100
412	456	LRLRCQCRRRRRR		X	X	P25100
413	457	RRRRRRRPLWR		X	X	P25100
414	458	CRRRRRRRPLWRV		X	X	P25100
415	459	LRCQCRRRRRRRP		X	X	P25100
416	460	LRLRCQCRRRRR		X	X	P25100
417	461	QCRRRRRRRPLWR		X	X	P25100
418	462	RCQCRRRRRRRPL		X	X	P25100
419	463	RLLRCQCRRRRRR		X	X	P25100
420	464	YPAIMTERKAAAI		X	X	P25100
421	465	EIIPSSSKVIPLIG		X	X	P30532
422	466	RSHVDRYFTQKEET		X	X	P30532
423	467	LKQEWTDYRLT		X	X	P30926
424	468	LMTPTASMDDF		X	X	P30926
425	469	MFVCVLGTVGL		X	X	P30926
426	470	QLSLAQLISVN		X	X	P30926
427	471	RPATSSSQLIS		X	X	P30926
428	472	SKSPAGSTPVAIPR		X	X	P30926
429	473	STHTMAPWVKRCFL		X	X	P30926
430	474	VCVLGTVGLFL		X	X	P30926
431	475	YEVSVYTNLIV		X	X	P30926
432	476	SEGPYAA		X	X	P30926
433	477	AEHRLFERLFEDYN		X	X	P32297
434	478	ERLFEDYNEIIRP		X	X	P32297
435	479	LNQYDLLGHVVGTE		X	X	P34903
436	480	ETKTYNSVSKVDKI		X	X	P34903
437	481	AAKTLGIVVGCFL		X	X	P35348
438	482	GGSGMASAKTK		X	X	P35348
439	483	ILLGVILGGLILFG		X	X	P35348
440	484	TFYRISKTDGV		X	X	P35348
441	485	YRISKTDGVCE		X	X	P35348
442	486	DQSSCTTARVRSK		X	X	P35348
443	487	CQCRGRGRRRRRR		X	X	P35368
444	488	LGCQCRGRGRRRRR		X	X	P35368
445	489	LSLCAISIDRYIGV		X	X	P35368
446	490	QCRGRGRRRRRRRR		X	X	P35368
447	491	RGRGRRRRRRRR		X	X	P35368
448	492	RGRGRRRRRRRRRL		X	X	P35368
449	493	RHDSGPLFTFKLLT		X	X	P35368
450	494	GCQCRGRGRRRRR		X	X	P35368
451	495	GRRRRRRRRRLGG		X	X	P35368

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
452	496	RRRRRRRLGGCAY		X	X	P35368
453	497	RRRRRRRLGGCA		X	X	P35368
454	498	RRRRRRRLGGC		X	X	P35368
455	499	DEKNQVLTTNI		X	X	P36544
456	500	AQEVASTLASSPPS		X	X	P37088
457	501	GRGAQEVASTLASS		X	X	P37088
458	502	ETAAEILKQILFMG		X	X	P39086
459	503	GVSCVLFVIARFTP		X	X	P39086
460	504	KPLLKEMKKGKEFY		X	X	P39086
461	505	RIGGIFETVENEPV		X	X	P39086
462	506	ALVTKTNRIARILA		X	X	P41594
463	507	MEPPDIMHDYPSIR		X	X	P41594
464	508	CEKGQIKVIRKGEV		X	X	P41594
465	509	ANQFEGNDRYEGYC		X	X	P42261
466	510	FNSLWFSLGAFMQQ		X	X	P42261
467	511	GIRKIGYWNEDDKF		X	X	P42261
468	512	HVCFITPSFPVDT		X	X	P42261
469	513	LTVERMVSPIESAE		X	X	P42261
470	514	PCMSHSSGMPLGAT		X	X	P42261
471	515	RKSKGKYAYLLEST		X	X	P42261
472	516	ERLVVDCESERLN		X	X	P42261
473	517	MRSAEPSVFVRTTA		X	X	P42262
474	518	SRAEAKRMKVAKNA		X	X	P42262
475	519	IAVYEKMWSYMKSA		X	X	P42263
476	520	KIAVYEKMWSYMK		X	X	P42263
477	521	PYEWHLNNEEPR		X	X	P42263
478	522	WEKFVLYDTERGF		X	X	P42263
479	523	NFKPAPATNTQNYA		X	X	P42263
480	524	RVRKSKGKFAFLE		X	X	P42263
481	525	LHRQNEEPVFSKDG		X	X	P42658
482	526	LYSANTVGNFNRQC		X	X	P42658
483	527	APSRPTACVRPT		X	X	P43146
484	528	DPTDPPVDDYPLDD		X	X	P43146
485	529	SITDPTDPPVDDYPL		X	X	P43146
486	530	DQLPPQQPLEA		X	X	P43681
487	531	DVVLVRFGLSIAQL		X	X	P43681
488	532	HSRVDQLDFWE		X	X	P43681
489	533	PDQPSCKCTC		X	X	P43681
490	534	RVDQLDFWESG		X	X	P43681
491	535	SAELPPPDQPS		X	X	P43681
492	536	ELPPPDQPSCKC		X	X	P43681
493	537	NTHSAELPPPDQP		X	X	P43681
494	538	PPPDQPSCKCTC		X	X	P43681
495	539	RIFLWMFIIVCLL		X	X	P43681
496	540	THSAELPPPDQPS		X	X	P43681
497	541	NMQFLLFVFLVWDP		X	X	P47869
498	542	SVQVAPDGSRLNQY		X	X	P47869

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
499	543	CALAGVLTAMPVP		X	X	P48547
500	544	HFDYDPRADEFFFD		X	X	P48547
501	545	LSGLSSKAAKDVLG		X	X	P48547
502	546	PVPVIVNNFGMYYS		X	X	P48547
503	547	VFAHILNYYRTGKL		X	X	P48547
504	548	WLAEPDAHSHFDYD		X	X	P48547
505	549	CQARQFRTFHHPTY		X	X	P51172
506	550	KDNGVTPGEKMLTV		X	X	P51787
507	551	TYEQLTVPRRGPE		X	X	P51787
508	552	ERPTGWKCFVYHFA		X	X	P51787
509	553	KCFVYHFAVFLIVL		X	X	P51787
510	554	NFLERPTGWKCFVY		X	X	P51787
511	555	TGWKCFVYHFAVFL		X	X	P51787
512	556	AAAWSILQQFL		X	X	P54289
513	557	QWREDFASNEV		X	X	P54289
514	558	SCFQHLVQANV		X	X	P54289
515	559	VDVSGSVSGLT		X	X	P54289
516	560	YDVRRRPWYIQ		X	X	P54289
517	561	LEETITQARYSETL		X	X	P54289
518	562	GSPLPPGAPLPGPG		X	X	P56696
519	563	PRTSAEDAPSEEVA		X	X	P56696
520	564	APRAELVALTAVQS		X	X	P56696
521	565	DITSDYHSPVDHED		X	X	P56696
522	566	AAEAPEGVDPP		X	X	Q00975
523	567	CLSPTNLLRRF		X	X	Q00975
524	568	DFVVVLTGILATAG		X	X	Q00975
525	569	EMDPEERLRFA		X	X	Q00975
526	570	FIMAMIALNTV		X	X	Q00975
527	571	GPDGEPQGLE		X	X	Q00975
528	572	GPTGCRRERER		X	X	Q00975
529	573	PGPHPQSGSV		X	X	Q00975
530	574	QGSPPGYRMEL		X	X	Q00975
531	575	RARGGGAGGAG		X	X	Q00975
532	576	RARGGGAGGAGGPG		X	X	Q00975
533	577	RGGGAGGAGGP		X	X	Q00975
534	578	RQKSSTSLNNGAI		X	X	Q00975
535	579	RRGPDGEPQPG		X	X	Q00975
536	580	TDAEPVGDFPC		X	X	Q00975
537	581	YKRLVRMNMPISE		X	X	Q00975
538	582	YSEMDPEERLR		X	X	Q00975
539	583	GGERARGGGAGGAG		X	X	Q00975
540	584	ACISIVEWKPF		X	X	Q01668
541	585	AKSNPEECRGL		X	X	Q01668
542	586	ALLGNHVNHN		X	X	Q01668
543	587	ECLRRQSSQEE		X	X	Q01668
544	588	EIRRAISCDLQDDE		X	X	Q01668
545	589	ESVNTENVSGE		X	X	Q01668

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
546	590	ETESVNTENVS		X	X	Q01668
547	591	GALLGNHVNHVNSD		X	X	Q01668
548	592	GLGRYARDPKFVSA		X	X	Q01668
549	593	GRYARDPKFVS		X	X	Q01668
550	594	IGVQLFKGKFYRCT		X	X	Q01668
551	595	IIVAFFMMNIFVGF		X	X	Q01668
552	596	ILLAIFANCVALAI		X	X	Q01668
553	597	LGNHVNHVNSD		X	X	Q01668
554	598	LPYVALLIAML		X	X	Q01668
555	599	LTISSEHYNQPDWL		X	X	Q01668
556	600	NLADAESLNTA		X	X	Q01668
557	601	PFPEDDSNTN		X	X	Q01668
558	602	SETESVNTENVS		X	X	Q01668
559	603	TSMPTSETESVNT		X	X	Q01668
560	604	FVIVTFQEQGEKEY		X	X	Q01668
561	605	PFPEDDSNTNHN		X	X	Q01668
562	606	SRRWRRWNRFNRR		X	X	Q01668
563	607	WSEYDPEAKGRIKH		X	X	Q01668
564	608	ARQGSWEDEEE		X	X	Q02641
565	609	EDEEDYEEEL		X	X	Q02641
566	610	EEEDYEEELTD		X	X	Q02641
567	611	GDNSSSSLG		X	X	Q02641
568	612	LGRNKNELEGW		X	X	Q02641
569	613	NSAYTELG		X	X	Q02641
570	614	PGSRNSAYTE		X	X	Q02641
571	615	QGSWEDEEEDY		X	X	Q02641
572	616	SQEIPMEVFDP		X	X	Q02641
573	617	SRNSAYTE		X	X	Q02641
574	618	SRNSAYTE		X	X	Q02641
575	619	SWEDEEEDYEE		X	X	Q02641
576	620	YNPSPGDEVPV		X	X	Q02641
577	621	YPPSQEIPMEVFDP		X	X	Q02641
578	622	CPADVCGPLFEEEL		X	X	Q03721
579	623	ITSVHFRREVETEP		X	X	Q03721
580	624	NKPPSKTCLKEEMA		X	X	Q03721
581	625	DDFGGIETLRV		X	X	Q04844
582	626	GKTINKIDIDTEAY		X	X	Q04844
583	627	SLNEKEETLTT		X	X	Q04844
584	628	KIQLNATSVTHKPN		X	X	Q05586
585	629	PFGRFKVNSEEEEE		X	X	Q05586
586	630	VPPYSHQSSVWFEM		X	X	Q05586
587	631	IPCLGLSFLTVLVF		X	X	Q05901
588	632	IVTVFVINVHH		X	X	Q05901
589	633	CLFVVT		X	X	Q07001
590	634	GANFIVNHMRD		X	X	Q07001
591	635	NQPPPQPFPGD		X	X	Q07001
592	636	PPPQPFPGDPY		X	X	Q07001

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
593	637	CLFVVTPVMVVGT		X	X	Q07001
594	638	DVSLEEDREAVRRE		X	X	Q08289
595	639	EKFNNDDWWIGR		X	X	Q08289
596	640	HTPPYDVVPSMRPV		X	X	Q08289
597	641	YVEPKEDYSHDHVD		X	X	Q08289
598	642	TTVIYNSNIFTDPF		X	X	Q09470
599	643	IAEQEGNQKGEQAT		X	X	Q09470
600	644	FMACEELPPGAPEL		X	X	Q12809
601	645	GESPSSGPSSPESS		X	X	Q12809
602	646	LRLVRVARKLDYS		X	X	Q12809
603	647	KFSYIPEAKASCYQ		X	X	Q12879
604	648	LLVLPALLVWRGPA		X	X	Q12879
605	649	NSTNEGMNVKKCKK		X	X	Q12879
606	650	PSFTIGKAIWLLWG		X	X	Q12879
607	651	PSGLISVSYYDDWDY		X	X	Q12879
608	652	LRISRQHSYDNIVD		X	X	Q12879
609	653	HSYDNIVDKPRELD		X	X	Q12879
610	654	KLSGKKSSLPQGL		X	X	Q12879
611	655	MSLIKEAHWEGLTG		X	X	Q13002
612	656	IPVSFEWSNDSSVI		X	X	Q13018
613	657	SDRTPVVSFLDNT		X	X	Q13018
614	658	TIKDEAENAFLEE		X	X	Q13018
615	659	AMALSLITFICEHL		X	X	Q13224
616	660	APWEKNLTNVEWED		X	X	Q13224
617	661	ASVMLNIMEEYDWY		X	X	Q13224
618	662	EGNAAKRRKQYKQD		X	X	Q13224
619	663	ETEEQEDDHLSIVT		X	X	Q13224
620	664	FPTGLISVSDEWD		X	X	Q13224
621	665	GVPAPWEKNLTNVE		X	X	Q13224
622	666	HMFEMSAGESTFAN		X	X	Q13224
623	667	IENSFVGWELEEV		X	X	Q13224
624	668	QFGPSIEQQASVML		X	X	Q13224
625	669	SRREFDEIELAYRR		X	X	Q13224
626	670	RERLPKARVVVCFC		X	X	Q13255
627	671	SAMCYSALVTKTNR		X	X	Q13255
628	672	ADFPGDDEEDEPEI		X	X	Q13698
629	673	DIVATVENEPP		X	X	Q13698
630	674	FIGTDIVATVE		X	X	Q13698
631	675	GSLDQHQGSQE		X	X	Q13698
632	676	GTDIVATVENE		X	X	Q13698
633	677	IDEFESNVNEV		X	X	Q13698
634	678	KLCDPESDYAPGEE		X	X	Q13698
635	679	KLMAFKARGYFGDP		X	X	Q13698
636	680	LLIQKALVRGGLGT		X	X	Q13698
637	681	TDLSKMTEEEC		X	X	Q13698
638	682	TGQALADACQMEPE		X	X	Q13698
639	683	TSMKLLDQVIPPIG		X	X	Q13698

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
640	684	YPSADFPGDDEEDE		X	X	Q13698
641	685	DIVATVENEESPSPC		X	X	Q13698
642	686	PDKSEEEKSTMAKK		X	X	Q13698
643	687	AAIDAARQAKLMGS		X	X	Q13936
644	688	DAARQAKLMGSAGN		X	X	Q13936
645	689	EGLGQFAQDPKFIE		X	X	Q13936
646	690	GQFAQDPKFIEVTT		X	X	Q13936
647	691	GWPPQPVPTLR		X	X	Q13936
648	692	GWPPQPVPTLRLEG		X	X	Q13936
649	693	IVTFQEQGEQE		X	X	Q13936
650	694	LETGHGRQCQN		X	X	Q13936
651	695	LRRDSGSAGTQAHC		X	X	Q13936
652	696	PPQPVPPTLRLE		X	X	Q13936
653	697	QDPKFIEVTTQ		X	X	Q13936
654	698	QPVPTLRLEGV		X	X	Q13936
655	699	SMNAEENSRIIS		X	X	Q13936
656	700	VACKRLVSMNM		X	X	Q13936
657	701	YPSTVSTVEGH		X	X	Q13936
658	702	PRPAGYPSTVSTVE		X	X	Q13936
659	703	YIPFPEDDSNATNS		X	X	Q13936
660	704	FPEDDSNATNSNLE		X	X	Q13936
661	705	LLYRSIDSHTEKDG		X	X	Q13936
662	706	CPAIDQPAMSPEDK		X	X	Q14003
663	707	ENITNVEVETEPFL		X	X	Q14003
664	708	ESPPPPPLPPQQQQ		X	X	Q14003
665	709	HEDCPAIDQPAMSP		X	X	Q14003
666	710	IPGAPPENITNVEV		X	X	Q14003
667	711	PNYCKPDPPPPPPP		X	X	Q14003
668	712	ERIGADPDILGSN		X	X	Q14003
669	713	VKSVQPGEVCCWLC		X	X	Q14416
670	714	AEKDEDDTKFKSIP		X	X	Q14721
671	715	FPGPCTWRRISSE		X	X	Q14957
672	716	FVAYCSREEAEVLF		X	X	Q14957
673	717	GIVFEDNVDTEAVA		X	X	Q14957
674	718	KRVRGVWNGMIGEV		X	X	Q14957
675	719	LAAFMIQEQYIDTV		X	X	Q14957
676	720	PATFPVGLISVVTE		X	X	Q14957
677	721	PCTWRRISSESEV		X	X	Q14957
678	722	PLEIQPLTVGVNTT		X	X	Q14957
679	723	LEIQPLTVGVNTTN		X	X	Q14957
680	724	VEEEDRWACAG		X	X	Q15822
681	725	GSWTYDKAEID		X	X	Q15825
682	726	IGSKVDMNDFW		X	X	Q15825
683	727	KSSCPMDITFF		X	X	Q15825
684	728	QLANVDEVNQI		X	X	Q15825
685	729	SKVDMNDFWEN		X	X	Q15825
686	730	YNCCEEIYTDITYS		X	X	Q15825

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
687	731	APMFQRMEPSS		X	X	Q15878
688	732	EEETLTFEAAV		X	X	Q15878
689	733	GSAPPLRHSWQMPN		X	X	Q15878
690	734	GTNKGRDIKI		X	X	Q15878
691	735	HRACFMNNSGILEG		X	X	Q15878
692	736	ITMEGWTTVLY		X	X	Q15878
693	737	KNAPMFQRMEP		X	X	Q15878
694	738	MMKYYSAPCTYELA		X	X	Q15878
695	739	QCITMEGWTTV		X	X	Q15878
696	740	QELTKDEQEEEEAF		X	X	Q15878
697	741	QQEAGGGEAVV		X	X	Q15878
698	742	RERGRSKERHLLS		X	X	Q15878
699	743	SPLKEAEIREDEEE		X	X	Q15878
700	744	TDPSSMRRSFSTIR		X	X	Q15878
701	745	PMRLVNFPMGDGHAC		X	X	Q16445
702	746	ALSRGHGKYFF		X	X	Q8IZS8
703	747	DGAHGLDPYN		X	X	Q8IZS8
704	748	ESLNKVFVDNF		X	X	Q8IZS8
705	749	IMLITDGAVDTYDT		X	X	Q8IZS8
706	750	PELRLLYEEGK		X	X	Q8IZS8
707	751	PGIKWEPDENG		X	X	Q8IZS8
708	752	TIKQTVSSIL		X	X	Q8IZS8
709	753	TTVAMPVFSKQ		X	X	Q8IZS8
710	754	VDKGKRVLMTNDY		X	X	Q8IZS8
711	755	RIAKIDSYSRIFFP		X	X	Q8N1C3
712	756	KFRSARYSRSLSTE		X	X	Q8TAE7
713	757	RTFEEPTSSLAAQI		X	X	Q8TAE7
714	758	FIMDKALLDYEVS		X	X	Q8TCU5
715	759	IPSTMNCMEVETTN		X	X	Q8TCU5
716	760	QRLHRAINTSFIEE		X	X	Q8TCU5
717	761	DAFIMDKALLDYE		X	X	Q8TCU5
718	762	KTKRVEKRSNVGPR		X	X	Q8TCU5
719	763	ETECFFVEPDEPFH		X	X	Q8TDD5
720	764	GGGGGGGGGAG		X	X	Q8WXS5
721	765	GLAGAGGGGGGAVG		X	X	Q8WXS5
722	766	SNIIGVIVYIS		X	X	Q8WXS5
723	767	VAAGLAGAGGGGGG		X	X	Q8WXS5
724	768	RLPSYRFRYRRRSR		X	X	Q8WXS5
725	769	FSSRERSFTEIDT		X	X	Q92953
726	770	KEQMNEELRREAET		X	X	Q92953
727	771	RSFTEIDTGDDDEF		X	X	Q92953
728	772	SADDNHLSPSRWKW		X	X	Q92953
729	773	VCDDYNLNENEYFF		X	X	Q92953
730	774	CDDYDEAAREFYFD		X	X	Q96KK3
731	775	LRLGATLKHSYRE		X	X	Q96KK3
732	776	VSEASLETSRETSQ		X	X	Q96KK3
733	777	VYCSDGFCELAGFA		X	X	Q96L42

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
734	778	IRVSRNSPKTKQE		X	X	Q96L42
735	779	SPICTRGSSSRNKK		X	X	Q96L42
736	780	TLPGTRLALLASSE		X	X	Q96PR1
737	781	LEGKANGGLVDGEV		X	X	Q96RP8
738	782	CGPSVRPVPAW		X	X	Q9GZZ6
739	783	DRFFLAIFFSM		X	X	Q9GZZ6
740	784	FFLAIFFSMAL		X	X	Q9GZZ6
741	785	QSRPPELSPSPQSP		X	X	Q9GZZ6
742	786	RPPELSPSPQS		X	X	Q9GZZ6
743	787	LSPSPQS		X	X	Q9GZZ6
744	788	LYLWIRQ		X	X	Q9GZZ6
745	789	QGHASYILEAPASN		X	X	Q9H252
746	790	GSQNSMGAGPCAPG		X	X	Q9H252
747	791	LGPQFPSKGYSLLG		X	X	Q9H252
748	792	YSAAFLLSDQDESR		X	X	Q9H252
749	793	KDRTHNVTEKVTQV		X	X	Q9NS40
750	794	ENSTNDPEDSADTI		X	X	Q9NS40
751	795	GEKENSTNDPEDSA		X	X	Q9NS40
752	796	RECGYSCSPLNVVD		X	X	Q9NS40
753	797	YSEYGAAVLMLLMC		X	X	Q9NS40
754	798	SRPDVMQKPCTCDF		X	X	Q9NS40
755	799	GRRTLRAVVG		X	X	Q9NY47
756	800	LDFLDAELEDE		X	X	Q9NY47
757	801	LDNHGYVFKPPHQD		X	X	Q9NY47
758	802	RTLRAVVGVK		X	X	Q9NY47
759	803	RTLKSLDERY		X	X	Q9NY47
760	804	TRRPTSGPPRP		X	X	Q9NY47
761	805	VTLDFLDAELEDEN		X	X	Q9NY47
762	806	REYCKDLNASDNNT		X	X	Q9NY47
763	807	LYGLIYHSWFQADP		X	X	Q9NY47
764	808	DFFYHPETQQYFFD		X	X	Q9NZV8
765	809	LIPEIIGDCCYEY		X	X	Q9NZV8
766	810	RYPDTLLGSSERDF		X	X	Q9NZV8
767	811	VTMTTLGYGDMVVPK		X	X	Q9NZV8
768	812	ANRSYDEDEQSSSN		X	X	Q9P0X4
769	813	DATPHTLVQPI		X	X	Q9P0X4
770	814	DNGIMGCHEIP		X	X	Q9P0X4
771	815	DRGEDEEEIDY		X	X	Q9P0X4
772	816	ELGKEEEEEEQ		X	X	Q9P0X4
773	817	FYHCLGVDTRN		X	X	Q9P0X4
774	818	GGAGGGGAGSE		X	X	Q9P0X4
775	819	GKFYHCLGVDT		X	X	Q9P0X4
776	820	GMHIFGCKFSL		X	X	Q9P0X4
777	821	GRGGAGGGGAGSEH		X	X	Q9P0X4
778	822	LFKGKFYHCLGVDT		X	X	Q9P0X4
779	823	NRVPSMRILVN		X	X	Q9P0X4
780	824	QEVQLAETEF		X	X	Q9P0X4

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
781	825	QPIPATLASDP		X	X	Q9POX4
782	826	RQATGSDTSLD		X	X	Q9POX4
783	827	RQATGSDTSLDASP		X	X	Q9POX4
784	828	SLRGLRAHQRS		X	X	Q9POX4
785	829	SMRILVNLLD		X	X	Q9POX4
786	830	SPSSSAGSLQTTLE		X	X	Q9POX4
787	831	TAVSPDPENFL		X	X	Q9POX4
788	832	TGSDTSLDASPSS		X	X	Q9POX4
789	833	LVQPIPATLASDPA		X	X	Q9POX4
790	834	PYARMPSYRYYYY		X	X	Q9UBN1
791	835	RMPSYRYYYYRSRS		X	X	Q9UBN1
792	836	EWEVHGMPAVKNVI		X	X	Q9UGM1
793	837	LSDFIEDVEWE		X	X	Q9UGM1
794	838	VLNVTLQITLSQIK		X	X	Q9UGM1
795	839	VLYNKADDESSEPV		X	X	Q9UGM1
796	840	DESSEPV		X	X	Q9UGM1
797	841	LLKRRSSFYIVN		X	X	Q9UGM1
798	842	TFGSWTYNGNQVD		X	X	Q9UGM1
799	843	AIRNGVNRNSAIIG		X	X	Q9UHC6
800	844	GDNSDYDYSALSCT		X	X	Q9UIX4
801	845	QPEDRRRIIINVG		X	X	Q9UIX4
802	846	SDYDYSALSCTSDA		X	X	Q9UIX4
803	847	TREFGLLLFLCVA		X	X	Q9UIX4
804	848	FHTFSRSYSELKEQ		X	X	Q9UIJ96
805	849	RLRACRGHDDLRLV		X	X	Q9UIJ96
806	850	RVCDDYDVSREFF		X	X	Q9UIJ96
807	851	LGAGGSAEVDTS		X	X	Q9ULD8
808	852	PDLSPRVVDGIEDG		X	X	Q9ULD8
809	853	TAPRRLGGRGRPG		X	X	Q9ULD8
810	854	SAMRSCDFGDMKE		X	X	Q9ULS6
811	855	RSCDFGDMKEVPS		X	X	Q9ULS6
812	856	ILKFQVQREVNSYL		X	X	Q9UN88
813	857	QPRRHRPRRVIAR		X	X	Q9UN88
814	858	DLSPRIVDGIEDSG		X	X	Q9UQ05
815	859	IEDSGSTAEAPSFR		X	X	Q9UQ05
816	860	DKTLPSITEAESGA		X	X	Q9UQ05
817	861	ASPVGIKGFNTLPS		X	X	Q9Y698
818	862	LAVHMFIDRHK		X	X	Q9Y698
819	863	DASPVGIKGFNTLP		X	X	Q9Y698
820	864	AVNFNGSAGTPVTF			X	O00222
821	865	CEGYNYQVDELSCE			X	O00222
822	866	CSRDTYALEQSLTF			X	O00222
823	867	ESGVEAFTQISREI			X	O00222
824	868	FNGSAGTPVTFNEN			X	O00222
825	869	GHFLWIGSDSWGSK			X	O00222
826	870	IAQSQKIPREPRPG			X	O00222
827	871	IFEQGKKSVTAPKF			X	O00222

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
828	872	ILPKRASIDGFDRY			X	O00222
829	873	KLIQKGNDRPNGEV			X	O00222
830	874	KSVTAPKFISPASQ			X	O00222
831	875	NNRRNVWFAEFWEE			X	O00222
832	876	NQSGHFLWIGSDSW			X	O00222
833	877	QGKKSVTAPKFISP			X	O00222
834	878	RMSTIDGKELLGYI			X	O00222
835	879	IDQINKDPDLLSNI			X	O00222
836	880	QSAEKMYIQTTLT			X	O00222
837	881	AEVQSEIERIF			X	O00305
838	882	AKRSVLNNPSK			X	O00305
839	883	ISITRVTADISLAK			X	O00305
840	884	RPSDSVSLLEE			X	O00305
841	885	SEIERIFELAR			X	O00305
842	886	SLAEVQSEIER			X	O00305
843	887	YPLVEEDYPDSYQD			X	O00305
844	888	AANQKLALQKAKEV			X	O00555
845	889	AGGSGPPQQQQ			X	O00555
846	890	AGGSGPPQQQQQQQ			X	O00555
847	891	AKPLTRHMPQN			X	O00555
848	892	ALEQHLPDDDKTPM			X	O00555
849	893	ALYNEMDPDER			X	O00555
850	894	ANAQELTKDEQEEE			X	O00555
851	895	ARDREWKKYEFHYD			X	O00555
852	896	ARGGEGEGEGP			X	O00555
853	897	ARTMALYNPIVVRQ			X	O00555
854	898	ASERSLGRYTDVDT			X	O00555
855	899	ASREALYNEMDPDE			X	O00555
856	900	AVDNLANAQEL			X	O00555
857	901	DEDSDEDEFQI			X	O00555
858	902	DEGTPPTNFDT			X	O00555
859	903	DHHAREGSLEQPGF			X	O00555
860	904	DPQENRNNNTN			X	O00555
861	905	DRARDPSGSAGLDA			X	O00555
862	906	EEEKKEEEEDD			X	O00555
863	907	EEKKEEEEDDRGED			X	O00555
864	908	EGPYGRESDDHH			X	O00555
865	909	EPYSESDDDDWC			X	O00555
866	910	EQDRTPLMFQRMEP			X	O00555
867	911	EQEEEEAAANQK			X	O00555
868	912	EQGPPTDMPNS			X	O00555
869	913	EVAEVSPLSAA			X	O00555
870	914	EVILAEDETGDGEQR			X	O00555
871	915	EVKARDREWKKYEF			X	O00555
872	916	EYLTRDSSILG			X	O00555
873	917	FDTFPAAIMTV			X	O00555
874	918	FEKDCRGKYL			X	O00555

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
875	919	FEYLTRDSSIL			X	O00555
876	920	FFIYAIIGMQV			X	O00555
877	921	FLKLRRQQQIE			X	O00555
878	922	FVAVIMDNFEY			X	O00555
879	923	GALMAHESGLKESP			X	O00555
880	924	GPPQQQQQQQQ			X	O00555
881	925	GRESDDHHAREG			X	O00555
882	926	GSDYDEADGPG			X	O00555
883	927	GSGPPQQQQQQ			X	O00555
884	928	GSGVPVSGPNLSTT			X	O00555
885	929	HHHHHHHHHHPPPP			X	O00555
886	930	HHHHHHHPPPPDKD			X	O00555
887	931	HHHHHHPPPPD			X	O00555
888	932	HHHHPPPPDKD			X	O00555
889	933	HHLDEYVRVWAEYD			X	O00555
890	934	HYLPMEGQGRA			X	O00555
891	935	IDVEDEDSDED			X	O00555
892	936	IQQDLGRQDPP			X	O00555
893	937	KDEQEEEEAAN			X	O00555
894	938	KGGADKQQMDA			X	O00555
895	939	KGGADKQQMDAELR			X	O00555
896	940	KKEEEKKEEEE			X	O00555
897	941	KPCDKNSGILT			X	O00555
898	942	LAEDETDGEQR			X	O00555
899	943	LFGNYTLNVLAI			X	O00555
900	944	LGVLSGEFAKERER			X	O00555
901	945	LIFAIIGLEFY			X	O00555
902	946	LRALRLLRIFKVTK			X	O00555
903	947	LRPLKTIKRLPKLK			X	O00555
904	948	LSTTRPIQQDL			X	O00555
905	949	LTKDEQEEEEA			X	O00555
906	950	LTRDSSILGPH			X	O00555
907	951	MAGAYDAPPPV			X	O00555
908	952	NIGIDVEDEDSDED			X	O00555
909	953	PLMFQRMEPPS			X	O00555
910	954	PLPKKEEEKKEEEE			X	O00555
911	955	PLSAANMSIAV			X	O00555
912	956	PNAPRNNVLRIFYDY			X	O00555
913	957	PNSQSVEMREM			X	O00555
914	958	PQQQQQQQQQQQ			X	O00555
915	959	PQQQQQQQQQQQQQ			X	O00555
916	960	PTNFDTFPAAIMTV			X	O00555
917	961	PYGRESDDHAR			X	O00555
918	962	QILTGEDWNEVMYD			X	O00555
919	963	QQQQQQQQQQQA			X	O00555
920	964	QQQQQQQQQQQ			X	O00555
921	965	RDGYSDSEHYLPME			X	O00555

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
922	966	RDRSHRASERS			X	O00555
923	967	RMRFYIRRMVK			X	O00555
924	968	RRMRFYIRRMVKTQ			X	O00555
925	969	RRQQQIERELNGYM			X	O00555
926	970	RTPLMFQRMEPPSP			X	O00555
927	971	RYHDRARDPSGSAG			X	O00555
928	972	SDSEHYLPMEG			X	O00555
929	973	SEHYLPMEGQG			X	O00555
930	974	SGKPCDKNSGILTR			X	O00555
931	975	SGLKESPSWVT			X	O00555
932	976	SGPPQQQQQQQQQ			X	O00555
933	977	SLFSLECVLKV			X	O00555
934	978	SPEQGPPTDMP			X	O00555
935	979	SPLSAANMSIAVKE			X	O00555
936	980	STDPGPMLAIPAMA			X	O00555
937	981	TGTWSPEQGPPTDM			X	O00555
938	982	TRPYFHSSFNCFDC			X	O00555
939	983	VEDEDSDEDEF			X	O00555
940	984	VFQILTGEDWNEVM			X	O00555
941	985	VIKPGTSFGISVLR			X	O00555
942	986	WAEYDPAAWGRMPY			X	O00555
943	987	YNPIPVRQNCLTVN			X	O00555
944	988	YRGSDYDEADG			X	O00555
945	989	YSDSEHYLPMEGQG			X	O00555
946	990	DNFEYLTRDSSILG			X	O00555
947	991	DGPGSGGGGEEAMAG			X	O00555
948	992	DPQENRRNNNTNKS			X	O00555
949	993	EDSDEDEFQITEHN			X	O00555
950	994	GIDVEDEDSDEDEF			X	O00555
951	995	GNIGIDVEDEDSDE			X	O00555
952	996	LMAHESGLKESPSW			X	O00555
953	997	LVVDPQENRRNNNTN			X	O00555
954	998	MDNFEYLTRDSSIL			X	O00555
955	999	NAQELTKDEQEEEE			X	O00555
956	1000	PKKEEEKKEEEEDD			X	O00555
957	1001	VEDEDSDEDEFQIT			X	O00555
958	1002	GICFSFVFGALLEY			X	O00591
959	1003	STVACDMDLAKYPM			X	O14764
960	1004	DEQECMLDLESYGY			X	O14764
961	1005	KKQKAKVKVSRPRA			X	O14764
962	1006	TTELMNFKSAGQFP			X	O14764
963	1007	KDNKGYCAQYRGEV			X	O15146
964	1008	LYCCRRLKQWKNKK			X	O15146
965	1009	QECSPGVVPTPIPI			X	O15146
966	1010	ELLPGVRLGARLLD			X	O15303
967	1011	SVIDYEEQRTVDPE			X	O15303
968	1012	AREEAEPVFRAAEE			X	O15399

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
969	1013	DLALLQLGDDDEIE			X	O15399
970	1014	DNMAGVFYMLLVAM			X	O15399
971	1015	ERSEIVDFSVPFVE			X	O15399
972	1016	GGAGGPGGGLGGAR			X	O15399
973	1017	IRLLFCAREEAEPV			X	O15399
974	1018	LADGFHRYYGPIEP			X	O15399
975	1019	LLGPGAGGAGGTGG			X	O15399
976	1020	PGAGGAGGTGGAGG			X	O15399
977	1021	PSPDSEDSSESLGG			X	O15399
978	1022	PWWFADFPYPAER			X	O15399
979	1023	SQPLLPGAGGAGG			X	O15399
980	1024	SRYGRFLQPVDDTQ			X	O15399
981	1025	SYTANLAAFMIQEE			X	O15399
982	1026	TEQQLQVIFEVLEE			X	O15399
983	1027	TQHLLTVATLEERPF			X	O15399
984	1028	ALLQLGDDDEIEML			X	O15399
985	1029	GDDEIEMLERLWLS			X	O15399
986	1030	GPGAGGAGGTGGAG			X	O15399
987	1031	IDLALLQLGDDDEI			X	O15399
988	1032	KKIDGVWNGMIGEV			X	O15399
989	1033	PLLPGAGGAGGTG			X	O15399
990	1034	QFLGDDDEIEMLERL			X	O15399
991	1035	VWVMFMFVMCLTVVA			X	O15399
992	1036	NLFDTAEVYAAGKA			X	O43448
993	1037	ANKSESEPFFF			X	O43497
994	1038	AQRPLRRQAAIRTD			X	O43497
995	1039	AWIAIFQVITLEGW			X	O43497
996	1040	CVTLGMFRPCEDIA			X	O43497
997	1041	DFFSPSLDGDGDRK			X	O43497
998	1042	DGDRKKCLALVSLG			X	O43497
999	1043	DRKNFDSLLWAIVT			X	O43497
1000	1044	DSCPYCARAGAGEV			X	O43497
1001	1045	DSKDPLASGPPDSM			X	O43497
1002	1046	DTLPMLGNVLL			X	O43497
1003	1047	EAELEAELELE			X	O43497
1004	1048	ELTNALEISNIVFT			X	O43497
1005	1049	ENFHKCRQHQQEEE			X	O43497
1006	1050	EWELKLMDELA			X	O43497
1007	1051	FAALGVLEFGDLEC			X	O43497
1008	1052	FIIFGILGVQLFKG			X	O43497
1009	1053	FVLTAQFVLVN			X	O43497
1010	1054	FYHADCHLEPV			X	O43497
1011	1055	GAGEVELADREMPD			X	O43497
1012	1056	GDLLPPGGQEE			X	O43497
1013	1057	GERRSLSGEG			X	O43497
1014	1058	GGSDPQIPLAE			X	O43497
1015	1059	GIMIAILVNLT			X	O43497

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1016	1060	GLDYEAYNSSSNTT			X	O43497
1017	1061	GQESQDEEESSEEE			X	O43497
1018	1062	HPTDRQLFDTISLL			X	O43497
1019	1063	HSPLGSPFLWPGVE			X	O43497
1020	1064	IPLAEMEALSL			X	O43497
1021	1065	KEAKEEAELEAELE			X	O43497
1022	1066	KKRRNLMLDDVIAS			X	O43497
1023	1067	KLLKMAVGMRALLD			X	O43497
1024	1068	KMAVGMRALLDTVM			X	O43497
1025	1069	LARALRPDDPPLDG			X	O43497
1026	1070	LDGDGDRKKCLALV			X	O43497
1027	1071	LDYEAYNSSSN			X	O43497
1028	1072	LKYLVIYLRKAARR			X	O43497
1029	1073	LMTFGNYVLFN			X	O43497
1030	1074	LNIPPGPYSSM			X	O43497
1031	1075	LPACCLERDSW			X	O43497
1032	1076	LVHHHHHHHHHYHL			X	O43497
1033	1077	LVTLLDTLPM			X	O43497
1034	1078	MDAHSFYNYFIL			X	O43497
1035	1079	MFVGVVVENFHKCR			X	O43497
1036	1080	MRILVTLLDTLPM			X	O43497
1037	1081	NYIFTAVFLAE			X	O43497
1038	1082	PPETRSSLIED			X	O43497
1039	1083	PQIPLAEMEAL			X	O43497
1040	1084	PSGERRSLLSGEGQ			X	O43497
1041	1085	PSLGSDPQIPLAE			X	O43497
1042	1086	QEDWNKVLYNG			X	O43497
1043	1087	QSGSVLSVHSQPAD			X	O43497
1044	1088	RARLPACCLERDSW			X	O43497
1045	1089	RLEKKRRNLMLDDV			X	O43497
1046	1090	RLRRLEKKRRNLML			X	O43497
1047	1091	RLSVHHLVHHHHHH			X	O43497
1048	1092	RQHQEERARRREE			X	O43497
1049	1093	SLEWELKLMDE			X	O43497
1050	1094	SPEIQDRDANGSRR			X	O43497
1051	1095	SRFRLLVHHLC			X	O43497
1052	1096	SVLSVHSQPAD			X	O43497
1053	1097	VGSGKVYPTVH			X	O43497
1054	1098	VIDILVSMVSDSGT			X	O43497
1055	1099	VLYNGMASTSS			X	O43497
1056	1100	WSAYIFPPQSR			X	O43497
1057	1101	YEAYNSSSNTT			X	O43497
1058	1102	ALGVELFGDLEUDE			X	O43497
1059	1103	ASGRLARALRPDDP			X	O43497
1060	1104	DYEAYNSSSNTTCV			X	O43497
1061	1105	FFVCQGEDTRNITN			X	O43497
1062	1106	FGDLECDETHPCEG			X	O43497

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1063	1107	FILLIIVGSFFMIN			X	O43497
1064	1108	GNVLLLCFFVFFIF			X	O43497
1065	1109	KRLRRLEKKRRNLM			X	O43497
1066	1110	LRainRVPSMRILV			X	O43497
1067	1111	NIGYAWIAIFQVIT			X	O43497
1068	1112	PAPCPGPEPNWGKG			X	O43497
1069	1113	RRREEKRLRRLEKK			X	O43497
1070	1114	SETKQRESQLMREQ			X	O43497
1071	1115	AAAGDEERKVGGLAP			X	O43525
1072	1116	DAIEESPSKEPKPV			X	O43525
1073	1117	DRGYGNDFPIEDMI			X	O43525
1074	1118	DTDPFTPSGSMPLS			X	O43525
1075	1119	ELERSPSGFSISQD			X	O43525
1076	1120	GDEERKVGGLAPGDV			X	O43525
1077	1121	GGGAANPAGGDAAA			X	O43525
1078	1122	SITRDSDTPLSLMS			X	O43525
1079	1123	TIICNYSETGPPEP			X	O43525
1080	1124	DQSMMGKFVKVERQ			X	O43525
1081	1125	EELERSPSGFSISQ			X	O43525
1082	1126	EVDAQGEEMKEEFE			X	O43525
1083	1127	HALVFLIVLGCLIL			X	O43525
1084	1128	MMGKFVKVERQVQD			X	O43525
1085	1129	RYKGWRGRLKFARK			X	O43525
1086	1130	VRILQFRLYKKKFK			X	O43525
1087	1131	DLHSTWQYYERTVT			X	O43526
1088	1132	GEDIVDDKSCPEF			X	O43526
1089	1133	ARLPPYRYRFRRRS			X	O60359
1090	1134	KESLHNNPANR			X	O60359
1091	1135	TFARLPPYRYR			X	O60359
1092	1136	FPEDADYEQDTAEY			X	O60359
1093	1137	IDHFPEDADYEQDT			X	O60359
1094	1138	YRYRFRRRSSSRST			X	O60359
1095	1139	AEDTPDFELYLVG			X	O60391
1096	1140	AQVQPKRALLPAPV			X	O60391
1097	1141	DLLERLAEDTPDFD			X	O60391
1098	1142	EPGPEVEQQQQQQ			X	O60391
1099	1143	ERLAEDTPDFELY			X	O60391
1100	1144	FEELSGIHDPKLHH			X	O60391
1101	1145	GEHAFFRLALPRIR			X	O60391
1102	1146	GPEVEQQQQQQDQP			X	O60391
1103	1147	KMVPCGKRFAVTE			X	O60391
1104	1148	LVRGQQLLAQLGDS			X	O60391
1105	1149	NAFIMDKSLLDYEV			X	O60391
1106	1150	QPKRALLPAPVNCG			X	O60391
1107	1151	SYTANLAAVMVGDK			X	O60391
1108	1152	TPPDFELYLVGDGK			X	O60391
1109	1153	EGPVWLCSYGRPPA			X	O60391

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1110	1154	EGSKEETAEAEPSPG			X	O60391
1111	1155	EHPFVFARDPDEDG			X	O60391
1112	1156	EPPEGSKEETAEE			X	O60391
1113	1157	LCQALVPPGVAALL			X	O60391
1114	1158	LRKCCYGYCIDLLE			X	O60391
1115	1159	QQQQQQDQPTAPEG			X	O60391
1116	1160	TAGLPPGLLALGEV			X	O60391
1117	1161	ENILNELNDPLREE			X	O60741
1118	1162	ESSSVLNTDPDAEK			X	O60741
1119	1163	GGGEPPAGGFEDAE			X	O60741
1120	1164	GGGGGGGGGGGGGEE			X	O60741
1121	1165	IHPYSDFRFYWDLI			X	O60741
1122	1166	KVDGGGGGGGGGGGG			X	O60741
1123	1167	LIMMVGNLVIIPVG			X	O60741
1124	1168	LNDPLREEIVNFNC			X	O60741
1125	1169	LYSLVDNFNEVLE			X	O60741
1126	1170	RTGTVNEDSSEIIL			X	O60741
1127	1171	RYQKGIFDEENILN			X	O60741
1128	1172	SLSHSNLHSPSPST			X	O60741
1129	1173	SQPPQTQPQQPSPQ			X	O60741
1130	1174	SVLNTDPDAEKPRF			X	O60741
1131	1175	TAGFWIIHPYSDFR			X	O60741
1132	1176	TATSLSHSNLHSPS			X	O60741
1133	1177	YPMMRRAFETVAID			X	O60741
1134	1178	DGGGGGGGGGGGGGE			X	O60741
1135	1179	EGGGKPNSSNSRD			X	O60741
1136	1180	FKVDGGGGGGGGGGG			X	O60741
1137	1181	FRTGTVNEDSSEII			X	O60741
1138	1182	GGGGGGGGGGGEEPA			X	O60741
1139	1183	IFDEENILNELNDP			X	O60741
1140	1184	QGKIFDEENILNEL			X	O60741
1141	1185	QSPPQTQPQQPSP			X	O60741
1142	1186	SVCFKVDGGGGGGGG			X	O60741
1143	1187	ADMEEEEEEEE			X	O60840
1144	1188	ALGVYIPFPED			X	O60840
1145	1189	ALTCDEEEEE			X	O60840
1146	1190	ASLPASDTGSM			X	O60840
1147	1191	CKRLVAMNMPL			X	O60840
1148	1192	CVALGVYIPFPEDD			X	O60840
1149	1193	DEDEEEGALAS			X	O60840
1150	1194	DEFKRIWSEYD			X	O60840
1151	1195	DEVIPPPDEEEVTV			X	O60840
1152	1196	DTEEEEEEGQE			X	O60840
1153	1197	DWITQAEELDMEDP			X	O60840
1154	1198	DYAFTSIFTVE			X	O60840
1155	1199	EDEEVPDRLSY			X	O60840
1156	1200	EEEEEEEEEEEGA			X	O60840

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1157	1201	EEEEEEEEEEG			X	O60840
1158	1202	EEEEEEEEGAG			X	O60840
1159	1203	EEEEQEGVEE			X	O60840
1160	1204	EEEEQEGVEEED			X	O60840
1161	1205	EEGQEGVEEED			X	O60840
1162	1206	EEVPDRLSYLD			X	O60840
1163	1207	EGADMEEEEEE			X	O60840
1164	1208	ELDKNQRCQVEYAL			X	O60840
1165	1209	EPSPANGAGPGPEW			X	O60840
1166	1210	EQVEYVFLVIF			X	O60840
1167	1211	ESILSRFDEED			X	O60840
1168	1212	ETQGDEDEEEG			X	O60840
1169	1213	EVIPPPDEEEV			X	O60840
1170	1214	FACIGVQLFKGKFY			X	O60840
1171	1215	FDNFFFAMLTVFQC			X	O60840
1172	1216	FDYAFTSIFTVEIL			X	O60840
1173	1217	GILETTLVEVG			X	O60840
1174	1218	GSIVDIAVTEVNNG			X	O60840
1175	1219	GVYIPFPEDDS			X	O60840
1176	1220	GYLDWITQAEELDM			X	O60840
1177	1221	IMKTRVCRRLR			X	O60840
1178	1222	IPPPDEEEVTV			X	O60840
1179	1223	ITQAEELDMED			X	O60840
1180	1224	KIKTEGNLEQA			X	O60840
1181	1225	KLLDEVIPPPDEEE			X	O60840
1182	1226	KQEIADACRLT			X	O60840
1183	1227	KQQMEEDLRGYLDW			X	O60840
1184	1228	KRLVAMNMPLN			X	O60840
1185	1229	LGSDMEAEEDP			X	O60840
1186	1230	LISFGIHSSAISVV			X	O60840
1187	1231	LLVLFVHIIYAIIG			X	O60840
1188	1232	LRIVIKKIWKR			X	O60840
1189	1233	MALFTVSTFEG			X	O60840
1190	1234	MEEEEEEEEEE			X	O60840
1191	1235	MLCAFLIINLFVAV			X	O60840
1192	1236	MSESEGGKDTTPEP			X	O60840
1193	1237	MTETQGDEDEE			X	O60840
1194	1238	NATLFALVRTS			X	O60840
1195	1239	NLEQVEYVFLV			X	O60840
1196	1240	PFPEDDSN TAN			X	O60840
1197	1241	QAEELDMEDPS			X	O60840
1198	1242	QDAMGYELPWV			X	O60840
1199	1243	QGTSSLYSDEE			X	O60840
1200	1244	QYRVWATVNSA			X	O60840
1201	1245	RLTLDMDNAASDL			X	O60840
1202	1246	RNNNFQTFPQAVLL			X	O60840
1203	1247	RREGADMEEEE			X	O60840

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1204	1248	RREGADMEEEEEE			X	O60840
1205	1249	RVCRRRLRRANR			X	O60840
1206	1250	SHASLPASDTGSMT			X	O60840
1207	1251	SLPASDTGSMTETQ			X	O60840
1208	1252	STSSHASLPASDTG			X	O60840
1209	1253	TFEGWPALLYKAID			X	O60840
1210	1254	TGSMTETQGDEDEE			X	O60840
1211	1255	TNRRRGRLRWF			X	O60840
1212	1256	TQAEELDMEDPSAD			X	O60840
1213	1257	TSSLYSDEESILSR			X	O60840
1214	1258	VASAQRSPRAL			X	O60840
1215	1259	VEYVFLVIFTVETV			X	O60840
1216	1260	VVPKEKVVIP			X	O60840
1217	1261	WATPPQRGRLL			X	O60840
1218	1262	YFLGSDMEAEE			X	O60840
1219	1263	YIPFPEDDSNT			X	O60840
1220	1264	YLDWITQAEEL			X	O60840
1221	1265	YLGRSSGPLRT			X	O60840
1222	1266	YVFLVIFTVET			X	O60840
1223	1267	ARREGADMEEEEEE			X	O60840
1224	1268	DMEEEEEEEEEEEE			X	O60840
1225	1269	DTEEEEEEGQEGVE			X	O60840
1226	1270	EEEEEEE			X	O60840
1227	1271	EEEEEEEEEEEEEG			X	O60840
1228	1272	EEEEEEEEEGAGG			X	O60840
1229	1273	EEEEEEEGAGGVEL			X	O60840
1230	1274	EEEEEGQEGVEEED			X	O60840
1231	1275	EEGQEGVEEEDKD			X	O60840
1232	1276	EGADMEEEEEEEE			X	O60840
1233	1277	FDEEDLGDEMACVH			X	O60840
1234	1278	FYATFLIQDYFRKF			X	O60840
1235	1279	LDWITQAEELDMED			X	O60840
1236	1280	LTCDEEEEEEGQE			X	O60840
1237	1281	NTFDALIVGSIVD			X	O60840
1238	1282	QCLQRQGSCEDLPI			X	O60840
1239	1283	RIVIKKIWKRMKQK			X	O60840
1240	1284	RLRRANRVLRRCR			X	O60840
1241	1285	RQALTCDEEEEE			X	O60840
1242	1286	SDEESILSRFDEED			X	O60840
1243	1287	VYIPFPEDDSNTAN			X	O60840
1244	1288	CDGDNDCEDDSDSEQ			X	O75096
1245	1289	CDGDNDCGDHSDED			X	O75096
1246	1290	DDDCGDWSDESDCS			X	O75096
1247	1291	DNDCEDDSDEQDCP			X	O75096
1248	1292	DNDCGDHSDEDEGCI			X	O75096
1249	1293	KKEGGPDHNYTKEK			X	O75096
1250	1294	NLDGSEKVLINTD			X	O75096

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1251	1295	GPGTLHTIDNATTN			X	O94759
1252	1296	KYVRVSQDTPSSVI			X	O94759
1253	1297	LENGVQLKEFVTWD			X	O94759
1254	1298	LEPLSTIQYNVVDG			X	O94759
1255	1299	LSTIQYNVVDGLRD			X	O94759
1256	1300	VCEEMRQLFYDPDE			X	O94759
1257	1301	ADEEQRVYPALAA			X	O95180
1258	1302	ADGGLSVLRTF			X	O95180
1259	1303	AELDAEIELEM			X	O95180
1260	1304	AGTPLGSVASV			X	O95180
1261	1305	AIVLLSLMGITLEE			X	O95180
1262	1306	AIVPLEPPESEPPM			X	O95180
1263	1307	APHRPLQEVE			X	O95180
1264	1308	ASAPHRPLQE			X	O95180
1265	1309	ATGMRALLDTV			X	O95180
1266	1310	ATGMRALLDTVVQA			X	O95180
1267	1311	CEGPDTRNISTKAQ			X	O95180
1268	1312	CGERESLLSGE			X	O95180
1269	1313	CTLLMLFIFISIL			X	O95180
1270	1314	DAELDAEIELEMAQ			X	O95180
1271	1315	DEDKTSVHFEEDFH			X	O95180
1272	1316	DKTSVHFEEDF			X	O95180
1273	1317	DLFITFIICVN			X	O95180
1274	1318	DLGVPSGDPFL			X	O95180
1275	1319	DPAEPGEKTPV			X	O95180
1276	1320	EAEASDPADEE			X	O95180
1277	1321	EDAAELDDSEDSC			X	O95180
1278	1322	EGSGAGGDPAA			X	O95180
1279	1323	EPESEPPMPV			X	O95180
1280	1324	EPTGSGAGGDPAA			X	O95180
1281	1325	ERRRRSTFPSP			X	O95180
1282	1326	ERVFLSVSNYIFTA			X	O95180
1283	1327	EVEMETYGAGT			X	O95180
1284	1328	FFLRIDSHREDAAE			X	O95180
1285	1329	FGILGVQLFKGKFY			X	O95180
1286	1330	FIFLNCVTIALERP			X	O95180
1287	1331	FLRPYYQTEEGEEN			X	O95180
1288	1332	FVTFVLVAQFVLVN			X	O95180
1289	1333	GAIVPLEPPES			X	O95180
1290	1334	GEENPFICSSR			X	O95180
1291	1335	GIMMAILVNTL			X	O95180
1292	1336	GSELGVSPSESPAA			X	O95180
1293	1337	HADCHIEGPQERAR			X	O95180
1294	1338	HNGAINFDNIGYAW			X	O95180
1295	1339	ILGMHLFGCKFSK			X	O95180
1296	1340	KRLRRLERRRR			X	O95180
1297	1341	KTSVHFEEDFHKLK			X	O95180

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1298	1342	LDPAEPGEKTPVRP			X	O95180
1299	1343	LGVQLFKGKFYYCE			X	O95180
1300	1344	LQSSWNLLDGLLV			X	O95180
1301	1345	LSPPLIMCTAATPM			X	O95180
1302	1346	LSPRG TARSPS			X	O95180
1303	1347	MCTAATPMPTP			X	O95180
1304	1348	MFALEMLLKLLACG			X	O95180
1305	1349	MGRLWVTFSGKLRR			X	O95180
1306	1350	MHLFGCKFSLKTD			X	O95180
1307	1351	PAESCASLQIPLAV			X	O95180
1308	1352	PASAPHRPLQEVE			X	O95180
1309	1353	PEAEPALGARRKKK			X	O95180
1310	1354	PEPGACDTRLVRAG			X	O95180
1311	1355	PLEPPESEPPMPVG			X	O95180
1312	1356	PLIMCTAATPMPTP			X	O95180
1313	1357	PSPGRGPPDAE			X	O95180
1314	1358	QESPGARDAPNLVA			X	O95180
1315	1359	QVVALPSDFFL			X	O95180
1316	1360	RASSSGAIVPLEPP			X	O95180
1317	1361	SAVQGQGPGRQRR			X	O95180
1318	1362	SCASLQIPLAVSSP			X	O95180
1319	1363	SHREDAAELDDSE			X	O95180
1320	1364	SLQIPLAVSSPARS			X	O95180
1321	1365	SNPHNGAINFDNIG			X	O95180
1322	1366	SPPSPGRGPPD			X	O95180
1323	1367	TLGMFRPCEDV			X	O95180
1324	1368	TRNISTKAQCR			X	O95180
1325	1369	VALMTFGNYVL			X	O95180
1326	1370	YTQPQAEGVGAARN			X	O95180
1327	1371	AAELDDSEDSCL			X	O95180
1328	1372	AGRHTASVHHLVYH			X	O95180
1329	1373	APGEPGWMGRLWVT			X	O95180
1330	1374	AYTQPQAEGVGAAR			X	O95180
1331	1375	CKFSLKTDGDTVP			X	O95180
1332	1376	CSSRRDNGMQKCSH			X	O95180
1333	1377	GMHLFGCKFSLKTD			X	O95180
1334	1378	GPEAEPALGARRKK			X	O95180
1335	1379	LDLGVPSPGDPFLDG			X	O95180
1336	1380	LLKMATGMRALLDT			X	O95180
1337	1381	PDSRRGSSSSGDPP			X	O95180
1338	1382	QRCVSSRPAAPGGE			X	O95180
1339	1383	QSRWRKKVDPSAVQ			X	O95180
1340	1384	SATPAPGGGADDPV			X	O95180
1341	1385	TFGQRCVSSRPAAP			X	O95180
1342	1386	TILPSGVGSGKGST			X	O95180
1343	1387	VPLEPPESEPPMPV			X	O95180
1344	1388	WNRLDFFIVVAGMM			X	O95180

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1345	1389	YHHHHHHHHHHYHFS			X	O95180
1346	1390	FLENIVRRSNDTNF			X	O95259
1347	1391	PYDVINAFENVDEV			X	O95259
1348	1392	AYFLCLLSALLLTE			X	O95970
1349	1393	DHILLGVFMLV			X	P02708
1350	1394	DQESNNAAAEW			X	P02708
1351	1395	EIIVTHFPFDE			X	P02708
1352	1396	ETMKSDQESNNAAA			X	P02708
1353	1397	GLVLGSEHETR			X	P02708
1354	1398	GSVVAINPESDQPD			X	P02708
1355	1399	KSDQESNNAAA			X	P02708
1356	1400	KVLLQYTGKIT			X	P02708
1357	1401	LVLNNADGDFAIV			X	P02708
1358	1402	NVIIPCLLSF			X	P02708
1359	1403	QDKKIFTEDID			X	P02708
1360	1404	QLIQLINVDEV			X	P02708
1361	1405	RPVEDHRQVVE			X	P02708
1362	1406	SAGLVLGSEHE			X	P02708
1363	1407	SIITVIVINTHHR			X	P02708
1364	1408	SYCEIIVTHFPFDE			X	P02708
1365	1409	VFVIASIIITV			X	P02708
1366	1410	VINTHHRSPST			X	P02708
1367	1411	VNVIIPCLLSFLT			X	P02708
1368	1412	VPLFSLQNEQ			X	P02708
1369	1413	YNNADGDFAIVKFT			X	P02708
1370	1414	CCPDTPYLDITYH			X	P02708
1371	1415	CPDTPYLDITYHF			X	P02708
1372	1416	FLLVIVE			X	P02708
1373	1417	GLQLIQLINVDEV			X	P02708
1374	1418	GSVVAINPESDQP			X	P02708
1375	1419	HSVTYSCCPDTPY			X	P02708
1376	1420	INVDEVNQIVTTN			X	P02708
1377	1421	KRPSREKQDKKIF			X	P02708
1378	1422	LQLIQLINVDEVN			X	P02708
1379	1423	LSNFMESGEWVIK			X	P02708
1380	1424	NVDEVNQIVTTNV			X	P02708
1381	1425	NVIIPCLLSFLT			X	P02708
1382	1426	PDTPYLDITY			X	P02708
1383	1427	SCCPDTPYLDITY			X	P02708
1384	1428	SVVAINPESDQPD			X	P02708
1385	1429	TYSCCPDTPYLDI			X	P02708
1386	1430	VCIIGTLAVFAGR			X	P02708
1387	1431	VTYSCCPDTPYLD			X	P02708
1388	1432	YSCCPDTPYLDIT			X	P02708
1389	1433	AAAAPLLVAVAALL			X	P06213
1390	1434	APESSELEMEFEDM			X	P06213
1391	1435	CSISVTYFPFD			X	P07510

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1392	1436	DGQTIEWIFID			X	P07510
1393	1437	DPNLRPAERDS			X	P07510
1394	1438	EERLLADLMQN			X	P07510
1395	1439	FDNGNEEWFLV			X	P07510
1396	1440	IFQSQTYSTNEIDL			X	P07510
1397	1441	KMLLDPAAPAQ			X	P07510
1398	1442	LAVCLGAQGRNQEE			X	P07510
1399	1443	LGAQGRNQEER			X	P07510
1400	1444	LLDPAAPAEQA			X	P07510
1401	1445	LSQEDGQTIEW			X	P07510
1402	1446	LTNLISLNEREEAL			X	P07510
1403	1447	NQEERLLADLM			X	P07510
1404	1448	NRVPALPFGD			X	P07510
1405	1449	NYDPNLRPAER			X	P07510
1406	1450	PAKMLLDPAAP			X	P07510
1407	1451	PDIVLENNVDG			X	P07510
1408	1452	PDIVLENNVDGVFE			X	P07510
1409	1453	QTIEWIFIDPE			X	P07510
1410	1454	RHQQSHFDNGNEEW			X	P07510
1411	1455	SHFDNGNEEWF			X	P07510
1412	1456	SKYLTFLLVVT			X	P07510
1413	1457	SQTYSTNEIDL			X	P07510
1414	1458	VDGVFEVALYC			X	P07510
1415	1459	VPALPFGDPR			X	P07510
1416	1460	VWRPDIVLENNVDG			X	P07510
1417	1461	AALEKLE			X	P07510
1418	1462	DIVLENNVDGVFE			X	P07510
1419	1463	ETSQAVP			X	P07510
1420	1464	FQSQTYSTNEIDL			X	P07510
1421	1465	HFDNGNEEWFLVG			X	P07510
1422	1466	HYNRVPALPFGD			X	P07510
1423	1467	LLAVCLGAQGRN			X	P07510
1424	1468	LQLSQEDGQTIEW			X	P07510
1425	1469	LSLFICG			X	P07510
1426	1470	LVAKKVPETSQAV			X	P07510
1427	1471	QWQRQGLVAAALE			X	P07510
1428	1472	RQGLVAAALEKLE			X	P07510
1429	1473	STNEIDL			X	P07510
1430	1474	TIEWIFIDPEAFT			X	P07510
1431	1475	VLENNVDGVFEVA			X	P07510
1432	1476	VVNAVVV			X	P07510
1433	1477	WQRQGLVAAALEK			X	P07510
1434	1478	APDHDVTQERDEVW			X	P07550
1435	1479	CYANETCCDFF			X	P07550
1436	1480	DSQGRNCSTNDSLL			X	P07550
1437	1481	FAITSPFKYQSLLT			X	P07550
1438	1482	NFWCEFWTSIDVLC			X	P07550

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1439	1483	NGYSSNGNTGEQSG			X	P07550
1440	1484	QEKENKLLCEDLPG			X	P07550
1441	1485	QGRNCSTNDSL			X	P07550
1442	1486	CLKEHKALKTLGI			X	P07550
1443	1487	DNIDSQGRNCSTN			X	P07550
1444	1488	DSQGRNCSTNDSL			X	P07550
1445	1489	FCLKEHKALKTLG			X	P07550
1446	1490	GRNCSTN			X	P07550
1447	1491	IASSIVS			X	P07550
1448	1492	NCSTNDS			X	P07550
1449	1493	RNCSTND			X	P07550
1450	1494	SLLTKNKARVIL			X	P07550
1451	1495	TVPSDNI			X	P07550
1452	1496	VLAIVFG			X	P07550
1453	1497	YQSLLTK			X	P07550
1454	1498	AIAAFYLPVIIMTV			X	P08172
1455	1499	APRDPVTENCV			X	P08172
1456	1500	CAPCIPNTVWT			X	P08172
1457	1501	DSCTPTNTTVE			X	P08172
1458	1502	GRIVKPNNNNMPSS			X	P08172
1459	1503	INTFCAPCIPNTVW			X	P08172
1460	1504	ISFDYFCVTKPLT			X	P08172
1461	1505	IVKPNNNNMPSSDD			X	P08172
1462	1506	KQNIIVARKIVKMTK			X	P08172
1463	1507	KVNRHLQTVNN			X	P08172
1464	1508	LFWQFIVGVRTVED			X	P08172
1465	1509	LIISFDYFCV			X	P08172
1466	1510	LVQGRIIVKPNNNNM			X	P08172
1467	1511	MNNSTNSSNNSLAL			X	P08172
1468	1512	MVSIKVNRLQTVN			X	P08172
1469	1513	NSTNSSNNSLA			X	P08172
1470	1514	PAILFWQFIVG			X	P08172
1471	1515	PCIPNTVWTIG			X	P08172
1472	1516	PVTENCVQGEE			X	P08172
1473	1517	QFIVGVRTVED			X	P08172
1474	1518	QGRIVKPNNNNMPS			X	P08172
1475	1519	QNIIVARKIVKMTKQ			X	P08172
1476	1520	SRIKKDKKEPV			X	P08172
1477	1521	SVMNLLIISFD			X	P08172
1478	1522	TENCVQGEEKE			X	P08172
1479	1523	TENCVQGEEKESN			X	P08172
1480	1524	TFCAPCIPNTVWTI			X	P08172
1481	1525	TPKSDSCTPTNTTV			X	P08172
1482	1526	TVEVVGSSGQNGDE			X	P08172
1483	1527	VCDLWLALDYV			X	P08172
1484	1528	VLVAGSLSLVTIIG			X	P08172
1485	1529	VSIKVNRLQTVNN			X	P08172

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1486	1530	WPLGPPVCDLW			X	P08172
1487	1531	IVKMTKQPAKKK			X	P08172
1488	1532	KIVKMTKQPAKKK			X	P08172
1489	1533	LFWQFIVGVRTVE			X	P08172
1490	1534	NNNNMPSSDDGLE			X	P08172
1491	1535	NNSTNSS			X	P08172
1492	1536	NSTNSSN			X	P08172
1493	1537	NSTNSSNNSLALT			X	P08172
1494	1538	RKIVKMTKQPAKK			X	P08172
1495	1539	SRASKSRIKKDKK			X	P08172
1496	1540	STNSSNNSLALTS			X	P08172
1497	1541	TNSSNNS			X	P08172
1498	1542	VKPNNNNMPSSDD			X	P08172
1499	1543	WTIGYWL			X	P08172
1500	1544	YINSTIN			X	P08172
1501	1545	AFYLPVVIMTV			X	P08173
1502	1546	AKTLAFLKSPL			X	P08173
1503	1547	EATTPAMPAPP			X	P08173
1504	1548	EMVFIATVTGS			X	P08173
1505	1549	ETVEMVFIATVTGS			X	P08173
1506	1550	LSIKVNRQLQTVNN			X	P08173
1507	1551	LSTTEATTPAMPAP			X	P08173
1508	1552	NRYETVEMVFIATV			X	P08173
1509	1553	TVEMVFIATVT			X	P08173
1510	1554	VNRQLQTVNNY			X	P08173
1511	1555	WTPYNVMVLVN			X	P08173
1512	1556	AKTLAFL			X	P08173
1513	1557	DKDTSNE			X	P08173
1514	1558	KDTSNES			X	P08173
1515	1559	LYTVYIIKGYWPL			X	P08173
1516	1560	RNQVRKKRQMAAR			X	P08173
1517	1561	RYETVEMVFIATV			X	P08173
1518	1562	SATQNTK			X	P08173
1519	1563	YETVEMVFIATVT			X	P08173
1520	1564	EYGSFFCELWTSVD			X	P08588
1521	1565	LAITSPFRYQSLT			X	P08588
1522	1566	LVALREQKALK			X	P08588
1523	1567	PGAASDDDDDD			X	P08588
1524	1568	PPSPSPSPVPA			X	P08588
1525	1569	RARARGLVCTV			X	P08588
1526	1570	SFFCELWTSVD			X	P08588
1527	1571	VWALSALVSFL			X	P08588
1528	1572	WEYGSFFCELW			X	P08588
1529	1573	ARLLEPW			X	P08588
1530	1574	ARLLVPA			X	P08588
1531	1575	DVVGATPPARLLE			X	P08588
1532	1576	LPPASES			X	P08588

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1533	1577	PPARLLE			X	P08588
1534	1578	QQWTAGMGLLMAL			X	P08588
1535	1579	RLLCCARRAARRR			X	P08588
1536	1580	SFFCELWTSVDVL			X	P08588
1537	1581	RAARFRIRKTVKKV			X	P08908
1538	1582	AQRERNQASWS			X	P08912
1539	1583	CLRCRPTLAQRER			X	P08912
1540	1584	CWQYLVGKRTV			X	P08912
1541	1585	DSYHNATTVNG			X	P08912
1542	1586	EDEDKPATDPV			X	P08912
1543	1587	GEEFSAEETEETFV			X	P08912
1544	1588	GKRTVPLDECQ			X	P08912
1545	1589	GTPVNHQPLER			X	P08912
1546	1590	KPATDPVLQVV			X	P08912
1547	1591	KRTKDLADLQGSDS			X	P08912
1548	1592	LGYWLCYVNSTVNP			X	P08912
1549	1593	NLLVISFDRYF			X	P08912
1550	1594	PICYALCNRTF			X	P08912
1551	1595	QGKESPGEEFSAEE			X	P08912
1552	1596	QYLVGKRTVPLDEC			X	P08912
1553	1597	RKTFKMLLLCRWKK			X	P08912
1554	1598	TEETFVKAETE			X	P08912
1555	1599	TLAQRERNQAS			X	P08912
1556	1600	TVNGTPVNHQPLER			X	P08912
1557	1601	WALGSLACDLW			X	P08912
1558	1602	AETEKSD			X	P08912
1559	1603	ALFRSCLRCRPT			X	P08912
1560	1604	ASWSSRRSTSTT			X	P08912
1561	1605	DPVLQVV			X	P08912
1562	1606	EEFSAEETEETFV			X	P08912
1563	1607	EFSAEETEETFVK			X	P08912
1564	1608	FKMLLLCRWKKKK			X	P08912
1565	1609	FRSCLRCRPTLA			X	P08912
1566	1610	FSAEETEETFVKA			X	P08912
1567	1611	GKRTVPLDECQIQ			X	P08912
1568	1612	GYWLCYVNSTVNP			X	P08912
1569	1613	KMLLLCRWKKKKV			X	P08912
1570	1614	KPAHRALFRSCLR			X	P08912
1571	1615	LYTTYILMGRWAL			X	P08912
1572	1616	SPGEEFSAEETEE			X	P08912
1573	1617	SSYPSEDEDKPA			X	P08912
1574	1618	SSYPSEDEDKPAT			X	P08912
1575	1619	TCSSYPSEDEDK			X	P08912
1576	1620	VNSTVNP			X	P08912
1577	1621	YVNSTVN			X	P08912
1578	1622	YWLCYVNSTVNPI			X	P08912
1579	1623	AWCEIYLALDV			X	P08913

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1580	1624	DSLPRRGPGAT			X	P08913
1581	1625	HAERPPGPRRPERG			X	P08913
1582	1626	ISLDRYWSITQAIE			X	P08913
1583	1627	KFFFWFGYCNSSLN			X	P08913
1584	1628	LALDVLCTSSIVH			X	P08913
1585	1629	PMGSLQPDAGN			X	P08913
1586	1630	PPGGTERRPNG			X	P08913
1587	1631	SSDHAERPPGPRRP			X	P08913
1588	1632	SSIVHLCAISLDY			X	P08913
1589	1633	TERRPNGLGPE			X	P08913
1590	1634	VHLCAISLDY			X	P08913
1591	1635	YTIFNHDFRRA			X	P08913
1592	1636	ALDLEES			X	P08913
1593	1637	ATLVIPFSLANEV			X	P08913
1594	1638	DFRRAFK			X	P08913
1595	1639	FSLANEV			X	P08913
1596	1640	GAEAEPL			X	P08913
1597	1641	AYSWKEEEEED			X	P11229
1598	1642	CKDCVPETLWELGY			X	P11229
1599	1643	CVPETLWELGYWLC			X	P11229
1600	1644	GSEVVIKMPMV			X	P11229
1601	1645	GYWLCYVNSTINPM			X	P11229
1602	1646	KQPPRSSPNTVKRP			X	P11229
1603	1647	LLQAYSWKEEEEED			X	P11229
1604	1648	LQAYSWKEEEE			X	P11229
1605	1649	NLLVLISFKVNTL			X	P11229
1606	1650	SEGEEPGSEVV			X	P11229
1607	1651	SWKEEEEDEG			X	P11229
1608	1652	EEEEDE			X	P11229
1609	1653	EEEEDEGSMESL			X	P11229
1610	1654	KEEEEED			X	P11229
1611	1655	LLQAYSW			X	P11229
1612	1656	QAYSWKEEEEDE			X	P11229
1613	1657	RPLSYRAKRTPRR			X	P11229
1614	1658	SLTSSEG			X	P11229
1615	1659	WKEEEE			X	P11229
1616	1660	GLGPDGQGHQE			X	P11230
1617	1661	LKRPKPERDLMPEP			X	P11230
1618	1662	YLDLEWTDYRLSWD			X	P11230
1619	1663	AVALLPELREVVS			X	P11230
1620	1664	CTMVFSS			X	P11230
1621	1665	HEGTFIE			X	P11230
1622	1666	LAPGVRG			X	P11230
1623	1667	SYSYDSSEVSLQT			X	P11230
1624	1668	TPGALLM			X	P11230
1625	1669	WTFIIFT			X	P11230
1626	1670	ATGCELWTSVD			X	P13945

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1627	1671	GLIMGTFTLCW			X	P13945
1628	1672	LPTLAPNTANT			X	P13945
1629	1673	RALGGPSLVPG			X	P13945
1630	1674	SRS LAPAPVGT			X	P13945
1631	1675	VDRYLAVTNPL			X	P13945
1632	1676	VGADAE AQRCHSNP			X	P13945
1633	1677	RYGALVT			X	P13945
1634	1678	IKIYIVLRRRRKRV			X	P14416
1635	1679	LVYIKIYIVLRRRR			X	P14416
1636	1680	HGLHSTPDSPAKPE			X	P14416
1637	1681	IVLRRRRKRVNTKR			X	P14416
1638	1682	KIYIVLRRRRKRVN			X	P14416
1639	1683	MPNGKTRTSLKTMS			X	P14416
1640	1684	RRRRKRVNTRKSSR			X	P14416
1641	1685	VYIKIYIVLRRRRK			X	P14416
1642	1686	AVCYAFVFSALIEF			X	P14867
1643	1687	ECPMHLEDFPMDAH			X	P14867
1644	1688	KVAYATAMDWFIAV			X	P14867
1645	1689	YFVIQTYLPCIMTV			X	P14867
1646	1690	FTKRGYAWDGKSVV			X	P14867
1647	1691	FNYYIESDAWQEKD			X	P15382
1648	1692	AIIYYQSGGRLRR			X	P16389
1649	1693	DENEDMHGSGVTFH			X	P16389
1650	1694	DYMEIQEGVNNSNE			X	P16389
1651	1695	EDMHGSGVTFHTYS			X	P16389
1652	1696	EGVNNSNEDFREEN			X	P16389
1653	1697	EIQEGVNNSNEDFR			X	P16389
1654	1698	EMFREDEGYIKEEE			X	P16389
1655	1699	FRIFKLSRHSKGLQ			X	P16389
1656	1700	FYELGEEAMEMFRE			X	P16389
1657	1701	ISIVSFCLETLPF			X	P16389
1658	1702	KLSRHSKGLQILGQ			X	P16389
1659	1703	PQDTYDPEADHECC			X	P16389
1660	1704	MEIQEGVNNSNEDF			X	P16389
1661	1705	SDYMEIQEGVNNSN			X	P16389
1662	1706	VNNSNEDFREENLK			X	P16389
1663	1707	FLHLTRADLSYPSH			X	P16473
1664	1708	YVFFEEQEDEIIGF			X	P16473
1665	1709	EYPESSGPARGIAI			X	P17658
1666	1710	GGSFFTDPFFLVET			X	P17658
1667	1711	GVS RVSPVSRGSQE			X	P17658
1668	1712	LAAPGEVRGPEGEQ			X	P17658
1669	1713	LRATDNGLGKPDFP			X	P17658
1670	1714	PVSRGSQEEEEDED			X	P17658
1671	1715	QEEEEDEDDSYTFH			X	P17658
1672	1716	REDEGCLPEGGEDE			X	P17658
1673	1717	RGSQEEEEDEDDSY			X	P17658

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1674	1718	SQPFQRQVWLLFEY			X	P17658
1675	1719	STLGGSFFTDPFFL			X	P17658
1676	1720	ERLVINISGLRFET			X	P17658
1677	1721	RSEKSLTLAAPGEV			X	P17658
1678	1722	SQEEEEDEDDSYTF			X	P17658
1679	1723	YFAEADDDDSLFP			X	P17658
1680	1724	ACKIEVKHFPF			X	P17787
1681	1725	AGAFGAEPAPV			X	P17787
1682	1726	CARQRLRLRRR			X	P17787
1683	1727	CGEKMTLCISV			X	P17787
1684	1728	EKMTLCISVLL			X	P17787
1685	1729	GPVALLLGFL			X	P17787
1686	1730	ISVHEREQIMTTNV			X	P17787
1687	1731	KVRLPSKHIWLPDV			X	P17787
1688	1732	MTTNVWLTQEWEDY			X	P17787
1689	1733	PPAIKSACKI			X	P17787
1690	1734	QRLRLRRRQREREG			X	P17787
1691	1735	RLRRRQREREG			X	P17787
1692	1736	RQRLRLRRRQR			X	P17787
1693	1737	RSWTYDRTEID			X	P17787
1694	1738	VASLDDFTPSGEWD			X	P17787
1695	1739	VHEREQIMTTN			X	P17787
1696	1740	VSLAQLISVHEREQ			X	P17787
1697	1741	WTYDRTEIDLVLKS			X	P17787
1698	1742	YDRTEIDLVLK			X	P17787
1699	1743	CARQRLRLRRRQR			X	P17787
1700	1744	GAEPAPV			X	P17787
1701	1745	GLAGAFGAEPAPV			X	P17787
1702	1746	HHCARQRLRLRRR			X	P17787
1703	1747	ISVHEREQIMTTN			X	P17787
1704	1748	NAVVSVD			X	P17787
1705	1749	RHHCARQRLRLRR			X	P17787
1706	1750	AAITFLILFTI			X	P18089
1707	1751	ASPEDEAEED			X	P18089
1708	1752	CGASPEDEAEED			X	P18089
1709	1753	EEEEEECEPQAVPV			X	P18089
1710	1754	EEEEEECEPQ			X	P18089
1711	1755	EEEEEECEP			X	P18089
1712	1756	EEEEEECEPQA			X	P18089
1713	1757	GASPEDEAEED			X	P18089
1714	1758	PEDEAEED			X	P18089
1715	1759	SGQGQKEGVCASP			X	P18089
1716	1760	SPEDEAEED			X	P18089
1717	1761	STGKEEGETP			X	P18089
1718	1762	AEEED			X	P18089
1719	1763	AEEEEEEEEED			X	P18089
1720	1764	DEAEED			X	P18089

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1721	1765	EAESEEE			X	P18089
1722	1766	EAESESESESESE			X	P18089
1723	1767	EDEAESESESESE			X	P18089
1724	1768	ESESECE			X	P18089
1725	1769	ESESEEC			X	P18089
1726	1770	ESESESECEPQA			X	P18089
1727	1771	ESESESESECEPQ			X	P18089
1728	1772	ESESESESECEP			X	P18089
1729	1773	ESESESESESECE			X	P18089
1730	1774	ESESESESESEEC			X	P18089
1731	1775	GEKEEGE			X	P18089
1732	1776	GQKEGVC			X	P18089
1733	1777	IILTVWLIAAVIS			X	P18089
1734	1778	IYTIFNQ			X	P18089
1735	1779	NSGQGQKEGVCQA			X	P18089
1736	1780	PEDEAESESESE			X	P18089
1737	1781	RALPPSWAALPNS			X	P18089
1738	1782	RAQLTRE			X	P18089
1739	1783	RGRPQCK			X	P18089
1740	1784	SPEDEAESESESE			X	P18089
1741	1785	TGEKEEG			X	P18089
1742	1786	TIFNQDF			X	P18089
1743	1787	VNGHSTGEKEE			X	P18089
1744	1788	WAALPNSGQGQKE			X	P18089
1745	1789	ETLPKIPYVKAIDI			X	P18505
1746	1790	IDVASIDMVSEVNM			X	P18505
1747	1791	LRPDFGGPPVDVGM			X	P18505
1748	1792	PLDEQNCTLEIESY			X	P18505
1749	1793	VCCAHSSTNEPSNMS			X	P18505
1750	1794	AARVALGITTVLTM			X	P18505
1751	1795	GCFVFVFLALLEYA			X	P18505
1752	1796	YDIRLRPDFGGPPV			X	P18505
1753	1797	ATHLQERDEEYGYE			X	P18507
1754	1798	DAECQLQLHNFPMQ			X	P18507
1755	1799	DAVPARTSLGITTV			X	P18507
1756	1800	KKNPAPTIDIRPRS			X	P18507
1757	1801	KVSYSVTAMDLFVSV			X	P18507
1758	1802	LDGKDCASFFCCFE			X	P18507
1759	1803	LIHTDMYVNSIGPV			X	P18507
1760	1804	NFPMDEHSCPLEFS			X	P18507
1761	1805	NTTEVVKTTSQDYV			X	P18507
1762	1806	SNRKPSKDKDKKKK			X	P18507
1763	1807	KPSKDKDKKKKNPA			X	P18507
1764	1808	VLYTLRLTIDAECQ			X	P18507
1765	1809	AAAGPNASGAGERG			X	P18825
1766	1810	ADVEPDESSAAER			X	P18825
1767	1811	ANASGASWGPPRGQ			X	P18825

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1768	1812	APPPADVEPDE			X	P18825
1769	1813	GAAYPQCGLND			X	P18825
1770	1814	HCAPPADVEPDES			X	P18825
1771	1815	IAVLTSRALRA			X	P18825
1772	1816	ILFRRRRRGFR			X	P18825
1773	1817	IVFTVVGNVLV			X	P18825
1774	1818	LIMGLVYARIY			X	P18825
1775	1819	PADVEPDESSA			X	P18825
1776	1820	PCLIMGLVYAR			X	P18825
1777	1821	PDGAAYPQCGLNDE			X	P18825
1778	1822	PFSLANELMAY			X	P18825
1779	1823	PPPADVEPDES			X	P18825
1780	1824	PPPADVEPDESSAA			X	P18825
1781	1825	RRGALRRGGRR			X	P18825
1782	1826	AAAERRRRRGALR			X	P18825
1783	1827	AAERRRRRGALRR			X	P18825
1784	1828	AAGPNAS			X	P18825
1785	1829	AAVVGFL			X	P18825
1786	1830	AERRRRR			X	P18825
1787	1831	AERRRRRGALRRG			X	P18825
1788	1832	AGERGSG			X	P18825
1789	1833	FRRSFKHILFRRR			X	P18825
1790	1834	GFLIVFT			X	P18825
1791	1835	KHILFRRRRRGFR			X	P18825
1792	1836	LFRRRRR			X	P18825
1793	1837	NASGAGE			X	P18825
1794	1838	PFFFSYSLYGICR			X	P18825
1795	1839	RRRGALRRGGRRR			X	P18825
1796	1840	RRRRARSSVCRRK			X	P18825
1797	1841	RRRRGALRRGGRR			X	P18825
1798	1842	RRRRRGALRRGGR			X	P18825
1799	1843	SFKHILFRRRRRG			X	P18825
1800	1844	SRALRAP			X	P18825
1801	1845	SRRRRARSSVCRR			X	P18825
1802	1846	YRVAKLRTRLSE			X	P18825
1803	1847	AASLENSASSDEED			X	P20309
1804	1848	CYINSTVNPVC			X	P20309
1805	1849	DNLQVPEEELG			X	P20309
1806	1850	FSKLPIQLES AVDT			X	P20309
1807	1851	LACDLWLAI DY			X	P20309
1808	1852	LERKADKLQAQ			X	P20309
1809	1853	LGNLACDLWLAI DY			X	P20309
1810	1854	LPIQLES AVDT			X	P20309
1811	1855	LQVPEEELGMV			X	P20309
1812	1856	PLFPNISSWI			X	P20309
1813	1857	TAIAAFYMPVT			X	P20309
1814	1858	TFGTIAAFYMPVT			X	P20309

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1815	1859	TTKRAGVMIGLAWV			X	P20309
1816	1860	VDTAKTSDVNS			X	P20309
1817	1861	WLCYINSTVNP			X	P20309
1818	1862	ELAGLQA			X	P20309
1819	1863	IFHKRAP			X	P20309
1820	1864	INSTVNP			X	P20309
1821	1865	NSTVNPV			X	P20309
1822	1866	QQQSMKRSNRRKY			X	P20309
1823	1867	QSMKRSN			X	P20309
1824	1868	RPLTYRAKRTTKR			X	P20309
1825	1869	TKRKRMSLVKEKK			X	P20309
1826	1870	YINSTVN			X	P20309
1827	1871	FKTGNSTATCTNN			X	P22001
1828	1872	GRELPDMTVVPGD			X	P22001
1829	1873	AAAAAATAAA			X	P22459
1830	1874	ATAAVEGSGGSGGG			X	P22459
1831	1875	CTSHDPQSSRGSR			X	P22459
1832	1876	EEEEEEGRFYSE			X	P22459
1833	1877	EEEEGRFYSEDDH			X	P22459
1834	1878	FREDEGFVREEEDR			X	P22459
1835	1879	FYSEDDHGDECSY			X	P22459
1836	1880	GVKESLCAKEEKCK			X	P22459
1837	1881	KILRELSEEEDEE			X	P22459
1838	1882	LLKFREDEGFVREE			X	P22459
1839	1883	QLGEEALLKFREDE			X	P22459
1840	1884	SEEKILRELSEEE			X	P22459
1841	1885	SFPHCSDLMPGSE			X	P22459
1842	1886	SGHTIFNDPFFIVE			X	P22459
1843	1887	SSTSSSLGDKSEYL			X	P22459
1844	1888	TIFNDPFFIVETVC			X	P22459
1845	1889	TQYFDPLRNEYFFD			X	P22459
1846	1890	VSGLRFETQMKTLA			X	P22459
1847	1891	EEDEEEEEEEEEEG			X	P22459
1848	1892	RELSEEEDEEEEEE			X	P22459
1849	1893	SEEEDEEEEEEEEE			X	P22459
1850	1894	RGSRRRRRQRSEKK			X	P22459
1851	1895	RRRRRQRSEKKKAH			X	P22459
1852	1896	ELPRRRPPPEDEE			X	P22460
1853	1897	ENGAMTVRGGDEA			X	P22460
1854	1898	FDRNRPSFDGILYY			X	P22460
1855	1899	LLPRTLADPFFIVE			X	P22460
1856	1900	LPPLPEELPRRRP			X	P22460
1857	1901	LSDGPKEPAPKGRG			X	P22460
1858	1902	PLEKCNVKAASNVD			X	P22460
1859	1903	RETDHEEPAVLKEE			X	P22460
1860	1904	SLDVFADEIRFYQL			X	P22460
1861	1905	TFELLVRFFACPSK			X	P22460

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1862	1906	TVGYGDMRPITVGG			X	P22460
1863	1907	EEEEGDPGLGTVED			X	P22460
1864	1908	PEDEEEGDPGLGT			X	P22460
1865	1909	VNVSLDVFADEIRF			X	P22460
1866	1910	AKDGISVKGANNSN			X	P23415
1867	1911	ANNSNTTNPPAPPS			X	P23415
1868	1912	CLLFVFSALLEYAA			X	P23415
1869	1913	GISVKGANNSNTTN			X	P23415
1870	1914	VKGANNSNTTNPPP			X	P23415
1871	1915	DFSMRPGFGGPAIP			X	P24046
1872	1916	DSLKTDERISLSQF			X	P24046
1873	1917	GFGGPAIPVGVDVQ			X	P24046
1874	1918	GKVLVSLRVTVTAM			X	P24046
1875	1919	MRPGFGGPAIPVGV			X	P24046
1876	1920	QPDGKVLVSLRVTV			X	P24046
1877	1921	TLYLRHYWKDERLS			X	P24046
1878	1922	VQVESLDSISEVDM			X	P24046
1879	1923	WVPDMFFVHSKRSF			X	P24046
1880	1924	CSLEIESYAYTEDD			X	P24046
1881	1925	ERLSFPSTNNLSMT			X	P24046
1882	1926	SLEEKQSCLKFKAN			X	P24530
1883	1927	AADAFDIGSFDEED			X	P25098
1884	1928	AFDIGSFDEED			X	P25098
1885	1929	DLFQPYIEEIC			X	P25098
1886	1930	DRLEARKKAKN			X	P25098
1887	1931	EEARPLVEFYEEIK			X	P25098
1888	1932	EEERVAREREIFDS			X	P25098
1889	1933	FQKFIESDKFT			X	P25098
1890	1934	GEGEAPQSLLT			X	P25098
1891	1935	HKTKDKHEIDR			X	P25098
1892	1936	LLTMEEIQSVE			X	P25098
1893	1937	LPDSFSPELRSLL			X	P25098
1894	1938	NHLEEARPLVE			X	P25098
1895	1939	QNLRGDVFQKFIES			X	P25098
1896	1940	QQEVAETVFDITNA			X	P25098
1897	1941	RPLVEFYEEIK			X	P25098
1898	1942	SFSPELRSLL			X	P25098
1899	1943	SVEETQIKERK			X	P25098
1900	1944	TMEEIQSVEET			X	P25098
1901	1945	WRGEGEAPQSLLTM			X	P25098
1902	1946	YLEDRGVETFE			X	P25098
1903	1947	AAEILG			X	P25098
1904	1948	APQSLLT			X	P25098
1905	1949	EEERVAREREIFD			X	P25098
1906	1950	EIQSVEE			X	P25098
1907	1951	ERVAREREIFDSY			X	P25098
1908	1952	GRGGFGE			X	P25098

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1909	1953	GYMAPEV			X	P25098
1910	1954	HPFSKSA			X	P25098
1911	1955	IGRGGFG			X	P25098
1912	1956	IPPRGEV			X	P25098
1913	1957	IQSVEETQIKERK			X	P25098
1914	1958	ISERWQQEVAETV			X	P25098
1915	1959	KYPPPLIPPRGEV			X	P25098
1916	1960	LEDERGEV			X	P25098
1917	1961	LTMNDFS			X	P25098
1918	1962	PQSLLTM			X	P25098
1919	1963	QSVEETQIKERKC			X	P25098
1920	1964	RGGFGEV			X	P25098
1921	1965	RVARSRIFDSYI			X	P25098
1922	1966	SVMQKYLEDRGEV			X	P25098
1923	1967	ALTALPDPDPE			X	P25100
1924	1968	APSSGDAPPGAPLA			X	P25100
1925	1969	CQCRRRRRRRP			X	P25100
1926	1970	CRRRRRRRPLW			X	P25100
1927	1971	DPEPPGTPEMQAPV			X	P25100
1928	1972	ERGKASEVVLR			X	P25100
1929	1973	FRDLLSVSFEG			X	P25100
1930	1974	LRCQCRRRRRR			X	P25100
1931	1975	LRCQCRRRRRRRPL			X	P25100
1932	1976	MQAPVASRRKPPSA			X	P25100
1933	1977	PLLGWKEPVPPDER			X	P25100
1934	1978	QCRRRRRRRPL			X	P25100
1935	1979	QDCAPSSGDAPPGA			X	P25100
1936	1980	RCQCRRRRRRR			X	P25100
1937	1981	WRASTSLRQDCAP			X	P25100
1938	1982	CQCRRRRRRRPLW			X	P25100
1939	1983	CRRRRRR			X	P25100
1940	1984	EVAEGATCQAYEL			X	P25100
1941	1985	FLRLLRCQCRRRR			X	P25100
1942	1986	FSREKKAATLAI			X	P25100
1943	1987	GATCQAYELADYS			X	P25100
1944	1988	LCCTASILSLCTI			X	P25100
1945	1989	PEMQAPV			X	P25100
1946	1990	RRRRRRRPLWRVYG			X	P25100
1947	1991	RRRRRRR			X	P25100
1948	1992	RRRRRRRPLWRVY			X	P25100
1949	1993	SATMEVL			X	P25100
1950	1994	VIFWLGY			X	P25100
1951	1995	VLCWFPPFFVLPL			X	P25100
1952	1996	VVCCAQSVNDPGNM			X	P28472
1953	1997	LYWKNGDESLKTDE			X	P28476
1954	1998	QTCSLEESYAYTD			X	P28476
1955	1999	CTIDVTFFPFD			X	P30532

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
1956	2000	DQDVKRDFFD			X	P30532
1957	2001	GLSFLTVLVFY			X	P30532
1958	2002	HEDSLLKDLFQDYE			X	P30532
1959	2003	PSDSVWTPDIVLFD			X	P30532
1960	2004	QDVKRDFFDNGEW			X	P30532
1961	2005	QKEETESGSGP			X	P30532
1962	2006	RDFFDNGEWEL			X	P30532
1963	2007	SVWTPDIVLFDNAD			X	P30532
1964	2008	SWTYDGSQVDIILE			X	P30532
1965	2009	TKTVIRYNGTVTWT			X	P30532
1966	2010	AISQLVDVDEKNQ			X	P30532
1967	2011	RYNGTVT			X	P30532
1968	2012	TYSFVIKRLPLFY			X	P30532
1969	2013	VTYSFVIKRLPLF			X	P30532
1970	2014	DFIIKRKPLFY			X	P30926
1971	2015	MRRAPSLVFLFLVA			X	P30926
1972	2016	NEREQIMTTNV			X	P30926
1973	2017	SLAQLISVNER			X	P30926
1974	2018	TSPSNFYGNM			X	P30926
1975	2019	VFMFVCVLGTV			X	P30926
1976	2020	DFIIKRKPLFYTI			X	P30926
1977	2021	ISVNEREQIMTTN			X	P30926
1978	2022	LISVNEREQIMTT			X	P30926
1979	2023	ECPMQLEDFPMDAH			X	P31644
1980	2024	GMFSGFIMIKNLLL			X	P31644
1981	2025	ISAECPMQLEDFPM			X	P31644
1982	2026	KKREVILNKSTNAF			X	P31644
1983	2027	MNLSSHFGFSQMPT			X	P31644
1984	2028	SGFIMIKNLLFCI			X	P31644
1985	2029	DGKKALEAAKIKKK			X	P31644
1986	2030	EVILNKSTNAFTTG			X	P31644
1987	2031	ASEAEHRLFERLFE			X	P32297
1988	2032	DIKYNCCIEIY			X	P32297
1989	2033	ERLFEDYNEIIRPV			X	P32297
1990	2034	HHRRIKISNFSANL			X	P32297
1991	2035	HRLFERLFEDY			X	P32297
1992	2036	IRPVANVSDPV			X	P32297
1993	2037	KIDVTYFPFDY			X	P32297
1994	2038	MSQLVKVDEVN			X	P32297
1995	2039	PVANVSDPVIIHFE			X	P32297
1996	2040	RLFERLFEDYNEII			X	P32297
1997	2041	VARASEAEHRLFER			X	P32297
1998	2042	VDEVNQIMETN			X	P32297
1999	2043	VDEVNQIMETNLWL			X	P32297
2000	2044	CCEIYPDITYSL			X	P32297
2001	2045	CCEIYPDITYSLY			X	P32297
2002	2046	DKTKALLKYTGEV			X	P32297

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2003	2047	ENMKAQN			X	P32297
2004	2048	EVSMSQLVKVDEV			X	P32297
2005	2049	IAENMKAQNEAKE			X	P32297
2006	2050	LFERLFEDYNEII			X	P32297
2007	2051	LKYTGEV			X	P32297
2008	2052	RLFEDYNEIIRPV			X	P32297
2009	2053	YSLYIRRLPLFYT			X	P32297
2010	2054	AECPMHLEDFPMDV			X	P34903
2011	2055	DSPTETKTYNSVSK			X	P34903
2012	2056	IFTRILDRLLDGYD			X	P34903
2013	2057	LYTMRLTIHAECPM			X	P34903
2014	2058	PMHLEDFPMDVHAC			X	P34903
2015	2059	TETKTYNSVSKVDK			X	P34903
2016	2060	VVGTEIIRSSTGEY			X	P34903
2017	2061	GQGESRRQEPGDFV			X	P34903
2018	2062	SPTETKTYNSVSKV			X	P34903
2019	2063	GLCIISIDRYI			X	P35348
2020	2064	IDRYIGVSYPL			X	P35348
2021	2065	IGPLFGWRQPAPED			X	P35348
2022	2066	LKTDKSDSEQVTLR			X	P35348
2023	2067	LTSTVLPFSAIFEV			X	P35348
2024	2068	VLCWLPPFLVMPIG			X	P35348
2025	2069	ITVSKDQSSCTTA			X	P35348
2026	2070	PSETVFK			X	P35348
2027	2071	ANGQPGFKSNMPLA			X	P35368
2028	2072	ASILSLCAISIDRY			X	P35368
2029	2073	CQCRGRGRRRR			X	P35368
2030	2074	CRGRGRRRRRR			X	P35368
2031	2075	DKECGVTEEPF			X	P35368
2032	2076	GCQCRGRGRRRRRR			X	P35368
2033	2077	GRGRRRRRRRR			X	P35368
2034	2078	GRGRRRRRRRRRLG			X	P35368
2035	2079	GRRRRRRRRRL			X	P35368
2036	2080	LCWLPPFIALPLGS			X	P35368
2037	2081	LSLCAISIDRY			X	P35368
2038	2082	PCSSKEFKRAFVRI			X	P35368
2039	2083	QCRGRGRRRRR			X	P35368
2040	2084	RGRRRRRRRRR			X	P35368
2041	2085	RILGCQCRGRGRRR			X	P35368
2042	2086	RRRRRRRRRLG			X	P35368
2043	2087	SIDRYIGVRYS			X	P35368
2044	2088	ANFTGPNQTSSNS			X	P35368
2045	2089	FTGPNQTSSNSTL			X	P35368
2046	2090	GRRRRRR			X	P35368
2047	2091	LGCQCRGRGRRRR			X	P35368
2048	2092	NFTGPNQTSSNST			X	P35368
2049	2093	QTSSNST			X	P35368

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2050	2094	RRRRRLGGCAYT			X	P35368
2051	2095	SFTVLPFSAALEV			X	P35368
2052	2096	TGPNQTSSNSTLP			X	P35368
2053	2097	CVPTPDSGVVCGRM			X	P36544
2054	2098	DHYLQWNVSEY			X	P36544
2055	2099	DISGYIPNGEW			X	P36544
2056	2100	EGDPDLAKILE			X	P36544
2057	2101	ELVKYNPLER			X	P36544
2058	2102	EVRYIANRFRCQDE			X	P36544
2059	2103	FSLSLQIMDVDEK			X	P36544
2060	2104	GEDKVRPACQHKQR			X	P36544
2061	2105	GIFKSSCYIDV			X	P36544
2062	2106	HGGQPPEGDPD			X	P36544
2063	2107	LERPVANDSQP			X	P36544
2064	2108	LHGGQPPEGDPDLA			X	P36544
2065	2109	LQMQEADISGY			X	P36544
2066	2110	MLLVAEIMPAT			X	P36544
2067	2111	MSAPNFVEAVS			X	P36544
2068	2112	PACQHKQRRCSLAS			X	P36544
2069	2113	SGYIPNGEWDL			X	P36544
2070	2114	SLSLLQIMDVD			X	P36544
2071	2115	SVPLIAQYFASTMI			X	P36544
2072	2116	TVYFSLSLQIMDV			X	P36544
2073	2117	VKNYNPLERP			X	P36544
2074	2118	VTVIVLQYHHHDPD			X	P36544
2075	2119	YIANRFRCQDE			X	P36544
2076	2120	YNPLERPVANDSQP			X	P36544
2077	2121	DEKNQVLTNIWL			X	P36544
2078	2122	DILLYNS			X	P36544
2079	2123	EKISLGI			X	P36544
2080	2124	ERFYECCKEPPD			X	P36544
2081	2125	IPGKRSE			X	P36544
2082	2126	KISLGIT			X	P36544
2083	2127	KNYNPLE			X	P36544
2084	2128	VKTVRFP			X	P36544
2085	2129	YFSLSLQIMDVD			X	P36544
2086	2130	PEPAAPQQPTAEEE			X	P37088
2087	2131	YGNCYTFNDKNNSN			X	P37088
2088	2132	ACDQLALGVAALFG			X	P39086
2089	2133	ACLGVSCVLFVIAR			X	P39086
2090	2134	AEILKQILFMGMMT			X	P39086
2091	2135	ALSTRIVGGIWWFF			X	P39086
2092	2136	FEASRRACDQLALG			X	P39086
2093	2137	FGPSHSSSVSAVQS			X	P39086
2094	2138	GYCLDLLKELSNIL			X	P39086
2095	2139	IDNPHVSSIIEKWS			X	P39086
2096	2140	IFETVENEPVNVVE			X	P39086

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2097	2141	LKEMKKGKEFYVIF			X	P39086
2098	2142	LLMESTSIEYVTQR			X	P39086
2099	2143	LLNIDNPHVSSIIE			X	P39086
2100	2144	LNSFWFGVGALMQQ			X	P39086
2101	2145	PLYGNDRFEGYCLD			X	P39086
2102	2146	QLALGVAAALFGPSH			X	P39086
2103	2147	SDKPLYGNDRFEGY			X	P39086
2104	2148	SLQCHRHKPWRLGP			X	P39086
2105	2149	TVENEPVNVEELAF			X	P39086
2106	2150	GIFETVENEPVNVE			X	P39086
2107	2151	NIKIKIRQLPSGNK			X	P39086
2108	2152	RLLNIDNPHVSSII			X	P39086
2109	2153	ARPRSPSPISTLSH			X	P41594
2110	2154	CKENEYVFDEYTCK			X	P41594
2111	2155	CMFVPKVYIILAKP			X	P41594
2112	2156	CWTCTPCKENEYVF			X	P41594
2113	2157	EFIRDSLISSEEEE			X	P41594
2114	2158	ESRGLGAGAGAGGS			X	P41594
2115	2159	FSVLSATVALGCM			X	P41594
2116	2160	GLGAGAGAGGSAGG			X	P41594
2117	2161	IKLQSPDVKWFDDY			X	P41594
2118	2162	IMNFKEMGKDYFDY			X	P41594
2119	2163	QARAMVDIVKRYNW			X	P41594
2120	2164	RPETNHRNPWFQEF			X	P41594
2121	2165	PCKENEYVFDEYTC			X	P41594
2122	2166	PQENSKYNKTCNSS			X	P41594
2123	2167	RILAGSKKKICTKK			X	P41594
2124	2168	RTDDDVPSLHSEPV			X	P41594
2125	2169	WPTDDLGTGCDLIPV			X	P41594
2126	2170	AAEKNWQVTAVNIL			X	P42261
2127	2171	APLTITLVREEVID			X	P42261
2128	2172	FEEGRDQTTSQSN			X	P42261
2129	2173	GAFMQQGCDISPRS			X	P42261
2130	2174	KGKYAYLLESTMNE			X	P42261
2131	2175	KHDGIRKIGYWNED			X	P42261
2132	2176	KIGYWNEDDKFVPA			X	P42261
2133	2177	KKNANQFEGNDRYE			X	P42261
2134	2178	KYAYLLESTMNEYI			X	P42261
2135	2179	LNKFKESGANVTGF			X	P42261
2136	2180	PLTITLVREEVIDF			X	P42261
2137	2181	SAEPSVFVRTTEEG			X	P42261
2138	2182	SKGKYAYLLESTMN			X	P42261
2139	2183	SRFSPYEWHSSEFE			X	P42261
2140	2184	VRKSKGKYAYLLES			X	P42261
2141	2185	YAYLLESTMNEYIE			X	P42261
2142	2186	YWNEDDKFVPAATD			X	P42261
2143	2187	EHAAFRFALSQLTE			X	P42261

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2144	2188	VIDFSKPFMSLGIS			X	P42261
2145	2189	AIFGFYDKKSVNTI			X	P42262
2146	2190	IESAEDLSKQTEIA			X	P42262
2147	2191	INPSSSQNSQNFAT			X	P42262
2148	2192	LKKERRVILDCERD			X	P42262
2149	2193	MLVALIEFCYKSRA			X	P42262
2150	2194	NHEMLEGNERYEGY			X	P42262
2151	2195	NPAVPWGQGVEIER			X	P42262
2152	2196	PIESAEDLSKQTEI			X	P42262
2153	2197	PYEWHTTEEFEDGRE			X	P42262
2154	2198	RFSPYEWHTTEEFED			X	P42262
2155	2199	ALHTSFVTPSFPTD			X	P42263
2156	2200	ERYEGYCVDLAYEI			X	P42263
2157	2201	FALLLESTMNEYIE			X	P42263
2158	2202	FVYLYDTERGFSIL			X	P42263
2159	2203	GFSILQAIMEAAVQ			X	P42263
2160	2204	LGLLGSHSHGGFPNT			X	P42263
2161	2205	NITGFQIVNNENPM			X	P42263
2162	2206	PFSDDQISNDSASS			X	P42263
2163	2207	RIKYKLSIVGDGKY			X	P42263
2164	2208	RKSKGKFALLLEST			X	P42263
2165	2209	RQEKRYLIDCEVER			X	P42263
2166	2210	SIVGDGKYGARDPE			X	P42263
2167	2211	SKGKFALLLESTMN			X	P42263
2168	2212	SRGVYAIFGFYDQM			X	P42263
2169	2213	TQNFKPAPATNTQN			X	P42263
2170	2214	VTPSFPTDADVQFV			X	P42263
2171	2215	YKLSIVGDGKYGAR			X	P42263
2172	2216	KFALLLESTMNEYI			X	P42263
2173	2217	VRKSKGKFALLLES			X	P42263
2174	2218	GKFAFLLLESTMNEY			X	P42263
2175	2219	DGRKFFFIRAIPQG			X	P42658
2176	2220	ENDLDESQVPDQPS			X	P43146
2177	2221	LDESQVPDQPSSLH			X	P43146
2178	2222	NPLLPPPMISAIEPK			X	P43146
2179	2223	VPDLSTPMLPPVGV			X	P43146
2180	2224	ADHLKAEDTDF			X	P43681
2181	2225	CCAEIYPDITY			X	P43681
2182	2226	DAVGTYNTRKY			X	P43681
2183	2227	EDTDFSVKEDW			X	P43681
2184	2228	FWESGEWVIVD			X	P43681
2185	2229	GTYNTRKYECCAEI			X	P43681
2186	2230	KKLFSGYNKWSRPV			X	P43681
2187	2231	KSPSDQLPPQQPLE			X	P43681
2188	2232	LDFWESGEWVI			X	P43681
2189	2233	LLLMKRPSVVK			X	P43681
2190	2234	LMKRPSVVKDN			X	P43681

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2191	2235	NVTSIRIPSEL			X	P43681
2192	2236	RKYECCEAIYP			X	P43681
2193	2237	RSRSIQYCVPR			X	P43681
2194	2238	RWDPADYENV			X	P43681
2195	2239	SCSIDVTFFPFDQQ			X	P43681
2196	2240	TGLLRASSHVETRA			X	P43681
2197	2241	VGLFLPPWLAG			X	P43681
2198	2242	YECCAEIYPD			X	P43681
2199	2243	YNKWSRPVANISDV			X	P43681
2200	2244	ADGQAAGALASRN			X	P43681
2201	2245	LPPPDQP			X	P43681
2202	2246	LPPPDQPSCKCT			X	P43681
2203	2247	PPPDQPS			X	P43681
2204	2248	SIQYCVPRDDAAP			X	P43681
2205	2249	TPPAIYK			X	P43681
2206	2250	WDPADYE			X	P43681
2207	2251	DDGTLTYMRLTVQ			X	P47869
2208	2252	GLGDSITEVFTNIY			X	P47869
2209	2253	MHLEDFPMDAHSCP			X	P47869
2210	2254	SRLNQYDLLGQSIG			X	P47869
2211	2255	VMIQNNAYAVAVAN			X	P47869
2212	2256	VQAECPMHLEDFPM			X	P47869
2213	2257	AVCAQSVNDPSNMS			X	P47870
2214	2258	LMGCFVVFVFMALLE			X	P47870
2215	2259	TLEIKNEMATSEAV			X	P47870
2216	2260	VNDPSNMSLVKETV			X	P47870
2217	2261	DLARVPANSTSNIL			X	P48167
2218	2262	DIYVTSFGPVSDVE			X	P48169
2219	2263	NKESVPARTVFGIT			X	P48169
2220	2264	TGKLSATPPPSAPP			X	P48169
2221	2265	VCLNESPQNQKEE			X	P48169
2222	2266	AGVLTIAMPPVPVIV			X	P48547
2223	2267	AHSHFDYDPRADEF			X	P48547
2224	2268	ALAGVLTIAMPPVPV			X	P48547
2225	2269	CPADVCGPLYEEEL			X	P48547
2226	2270	DTCPLAQEEILEIN			X	P48547
2227	2271	DVCGPLYEEELAFW			X	P48547
2228	2272	EVGLSGLSSKAAKD			X	P48547
2229	2273	GALCALAGVLTIAM			X	P48547
2230	2274	HILNYYRTGKLHCP			X	P48547
2231	2275	KLHCPADVCGPLYE			X	P48547
2232	2276	LAGVLTIAMPPVPI			X	P48547
2233	2277	LCALAGVLTIAMPV			X	P48547
2234	2278	SLAMAKQKLPPKKK			X	P48547
2235	2279	KQKLPKKKKKHIPR			X	P48547
2236	2280	SHFDYDPRADEFFF			X	P48547
2237	2281	YSLAMAKQKLPPKK			X	P48547

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2238	2282	FKQFKTQYSTRVVT			X	P48664
2239	2283	RTENGSEPGASMPP			X	P48664
2240	2284	TLQEMLSFEETVPV			X	P48664
2241	2285	EITIGAEPKETTED			X	P49418
2242	2286	LFTMQTDQSMICNL			X	P49418
2243	2287	QDAGWLVGVKESDW			X	P49418
2244	2288	FRNFTSATQALTEW			X	P51168
2245	2289	GEPYSPCTVNGSEV			X	P51168
2246	2290	NYDSLRLQPLDVIE			X	P51168
2247	2291	EEEYNPFLVSSTGA			X	P51170
2248	2292	GLQVILYINEEEYN			X	P51170
2249	2293	ILYINEEEYNPFLV			X	P51170
2250	2294	INEEEYNPFLVSST			X	P51170
2251	2295	LQVILYINEEEYNP			X	P51170
2252	2296	QVPLEKKINMSYSA			X	P51170
2253	2297	RPGITHGVGLVLRV			X	P51172
2254	2298	DAVNESGRVEFGSY			X	P51787
2255	2299	GARLN RVEDKVTQL			X	P51787
2256	2300	HITCDPPEERRLDH			X	P51787
2257	2301	SYADALWWGVVTVT			X	P51787
2258	2302	PKKS VVVKKKFKL			X	P51787
2259	2303	SPKPKS VVVKKK			X	P51787
2260	2304	FNRQIPAAASLIQT			X	P51787
2261	2305	QKHFN RQIPAAASL			X	P51787
2262	2306	QLEDACEHLAEYLE			X	P54284
2263	2307	QCPPE SFDVILDEN			X	P54284
2264	2308	CGNCS RIFHGEKLM			X	P54289
2265	2309	CS RIFHGEKLMNTN			X	P54289
2266	2310	DCKRNSDVMDC			X	P54289
2267	2311	DDFVN VASFNS			X	P54289
2268	2312	DIKRLTPRFTL			X	P54289
2269	2313	ENPETYEDSFY			X	P54289
2270	2314	FRTL VKSQDERYID			X	P54289
2271	2315	FTLCPNGYYFAIDP			X	P54289
2272	2316	GEKLMNTNLIFIMV			X	P54289
2273	2317	GRFFGEIDPSL			X	P54289
2274	2318	IEDANFGRQJS			X	P54289
2275	2319	IFHGEKLMNTNLIF			X	P54289
2276	2320	IFIMVESKGTCPCD			X	P54289
2277	2321	IPSIGAIRINTQEY			X	P54289
2278	2322	LCPNGYYFAID			X	P54289
2279	2323	LIGPSSEEPFPSAV			X	P54289
2280	2324	PNGYYFAIDPN			X	P54289
2281	2325	QEYLDVLGRPM			X	P54289
2282	2326	QIGRFFGEIDP			X	P54289
2283	2327	RIKPVFIEDANFGR			X	P54289
2284	2328	SLSKQSCITEQ			X	P54289

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2285	2329	SSEPFPSAVT			X	P54289
2286	2330	TLSDDDFVNVASFN			X	P54289
2287	2331	TLTLFQSLLIG			X	P54289
2288	2332	TLVKSQDERYI			X	P54289
2289	2333	VCFDNNVLEDY			X	P54289
2290	2334	VEMEDDDFTAS			X	P54289
2291	2335	VKSQDERYIDK			X	P54289
2292	2336	DYCNDLKISDNTE			X	P54289
2293	2337	HGEKLMNTNLIFIM			X	P54289
2294	2338	PDNFEESEGYTFIAP			X	P54289
2295	2339	TLKPDNFEESEGYTF			X	P54289
2296	2340	VLNELNWTSSALDEV			X	P54289
2297	2341	ALLGISFFALPAGI			X	P56696
2298	2342	CVIDFIVFVASVAV			X	P56696
2299	2343	ELVALTAVQSEQGE			X	P56696
2300	2344	HQELANECLLILEF			X	P56696
2301	2345	LANECLLILEFVMI			X	P56696
2302	2346	MIVVFGLEYIVRVW			X	P56696
2303	2347	PRAELVALTAVQSE			X	P56696
2304	2348	PSKQHLAPPTMPTS			X	P56696
2305	2349	QTLISRSVSTNMD			X	P56696
2306	2350	RIRMGSSQRRTPGS			X	P56696
2307	2351	YQCELTVDIMPVAV			X	P56696
2308	2352	AELVALTAVQSEQG			X	P56696
2309	2353	VALTAVQSEQGEAG			X	P56696
2310	2354	EYFLEPEINLV TEN			X	P62955
2311	2355	LEPEINLV TEN			X	P62955
2312	2356	CFVFCFCALLEFAV			X	P78334
2313	2357	IAICFVFCFCALLE			X	P78334
2314	2358	KCQKEAKRSSADKG			X	P78348
2315	2359	KRSSADKGVALSLD			X	P78348
2316	2360	AAETQPVT DAS			X	Q00975
2317	2361	AAETQPVT DASP MK			X	Q00975
2318	2362	AEEVMLAEEDRNAE			X	Q00975
2319	2363	AGPREAESGEE			X	Q00975
2320	2364	ALEQHLPDGD KTPM			X	Q00975
2321	2365	ASCEALYSEMDPEE			X	Q00975
2322	2366	CAVGSPFARAS			X	Q00975
2323	2367	CEALYSEMDPE			X	Q00975
2324	2368	CRGQYLDYEKEEVE			X	Q00975
2325	2369	CRRERERRQER			X	Q00975
2326	2370	DEFIRVWAEYDPAA			X	Q00975
2327	2371	EATVVP SGNV D			X	Q00975
2328	2372	ETQPVT DASP M			X	Q00975
2329	2373	FYDAPYEYELM			X	Q00975
2330	2374	GPGGGERARGGGAG			X	Q00975
2331	2375	GPLGEATV VPS			X	Q00975

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2332	2376	ITRRGPDGEPQ			X	Q00975
2333	2377	KELERDCRGQYLDY			X	Q00975
2334	2378	KHSVDATYEEQ			X	Q00975
2335	2379	KQNCFTVNRSLFVF			X	Q00975
2336	2380	LCEGDTECREY			X	Q00975
2337	2381	LFGGQFNQDE			X	Q00975
2338	2382	LGEATVVPNGN			X	Q00975
2339	2383	LPDGDKTPMSE			X	Q00975
2340	2384	LTFEAVATNS			X	Q00975
2341	2385	LTKDEEEMEEA			X	Q00975
2342	2386	MKFYDAPYEYE			X	Q00975
2343	2387	MPRLAAETQPV			X	Q00975
2344	2388	NAQELTKDEEE			X	Q00975
2345	2389	PDEMTVGKVYA			X	Q00975
2346	2390	PEAAEAPEGVD			X	Q00975
2347	2391	PLVVELGRDGA			X	Q00975
2348	2392	PVGDFPCGKEA			X	Q00975
2349	2393	RDCRGQYLDYE			X	Q00975
2350	2394	REPRRHRAHRH			X	Q00975
2351	2395	RLCEGDTECREYWP			X	Q00975
2352	2396	RPPLERGHSTEIPV			X	Q00975
2353	2397	RRGPDGEPQPGLES			X	Q00975
2354	2398	RVAYKRLVRNMPI			X	Q00975
2355	2399	SADMDGAPSSA			X	Q00975
2356	2400	SERGRGPGPEG			X	Q00975
2357	2401	SFYFIVLTFLGNVT			X	Q00975
2358	2402	SLEKGPSLSAD			X	Q00975
2359	2403	SSSSSEKQRFY			X	Q00975
2360	2404	SVSWGTQRTQD			X	Q00975
2361	2405	TGCRERERRRQ			X	Q00975
2362	2406	THLCSTTPDRP			X	Q00975
2363	2407	VFLRQKSSTLSNG			X	Q00975
2364	2408	VLKHSVDATYE			X	Q00975
2365	2409	VLMMKFYDAPYEYE			X	Q00975
2366	2410	VMLTGPLGEATVVP			X	Q00975
2367	2411	VRFGDELGGRY			X	Q00975
2368	2412	VYAALMIFDFY			X	Q00975
2369	2413	YKRLVRNMPI			X	Q00975
2370	2414	GGAIQNQESGIKES			X	Q00975
2371	2415	GIKIALGFVFHKG			X	Q00975
2372	2416	HHHRCHRRDRKQR			X	Q00975
2373	2417	NLANAQELTKDEEE			X	Q00975
2374	2418	QERRQPSSSSSEKQ			X	Q00975
2375	2419	RNVTRMGSPQPPDPN			X	Q00975
2376	2420	SSSSSEKQRFYSCD			X	Q00975
2377	2421	ALAIYIPFPED			X	Q01668
2378	2422	ANCVLAIYIPFPE			X	Q01668

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2379	2423	CLAMQHYESKMFN			X	Q01668
2380	2424	CLGEQEYFSSEECY			X	Q01668
2381	2425	CQAISKSKLSRRWR			X	Q01668
2382	2426	CVALAIYIPFEDD			X	Q01668
2383	2427	DACDLTIDEME			X	Q01668
2384	2428	DDDSPVCYDSRRSP			X	Q01668
2385	2429	DDSNSTNHNLE			X	Q01668
2386	2430	DDYREEDDKD			X	Q01668
2387	2431	DEEPPGRDEEDLA			X	Q01668
2388	2432	DFGPGYSDEEP			X	Q01668
2389	2433	DIFILLAIFANCVA			X	Q01668
2390	2434	DPESDYNPGEE			X	Q01668
2391	2435	DPYPPCDVPVGEE			X	Q01668
2392	2436	DVPVGEEEEEE			X	Q01668
2393	2437	DVPVGEEEEEEED			X	Q01668
2394	2438	EDKDPYPPCDVPVG			X	Q01668
2395	2439	EEEEDEPEVP			X	Q01668
2396	2440	EEEEEEDEPE			X	Q01668
2397	2441	EEEEEEDEPEVPA			X	Q01668
2398	2442	EEDPGRDEED			X	Q01668
2399	2443	EKVEYAFLIIFTVE			X	Q01668
2400	2444	EPEETKREED			X	Q01668
2401	2445	EQEYFSSEECY			X	Q01668
2402	2446	EQEYFSSEECYEDD			X	Q01668
2403	2447	ESDYNPGEEYT			X	Q01668
2404	2448	ETESVNTENVSSEG			X	Q01668
2405	2449	EVPAAGPRPRI			X	Q01668
2406	2450	EYFSSEECYED			X	Q01668
2407	2451	FGIQSSAISVV			X	Q01668
2408	2452	FLEDDDSPVCY			X	Q01668
2409	2453	FNFECLRRQSSQEE			X	Q01668
2410	2454	FQCITMEGWTDVLY			X	Q01668
2411	2455	FRNTILGYFDY			X	Q01668
2412	2456	GCHKLINHHIF			X	Q01668
2413	2457	GEEEEEEDE			X	Q01668
2414	2458	GGEEGKRNTSMPTS			X	Q01668
2415	2459	GYSDEEPPGRDEE			X	Q01668
2416	2460	HPQGFLDDDS			X	Q01668
2417	2461	HVNSDRRDSLQ			X	Q01668
2418	2462	IADACDLTIDEMES			X	Q01668
2419	2463	ILNMVFTGVFTVEM			X	Q01668
2420	2464	ILYKDGDDVDS			X	Q01668
2421	2465	IPFPEDDSNSTNHN			X	Q01668
2422	2466	IVAEDPAPCA			X	Q01668
2423	2467	KGKFYRCTDEAKSN			X	Q01668
2424	2468	KQRSADSLVEA			X	Q01668
2425	2469	KRQQYAKSKKQGNS			X	Q01668

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2426	2470	KSKLSRRWRRW			X	Q01668
2427	2471	KVTIDDYREED			X	Q01668
2428	2472	LEEDLKGyLDW			X	Q01668
2429	2473	LFILYKDGdVD			X	Q01668
2430	2474	LKMTTFGAFLH			X	Q01668
2431	2475	LQDDEPEETKREEE			X	Q01668
2432	2476	LQDFGPGYSDEEPD			X	Q01668
2433	2477	LREKQQLEEDL			X	Q01668
2434	2478	LSRRWRRWNRFNRR			X	Q01668
2435	2479	LTIDEMESAASTLL			X	Q01668
2436	2480	MMKKMQHQRRQQAD			X	Q01668
2437	2481	MPTSETESVNTENV			X	Q01668
2438	2482	MVFTGVFTVEM			X	Q01668
2439	2483	NKVTIDDYREEDD			X	Q01668
2440	2484	NMKEKIAPIPE			X	Q01668
2441	2485	NMKEKIAPIEGSA			X	Q01668
2442	2486	NSDRRDSLQQT			X	Q01668
2443	2487	PCDVPVGEEEE			X	Q01668
2444	2488	PDPGRDEEDLADEM			X	Q01668
2445	2489	PEDDSNSTNHN			X	Q01668
2446	2490	PEDDSNSTNHNLEK			X	Q01668
2447	2491	PPASDTEKPLFPPA			X	Q01668
2448	2492	PPCDVPVGEEEEEE			X	Q01668
2449	2493	PTSETESVNTENV			X	Q01668
2450	2494	PVGEEEEEEEE			X	Q01668
2451	2495	QGfLEDDSPV			X	Q01668
2452	2496	QKLREKQQL			X	Q01668
2453	2497	QLFKGKFYRCTDEA			X	Q01668
2454	2498	QTVLSWQAAID			X	Q01668
2455	2499	QVPTSTNANLNNAN			X	Q01668
2456	2500	RAVIKKIWKKT			X	Q01668
2457	2501	RGLFILYKDGdVDS			X	Q01668
2458	2502	RSDSGDEQLPT			X	Q01668
2459	2503	SElNMKEKIAPIPE			X	Q01668
2460	2504	SQRKRQQYAKSKKQ			X	Q01668
2461	2505	SRRSPRRLLP			X	Q01668
2462	2506	SSKQTVLSWQAAID			X	Q01668
2463	2507	TESVNTENVSGEGE			X	Q01668
2464	2508	TETILVELEIM			X	Q01668
2465	2509	TIDDYREEDD			X	Q01668
2466	2510	TSETESVNTEN			X	Q01668
2467	2511	VETFLKIIAYG			X	Q01668
2468	2512	VGEEEEEEEEDEPE			X	Q01668
2469	2513	VIKKIWKKTSM			X	Q01668
2470	2514	WITQAEDIDPE			X	Q01668
2471	2515	YAFLIIFTVET			X	Q01668
2472	2516	YAFTAIFTVEI			X	Q01668

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2473	2517	YFDYAFTAIFTVEI			X	Q01668
2474	2518	YFRDPHCLGEQEYF			X	Q01668
2475	2519	SMPTSETESVNTEN			X	Q01668
2476	2520	AEDIDPENEEEGGE			X	Q01668
2477	2521	CDLQDDEPEETKRE			X	Q01668
2478	2522	EDDSNSTNHNLEKV			X	Q01668
2479	2523	ESVNTENVSGEGEN			X	Q01668
2480	2524	GEEEEEEEEDEPEV			X	Q01668
2481	2525	IDDYREEDEDKDPY			X	Q01668
2482	2526	ITQAEDIDPENEEE			X	Q01668
2483	2527	LLDQVVPAGDDEV			X	Q01668
2484	2528	PASDTEKPLFPAG			X	Q01668
2485	2529	PCDVPVGEEEEEEE			X	Q01668
2486	2530	QDFGPGYSDEEPDP			X	Q01668
2487	2531	QGFLDDDDSPVCYD			X	Q01668
2488	2532	RLFRVMRLVKLLSR			X	Q01668
2489	2533	RQQYAKSKKQGNSS			X	Q01668
2490	2534	VPPAGDDEVTVGKF			X	Q01668
2491	2535	VPVGEEEEEEEEDE			X	Q01668
2492	2536	GFLQEFSKEERDPV			X	Q02246
2493	2537	GVSSSEMNVTWEPV			X	Q02246
2494	2538	QLNLAAEDTRLFAP			X	Q02246
2495	2539	SGLSGGGGAPGELI			X	Q02246
2496	2540	TFTWTLDDFPIDFD			X	Q02246
2497	2541	AQCPEMFDIILDE			X	Q02641
2498	2542	DACEHLAEYLEAYW			X	Q02641
2499	2543	DMETDPSEGPG			X	Q02641
2500	2544	EEDYEEELTDNRNR			X	Q02641
2501	2545	EKLAQCPEMFDII			X	Q02641
2502	2546	GRFKRSDGSTSSDT			X	Q02641
2503	2547	PPARQGSWEDE			X	Q02641
2504	2548	PQGKYSKRKGRFKR			X	Q02641
2505	2549	QGPYLASGDQPLER			X	Q02641
2506	2550	RGYPYPSQEIPMEV			X	Q02641
2507	2551	TPPARQGSWEDEEE			X	Q02641
2508	2552	YLASGDQPLER			X	Q02641
2509	2553	ARQGSWEDEEEDYE			X	Q02641
2510	2554	DADTPGSRNSAYTE			X	Q02641
2511	2555	EDEEEDYEEELTDN			X	Q02641
2512	2556	GSWEDEEEDYEEEL			X	Q02641
2513	2557	NVGYNPSPGDEVV			X	Q02641
2514	2558	RNKARYCAEGGGPV			X	Q02641
2515	2559	TPGSRNSAYTELGD			X	Q02641
2516	2560	KRSDGSTSSDTSN			X	Q02641
2517	2561	ADVCGPLFEEELTF			X	Q03721
2518	2562	LRDLPLQHSPEAAC			X	Q03721
2519	2563	RREVETEPILTYIE			X	Q03721

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2520	2564	HCPADVCGPLFEEE			X	Q03721
2521	2565	CCPDTLDFVKNLLN			X	Q03721
2522	2566	DHTDFKNIPIGFWW			X	Q03721
2523	2567	EELTFWGIETDVE			X	Q03721
2524	2568	FLVRIVCCPDTLDF			X	Q03721
2525	2569	KQKLPKKRKKHVPR			X	Q03721
2526	2570	LFEEELTFWGIET			X	Q03721
2527	2571	TLEFLVRIVCCPDT			X	Q03721
2528	2572	AGGQKCTVSIN			X	Q04844
2529	2573	ALVLFVSGSSLIFL			X	Q04844
2530	2574	AYTENGEWAID			X	Q04844
2531	2575	AYTENGEWAIDFCP			X	Q04844
2532	2576	CCVDAVNFAE			X	Q04844
2533	2577	DTEAYTENGEWAID			X	Q04844
2534	2578	IFRSQTYNAEEVEF			X	Q04844
2535	2579	LGVLALLG			X	Q04844
2536	2580	NNYDPGSRPVREPE			X	Q04844
2537	2581	PPRRASSVGLL			X	Q04844
2538	2582	SQTYNAEEVEF			X	Q04844
2539	2583	TYNAEEVEFTF			X	Q04844
2540	2584	VCAVEVTYFPFDWQ			X	Q04844
2541	2585	VDAVNFAEST			X	Q04844
2542	2586	VGLLLRAEELILKK			X	Q04844
2543	2587	VRCCVDAVNFAE			X	Q04844
2544	2588	VRCCVDAVNFAES			X	Q04844
2545	2589	KKPRSELVFEGQR			X	Q04844
2546	2590	LGAAPEVRCCVD			X	Q04844
2547	2591	LGLLGRGVGKNEE			X	Q04844
2548	2592	NAEEVEFTFAVDN			X	Q04844
2549	2593	TENGEWAIDFCPG			X	Q04844
2550	2594	TLTTSVW			X	Q04844
2551	2595	YSLIRR			X	Q04844
2552	2596	ERESKAIEKVLQFDP			X	Q05586
2553	2597	FSWGVLLNSGIGEG			X	Q05586
2554	2598	GETEKPRGYQMSTR			X	Q05586
2555	2599	GINDPRLRNPSDKF			X	Q05586
2556	2600	GSWKIQLNATSVTH			X	Q05586
2557	2601	LHAFIWDSAVLEFE			X	Q05586
2558	2602	LLEERESKAIEKVLQ			X	Q05586
2559	2603	MLYLLDRFSPFGRF			X	Q05586
2560	2604	NDHFTPTPVSYTAG			X	Q05586
2561	2605	PLTINNERAQYIEF			X	Q05586
2562	2606	RFKVNSEEEEDAL			X	Q05586
2563	2607	RRSSKDTSTGGGRG			X	Q05586
2564	2608	SDDHEGRAAQKRLE			X	Q05586
2565	2609	FDPGTKNVTALLME			X	Q05586
2566	2610	KLHAFIWDSAVLEF			X	Q05586

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2567	2611	SEEEEDALTSSA			X	Q05586
2568	2612	LPDFMLVLIVL			X	Q05901
2569	2613	SSSTYHPMAPW			X	Q05901
2570	2614	TVFVINVHHRSSST			X	Q05901
2571	2615	VLFEENADGRFE			X	Q05901
2572	2616	KEESQPV			X	Q05901
2573	2617	LIVLGIPSSATTG			X	Q05901
2574	2618	YFGLKISQLVDVD			X	Q05901
2575	2619	ARRPPASSEQAQQE			X	Q07001
2576	2620	IIRKPLFYII			X	Q07001
2577	2621	LGYISKAEEYF			X	Q07001
2578	2622	NQPPPQPFPGDPYS			X	Q07001
2579	2623	NVDPRAPLDSP			X	Q07001
2580	2624	PASSEQAQQEL			X	Q07001
2581	2625	PPASSEQAQQELFN			X	Q07001
2582	2626	PPQPFPGDPYSYNV			X	Q07001
2583	2627	PQPFPGDPYSY			X	Q07001
2584	2628	PSPGALVRRSSSLG			X	Q07001
2585	2629	QNCSLKFSSLK			X	Q07001
2586	2630	RRKPLFYIINI			X	Q07001
2587	2631	VEWIIIDPEGF			X	Q07001
2588	2632	VRRSSSLGYISKA			X	Q07001
2589	2633	FSSSKYT			X	Q07001
2590	2634	IRRKPLFYIINIL			X	Q07001
2591	2635	NYNEEKDSWNRVA			X	Q07001
2592	2636	PFPQDPYSYNVQD			X	Q07001
2593	2637	VYNQPPPQPFPGD			X	Q07001
2594	2638	AEEEPSVEPVK			X	Q08289
2595	2639	DACEHLADYLEAYW			X	Q08289
2596	2640	DREAVRREAERQAQ			X	Q08289
2597	2641	GTSRGLSRQET			X	Q08289
2598	2642	HKSKDRYCEKDGEV			X	Q08289
2599	2643	QLEDACEHLADYLE			X	Q08289
2600	2644	RKSTPPSSAID			X	Q08289
2601	2645	RSGTSRGLSRQ			X	Q08289
2602	2646	STPPSSAIDID			X	Q08289
2603	2647	HDHVDHYASHRDHN			X	Q08289
2604	2648	PTLASNSQGSQGDQ			X	Q08289
2605	2649	VDHYASHRDHNHRD			X	Q08289
2606	2650	ELGEEAMEKFREDE			X	Q09470
2607	2651	KSEYMEIEEDMNNS			X	Q09470
2608	2652	MFSEEIKFYELGEE			X	Q09470
2609	2653	MSGENVDEASAAPG			X	Q09470
2610	2654	MTVMMSGENVDEASA			X	Q09470
2611	2655	PLDMFSEEIKFYEL			X	Q09470
2612	2656	SAAPGHPQDGSYPR			X	Q09470
2613	2657	SNIFTDPFFIVETL			X	Q09470

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2614	2658	AAQIAQALLGAEER			X	Q12809
2615	2659	ALLALTARESSVRS			X	Q12809
2616	2660	CELCGYSRAEVMQR			X	Q12809
2617	2661	ENCAVIYCNDGFCE			X	Q12809
2618	2662	FDLLIFGSGSEELI			X	Q12809
2619	2663	FLCLVDVVPVKNEED			X	Q12809
2620	2664	GEPLMEDCEKSSDT			X	Q12809
2621	2665	IPGSPGSTELEGGF			X	Q12809
2622	2666	KLPALLALTARESS			X	Q12809
2623	2667	LIAHWLACIWYAIG			X	Q12809
2624	2668	LQADICLHLNRSLL			X	Q12809
2625	2669	LTSVGFGNVSPNTN			X	Q12809
2626	2670	LVRVARKLDYSEY			X	Q12809
2627	2671	RDDLLEVLDMYPEF			X	Q12809
2628	2672	RRRTDKDTEQPGEV			X	Q12809
2629	2673	SPGSTELEGGFSRQ			X	Q12809
2630	2674	SSVRSGGAGGAGAP			X	Q12809
2631	2675	MIPGSPGSTELEGG			X	Q12809
2632	2676	PALLALTARESSVR			X	Q12809
2633	2677	PQEGPTRRLSLPGQ			X	Q12809
2634	2678	PYSAAFLKETEEG			X	Q12809
2635	2679	SRQRKRKLSFRRRT			X	Q12809
2636	2680	ASCYQMERPEVPM			X	Q12879
2637	2681	DQYKLYSKHFTLKD			X	Q12879
2638	2682	EAKASCYQMERPE			X	Q12879
2639	2683	FTGVCSDRPGLLFS			X	Q12879
2640	2684	GKAPHGPSFTIGKA			X	Q12879
2641	2685	IYDAAVLNYKAGRD			X	Q12879
2642	2686	KAIWLLWGLVFNNS			X	Q12879
2643	2687	KEFPSGLISVSYYDD			X	Q12879
2644	2688	KFVKINNSTNEGMM			X	Q12879
2645	2689	LAKGKAPHGPSFTI			X	Q12879
2646	2690	LALLQFVGDGEMEE			X	Q12879
2647	2691	LISVSYYDDWDYSLE			X	Q12879
2648	2692	LWLTGICHNEKNEV			X	Q12879
2649	2693	NSVPVQNPKGTTSK			X	Q12879
2650	2694	PHGPSFTIGKAIWL			X	Q12879
2651	2695	PVQNPKGTTSKIMV			X	Q12879
2652	2696	TIGKAIWLLWGLVF			X	Q12879
2653	2697	VFNNVVPVQNPKG			X	Q12879
2654	2698	WGLVFNNVVPVQNP			X	Q12879
2655	2699	WLLWGLVFNNVVPV			X	Q12879
2656	2700	PCRKFVKINNSTNE			X	Q12879
2657	2701	AAAMALSLITFIWE			X	Q12879
2658	2702	SNRRVYKKMPSIES			X	Q12879
2659	2703	TLPENVDFPDYQD			X	Q12879
2660	2704	GNGCPEEESKEASA			X	Q13002

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2661	2705	WWRGNGCPPEESKE			X	Q13002
2662	2706	FAHIEEENFVNELL			X	Q13018
2663	2707	FGAHLASFAHIEEE			X	Q13018
2664	2708	DEAENAFLLLELFA			X	Q13018
2665	2709	STVLDSMSFEAAHE			X	Q13018
2666	2710	AKSRREFDEIELAY			X	Q13224
2667	2711	ALDFIRRESSVYDI			X	Q13224
2668	2712	CEENLFSDYISEVE			X	Q13224
2669	2713	DGIAIITTAASDML			X	Q13224
2670	2714	DSKIQNQLKKLQSP			X	Q13224
2671	2715	EEQEDDHLSIVTLE			X	Q13224
2672	2716	ELEEVLDDMSLDD			X	Q13224
2673	2717	EQEDDHLSIVTLEE			X	Q13224
2674	2718	ESSMFFQFGPSIEQ			X	Q13224
2675	2719	IDILKKISKSVKFT			X	Q13224
2676	2720	ILQLFGDGEMEELE			X	Q13224
2677	2721	IRSDVSDISTHTVT			X	Q13224
2678	2722	KYYVWPRMCPETEE			X	Q13224
2679	2723	LFGDGEMEELEALW			X	Q13224
2680	2724	LIVSAVAVFVFEYF			X	Q13224
2681	2725	NLAAFMIQEYVDQ			X	Q13224
2682	2726	PTGLISVSYDEWDY			X	Q13224
2683	2727	QASVMLNIMEEYDW			X	Q13224
2684	2728	SAKSRREFDEIELA			X	Q13224
2685	2729	SEHSFIPEPKSSCY			X	Q13224
2686	2730	SFVGWELEEVLLLD			X	Q13224
2687	2731	SGVPAPWEKNLTNV			X	Q13224
2688	2732	SPSAFLEPFSADVW			X	Q13224
2689	2733	SQKSPPSIGIAVIL			X	Q13224
2690	2734	VWPRMCPETEEQED			X	Q13224
2691	2735	WEKNLTNVEWEDRS			X	Q13224
2692	2736	YNNPPCEENLFSDY			X	Q13224
2693	2737	FSPVGYNRCLADGR			X	Q13224
2694	2738	IELAYRRRPPRSPD			X	Q13224
2695	2739	EETPLFLAEPALPK			X	Q13255
2696	2740	ENPNFKRICTGNES			X	Q13255
2697	2741	GLRSLYPPPPPPQH			X	Q13255
2698	2742	KLQSPEVRSFDDYF			X	Q13255
2699	2743	MLDIVKRYNWTYVS			X	Q13255
2700	2744	MPILSYPSIKEVYL			X	Q13255
2701	2745	PGNGLRSLYPPPPP			X	Q13255
2702	2746	STKTLYNVEEEEDA			X	Q13255
2703	2747	TACKENEYVQDEFT			X	Q13255
2704	2748	VQLTLVVTLIIMEP			X	Q13255
2705	2749	NTEEDELEEEEDL			X	Q13255
2706	2750	REGNTEEDELEEEE			X	Q13255
2707	2751	TLYNVEEEEDAQPI			X	Q13255

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2708	2752	CTYYAFKTRNV PAN			X	Q13255
2709	2753	DIPQIAYSATSIDL			X	Q13255
2710	2754	EDELEEEEDLQAA			X	Q13255
2711	2755	GLSSAMCYSALVTK			X	Q13255
2712	2756	RKLRERLPKARVVV			X	Q13255
2713	2757	FDTAEVYAAGKAEV			X	Q13303
2714	2758	VFANRPDPNTPMEE			X	Q13303
2715	2759	GAIQVLPKLSSSI			X	Q13303
2716	2760	PKLSSSIHEIDSI			X	Q13303
2717	2761	QVLPLKSSSIHEI			X	Q13303
2718	2762	SSSIHEIDSILGN			X	Q13303
2719	2763	VDVVFANRPDPNTP			X	Q13303
2720	2764	ALADACQMEPEEVE			X	Q13698
2721	2765	DACQMEPEEVE			X	Q13698
2722	2766	DFEDTEVRRSNFDN			X	Q13698
2723	2767	DIGFTSVFTVE			X	Q13698
2724	2768	DVILSEIDTFL			X	Q13698
2725	2769	EASSFFIFSPTNKI			X	Q13698
2726	2770	EHFRKFMKRQEYY			X	Q13698
2727	2771	EIEMEEMESPV			X	Q13698
2728	2772	EKAVPIPEASS			X	Q13698
2729	2773	FAEIEEMEEMES			X	Q13698
2730	2774	FRCTDLSKMTEEEC			X	Q13698
2731	2775	GFTSVFTVEIV			X	Q13698
2732	2776	GGLYCLGGGCGNVD			X	Q13698
2733	2777	HFRKFMKRQEE			X	Q13698
2734	2778	IEMEEMESPVFLED			X	Q13698
2735	2779	IILLTIFANCVALA			X	Q13698
2736	2780	KDPYPSADFPGDDE			X	Q13698
2737	2781	KLLDQVIPPIGDDE			X	Q13698
2738	2782	LADACQMEPEE			X	Q13698
2739	2783	LDEFKAIWAEYDPE			X	Q13698
2740	2784	LQFAEIEEMEEM			X	Q13698
2741	2785	LRHREWWHSDFHFD			X	Q13698
2742	2786	LRKACISIVEWKPF			X	Q13698
2743	2787	LSRPRPLAEL			X	Q13698
2744	2788	LYCLGGGCGNV			X	Q13698
2745	2789	MSWITQGEVMDVED			X	Q13698
2746	2790	NCVALAVYLPMPED			X	Q13698
2747	2791	PLQFAEIEEMEEMES			X	Q13698
2748	2792	QALADACQMEP			X	Q13698
2749	2793	QVIPPIGDDEV			X	Q13698
2750	2794	RCTDLSKMTEE			X	Q13698
2751	2795	RYDFEDTEVRR			X	Q13698
2752	2796	SADFPGDDEED			X	Q13698
2753	2797	SDYAPGEEYTCGTN			X	Q13698
2754	2798	TFEGWPQLLYKAID			X	Q13698

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2755	2799	VATVENEESP			X	Q13698
2756	2800	VFSSVHYREF			X	Q13698
2757	2801	VTFQEQGETEY			X	Q13698
2758	2802	WPQLLYKAIDS			X	Q13698
2759	2803	YAPGEEYTCGT			X	Q13698
2760	2804	YCLGGGCGNVDPDE			X	Q13698
2761	2805	DPESDYAPGEEYTC			X	Q13698
2762	2806	ATVENEESPSPCART			X	Q13698
2763	2807	GKFFRCTDLKMTTE			X	Q13698
2764	2808	VHYREFPEETETP			X	Q13698
2765	2809	AESLTSAQKEEEEE			X	Q13936
2766	2810	AGNATISTVSS			X	Q13936
2767	2811	AGYPSTVSTVEGHG			X	Q13936
2768	2812	AQDPKFIEVTTQEL			X	Q13936
2769	2813	CKGNYITYKDGEVD			X	Q13936
2770	2814	CKRLVSMNMPL			X	Q13936
2771	2815	CLTLKNPIRRA			X	Q13936
2772	2816	CSDSSKQTEAE			X	Q13936
2773	2817	CVRARGRPSEELQ			X	Q13936
2774	2818	DMTIEEMESAADNI			X	Q13936
2775	2819	EDEEPEMPVG			X	Q13936
2776	2820	EDEGMDEEKPR			X	Q13936
2777	2821	ETESVNTENVA			X	Q13936
2778	2822	FDIVFTTIFTIEIA			X	Q13936
2779	2823	GGPSFPGMLVCIYF			X	Q13936
2780	2824	GGSSAARRVRP			X	Q13936
2781	2825	GSAGNATISTV			X	Q13936
2782	2826	GSIVDIAITEVNPA			X	Q13936
2783	2827	GSRGWPPQPVPTLR			X	Q13936
2784	2828	HRISKSKFSRYWRR			X	Q13936
2785	2829	KLMGSAGNATISTV			X	Q13936
2786	2830	LFTVEMILKLIAFK			X	Q13936
2787	2831	LTIFANCVLAIYI			X	Q13936
2788	2832	LTSAQKEEEEE			X	Q13936
2789	2833	MDEEKPRNMSMPTS			X	Q13936
2790	2834	MHKTCYNQEGADV			X	Q13936
2791	2835	MVPSQAGAPGRQFH			X	Q13936
2792	2836	NYITYKDGEVD			X	Q13936
2793	2837	PEDDSNATNSN			X	Q13936
2794	2838	PETTGEDEEEE			X	Q13936
2795	2839	PHHLDEFKRIWAEY			X	Q13936
2796	2840	PLSPAIRVQEVAWK			X	Q13936
2797	2841	PVGPRPRPLSE			X	Q13936
2798	2842	QKEEEEEKERK			X	Q13936
2799	2843	QRKRQYQYKPK			X	Q13936
2800	2844	RNMSMPTSETESVN			X	Q13936
2801	2845	SAQKEEEEEKE			X	Q13936

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2802	2846	SITADGESPPA			X	Q13936
2803	2847	SKQTEAECKGN			X	Q13936
2804	2848	SRGWPPQPVPPT			X	Q13936
2805	2849	STEMLSYQDDENRQ			X	Q13936
2806	2850	STGSNANINNA			X	Q13936
2807	2851	STQRKRQQYGK			X	Q13936
2808	2852	TADGESPPATK			X	Q13936
2809	2853	TFDNFPQSLLT			X	Q13936
2810	2854	TFTPSSYSSTGSNA			X	Q13936
2811	2855	TGEEDEEEPEMPVG			X	Q13936
2812	2856	TIEIALKILGNADY			X	Q13936
2813	2857	TIFTNLILFFILLS			X	Q13936
2814	2858	TTGEEDEEEPE			X	Q13936
2815	2859	VEYLFLIIFTVEAF			X	Q13936
2816	2860	VGRDWPWIYFV			X	Q13936
2817	2861	VNSTYFEYLMFVLI			X	Q13936
2818	2862	VSLMVPSQAGAPGR			X	Q13936
2819	2863	WDGPKHGITNFDNF			X	Q13936
2820	2864	YFEYLMFVLIL			X	Q13936
2821	2865	YFSDPWNVDF			X	Q13936
2822	2866	YKVWYVVNSTYFEY			X	Q13936
2823	2867	YLFLIIFTVEA			X	Q13936
2824	2868	YPNPETTGEDEEEE			X	Q13936
2825	2869	YTCSOSSKQTE			X	Q13936
2826	2870	TESVNTENVAGGDI			X	Q13936
2827	2871	TSETESVNTENVAG			X	Q13936
2828	2872	DDSNATNSNLERVE			X	Q13936
2829	2873	APGEPCLAQEEVI			X	Q14003
2830	2874	ASPIPGAPPENITN			X	Q14003
2831	2875	CKPDPPPPPPPHPH			X	Q14003
2832	2876	DGGLDDEAGAGGGG			X	Q14003
2833	2877	DVCGPLFEEELGFW			X	Q14003
2834	2878	LCFQDAGGGAGGPP			X	Q14003
2835	2879	LDDEAGAGGGGLDG			X	Q14003
2836	2880	LKRLCFQDAGGGAG			X	Q14003
2837	2881	PDDILGSNHTYFKN			X	Q14003
2838	2882	PPPQPESPPPPPL			X	Q14003
2839	2883	RGRQGASKQQPAPP			X	Q14003
2840	2884	SNHTYFKNIPIGFW			X	Q14003
2841	2885	APPENITNVEVETE			X	Q14003
2842	2886	DAEEALDSFEAPDP			X	Q14003
2843	2887	RFDYDPGADEFFFD			X	Q14003
2844	2888	YYAERIGADPDDIL			X	Q14003
2845	2889	FDAPFRPADTHNEV			X	Q14416
2846	2890	GPAKKVLTLEGDLV			X	Q14416
2847	2891	DSLLEVCDYSLDD			X	Q14721
2848	2892	DYWGIDEIYLESCC			X	Q14721

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2849	2893	EAETLREREGEEFD			X	Q14721
2850	2894	ELGLLILFLAMGIM			X	Q14721
2851	2895	EMCALSFSQELDYW			X	Q14721
2852	2896	EPMEIVRSKACSR			X	Q14721
2853	2897	KGPSGQEKCKLENH			X	Q14721
2854	2898	MNMKDAFARSIEMM			X	Q14721
2855	2899	RDCNTHDSLLEVCD			X	Q14721
2856	2900	RLNVGGLAHEVLWR			X	Q14721
2857	2901	SAAQSKPKEELEME			X	Q14721
2858	2902	SFWWATITMTTVGY			X	Q14721
2859	2903	SGQEKCKLENHISP			X	Q14721
2860	2904	TSSLPEPMEIVRS			X	Q14721
2861	2905	VEAVCIAWFTMEYL			X	Q14721
2862	2906	YSLDDNEYFFDRHP			X	Q14721
2863	2907	CDDYSLDDNEYFFD			X	Q14721
2864	2908	LEVDDYSLDDNEY			X	Q14721
2865	2909	DVVFANRPDSNTPM			X	Q14722
2866	2910	KMTSHVVNEIDNIL			X	Q14722
2867	2911	VLPKMTSHVVNEID			X	Q14722
2868	2912	FANRPDSNTPMEEI			X	Q14722
2869	2913	PCCWTCEPCDGYQY			X	Q14831
2870	2914	PELNVQKRKRFSKA			X	Q14831
2871	2915	CWICIPCEPYEYLA			X	Q14832
2872	2916	FGDGMGRYNVFNQ			X	Q14832
2873	2917	AALVRRAPQPPGRP			X	Q14957
2874	2918	APVFVAYCSREEAE			X	Q14957
2875	2919	CLTVVAITVFMFEY			X	Q14957
2876	2920	DMVTTAGVSSSLDR			X	Q14957
2877	2921	FMIQEQYIDTVSGL			X	Q14957
2878	2922	IQPLTVGVNTTNPS			X	Q14957
2879	2923	KLRHSVPNSSQLDF			X	Q14957
2880	2924	LTVGVNTTNPSLL			X	Q14957
2881	2925	NEKNEVMSSKLDID			X	Q14957
2882	2926	PAPAGDCRVHPPGPV			X	Q14957
2883	2927	PEPSPTGWGPPDGG			X	Q14957
2884	2928	QLQVLFKVLEEYDW			X	Q14957
2885	2929	RLLDVVTLELPGGG			X	Q14957
2886	2930	RPFLPLFPELEDLP			X	Q14957
2887	2931	RSGRPFLPLFPELE			X	Q14957
2888	2932	SQTHVPILSISGGS			X	Q14957
2889	2933	SVVTESWRLSLRQK			X	Q14957
2890	2934	VKFNQRSVEDALTS			X	Q14957
2891	2935	ATFPVGLISVVTES			X	Q14957
2892	2936	FLGDGETQKLETWV			X	Q14957
2893	2937	QPLTVGVNTTNPS			X	Q14957
2894	2938	VWLSGICQNEKNEV			X	Q14957
2895	2939	AEEREVVVEEDRW			X	Q15822

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2896	2940	AKIDLEQMEQTVDL			X	Q15822
2897	2941	ALLQEGELLLS			X	Q15822
2898	2942	ASGPKA EALLQEGE			X	Q15822
2899	2943	CKMKFGSWTYD			X	Q15822
2900	2944	FRGYNRWARPV			X	Q15822
2901	2945	IDLEQMEQTV D			X	Q15822
2902	2946	LESNVDAEEREVVV			X	Q15822
2903	2947	LMNRPPPVEL			X	Q15822
2904	2948	NVDAEEREVVV			X	Q15822
2905	2949	NVDAEEREVVVEE			X	Q15822
2906	2950	REVVVEEDRW			X	Q15822
2907	2951	RWNPTDFGNIT			X	Q15822
2908	2952	WLLMNRPPPVELC			X	Q15822
2909	2953	AEALLQE			X	Q15822
2910	2954	ALLQEGE			X	Q15822
2911	2955	ALLQEGELLSPH			X	Q15822
2912	2956	GASGPKA EALLQE			X	Q15822
2913	2957	VPPAIYKSSCSID			X	Q15822
2914	2958	CEEIYTDITYS			X	Q15825
2915	2959	CFHCHKSNELA			X	Q15825
2916	2960	DGIETLRVPAD			X	Q15825
2917	2961	DLLIIGSKVDM			X	Q15825
2918	2962	EIDLLIIGSKV			X	Q15825
2919	2963	ITQLANVDEVN			X	Q15825
2920	2964	ITQLANVDEVNQIM			X	Q15825
2921	2965	LANVDEVNQIMETN			X	Q15825
2922	2966	LRWDPM EYDGI			X	Q15825
2923	2967	NLWLRHIWNDY			X	Q15825
2924	2968	PAIFKSSCPMDITF			X	Q15825
2925	2969	SEHSPEVEDVI			X	Q15825
2926	2970	TLSIVVTVFVL			X	Q15825
2927	2971	VHFEVAITQLANVD			X	Q15825
2928	2972	WTPPAIFKSSCPMD			X	Q15825
2929	2973	YDKAEIDLLII			X	Q15825
2930	2974	YKLRWDPM EYD			X	Q15825
2931	2975	DMNDFWENSEWEI			X	Q15825
2932	2976	ENVSDPV			X	Q15825
2933	2977	EVAITQLANVDEV			X	Q15825
2934	2978	LANVDEV			X	Q15825
2935	2979	NLIIPCLFISFLT			X	Q15825
2936	2980	QFIRPVENVSDPV			X	Q15825
2937	2981	VAITQLANVDEVN			X	Q15825
2938	2982	VQFIAEN			X	Q15825
2939	2983	AAVATSLGRSN			X	Q15878
2940	2984	ACFMNNSGILE			X	Q15878
2941	2985	ADDGQFQERQSLEP			X	Q15878
2942	2986	AEIREDEEEVE			X	Q15878

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2943	2987	AKEPTIQEERAQDL			X	Q15878
2944	2988	AKEVSPMSAPN			X	Q15878
2945	2989	ALEQHLPEDDKTPM			X	Q15878
2946	2990	ALEVLRRATIK			X	Q15878
2947	2991	APNMPSIERDR			X	Q15878
2948	2992	CEPDTTAPSGQ			X	Q15878
2949	2993	DEFVRVWAEYD			X	Q15878
2950	2994	DSHASDCGEEE			X	Q15878
2951	2995	EDEEEVEKKKQ			X	Q15878
2952	2996	EPYLALHEDSH			X	Q15878
2953	2997	EQGDKMMEECS			X	Q15878
2954	2998	FMNNSGILEGF			X	Q15878
2955	2999	FRDLWNILDFV			X	Q15878
2956	3000	FRPGTSFGISV			X	Q15878
2957	3001	GDKMMEECSLE			X	Q15878
2958	3002	GDSDQSRNRQGTPV			X	Q15878
2959	3003	GQFQERQSLEP			X	Q15878
2960	3004	GWPQVLQHSVDVTE			X	Q15878
2961	3005	HGAKEPTIQEE			X	Q15878
2962	3006	HHLDEFVRVWAEYD			X	Q15878
2963	3007	HNQPQWLTHLL			X	Q15878
2964	3008	IAASSIALAAEDPV			X	Q15878
2965	3009	KDEQEEEEAFN			X	Q15878
2966	3010	KEAEIREDEEE			X	Q15878
2967	3011	KEAEIREDEEEVEK			X	Q15878
2968	3012	KRLVLMNMPVA			X	Q15878
2969	3013	KVAYKRLVLMNMPV			X	Q15878
2970	3014	KVKKQRQQLLE			X	Q15878
2971	3015	LGATWNWLYFI			X	Q15878
2972	3016	LGLALEKFEEE			X	Q15878
2973	3017	LPYLQQDPVSG			X	Q15878
2974	3018	LVLNMPVAED			X	Q15878
2975	3019	MSFLKLFRAAR			X	Q15878
2976	3020	PNGHYRRRRRGPG			X	Q15878
2977	3021	PPLRHSWQMPN			X	Q15878
2978	3022	PSLYRRPRAIE			X	Q15878
2979	3023	QPQWLTHLLYY			X	Q15878
2980	3024	QSRSPSEGRSQ			X	Q15878
2981	3025	QWLTHLLYYAE			X	Q15878
2982	3026	RSPSEGRSQTP			X	Q15878
2983	3027	SPMSAPNMPSI			X	Q15878
2984	3028	SPPLGLGKRCP			X	Q15878
2985	3029	TTESTSVTVAIPDV			X	Q15878
2986	3030	VHHNQPQWLTH			X	Q15878
2987	3031	VLTEQEPEGSS			X	Q15878
2988	3032	VQPSNHGIYLP			X	Q15878
2989	3033	WHFVVSPSFEY			X	Q15878

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
2990	3034	YKRLVLMNMPVAED			X	Q15878
2991	3035	EQKNAPMFQRM EPS			X	Q15878
2992	3036	AIPDVPDPLVDSTVV			X	Q15878
2993	3037	HRQSQR SRHRRVR			X	Q15878
2994	3038	IFDFITVIGSITEI			X	Q15878
2995	3039	LAEENKNAGTSALE			X	Q15878
2996	3040	QALESNNACLTESS			X	Q15878
2997	3041	RARHRQSQR SRHR			X	Q15878
2998	3042	TEQEPEGSSEQALL			X	Q15878
2999	3043	ADCPMRLVNFPMDG			X	Q16445
3000	3044	AGFNLVYVVVYLSK			X	Q16445
3001	3045	IKSNTGEYVIMTVY			X	Q16445
3002	3046	WLCIILWLENALGK			X	Q16445
3003	3047	RAPILQSTPVTPPP			X	Q16445
3004	3048	IFFEALNYETIEQK			X	Q16515
3005	3049	TIEQKKAYEVAALL			X	Q16515
3006	3050	TISHTVNVPLQTTL			X	Q16515
3007	3051	DSTTYAHFLFNAFD			X	Q6PIL6
3008	3052	YAQNSTKR SIKERL			X	Q6PIL6
3009	3053	ISSKVPKAEYIPTI			X	Q6X4W1
3010	3054	SLVSNGCYEGSLSE			X	Q6X4W1
3011	3055	AGYWNEYERFVP			X	P42263
3012	3056	FSPYEW HLEDNNEE			X	P42263
3013	3057	YEW HLEDNNEEPRD			X	P42263
3014	3058	NYNSVDLSEVEWED			X	Q7Z3S7
3015	3059	AHGLLDPYNAF			X	Q8IZS8
3016	3060	DQGPVLM TTVAMPV			X	Q8IZS8
3017	3061	DTLGDDDFNIIAY			X	Q8IZS8
3018	3062	DVLRNAMVNRK			X	Q8IZS8
3019	3063	EFDADLQYEF			X	Q8IZS8
3020	3064	EPDENGVI AFDCRN			X	Q8IZS8
3021	3065	FFNIIAYNEEL			X	Q8IZS8
3022	3066	FRGNVTIEEGL			X	Q8IZS8
3023	3067	GDDDFNIIAYNEE			X	Q8IZS8
3024	3068	GSFVYSIPFSTGPV			X	Q8IZS8
3025	3069	IMLITDGAVDT			X	Q8IZS8
3026	3070	KEYEKDVAIEE			X	Q8IZS8
3027	3071	KEYEKDVAIEEIDG			X	Q8IZS8
3028	3072	LALNKSENSDK			X	Q8IZS8
3029	3073	LPQAQKLTD DQGPV			X	Q8IZS8
3030	3074	LRNAMVNRKTG			X	Q8IZS8
3031	3075	LVDVSGSMKGLRLT			X	Q8IZS8
3032	3076	NERDKDGNFLE			X	Q8IZS8
3033	3077	NIIAYNEELHYVEP			X	Q8IZS8
3034	3078	NNLPVNISLSD			X	Q8IZS8
3035	3079	NYSSVDLSEVE			X	Q8IZS8
3036	3080	PVLM TTVAMPV			X	Q8IZS8

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
3037	3081	QLVKKLAKNMEEMF			X	Q8IZS8
3038	3082	QYPGIKWEPDE			X	Q8IZS8
3039	3083	SILDTLGDDDDFFNI			X	Q8IZS8
3040	3084	SQAIMLITDGAVDT			X	Q8IZS8
3041	3085	THPELRLLYEE			X	Q8IZS8
3042	3086	TSLALNKSENS			X	Q8IZS8
3043	3087	TVSSILDTLGDDDDF			X	Q8IZS8
3044	3088	VIDQEHDVVWTEAY			X	Q8IZS8
3045	3089	VSEDYTQTGDF			X	Q8IZS8
3046	3090	YWTSLALNKSENSD			X	Q8IZS8
3047	3091	EAYWTSLALNKSEN			X	Q8IZS8
3048	3092	LALNKSENSDKGVE			X	Q8IZS8
3049	3093	WTSLALNKSENSDK			X	Q8IZS8
3050	3094	AECYLQLHNFPMDE			X	Q8N1C3
3051	3095	GNCVDKADDEDDED			X	Q8N1C3
3052	3096	LHLGNCVDKADDED			X	Q8N1C3
3053	3097	TISGDYVIMTIFFD			X	Q8N1C3
3054	3098	YLQLHNFPMDEHSC			X	Q8N1C3
3055	3099	VDKADDEDDEDLTV			X	Q8N1C3
3056	3100	CASTLPDWRNAAAD			X	Q8TAE7
3057	3101	LEVCDYDRERNEY			X	Q8TAE7
3058	3102	RDVLEVCDYDRER			X	Q8TAE7
3059	3103	RMRRTFEPTSSLA			X	Q8TAE7
3060	3104	RSERDVLEVCDYD			X	Q8TAE7
3061	3105	CDDYDRERNEYFFD			X	Q8TAE7
3062	3106	SARYSRSLSTFLN			X	Q8TAE7
3063	3107	IFEITTQFGVMPPE			X	Q8TCU5
3064	3108	IPLPPRRRELPAIR			X	Q8TCU5
3065	3109	LDAFIMDKALLDYE			X	Q8TCU5
3066	3110	NNFFIWNLQHDPMG			X	Q8TCU5
3067	3111	PFVFTREVDDEGLC			X	Q8TCU5
3068	3112	QELQLAVSRKTELE			X	Q8TCU5
3069	3113	QLGIRIHQDIPLPP			X	Q8TCU5
3070	3114	RSQVIDFTSPFFST			X	Q8TCU5
3071	3115	RWVLGDSQNVEELR			X	Q8TCU5
3072	3116	TMNCMEVETTNLTS			X	Q8TCU5
3073	3117	TNGKADSLNVSRSNS			X	Q8TCU5
3074	3118	ADSLNVSRSNSVMQE			X	Q8TCU5
3075	3119	NGKADSLNVSRSNSV			X	Q8TCU5
3076	3120	DIDPEIETECFFVE			X	Q8TDD5
3077	3121	ECLFSLINGDDMFA			X	Q8TDD5
3078	3122	CDDYDEDSQEFFFFD			X	Q8TDN1
3079	3123	EEIVQLCDDYDEDS			X	Q8TDN1
3080	3124	DLRRFARSALNLVD			X	Q8TDN2
3081	3125	EEDEGEEDQWKD			X	Q8TDN2
3082	3126	KDDLAEEDQQAGEV			X	Q8TDN2
3083	3127	RRWSYRPWNTTEN			X	Q8TDN2

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
3084	3128	AAGGAGGGGGGGGG			X	Q8WXS5
3085	3129	AGLAGAGGGGGG			X	Q8WXS5
3086	3130	DTDYDHDSA EY			X	Q8WXS5
3087	3131	FGGAAGGAGGGGGG			X	Q8WXS5
3088	3132	GAGGGGGGAVG			X	Q8WXS5
3089	3133	GAGGGGGGGGGAGA			X	Q8WXS5
3090	3134	GGGGGAGAERD			X	Q8WXS5
3091	3135	GGGGGGGGGAGAERD			X	Q8WXS5
3092	3136	HFPESTDYDHD			X	Q8WXS5
3093	3137	INHFPEDTDYD			X	Q8WXS5
3094	3138	LYTRALICNTTNLT			X	Q8WXS5
3095	3139	NHFPESTDYDHDSA			X	Q8WXS5
3096	3140	PSYRFRYRRRS			X	Q8WXS5
3097	3141	RALICNTTNLT			X	Q8WXS5
3098	3142	RGVCVKINHFP			X	Q8WXS5
3099	3143	RLPSYRFRYRR			X	Q8WXS5
3100	3144	SDLLKAGGGAG			X	Q8WXS5
3101	3145	VTVTVTGPPAP			X	Q8WXS5
3102	3146	YRFRYRRRSRS			X	Q8WXS5
3103	3147	YTRALICNTTN			X	Q8WXS5
3104	3148	AILRLPSYRFRYRR			X	Q8WXS5
3105	3149	EPGPKRDEEKKNHY			X	Q8WXS5
3106	3150	FRYRRRSRSSRS			X	Q8WXS5
3107	3151	HFPESTDYDHDSAE			X	Q8WXS5
3108	3152	KINHFPEDTDYDHD			X	Q8WXS5
3109	3153	SYRFRYRRRSRSS			X	Q8WXS5
3110	3154	CNTHESLLEVCDY			X	Q92953
3111	3155	DDEDFLELPGAREE			X	Q92953
3112	3156	DGTLEYAPVDITVN			X	Q92953
3113	3157	ERPSAYEEEEEMEE			X	Q92953
3114	3158	HQKKEQMNEELRRE			X	Q92953
3115	3159	LFPFSSRERRSFTE			X	Q92953
3116	3160	NFKENRGSAQTTP			X	Q92953
3117	3161	RERRSFTEIDTGDD			X	Q92953
3118	3162	SAYEEEEIEMEVC			X	Q92953
3119	3163	TEIDTGDEDFLEL			X	Q92953
3120	3164	CDDYNLNENEYFFD			X	Q92953
3121	3165	SFTSCATDFTETER			X	Q92953
3122	3166	SIDSFTSCATDFTE			X	Q92953
3123	3167	ASEEQARRLCDDYD			X	Q96KK3
3124	3168	AVRNSNHQEFEDLL			X	Q96KK3
3125	3169	FEDLLSSIDGVSEA			X	Q96KK3
3126	3170	RRLCDDYDEAAREF			X	Q96KK3
3127	3171	ARYGAARCGRLRRR			X	Q96KK3
3128	3172	ASLETSRETSQEGQ			X	Q96KK3
3129	3173	IDGVSEASLETSRE			X	Q96KK3
3130	3174	DEEEEEEGEEEEAV			X	Q96L42

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
3131	3175	DLSPRIVDGIEDGN			X	Q96L42
3132	3176	EEEEGEEEEAVSLS			X	Q96L42
3133	3177	HQPCLHLQTGGAAY			X	Q96L42
3134	3178	IEDGNSSEESQTFD			X	Q96L42
3135	3179	IVEDEEEEEEGEEE			X	Q96L42
3136	3180	LEYFQTTWSVNNGI			X	Q96L42
3137	3181	LPSIVEDEEEEEEG			X	Q96L42
3138	3182	MQKSCSCKFLFGVE			X	Q96L42
3139	3183	NKRLPSIVEDEEEEE			X	Q96L42
3140	3184	NNTLGGPSIRSAYI			X	Q96L42
3141	3185	PEYAHKFVEDIQHD			X	Q96L42
3142	3186	PRIVDGIEDGNSSE			X	Q96L42
3143	3187	RLLRLLQKLD RYSQ			X	Q96L42
3144	3188	SCSCKFLFGVETNE			X	Q96L42
3145	3189	SSLTSVGFGNV SAN			X	Q96L42
3146	3190	VDGIEDGNSSEESQ			X	Q96L42
3147	3191	VSRNSPKTKQEID			X	Q96L42
3148	3192	EEEEEGEEEEAVS			X	Q96L42
3149	3193	GSWNQEGMASASTK			X	Q96L42
3150	3194	KIFSICTMLIGALM			X	Q96L42
3151	3195	NLPGSWNQEGMASA			X	Q96L42
3152	3196	PSIVEDEEEEEEGE			X	Q96L42
3153	3197	SLTSVGFGNVSANT			X	Q96L42
3154	3198	SVGFGNVSANTDAE			X	Q96L42
3155	3199	VEDEEEEEEGEEEE			X	Q96L42
3156	3200	ADVCGPLFEEELAF			X	Q96PR1
3157	3201	APPLSPGPGGCFEG			X	Q96PR1
3158	3202	DLAAKRLGIEDAAG			X	Q96PR1
3159	3203	PLFEEELAFWGIDE			X	Q96PR1
3160	3204	PSPPLSPPPRAPP			X	Q96PR1
3161	3205	QYEIETDPALTYVE			X	Q96PR1
3162	3206	TPDLIGDPPGDDDED			X	Q96PR1
3163	3207	LRFETRARTLGRFP			X	Q96RP8
3164	3208	YWQEFEDTCVYECL			X	Q99928
3165	3209	DSTDASSIEDNEDI			X	Q9BQ31
3166	3210	SEFQNEDEGEVDDPV			X	Q9BQ31
3167	3211	CHEDWKRLARV			X	Q9GZZ6
3168	3212	HYCGPSVRPVP			X	Q9GZZ6
3169	3213	ILIMNLHYCGPSVR			X	Q9GZZ6
3170	3214	PELSPSPQSPE			X	Q9GZZ6
3171	3215	PVPAWARALLL			X	Q9GZZ6
3172	3216	QEALLHHVATIAN T			X	Q9GZZ6
3173	3217	RGAAASLADFV			X	Q9GZZ6
3174	3218	RGEPCGQSRPPELS			X	Q9GZZ6
3175	3219	TLYLWIRQEW T			X	Q9GZZ6
3176	3220	ILIMNLHYCGPSV			X	Q9GZZ6
3177	3221	MDERNQV			X	Q9GZZ6

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
3178	3222	PPELSPSPQSPEG			X	Q9GZZ6
3179	3223	QSRPPELSPSPQS			X	Q9GZZ6
3180	3224	RPPELSPSPQSPE			X	Q9GZZ6
3181	3225	RPVPAWARALLG			X	Q9GZZ6
3182	3226	RRRAAY			X	Q9GZZ6
3183	3227	SPSPQSP			X	Q9GZZ6
3184	3228	SRPPELSPSPQSP			X	Q9GZZ6
3185	3229	TYGCCSEPYPDVT			X	Q9GZZ6
3186	3230	VRPRGAA			X	Q9GZZ6
3187	3231	VRPVPWARALLL			X	Q9GZZ6
3188	3232	WARALLL			X	Q9GZZ6
3189	3233	YLWIRQE			X	Q9GZZ6
3190	3234	RVSSDLRILQLLQ			X	Q9H252
3191	3235	SNDLALVPIASETT			X	Q9H252
3192	3236	VFTPYSAAFLLSDQ			X	Q9H252
3193	3237	AVSRLAQALLGAEE			X	Q9H252
3194	3238	FTPYSAAFLLSDQD			X	Q9H252
3195	3239	KHRSSSTEIEIIA			X	Q9H252
3196	3240	VAILGKNDIFGEPV			X	Q9H252
3197	3241	QSHPETLFKSIPQS			X	Q9H3M0
3198	3242	VLAILPFYVSLTLT			X	Q9H3M0
3199	3243	IRIMKFHVAKRKFK			X	Q9NR82
3200	3244	PFECEQTSQSPV			X	Q9NR82
3201	3245	AFRGASKGCLRALA			X	Q9NS40
3202	3246	DLHKIQREDLLEVL			X	Q9NS40
3203	3247	EDPDVVVIDSSKHS			X	Q9NS40
3204	3248	FNHIKSSLLGSTSD			X	Q9NS40
3205	3249	GIGKASGLDFEETV			X	Q9NS40
3206	3250	GLDFEETVPTSGRM			X	Q9NS40
3207	3251	GLHRHVSDPGLPGK			X	Q9NS40
3208	3252	GTIIRKFEGQNKKF			X	Q9NS40
3209	3253	IIAPKVKDRTHNVT			X	Q9NS40
3210	3254	KASGLDFEETVPTS			X	Q9NS40
3211	3255	LDYSEYGA AVLML			X	Q9NS40
3212	3256	LQKQTTVPPAYSM			X	Q9NS40
3213	3257	LQLLQKQTTVPPA			X	Q9NS40
3214	3258	NFRTTYVNQNEEVV			X	Q9NS40
3215	3259	QTTVPPAYSMVTA			X	Q9NS40
3216	3260	REDLLEVLD MYPEF			X	Q9NS40
3217	3261	RRASSVHDIEGFGV			X	Q9NS40
3218	3262	SSSFISSIDDEQKP			X	Q9NS40
3219	3263	VNISGPLDHSSPKR			X	Q9NS40
3220	3264	VVPPAYSMVTAGSE			X	Q9NS40
3221	3265	YCNDGFCENTGFSR			X	Q9NS40
3222	3266	GISESDLT YGEV			X	Q9NS40
3223	3267	KKNSSPPSSDKTII			X	Q9NS40
3224	3268	KSRSSSFISIDDE			X	Q9NS40

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
3225	3269	IAQIAQALLGSEER			X	Q9NS40
3226	3270	QEQLNRLESQMTTD			X	Q9NS40
3227	3271	EENFKQIYSQFFPQ			X	Q9NS61
3228	3272	GRKESLSDSRDLDG			X	Q9NS61
3229	3273	SLSGVLVIALPVPV			X	Q9NSA2
3230	3274	LGYTLKSCASELGF			X	Q9NSA2
3231	3275	SLLSSCCPRRAKRR			X	Q9NSA2
3232	3276	ARTCGASRPGP			X	Q9NY47
3233	3277	DAELDDPESED			X	Q9NY47
3234	3278	DALLRPLELEN			X	Q9NY47
3235	3279	DDDYVNVASFN			X	Q9NY47
3236	3280	DMVIIVDVSGS			X	Q9NY47
3237	3281	EDVERGSKASTLRL			X	Q9NY47
3238	3282	ELDDPESEDE			X	Q9NY47
3239	3283	FEKYNWPNRTV			X	Q9NY47
3240	3284	HAQRLTNTNLL			X	Q9NY47
3241	3285	HQDALLRPLEL			X	Q9NY47
3242	3286	KADAELDDPES			X	Q9NY47
3243	3287	KAHRWQDNIKEEDI			X	Q9NY47
3244	3288	LGANGYVFAID			X	Q9NY47
3245	3289	PTVADFLNLAWWTS			X	Q9NY47
3246	3290	QIPTDIYKGSTVIL			X	Q9NY47
3247	3291	RWQDNIKEEDIVYY			X	Q9NY47
3248	3292	SSPKDMVIIVDVSG			X	Q9NY47
3249	3293	TCGASRPGPAR			X	Q9NY47
3250	3294	WARRLEQEVDG			X	Q9NY47
3251	3295	YRRGPHICFDY			X	Q9NY47
3252	3296	YVFKPPHQDAL			X	Q9NY47
3253	3297	YVNVASFNEKAQPV			X	Q9NY47
3254	3298	CKDLNASDNNTFL			X	Q9NY47
3255	3299	TLVKSLDERYIDEV			X	Q9NY47
3256	3300	LEDLQDLDSLDEK			X	Q9NZQ8
3257	3301	DTLLGSSERDFYH			X	Q9NZV8
3258	3302	EQVFEESCMEVATV			X	Q9NZV8
3259	3303	ETQQYFFDRDPDIF			X	Q9NZV8
3260	3304	FEESCMEVATVNRP			X	Q9NZV8
3261	3305	HECISAYDEELAFF			X	Q9NZV8
3262	3306	KTTNHEFVDEQVFE			X	Q9NZV8
3263	3307	NHEFVDEQVFEESC			X	Q9NZV8
3264	3308	PFARAAAIGWMPVA			X	Q9NZV8
3265	3309	YHPETQQYFFDRDP			X	Q9NZV8
3266	3310	YPRHECISAYDEEL			X	Q9NZV8
3267	3311	YVTTAISITPPV			X	Q9NZV8
3268	3312	KRRAQKKARLARIR			X	Q9NZV8
3269	3313	LDTACVMIFTVEYL			X	Q9NZV8
3270	3314	LVMTDNEDVSGAFV			X	Q9NZV8
3271	3315	YIGLVMTDNEDVSG			X	Q9NZV8

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
3272	3316	AGGGGAGSEHS			X	Q9P0X4
3273	3317	ANYRWVHHKYN			X	Q9P0X4
3274	3318	DATPHTLVQPIPAT			X	Q9P0X4
3275	3319	DEEEIDYTLCF			X	Q9P0X4
3276	3320	DEGRHLGSRHCQTL			X	Q9P0X4
3277	3321	DNRDSVDLAELVPA			X	Q9P0X4
3278	3322	DRGDRGEDEEEIDY			X	Q9P0X4
3279	3323	DRGEDEEEIDYTLC			X	Q9P0X4
3280	3324	DSSQAPPSPFS			X	Q9P0X4
3281	3325	DVYKPDWCEVREDW			X	Q9P0X4
3282	3326	ECCLSKDDVYD			X	Q9P0X4
3283	3327	EDGASSELGKEEEE			X	Q9P0X4
3284	3328	EDQSSSNIEEF			X	Q9P0X4
3285	3329	EEEEEEQADGA			X	Q9P0X4
3286	3330	FNPVRSWLKHDSSQ			X	Q9P0X4
3287	3331	GAGGGGAGSEHSET			X	Q9P0X4
3288	3332	GASSELGKEEE			X	Q9P0X4
3289	3333	GEDEEEIDYTL			X	Q9P0X4
3290	3334	GKEEEEEQAD			X	Q9P0X4
3291	3335	GKFYHCLGVDTRNI			X	Q9P0X4
3292	3336	GSLQTTLEDSTLS			X	Q9P0X4
3293	3337	GSSAGGEDEAD			X	Q9P0X4
3294	3338	KDPPGRAPLPM			X	Q9P0X4
3295	3339	KEAQEDAEMDAELE			X	Q9P0X4
3296	3340	KFSLRTDTGDTVDP			X	Q9P0X4
3297	3341	KMGDRGDRGEDEEE			X	Q9P0X4
3298	3342	LDAVAVDQQPV			X	Q9P0X4
3299	3343	LDSSGDPKLCPIPM			X	Q9P0X4
3300	3344	LEGELTIIDNL			X	Q9P0X4
3301	3345	LERPQIEAGSTERI			X	Q9P0X4
3302	3346	LTSLFCPPPPP			X	Q9P0X4
3303	3347	LVALGSRKSSV			X	Q9P0X4
3304	3348	MKHLDDSNKEA			X	Q9P0X4
3305	3349	MRVGDLGECFFPLS			X	Q9P0X4
3306	3350	NFLCEMEEIPF			X	Q9P0X4
3307	3351	PAPGHEDCNGRMPS			X	Q9P0X4
3308	3352	PDASSPLLMPAEF			X	Q9P0X4
3309	3353	PENFLCEMEEI			X	Q9P0X4
3310	3354	PGLEEPLDGAD			X	Q9P0X4
3311	3355	PRRALGPPAPA			X	Q9P0X4
3312	3356	PSPFSPDASSP			X	Q9P0X4
3313	3357	QEDAEMDAELELEM			X	Q9P0X4
3314	3358	RGLRAHQRSYS			X	Q9P0X4
3315	3359	RGPGGAGGGGD			X	Q9P0X4
3316	3360	RILVNLLDNL			X	Q9P0X4
3317	3361	RSAAWASRRSS			X	Q9P0X4
3318	3362	SAERGGGARVC			X	Q9P0X4

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
3319	3363	SDRSSSILLGD			X	Q9P0X4
3320	3364	SGDPKLCPIPMTPN			X	Q9P0X4
3321	3365	SLFCPPPPPPA			X	Q9P0X4
3322	3366	SLTSLFCPPPPPPA			X	Q9P0X4
3323	3367	SPDASSPLLPM			X	Q9P0X4
3324	3368	SSELGKEEEEE			X	Q9P0X4
3325	3369	SSPLLMPAEF			X	Q9P0X4
3326	3370	TPHTLVQPIPA			X	Q9P0X4
3327	3371	TVASYAEPGDCYEE			X	Q9P0X4
3328	3372	VIFQVITLEGWVEI			X	Q9P0X4
3329	3373	VTLGMYQPCDDMDC			X	Q9P0X4
3330	3374	VYDFGAGRQDL			X	Q9P0X4
3331	3375	YNGLDAAVVDQQPV			X	Q9P0X4
3332	3376	ASSELGKEEEEEEQ			X	Q9P0X4
3333	3377	LNSDRSSSILLGDD			X	Q9P0X4
3334	3378	SYSDEDQSSSNIEE			X	Q9P0X4
3335	3379	AFSLNSDRSSSILL			X	Q9P0X4
3336	3380	DNLSGSIFHHYSSP			X	Q9P0X4
3337	3381	DRSSSILLGDDL			X	Q9P0X4
3338	3382	HDKQEVQLAETAEF			X	Q9P0X4
3339	3383	MHIFGCKFSLRTDT			X	Q9P0X4
3340	3384	SGSIFHHYSSPAGC			X	Q9P0X4
3341	3385	AHICNGTNLTM			X	Q9UBN1
3342	3386	FGALSIVAETVGV			X	Q9UBN1
3343	3387	GHCFRINHFE			X	Q9UBN1
3344	3388	LTTAGAFAAFS			X	Q9UBN1
3345	3389	LYSSAHICNGTNLT			X	Q9UBN1
3346	3390	NHFPEDNDYDH			X	Q9UBN1
3347	3391	PSRDVSPMGLK			X	Q9UBN1
3348	3392	RMPSYRYRRRR			X	Q9UBN1
3349	3393	VAETVGVAVN			X	Q9UBN1
3350	3394	YWLYSSAHICN			X	Q9UBN1
3351	3395	EDNDYDHSSEYLL			X	Q9UBN1
3352	3396	HFPEEDNDYDHSSE			X	Q9UBN1
3353	3397	RINHFPEDNDYDHD			X	Q9UBN1
3354	3398	SYRYRRRRSRSSSR			X	Q9UBN1
3355	3399	SFAFAAISFLLTES			X	Q9UF02
3356	3400	SSEASLQMNSNYP			X	Q9UF02
3357	3401	AYLTWDRDQYD			X	Q9UGM1
3358	3402	CLSPHHSRERD			X	Q9UGM1
3359	3403	DFIEDVEWEVH			X	Q9UGM1
3360	3404	DFIEDVEWEVHGMP			X	Q9UGM1
3361	3405	DIVLYNKADDE			X	Q9UGM1
3362	3406	DLSDFIEDVEWEVH			X	Q9UGM1
3363	3407	DLVWRPDIVLY			X	Q9UGM1
3364	3408	DSGDLSDFIED			X	Q9UGM1
3365	3409	DSGDLSDFIEDVEW			X	Q9UGM1

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
3366	3410	EDYSNALRPVEDTD			X	Q9UGM1
3367	3411	FQLMVAEIMPA			X	Q9UGM1
3368	3412	GDLSDFIEDVE			X	Q9UGM1
3369	3413	IATMALITASTALT			X	Q9UGM1
3370	3414	LTKVYSKLPESNLK			X	Q9UGM1
3371	3415	PAITKSSCVVD			X	Q9UGM1
3372	3416	PHWARVVILKY			X	Q9UGM1
3373	3417	QKLFNDLFEDY			X	Q9UGM1
3374	3418	RDHLTKVYSKLPE			X	Q9UGM1
3375	3419	TVFQLMVAEIMPAS			X	Q9UGM1
3376	3420	VHGMPAVKNVISYG			X	Q9UGM1
3377	3421	VLRDGLITWD			X	Q9UGM1
3378	3422	VVDVTYFPFDN			X	Q9UGM1
3379	3423	AITKSSC			X	Q9UGM1
3380	3424	DFIEDVE			X	Q9UGM1
3381	3425	DLSDFIEDVEWEV			X	Q9UGM1
3382	3426	DSGDLSDFIEDVE			X	Q9UGM1
3383	3427	GAEARPV			X	Q9UGM1
3384	3428	GDLSDFIEDVEWE			X	Q9UGM1
3385	3429	LTFGSWTYNGNQV			X	Q9UGM1
3386	3430	LYNKADDESSEPV			X	Q9UGM1
3387	3431	SFLAPLS			X	Q9UGM1
3388	3432	SGDLSDFIEDVEW			X	Q9UGM1
3389	3433	YNGNQVD			X	Q9UGM1
3390	3434	ASMDQISAITDSAE			X	Q9UHC6
3391	3435	DQISAITDSA EYCE			X	Q9UHC6
3392	3436	HTSVMTGSLDDHH			X	Q9UHC6
3393	3437	IYGHTSVMTGSLD			X	Q9UHC6
3394	3438	LPYRFRNKKMKTLC			X	Q9UHC6
3395	3439	MQAAPRAGCGAALL			X	Q9UHC6
3396	3440	NGVNRNSAIIGGVI			X	Q9UHC6
3397	3441	SSRVDNAPDQQNSH			X	Q9UHC6
3398	3442	VDNAPDQQNSHPDL			X	Q9UHC6
3399	3443	VYSASMDQISAITD			X	Q9UHC6
3400	3444	CDDYDVT CNEFFD			X	Q9UIX4
3401	3445	DASFHPAFLPQRQA			X	Q9UIX4
3402	3446	EEFAEMVEREEEDD			X	Q9UIX4
3403	3447	LLPGDNSDYDYSAL			X	Q9UIX4
3404	3448	LLREMCALSFQEEL			X	Q9UIX4
3405	3449	LNVCDDYDVT CNEF			X	Q9UIX4
3406	3450	MVERPHSGLPGKVF			X	Q9UIX4
3407	3451	NLSVSTLPSLREEE			X	Q9UIX4
3408	3452	TNFDDILNV CDDYD			X	Q9UIX4
3409	3453	TPGQVVALSSILSG			X	Q9UIX4
3410	3454	EEEEQGHCSQMCHN			X	Q9UIX4
3411	3455	EFPLTRLGQLKACT			X	Q9UIX4
3412	3456	MVEREEEDDALDSE			X	Q9UIX4

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
3413	3457	RVMFRRQAFLIKTK			X	Q9UIX4
3414	3458	DDYDVSRDEFFDNR			X	Q9UJ96
3415	3459	ECSPKCRSLFVLET			X	Q9UJ96
3416	3460	GHDDLRLVCDDYDV			X	Q9UJ96
3417	3461	HSATATEDSSQGPD			X	Q9UJ96
3418	3462	PLARLERLRACRGH			X	Q9UJ96
3419	3463	TERGAQGSPARALG			X	Q9UJ96
3420	3464	LLLFLCVAMALFAP			X	Q9UJ96
3421	3465	RALGPRGRLQRGRR			X	Q9UJ96
3422	3466	RRCAREFGLLLFL			X	Q9UJ96
3423	3467	VCDYDVSRDEFFD			X	Q9UJ96
3424	3468	ASTSGLLQPLCVDT			X	Q9ULD8
3425	3469	FDLLHAFKVVNYFG			X	Q9ULD8
3426	3470	FWCLLDVPIKNEK			X	Q9ULD8
3427	3471	GIEDGCGSDQPKFS			X	Q9ULD8
3428	3472	NTLMSTLEEKETDG			X	Q9ULD8
3429	3473	PRRTAPRPRLGGRG			X	Q9ULD8
3430	3474	RRRYGRARSKGFNA			X	Q9ULD8
3431	3475	RTTFVSKSGQVFA			X	Q9ULD8
3432	3476	TVSPAPADEPSSPL			X	Q9ULD8
3433	3477	TWAVNNGIDTTELL			X	Q9ULD8
3434	3478	VCDLAVEVLFILDI			X	Q9ULD8
3435	3479	VVDGIEDGCGSDQP			X	Q9ULD8
3436	3480	YITSLYFALSSLTS			X	Q9ULD8
3437	3481	LLDVIPIKNEKGEV			X	Q9ULD8
3438	3482	DLCSEPSTPASPPP			X	Q9ULD8
3439	3483	KHKLNKGVFGEKPN			X	Q9ULD8
3440	3484	LNFRITTFVSKSGQV			X	Q9ULD8
3441	3485	ATVSMTTVGYGDVV			X	Q9ULS6
3442	3486	AYTIEKEENEGLAT			X	Q9ULS6
3443	3487	FQIPDSQGNPGEDP			X	Q9ULS6
3444	3488	GNFRRQLWLALDNP			X	Q9ULS6
3445	3489	HSREAILCDDYD			X	Q9ULS6
3446	3490	STTSSFDEILAFYN			X	Q9ULS6
3447	3491	VFSFSQEIEYWGYN			X	Q9ULS6
3448	3492	CDDYDDVQREFYFD			X	Q9ULS6
3449	3493	LELCDDYDDVQREF			X	Q9ULS6
3450	3494	ACSLDLHKFPMKQ			X	Q9UN88
3451	3495	AQAPLASPELGS			X	Q9UN88
3452	3496	FYSRGPRRQPRRHR			X	Q9UN88
3453	3497	ILVCLFFVFLSLE			X	Q9UN88
3454	3498	KCDTNSTWGLNDDE			X	Q9UN88
3455	3499	RGPRRQPRRHRPR			X	Q9UN88
3456	3500	PRRQPRRHRPRRV			X	Q9UN88
3457	3501	QREVNSYLVQVYWP			X	Q9UN88
3458	3502	CIWYVIGRREMEAN			X	Q9UQ05
3459	3503	EICFYRKDGSAFWC			X	Q9UQ05

peptide #	SEQ ID NO	peptide	group I	group II	group III	protein (UniProt)
3460	3504	ELRHIMGLLQARLG			X	Q9UQ05
3461	3505	HKALEGHQEHRAEI			X	Q9UQ05
3462	3506	KTLPSITEAESGAE			X	Q9UQ05
3463	3507	LEGHQEHRAEICFY			X	Q9UQ05
3464	3508	LPRPLKQRMLEYFQ			X	Q9UQ05
3465	3509	NLRQGS DTSGLSRF			X	Q9UQ05
3466	3510	PSITEAESGAEPGG			X	Q9UQ05
3467	3511	REILQLPLFGAASR			X	Q9UQ05
3468	3512	RPSPELASEAEEVK			X	Q9UQ05
3469	3513	VDGIEDSGSTAEAP			X	Q9UQ05
3470	3514	VHRLPRPLKQRMLE			X	Q9UQ05
3471	3515	GDALQAHYYVCSGS			X	Q9UQ05
3472	3516	LPSITEAESGAEPG			X	Q9UQ05
3473	3517	PYNVCFSGDDDTPI			X	Q9UQ05
3474	3518	SDIAVEMLFILDII			X	Q9UQ05
3475	3519	SQPRSESLGSSSDK			X	Q9UQ05
3476	3520	GSDSSDSELELSTV			X	Q9Y2W7
3477	3521	SSTAPQGS DSDSE			X	Q9Y2W7
3478	3522	ASPVGIKGFNT			X	Q9Y698
3479	3523	FYFGALSFIIA			X	Q9Y698
3480	3524	GIKGFNTLPST			X	Q9Y698
3481	3525	KGFNTPSTEISMY			X	Q9Y698
3482	3526	LLFMGGLCIAASEF			X	Q9Y698
3483	3527	PEDADYEADTAIEYF			X	Q9Y698
3484	3528	RIPSYRYRYQRRSR			X	Q9Y698
3485	3529	SLHSNTANRRT			X	Q9Y698
3486	3530	VHMFIDRHKQL			X	Q9Y698
3487	3531	VLAVHMFIDRHKQL			X	Q9Y698
3488	3532	WLYSRGVCKTKSVS			X	Q9Y698
3489	3533	IKGFNTLPSTEISM			X	Q9Y698
3490	3534	LLTTVGAF AAFSLM			X	Q9Y698
3491	3535	PVGIKGFNTLPSTE			X	Q9Y698
3492	3536	SFYFGALSFIIAEM			X	Q9Y698

An extensive list of top autoantigens involved in neurological or neuropsychiatric conditions is provided in Table 2 below. See e.g. Prüss, 2021; Garza et al., 2021; Giannoccaro et al. 2018; Gardoni et al 2021. In addition, Hansen & Timäus, 2021 provide a review with a special focus on autoantibodies in psychiatric conditions, most importantly autoimmune encephalitis with psychiatric syndromes and related diseases. Galli et al, 2020, provide a review about the role of autoantibodies in paraneoplastic diseases. 2020). Also relevant are intracellular antigens such as Ma2[Ta], Hu, Ri, Yo, CV2/CRMP5, amphiphysin,

GAD65, and antinuclear antigens (ANAs), or thyroid tissue antigens such as TG, TPO or TRAK in the context of neurological diseases.

Table 3 below is a selection from Table 1 and lists peptides based on the top autoantigens of Table 2 found in the autoantibody screen performed in the course of the present invention.

Table 2

Examples of autoantigens associated with neurological or neuropsychiatric conditions

autoantigen	UniProt	associated diseases or symptoms
Acetylcholine receptor subunit alpha	P02708	Myasthenia Gravis
AMPA receptors (Glutamate receptors)	P42262, P42261, P42263, P48058	Limbic encephalitis, seizures, memory loss
Amphiphysin	P49418	limbic encephalitis, paraneoplastic syndr., stiff man syndr.
Aquaporin-4	P55087	neuromyelitis optica (NMOSD), MS
CASPR2	Q9UHC6	LGI1-like, neuromyotonia, Morvan's syndrome, neuropathic pain
CV2/CRMP5	Q9BPU6	Paraneoplastic striatal encephalitis, myelitis, optic neuritis and retinitis
D2R	P14416	Parkinsonism, chorea, psychosis, dystonia, mutism, psychiatric syndr, movement disorders
DPPX	P42658	encephalitis, Confusion, hallucinations, prodromal diarrhoea, memory loss, hyperexcitability
ephrin-B2	P52799	encephalitis psychiatric syndrome
Folate receptor alpha	P15328	autism spectrum disorders
GABAA receptor	P14867, P47869, P34903, P48169, P31644, Q16445	Seizures, status epilepticus, psychosis
GABAB receptor	P18505, P47870, P28472	Limbic encephalitis, seizures, memory loss
GAD65	Q05329	encephalitis; seizures and chronic epilepsy
Glycine receptor	P23415	Encephalomyelitis, rigidity, myoclonus, seizures, stiff person syndrome

autoantigen	UniProt	associated diseases or symptoms
IgLON5	A6NGN9	Parasomnia, sleep apnoea, cognitive impairment, gait abnormalities
LGI1	O95970	Limbic encephalitis (seizures, cognitive impairment), faciobrachial dystonic seizures, neuromyotonia
Ma2[Ta]	PNMA2	paraneoplastic syndrome
mGluR1	Q13255	Anti-mGluR1 encephalitis, cerebellar ataxia
mGluR5	P41594	Anti-mGluR5 encephalitis associates with a complex neuropsychiatric syndrome
MOG	Q16653	Optic neuritis, myelitis, ADEM
MuSK	O15146	Myasthenia Gravis
Neurexin 3 α	Q9Y4C0	encephalitis (NMDAR encephalitis)
NMDAR	Q05586, Q12879, Q13224, Q14957, O15399, Q8TCU5, Q5F0I5	Encephalitis, psychosis, amnesia, behavioural abnormalities, seizures, dysautonomia, autism, Tourette, ADHD
Septin 5	Q99719	Cerebellar ataxia, oscillopsia
Synapsin	P17600	limbic encephalitis
TDP-43	Q13148	ALS
TG (thyroid)	P01266	thyroid disorder
TPO (thyroid)	P07202	thyroid disorder
TRAK (thyroid)	P16473	thyroid disorder
VGKC	Q09470	limbic encephalitis
Voltage-dependent P/Q-type calcium channel subunit alpha-1A	O00555, Q13936, Q00975, Q01668, Q15878, O60840, O43497, O95180, Q9P0X4	headache with neurological deficits and lymphocytosis (HaNDL)

Table 3

Peptide hits based on autoantigens of Table 2

peptide #	peptide sequence	Protein (UniProt)
1	GQPGAQRMYKQ	O00555
7	SSPAPLGGQET	O43497
14	ASAGGAKILGVLRV	O95180

peptide #	peptide sequence	Protein (UniProt)
18	LINVDEVNQIVTTN	P02708
44	AVTGVNKIQLPQFS	P18505
61	YTIMTAHFHLKRKI	P31644
72	CTPCKENEYVFDEY	P41594
73	NTQNFKPAPATNTQ	P42263
84	LPSTCLQKVEEQPE	Q00975
87	AMDILNMVFTGVFT	Q01668
96	FIWDSAVLEFEASQ	Q05586
104	AGESTFANNKSSVP	Q13224
112	AGYPSTVSTVE	Q13936
119	GAAHVHGIVFEDNV	Q14957
126	LGRSNTIGSAP	Q15878
128	LFPVAFAGFNLVYW	Q16445
132	DMNFDFDLYIVGDG	Q8TCU5
144	DEEGRGGAGGGGAG	Q9P0X4
158	ILYAGNDRWTS DPR	A6NGN9
190	AAFMIQEEYVDTVS	O15399
229	CGGILETTLVE	O60840
323	GKTRTSLKTMSRRK	P14416
330	TWTLKKLPLSLSFL	P16473
380	MAVCLLFVFSALLE	P23415
435	LNQYDLLGHVVGTE	P34903
465	ANQFEGNDRYEGYC	P42261
473	MRSAEPSVFVRTTA	P42262
481	LHRQNEEPVFSKDG	P42658
497	NMQFLLFVFLVWDP	P47869
598	TTVIYNSNIFTDPF	Q09470
603	KFSYIPEAKASCYQ	Q12879
626	RERLPKARVVVCF	Q13255
799	AIRNGVNRNSAIIG	Q9UHC6
963	KDNKG YCAQYRGEV	O15146
1348	AYFLCLLSALLLTE	O95970
1642	AVCYAFVFSALIEF	P14867
1952	VVCCAQSVNDPGNM	P28472
2213	AVCAQSVNDPSNMS	P47870
2218	DIYVTSFGPVSDVE	P48169

peptide #	peptide sequence	Protein (UniProt)
2241	EITIGAEPKETTED	P49418

In light of the findings described in Tables 1-3 above as well as in Example 12, a particularly preferred embodiment is directed to the inventive compound wherein, for at least one of the peptides (preferably for each of the peptides), said amino-acid fragment comprises at least 4, preferably at least 5 or even at least 6, more preferably at least 7 or even at least 8, yet more preferably at least 9, even more preferably at least 10, yet even more preferably at least 11, especially at least 12 or even 13 consecutive amino acids of a sequence identified by any one of SEQ ID NOs: 45-3536, preferably any one of SEQ ID NOs: 45-863, especially any one of SEQ ID NOs: 45-201, optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

According to yet another preference, the peptides used in the compound of the present invention (e.g. peptide P or P_a or P_b or P₁ or P₂) comprise at least 4, preferably at least 5 or even at least 6, more preferably at least 7 or even at least 8, yet more preferably at least 9, even more preferably at least 10, yet even more preferably at least 11, especially at least 12 or even 13 consecutive amino acids of a sequence identified by any one of SEQ ID NOs: 45-3536, preferably any one of SEQ ID NOs: 45-863, especially any one of SEQ ID NOs: 45-201, optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

According to another preferred embodiment, the respective amino acid sequences of the at least two peptides of the inventive compound are the same. In other words, the at least two peptides are identical.

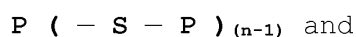
Narcolepsy type 1 is another autoantibody-associated disease (see e.g. Vuorela et al, 2021). The involved autoantigen turned out to be protein-O-mannosyltransferase 1 (POMT1), UniProt accession number Q9Y6A1. More specifically, one autoepitope discovered was located in residues 697-711 of UniProt accession

number Q9Y6A1. Accordingly, POMT1 is a particularly preferred target of the present invention. Even more preferably, said amino-acid fragment comprises at least 4, preferably at least 5 or even at least 6, more preferably at least 7 or even at least 8, yet more preferably at least 9, even more preferably at least 10, yet even more preferably at least 11, especially at least 12 or even 13 consecutive amino acids of residues 697-711 of UniProt accession number Q9Y6A1, optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

Preferably, in the entire context of the present invention, the at least two peptides comprise a peptide P_1 and a peptide P_2 , wherein P_1 and P_2 independently comprise a 6-, preferably a 7-, more preferably an 8-, even more preferably a 9-, even more preferably a 10-, yet even more preferably an 11-, especially a 12-, most preferably a 13-amino-acid fragment of an amino-acid sequence as disclosed hereinabove (by the indicated neuroreceptors and/or UniProt accession numbers), wherein P_1 and P_2 are present in form of a peptide dimer $P_1 - S - P_2$, wherein S is a non-peptide spacer, wherein the peptide dimer is covalently bound to the biopolymer scaffold, preferably via a linker.

A preferred embodiment of the inventive compound relates to a compound comprising

- a biopolymer scaffold and at least
- a first peptide n-mer of the general formula:



- a second peptide n-mer of the general formula:



wherein, independently for each occurrence, P is a peptide and S is a non-peptide spacer,

wherein, independently for each of the peptide n-mers, n is an integer of at least 1, preferably of at least 2, more preferably of at least 3, especially of at least 4,

wherein each of the peptide n-mers is bound to the biopolymer scaffold, preferably via a linker each. "P" in this context is defined, independently for each occurrence, in the

same way as disclosed for the at least two peptides of the inventive compound and/or as for P₁ and P₂ defined above.

The biopolymer scaffold used in the present invention may be a mammalian biopolymer such as a human biopolymer, a non-human primate biopolymer, a sheep biopolymer, a pig biopolymer, a dog biopolymer or a rodent biopolymer. In particular the biopolymer scaffold is a protein, especially a (non-modified or non-modified with respect to its amino-acid sequence) plasma protein. Preferably, the biopolymer scaffold is a mammalian protein such as a human protein, a non-human primate protein, a sheep protein, a pig protein, a dog protein or a rodent protein. Typically, the biopolymer scaffold is a non-immunogenic and/or non-toxic protein that preferably circulates in the plasma of healthy (human) individuals and can e.g. be efficiently scavenged or recycled by scavenging receptors, such as e.g. present on myeloid cells or on liver sinusoidal endothelial cells (reviewed by Sorensen et al 2015).

According to a particular preference, the biopolymer scaffold is a (preferably human) globulin, preferably selected from the group consisting of immunoglobulins, alpha1-globulins, alpha2-globulins and beta-globulins, in particular immunoglobulin G, haptoglobin and transferrin. Haptoglobin in particular has several advantageous properties, as shown in Examples 5-9, especially an advantageous safety profile.

The biopolymer scaffold may also be (preferably human) albumin, hemopexin, alpha-1-antitrypsin, C1 esterase inhibitor, lactoferrin or non-immunogenic (i.e. non-immunogenic in the individual to be treated) fragments of all of the aforementioned proteins, including the globulins.

In another preference, the biopolymer scaffold is an anti-CD163 antibody (i.e. an antibody specific for a CD163 protein) or CD163-binding fragment thereof.

Human CD163 (Cluster of Differentiation 163) is a 130 kDa membrane glycoprotein (formerly called M130) and prototypic class I scavenger receptor with an extracellular portion consisting of nine scavenger receptor cysteine-rich (SRCR) domains that are responsible for ligand binding. CD163 is an endocytic receptor present on macrophages and monocytes, it

removes hemoglobin/haptoglobin complexes from the blood but it also plays a role in anti-inflammatory processes and wound healing. Highest expression levels of CD163 are found on tissue macrophages (e.g. Kupffer cells in the liver) and on certain macrophages in spleen and bone marrow. Because of its tissue- and cell-specific expression and entirely unrelated to depletion of undesirable antibodies, CD163 is regarded as a macrophage target for drug delivery of e.g. immunotoxins, liposomes or other therapeutic compound classes (Skytthe et al., 2020).

Monoclonal anti-CD163 antibodies and the SRCR domains they are binding are for instance disclosed in Madsen et al., 2004, in particular Fig. 7. Further anti-CD163 antibodies and fragments thereof are e.g. disclosed in WO 2002/032941 A2 or WO 2011/039510 A2. At least two structurally different binding sites for ligands were mapped by using domain-specific antibodies such as e.g. monoclonal antibody (mAB) EDhu1 (see Madsen et al, 2004). This antibody binds to the third SRCR of CD163 and competes with hemoglobin/haptoglobin binding to CD163. Numerous other antibodies against different domains of CD163 were previously described in the literature, including Mac2-158, KiM8, GHI/61 and RM3/1, targeting SRCR domains 1, 3, 7 and 9, respectively. In addition, conserved bacterial binding sites were mapped and it was demonstrated that certain antibodies were able to inhibit either bacterial binding but not hemoglobin/haptoglobin complex binding and vice versa. This points to different modes of binding and ligand interactions of CD163 (Fabriek et al, 2009; see also citations therein).

Entirely unrelated to depletion of undesirable antibodies, CD163 was proposed as a target for cell-specific drug delivery because of its physiological properties. Tumor-associated macrophages represent one of the main targets where the potential benefit of CD163-targeting is currently explored. Remarkably, numerous tumors and malignancies were shown to correlate with CD163 expression levels, supporting the use of this target for tumor therapy. Other proposed applications include CD163 targeting by anti-drug conjugates (ADCs) in chronic inflammation and neuroinflammation (reviewed in Skytthe et al., 2020). Therefore, CD163-targeting by ADCs notably with dexamethasone or stealth liposome conjugates represents

therapeutic principle which is currently studied (Graversen et al., 2012; Etzerodt et al., 2012).

In that context, there are references indicating that anti-CD163 antibodies can be rapidly internalized by endocytosis when applied *in vivo*. This was shown for example for mAB Ed-2 (Dijkstra et al., 1985; Graversen et al., 2012) or for mAB Mac2-158 / KN2/NRY (Granfeldt et al., 2013). Based on those observations in combination with observations made in the course of the present invention (see in particular example section), anti-CD163 antibodies and CD163-binding turned out to be highly suitable biopolymer scaffolds for depletion/sequestration of undesirable antibodies.

Numerous anti-CD163 antibodies and CD163-binding fragments thereof are known in the art (see e.g. above). These are suitable to be used as a biopolymer scaffold for the present invention. For instance, any anti-CD163 antibody or fragment thereof mentioned herein or in WO 2011/039510 A2 (which is included herein by reference) may be used as a biopolymer scaffold in the invention. Preferably, the biopolymer scaffold of the inventive compound is antibody Mac2-48, Mac2-158, 5C6-FAT, BerMac3, or E10B10 as disclosed in WO 2011/039510, in particular humanised Mac2-48 or Mac2-158 as disclosed in WO 2011/039510 A2.

In a preferred embodiment, the anti-CD163 antibody or CD163-binding fragment thereof comprises a heavy-chain variable (V_H) region comprising one or more complementarity-determining region (CDR) sequences selected from the group consisting of SEQ ID NOs: 11-13 of WO 2011/039510 A2.

In addition, or alternatively thereto, in a preferred embodiment, the anti-CD163 antibody or CD163-binding fragment thereof comprises a light-chain variable (V_L) region comprising one or more CDR sequences selected from the group consisting of SEQ ID NOs: 14-16 of WO 2011/039510 A2 or selected from the group consisting of SEQ ID NOs: 17-19 of WO 2011/039510 A2.

In a further preferred embodiment, the anti-CD163 antibody or CD163-binding fragment thereof comprises a heavy-chain variable (V_H) region comprising or consisting of the amino acid sequence of SEQ ID NO: 20 of WO 2011/039510 A2.

In addition, or alternatively thereto, in a preferred embodiment, the anti-CD163 antibody or CD163-binding fragment thereof comprises a light-chain variable (V_L) region comprising or consisting of the amino acid sequence of SEQ ID NO: 21 of WO 2011/039510 A2.

In a further preferred embodiment, the anti-CD163 antibody or CD163-binding fragment thereof comprises a heavy-chain variable (V_H) region comprising or consisting of the amino acid sequence of SEQ ID NO: 22 of WO 2011/039510 A2.

In addition, or alternatively thereto, in a preferred embodiment, the anti-CD163 antibody or CD163-binding fragment thereof comprises a light-chain variable (V_L) region comprising or consisting of the amino acid sequence of SEQ ID NO: 23 of WO 2011/039510 A2.

In a further preferred embodiment, the anti-CD163 antibody or CD163-binding fragment thereof comprises a heavy-chain variable (V_H) region comprising or consisting of the amino acid sequence of SEQ ID NO: 24 of WO 2011/039510 A2.

In addition, or alternatively thereto, in a preferred embodiment, the anti-CD163 antibody or CD163-binding fragment thereof comprises a light-chain variable (V_L) region comprising or consisting of the amino acid sequence of SEQ ID NO: 25 of WO 2011/039510 A2.

In the context of the present invention, the anti-CD163 antibody may be a mammalian antibody such as a humanized or human antibody, a non-human primate antibody, a sheep antibody, a pig antibody, a dog antibody or a rodent antibody. In embodiments, the anti-CD163 antibody may be monoclonal.

According to a preference, the anti-CD163 antibody is selected from IgG, IgA, IgD, IgE and IgM.

According to a further preference, the CD163-binding fragment is selected from a Fab, a Fab', a F(ab)2, a Fv, a single-chain antibody, a nanobody and an antigen-binding domain.

CD163 amino acid sequences are for instance disclosed in WO 2011/039510 A2 (which is included here by reference). In the context of the present invention, the anti-CD163 antibody or CD163-binding fragment thereof is preferably specific for a

human CD163, especially with the amino acid sequence of any one of SEQ ID NOs: 28-31 of WO 2011/039510 A2.

In a further preferred embodiment, the anti-CD163 antibody or CD163-binding fragment thereof is specific for the extracellular region of CD163 (e.g. for human CD163: amino acids 42-1050 of UniProt Q86VB7, sequence version 2), preferably for an SRCR domain of CD163, more preferably for any one of SRCR domains 1-9 of CD163 (e.g. for human CD163: amino acids 51-152, 159-259, 266-366, 373-473, 478-578, 583-683, 719-819, 824-926 and 929-1029, respectively, of UniProt Q86VB7, sequence version 2), even more preferably for any one of SRCR domains 1-3 of CD163 (e.g. for human CD163: amino acids 51-152, 159-259, 266-366, and 373-473, respectively, of UniProt Q86VB7, sequence version 2), especially for SRCR domain 1 of CD163 (in particular with the amino acid sequence of any one of SEQ ID NOs: 1-8 of WO 2011/039510 A2, especially SEQ ID NO: 1 of WO 2011/039510 A2).

In a particular preference, the anti-CD163 antibody or CD163-binding fragment thereof is capable of competing for binding to (preferably human) CD163 with a (preferably human) hemoglobin-haptoglobin complex (e.g. in an ELISA).

In another particular preference, the anti-CD163 antibody or CD163-binding fragment thereof is capable of competing for binding to human CD163 with any of the anti-human CD163 mAbs disclosed herein, in particular Mac2-48 or Mac2-158 as disclosed in WO 2011/039510 A2.

In yet another particular preference, the anti-CD163 antibody or CD163-binding fragment thereof is capable of competing for binding to human CD163 with an antibody having a heavy chain variable (VH) region consisting of the amino acid sequence

DVQLQESGPGLVKPSQSLSLTCTVTGYSITSDYAWNWIHQFPGNKLEWMGYIT
YSGITNYNPSLKSQISITRDTSKNQFFLQLNSVTTEDTATYYCVSGTYYFDYW
GQGTTLTVSS (SEQ ID NO: 1),

and having a light-chain variable (VL) region consisting of the amino acid sequence

SVVMTQTPKSLGISIGDRVTITCKASQSVSSDVAWFQQKPGQSPKPLIYYASNRY

TGVPDRFTGSGYGTDFTFTISSVQAEDLAVYFCGQDYTSRPTFGGGTKLEIKRA (SEQ ID NO: 2) (e.g. in an ELISA).

Details on competitive binding experiments are known to the person of skilled in the art (e.g. based on ELISA) and are for instance disclosed in WO 2011/039510 A2 (which is included herein by reference).

In the course of the present invention, the epitopes of antibodies E10B10 and Mac2-158 as disclosed in WO 2011/039510 were mapped by fine mapping using circular peptide arrays, whereby the peptides were derived from CD163. These epitopes are particularly suitable for binding of the anti-CD163 antibody (or CD163-binding fragment thereof) of the inventive compound.

Accordingly, in particularly preferred embodiment, the anti-CD163 antibody or CD163-binding fragment thereof is specific for peptide consisting of 7-25, preferably 8-20, even more preferably 9-15, especially 10-13 amino acids, wherein the peptide comprises the amino acid sequence CSGRVEVKVQEEWGTVCNNGWSMEA (SEQ ID NO: 3) or a 7-24 amino-acid fragment thereof. Preferably, this peptide comprises the amino acid sequence GRVEVKVQEEW (SEQ ID NO: 4), WGTVCNNGWS (SEQ ID NO: 5) or WGTVCNNGW (SEQ ID NO: 6). More preferably, the peptide comprises an amino acid sequence selected from EWGTVCNNGWSME (SEQ ID NO: 7), QEEWGTVCNNGWS (SEQ ID NO: 8), WGTVCNNGWSMEA (SEQ ID NO: 9), EEWGTVCNNGWSM (SEQ ID NO: 10), VQEEWGTVCNNGW (SEQ ID NO: 11), EWGTVCNNGW (SEQ ID NO: 12) and WGTVCNNGWS (SEQ ID NO: 5). Even more preferably, the peptide consists of an amino acid sequence selected from EWGTVCNNGWSME (SEQ ID NO: 7), QEEWGTVCNNGWS (SEQ ID NO: 8), WGTVCNNGWSMEA (SEQ ID NO: 9), EEWGTVCNNGWSM (SEQ ID NO: 10), VQEEWGTVCNNGW (SEQ ID NO: 11), EWGTVCNNGW (SEQ ID NO: 12) and WGTVCNNGWS (SEQ ID NO: 5), optionally with an N-terminal and/or C-terminal cysteine residue.

Accordingly, in another particularly preferred embodiment, the anti-CD163 antibody or CD163-binding fragment thereof is specific for a peptide consisting of 7-25, preferably 8-20, even more preferably 9-15, especially 10-13 amino acids, wherein the peptide comprises the amino acid sequence DHVSCRGNESALWDCKHGDGWG (SEQ ID NO: 13) or a 7-20 amino-acid fragment thereof.

Preferably, this peptide comprises the amino acid sequence ESALW (SEQ ID NO: 14) or ALW. More preferably, the peptide comprises an amino acid sequence selected from ESALWDC (SEQ ID NO: 15), RGNESALWDC (SEQ ID NO: 16), SCRGNESALW (SEQ ID NO: 17), VSCRGNESALWDC (SEQ ID NO: 18), ALWDCKHDGW (SEQ ID NO: 19), DHVSCRGNESALW (SEQ ID NO: 20), CRGNESALWD (SEQ ID NO: 21), NESALWDCKHDGW (SEQ ID NO: 22) and ESALWDCKHDGWG (SEQ ID NO: 23). Even more preferably, the peptide consists of an amino acid sequence selected from ESALWDC (SEQ ID NO: 15), RGNESALWDC (SEQ ID NO: 16), SCRGNESALW (SEQ ID NO: 17), VSCRGNESALWDC (SEQ ID NO: 18), ALWDCKHDGW (SEQ ID NO: 19), DHVSCRGNESALW (SEQ ID NO: 20), CRGNESALWD (SEQ ID NO: 21), NESALWDCKHDGW (SEQ ID NO: 22) and ESALWDCKHDGWG (SEQ ID NO: 23), optionally with an N-terminal and/or C-terminal cysteine residue.

Accordingly, in another particularly preferred embodiment, the anti-CD163 antibody or CD163-binding fragment thereof is specific for a peptide consisting of 7-25, preferably 8-20, even more preferably 9-15, especially 10-13 amino acids, wherein the peptide comprises the amino acid sequence SSLGGTDKELRLVDGENKCS (SEQ ID NO: 24) or a 7-19 amino-acid fragment thereof. Preferably, this peptide comprises the amino acid sequence SSLGGTDKELR (SEQ ID NO: 25) or SSLGG (SEQ ID NO: 26). More preferably, the peptide comprises an amino acid sequence selected from SSLGGTDKELR (SEQ ID NO: 25), SSLGGTDKEL (SEQ ID NO: 28), SSLGGTDKE (SEQ ID NO: 29), SSLGGTDK (SEQ ID NO: 30), SSLGGTD (SEQ ID NO: 31), SSLGGT (SEQ ID NO: 32) and SSLGG (SEQ ID NO: 26). Even more preferably, the peptide consists of an amino acid sequence selected from SSLGGTDKELR (SEQ ID NO: 25), SSLGGTDKEL (SEQ ID NO: 28), SSLGGTDKE (SEQ ID NO: 29), SSLGGTDK (SEQ ID NO: 30), SSLGGTD (SEQ ID NO: 31), SSLGGT (SEQ ID NO: 32) and SSLGG (SEQ ID NO: 26), optionally with an N-terminal and/or C-terminal cysteine residue.

The peptides (or peptide n-mers) are preferably covalently conjugated (or covalently bound) to the biopolymer scaffold via a (non-immunogenic) linker known in the art such as for example amine-to-sulphydryl linkers and bifunctional NHS-PEG-maleimide linkers or other linkers known in the art. Alternatively, the peptides (or peptide n-mers) can be bound to the epitope carrier scaffold e.g. by formation of a disulfide bond between the

protein and the peptide (which is also referred to as "linker" herein), or using non-covalent assembly techniques, spontaneous isopeptide bond formation or unnatural amino acids for bio-orthogonal chemistry via genetic code expansion techniques (reviewed by Howarth et al 2018 and Lim et al 2016).

The compound of the present invention may comprise e.g. at least two, preferably between 3 and 40 copies of one or several different peptides (which may be present in different forms of peptide n-mers as disclosed herein). The compound may comprise one type of epitopic peptide (in other words: antibody-binding peptide or paratope-binding peptide), however the diversity of epitopic peptides bound to one biopolymer scaffold molecule can be a mixture of e.g. up to 8 different epitopic peptides.

Typically, since the peptides present in the inventive compound specifically bind to selected undesired antibodies, their sequence is usually selected and optimized such that they provide specific binding in order to guarantee selectivity of undesired antibody depletion from the blood. For this purpose, the peptide sequence of the peptides typically corresponds to the entire epitope sequence or portions of the undesired antibody epitope. The peptides used in the present invention can be further optimized by exchanging one, two or up to three amino-acid positions, allowing e.g. for modulating the binding affinity to the undesired antibody that needs to be depleted. Such single or multiple amino-acid substitution strategies that can provide "mimotopes" with increased binding affinity and are known in the field and were previously developed using phage display strategies or peptide microarrays. In other words, the peptides used in the present invention do not have to be completely identical to the native epitope sequences of the undesired antibodies.

Typically, the peptides used in the compound of the present invention (e.g. peptide P or P_a or P_b or P₁ or P₂) are composed of one or more of the 20 amino acids commonly present in mammalian proteins. In addition, the amino acid repertoire used in the peptides may be expanded to post-translationally modified amino acids e.g. affecting antigenicity of proteins such as post translational modifications, in particular oxidative post translational modifications (see e.g. Ryan 2014) or

modifications to the peptide backbone (see e.g. Müller 2018), or to non-natural amino acids (see e.g. Meister et al, 2018). These modifications may also be used in the peptides e.g. to adapt the binding interaction and specificity between the peptide and the variable region of an undesired antibody. In particular, epitopes (and therefore the peptides used in the compound of the present invention) can also contain citrulline as for example in autoimmune diseases. Furthermore, by introducing modifications into the peptide sequence the propensity of binding to an HLA molecule may be reduced, the stability and the physicochemical characteristics may be improved or the affinity to the undesired antibody may be increased.

In many cases, the undesired antibody that is to be depleted is oligo- or polyclonal (e.g. autoantibodies, ADAs or alloantibodies are typically poly- or oligoclonal), implying that undesired (polyclonal) antibody epitope covers a larger epitopic region of a target molecule. To adapt to this situation, the compound of the present invention may comprise a mixture of two or several epitopic peptides (in other words: antibody-binding peptides or paratope-binding peptides), thereby allowing to adapt to the polyclonality or oligoclonality of an undesired antibody.

Such poly-epitopic compounds of the present invention can effectively deplete undesired antibodies and are more often effective than mono-epitopic compounds in case the epitope of the undesired antibody extends to larger amino acid sequence stretches.

It is advantageous if the peptides used for the inventive compound are designed such that they will be specifically recognized by the variable region of the undesired antibodies to be depleted. The sequences of peptides used in the present invention may e.g. be selected by applying fine epitope mapping techniques (i.e. epitope walks, peptide deletion mapping, amino acid substitution scanning using peptide arrays such as described in Carter et al 2004, and Hansen et al 2013) on the undesired antibodies.

It is highly preferred that the peptides used for the inventive compound do not bind to any HLA Class I or HLA Class

II molecule (i.e. of the individual to be treated, e.g. human), in order to prevent presentation and stimulation via a T-cell receptor in vivo and thereby induce an immune reaction. It is generally not desired to involve any suppressive (or stimulatory) T-cell reaction in contrast to antigen-specific immunologic tolerization approaches. Therefore, to avoid T-cell epitope activity as much as possible, the peptides of the compound of the present invention (e.g. peptide P or P_a or P_b or P₁ or P₂) preferably fulfil one or more of the following characteristics:

- To reduce the probability for a peptide used in the compound of the present invention to bind to an HLA Class II or Class I molecule, the peptide (e.g. peptide P or P_a or P_b or P₁ or P₂) has a preferred length of 6-13 amino acids.
- To further reduce the probability that such a peptide binds to an HLA Class II or Class I molecule, it is preferred to test the candidate peptide sequence by HLA binding prediction algorithms such as NetMHCII-2.3 (reviewed by Jensen et al 2018). Preferably, a peptide (e.g. peptide P or P_a or P_b or P₁ or P₂) used in the compound of the present invention has (predicted) HLA binding (IC₅₀) of at least 500 nM. More preferably, HLA binding (IC₅₀) is more than 1000 nM, especially more than 2000 nM (cf. e.g. Peters et al 2006). In order to decrease the likelihood of HLA Class I binding, NetMHCpan 4.0 may also be applied for prediction (Jurtz et al 2017).
- To further reduce the probability that such a peptide binds to an HLA Class I molecule, the NetMHCpan Rank percentile threshold can be set to a background level of 10% according to Koşaloğlu-Yalçın et al, 2018. Preferably, a peptide (e.g. peptide P or P_a or P_b or P₁ or P₂) used in the compound of the present invention therefore has a %Rank value of more than 3, preferably more than 5, more preferably more than 10 according to the NetMHCpan algorithm.
- To further reduce the probability that such a peptide binds to an HLA Class II molecule, it is beneficial to perform in vitro HLA-binding assays commonly used in the art such as for example refolding assays, iTopia, peptide rescuing assays or array-based peptide binding assays. Alternatively, or in

addition thereto, LC-MS based analytics can be used, as e.g. reviewed by Gfeller et al 2016.

For stronger reduction of the titre of the undesired antibodies, it is preferred that the peptides used in the present invention are circularized (see also Example 4). Accordingly, in a preferred embodiment, at least one occurrence of P is a circularized peptide. Preferably at least 10% of all occurrences of P are circularized peptides, more preferably at least 25% of all occurrences of P are circularized peptides, yet more preferably at least 50% of all occurrences of P are circularized peptides, even more preferably at least 75% of all occurrences of P are circularized peptides, yet even more preferably at least 90% of all occurrences of P are circularized peptides or even at least 95% of all occurrences of P are circularized peptides, especially all of the occurrences of P are circularized peptides. Several common techniques are available for circularization of peptides, see e.g. Ong et al 2017. It goes without saying that "circularized peptide" as used herein shall be understood as the peptide itself being circularized, as e.g. disclosed in Ong et al. (and not e.g. grafted on a circular scaffold with a sequence length that is longer than 13 amino acids). Such peptides may also be referred to as cyclopeptides herein.

Further, for stronger reduction of the titre of the undesired antibodies relative to the amount of scaffold used, in a preferred embodiment of the compound of the present invention, independently for each of the peptide n-mers, n is at least 2, more preferably at least 3, especially at least 4. Usually, in order to avoid complexities in the manufacturing process, independently for each of the peptide n-mers, n is less than 10, preferably less than 9, more preferably less than 8, even more preferably less than 7, yet even more preferably less than 6, especially less than 5. To benefit from higher avidity through divalent binding of the undesired antibody, it is highly preferred that, for each of the peptide n-mers, n is 2.

For multivalent binding of the undesired antibodies, it is advantageous that the peptide dimers or n-mers are spaced by a hydrophilic, structurally flexible, immunologically inert, non-toxic and clinically approved spacer such as (hetero-

)bifunctional and -trifunctional polyethylene glycol (PEG) spacers (e.g. NHS-PEG-Maleimide) - a wide range of PEG chains is available and PEG is approved by the FDA. Alternatives to PEG linkers such as immunologically inert and non-toxic synthetic polymers or glycans are also suitable. Accordingly, in the context of the present invention, the spacer (e.g. spacer S) is preferably selected from PEG molecules or glycans. For instance, the spacer such as PEG can be introduced during peptide synthesis. Such spacers (e.g. PEG spacers) may have a molecular weight of e.g. 10000 Dalton. Evidently, within the context of the present invention, the covalent binding of the peptide n-mers to the biopolymer scaffold via a linker each may for example also be achieved by binding of the linker directly to a spacer of the peptide n-mer (instead of, e.g., to a peptide of the peptide n-mer).

Preferably, each of the peptide n-mers is covalently bound to the biopolymer scaffold, preferably via a linker each.

As used herein, the linker may e.g. be selected from disulphide bridges and PEG molecules.

According to a further preferred embodiment of the inventive compound, at least one occurrence of P is P_a and/or at least one occurrence of P is P_b (wherein P_a and P_b each independently is a peptide as defined above for P and/or P_1 and P_2). Preferably, independently for each occurrence, P is P_a or P_b .

Furthermore, it is preferred when in the first peptide n-mer, each occurrence of P is P_a and, in the second peptide n-mer, each occurrence of P is P_b . Alternatively, or in addition thereto, P_a and/or P_b is circularized.

Divalent binding is particularly suitable to reduce antibody titres. According, in a preferred embodiment,

the first peptide n-mer is $P_a - S - P_a$ and the second peptide n-mer is $P_a - S - P_a$;

the first peptide n-mer is $P_a - S - P_a$ and the second peptide n-mer is $P_b - S - P_b$;

the first peptide n-mer is $P_b - S - P_b$ and the second peptide n-mer is $P_b - S - P_b$;

the first peptide n-mer is $P_a - S - P_b$ and the second peptide n-mer is $P_a - S - P_b$;

the first peptide n-mer is $P_a - S - P_b$ and the second peptide n-mer is $P_a - S - P_a$; or

the first peptide n-mer is $P_a - S - P_b$ and the second peptide n-mer is $P_b - S - P_b$.

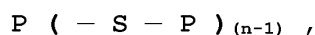
For increasing effectivity, in particular in autoimmune disease (which is usually based on polyclonal antibodies, see above), in a preferred embodiment the first peptide n-mer is different from the second peptide n-mer. For similar reasons, preferably, the peptide P_a is different from the peptide P_b , preferably wherein the peptide P_a and the peptide P_b are two different epitopes of the same antigen or two different epitope parts of the same epitope.

Especially for better targeting of polyclonal antibodies, it is advantageous when the peptide P_a and the peptide P_b comprise the same amino-acid sequence fragment, wherein the amino-acid sequence fragment has a length of at least 2 amino acids, preferably at least 3 amino acids, more preferably at least 4 amino acids, yet more preferably at least 5 amino acids, even more preferably at least 6 amino acids, yet even more preferably at least 7 amino acids, especially at least 8 amino acids or even at least 9 amino acids.

Further, for stronger reduction of the titre of the undesired antibodies relative to the amount of scaffold used, the compound comprises a plurality of said first peptide n-mer (e.g. up to 10 or 20 or 30) and/or a plurality of said second peptide n-mer (e.g. up to 10 or 20 or 30).

For stronger reduction of the titre of the undesired antibodies relative to the amount of scaffold used, the compound may also comprise at least

a third peptide n-mer of the general formula:



wherein, independently for each occurrence, P is a peptide defined as disclosed herein above (e.g. for P , P_1 , P_2 , and/or P_a), and S is a non-peptide spacer,

preferably wherein each occurrence of P is P_c, wherein P_c is a peptide defined as disclosed herein above (e.g. for P, P₁, P₂, and/or P_a),

more preferably wherein P_c is circularized;

preferably a fourth peptide n-mer of the general formula:

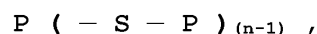


wherein, independently for each occurrence, P is a peptide defined as disclosed herein above (e.g. for P, P₁, P₂, and/or P_a), and S is a non-peptide spacer,

preferably wherein each occurrence of P is P_d, wherein P_d is a peptide defined as disclosed herein above (e.g. for P, P₁, P₂, and/or P_a),

more preferably wherein P_d is circularized;

preferably a fifth peptide n-mer of the general formula:

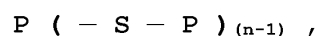


wherein, independently for each occurrence, P is a peptide defined as disclosed herein above (e.g. for P, P₁, P₂, and/or P_a), and S is a non-peptide spacer,

preferably wherein each occurrence of P is P_e, wherein P_e is a peptide defined as disclosed herein above (e.g. for P, P₁, P₂, and/or P_a),

more preferably wherein P_e is circularized;

preferably a sixth peptide n-mer of the general formula:



wherein, independently for each occurrence, P is a peptide defined as disclosed herein above (e.g. for P, P₁, P₂, and/or P_a), and S is a non-peptide spacer,

preferably wherein each occurrence of P is P_f, wherein P_f is a peptide defined as disclosed herein above (e.g. for P, P₁, P₂, and/or P_a),

more preferably wherein P_f is circularized;

preferably a seventh peptide n-mer of the general formula:



wherein, independently for each occurrence, P is a peptide defined as disclosed herein above (e.g. for P, P₁, P₂, and/or P_a), and S is a non-peptide spacer,

preferably wherein each occurrence of P is P_g, wherein P_g is a peptide defined as disclosed herein above (e.g. for P, P₁, P₂, and/or P_a),

more preferably wherein P_g is circularized;

preferably an eighth peptide n-mer of the general formula:



wherein, independently for each occurrence, P is a peptide defined as disclosed herein above (e.g. for P, P₁, P₂, and/or P_a), and S is a non-peptide spacer,

preferably wherein each occurrence of P is P_h, wherein P_h is a peptide defined as disclosed herein above (e.g. for P, P₁, P₂, and/or P_a),

more preferably wherein P_h is circularized;

preferably a ninth peptide n-mer of the general formula:

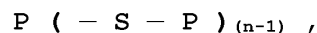


wherein, independently for each occurrence, P is a peptide defined as disclosed herein above (e.g. for P, P₁, P₂, and/or P_a), and S is a non-peptide spacer,

preferably wherein each occurrence of P is P_i, wherein P_i is a peptide defined as disclosed herein above (e.g. for P, P₁, P₂, and/or P_a),

more preferably wherein P_i is circularized;

preferably a tenth peptide n-mer of the general formula:



wherein, independently for each occurrence, P is a peptide defined as disclosed herein above (e.g. for P, P₁, P₂, and/or P_a), and S is a non-peptide spacer,

preferably wherein each occurrence of P is P_j, wherein P_j is a peptide defined as disclosed herein above (e.g. for P, P₁, P₂, and/or P_a),

more preferably wherein P_j is circularized.

Peptides P_c - P_j may have one or more of same features (e.g. sequence) as disclosed herein for peptides P_a and P_b (and/or for peptides P , P_1 , P_2). All preferred features disclosed herein for P , P_1 , and P_2 , are also preferred features of the peptides P_a - P_j . As also illustrated above, it is highly preferred when the compound of the present invention is non-immunogenic in a mammal, preferably in a human, in a non-human primate, in a sheep, in a pig, in a dog or in a rodent.

In the context of the present invention, a non-immunogenic compound preferably is a compound wherein the biopolymer scaffold (if it is a protein) and/or the peptides (of the peptide n-mers) have an IC50 higher than 100 nM, preferably higher than 500 nM, even more preferably higher than 1000 nM, especially higher than 2000 nM, against HLA-DRB1_0101 as predicted by the NetMHCII-2.3 algorithm. The NetMHCII-2.3 algorithm is described in detail in Jensen et al, which is incorporated herein by reference. The algorithm is publicly available under <http://www.cbs.dtu.dk/services/NetMHCII-2.3/>. Even more preferably, a non-immunogenic compound (or pharmaceutical composition) does not bind to any HLA and/or MHC molecule (e.g. in a mammal, preferably in a human, in a non-human primate, in a sheep, in a pig, in a dog or in a rodent; or of the individual to be treated) in vivo.

According to a further preference, the compound is for intracorporeal sequestration (or intracorporeal depletion) of at least one antibody in an individual, preferably in the bloodstream of the individual and/or for reduction of the titre of at least one antibody in the individual, preferably in the bloodstream of the individual. Preferably the antibody is an antibody specific for a (human) neuroreceptor, preferably a (human) neuroreceptor of the autonomic nervous system, more preferably a (human) neuroreceptor selected from the group consisting of muscarinic, and nicotinic cholinergic receptors, alpha- and beta- adrenergic receptors, serotonin receptors, angiotensin- and endothelin receptors; most preferably a (human) neuroreceptor selected from the group consisting of beta-1 adrenergic receptor, beta-2 adrenergic receptor, M3 muscarinic acetylcholine receptor, and M4 muscarinic acetylcholine receptor; preferably defined by a UniProt accession number

disclosed herein above (in the context of the peptides comprised in the inventive compound).

In an aspect, the present invention relates to a pharmaceutical composition comprising the inventive compound and at least one pharmaceutically acceptable excipient.

In embodiments, the composition is prepared for intraperitoneal, subcutaneous, intramuscular and/or intravenous administration. In particular, the composition is for repeated administration (since it is typically non-immunogenic).

In a preference, the molar ratio of peptides (e.g. P or P_a or P_b) to biopolymer scaffold in the composition is from 2:1 to 100:1, preferably from 3:1 to 90:1, more preferably from 4:1 to 80:1, even more preferably from 5:1 to 70:1, yet even more preferably from 6:1 to 60:1, especially from 7:1 to 50:1 or even from 8:10 to 40:1.

In another aspect, the compound and/or the pharmaceutical composition of the present invention is for use in therapy.

Preferably, the compound and/or the pharmaceutical composition is for use in prevention or treatment of ME/CFS in an individual.

In a further preference, the compound and/or the pharmaceutical composition is for use in prevention or treatment of POTS in an individual.

In yet a further preference, the compound and/or the pharmaceutical composition is for use in prevention or treatment of AAG in an individual.

In yet a further preference, the compound and/or the pharmaceutical composition is for use in prevention or treatment of IDC in an individual.

In yet a further preference, the compound and/or the pharmaceutical composition is for use in prevention or treatment of cChHD in an individual.

In yet a further preference, the compound and/or the pharmaceutical composition is for use in prevention or treatment of encephalitis such as limbic encephalitis or paraneoplastic striatal encephalitis or Anti-mGluR1 encephalitis or Anti-mGluR5 encephalitis or acute disseminated encephalomyelitis (ADEM) or

NMDAR encephalitis, paraneoplastic syndrome, stiff man syndrome, autoimmune channelopathies, neuromyelitis optica, neuromyotonia, Morvan's syndrome, neuropathic pain, myelitis, optic neuritis, retinitis, parkinsonism, chorea, psychosis, dystonia, mutism, movement disorders, confusion, hallucinations, prodromal diarrhoea, memory loss, hyperexcitability, encephalitis psychiatric syndrome, narcolepsy, autism spectrum disorders, seizures, status epilepticus, chronic epilepsy, myoclonus, encephalomyelitis, myoclonus, parasomnia, sleep apnoea, cognitive impairment, gait abnormalities, faciobrachial dystonic seizures, paraneoplastic syndrome, cerebellar ataxia, dysautonomia, Tourette, ADHD, cerebellar ataxia, oscillopsia, amyotrophic lateral sclerosis (ALS), thyroid disorder and headache with neurological deficits or lymphocytosis (HaNDL) in an individual.

In the course of the present invention, it turned out that the in vivo kinetics of undesirable-antibody lowering by the inventive compound is typically very fast, sometimes followed by a mild rebound of the undesirable antibody. It is thus particularly preferred when the compound (or the pharmaceutical composition comprising the compound) is administered at least twice within a 96-hour window, preferably within a 72-hour window, more preferably within a 48-hour window, even more preferably within a 36-hour window, yet even more preferably within a 24-hour window, especially within a 18-hour window or even within a 12-hour window.

In embodiments, one or more antibodies are present in the individual which are specific for at least one occurrence of the peptide of the inventive compound (e.g. the peptide P, P₁, P₂, or for peptide P_a and/or peptide P_b), preferably wherein said antibodies are specific for a neuroreceptor as defined herein above.

It is highly preferred that the composition is non-immunogenic in the individual (e.g. it does not comprise an adjuvant or an immunostimulatory substance that stimulates the innate or the adaptive immune system, e.g. such as an adjuvant or a T-cell epitope).

The composition of the present invention may be administered at a dose of 1-1000 mg, preferably 2-500 mg, more preferably 3-250 mg, even more preferably 4-100 mg, especially 5-50 mg, compound per kg body weight of the individual, preferably wherein the composition is administered repeatedly. Such administration may be intraperitoneally, subcutaneously, intramuscularly or intravenously.

In an aspect, the present invention relates to a method of ameliorating or treating an autoantibody-mediated condition, preferably selected from CFS/ME, POTS, AAG, IDC, and cChHD and encephalitis such as limbic encephalitis or paraneoplastic striatal encephalitis or Anti-mGluR1 encephalitis or Anti-mGluR5 encephalitis or acute disseminated encephalomyelitis (ADEM) or NMDAR encephalitis, paraneoplastic syndrome, stiff man syndrome, autoimmune channelopathies, neuromyelitis optica, neuromyotonia, Morvan's syndrome, neuropathic pain, myelitis, optic neuritis, retinitis, parkinsonism, chorea, psychosis, dystonia, mutism, movement disorders, confusion, hallucinations, prodromal diarrhoea, memory loss, hyperexcitability, encephalitis psychiatric syndrome, narcolepsy, autism spectrum disorders, seizures, status epilepticus, chronic epilepsy, myoclonus, encephalomyelitis, myoclonus, parasomnia, sleep apnoea, cognitive impairment, gait abnormalities, faciobrachial dystonic seizures, paraneoplastic syndrome, cerebellar ataxia, dysautonomia, Tourette, ADHD, cerebellar ataxia, oscillopsia, amyotrophic lateral sclerosis (ALS), thyroid disorder and headache with neurological deficits and lymphocytosis (HaNDL), in an individual in need thereof, comprising

obtaining the inventive pharmaceutical composition; and

administering an effective amount of the pharmaceutical composition to the individual. All preferred features disclosed for the compound and/or the pharmaceutical composition for use in prevention or treatment of an autoantibody-mediated condition, selected from CFS/ME, POTS, AAG, IDC, and cChHD and other conditions disclosed herein, in an individual also apply to this method.

In a further aspect, the present invention relates to a method of sequestering (or depleting) one or more antibodies present in an individual, comprising

obtaining a pharmaceutical composition as defined herein, wherein the composition is non-immunogenic in the individual and wherein the one or more antibodies present in the individual are specific for at least one occurrence of P, or for peptide P_a and/or peptide P_b; and

administering (in particular repeatedly administering, e.g. at least two times, preferably at least three times, more preferably at least five times) the pharmaceutical composition to the individual.

In a preference, the one or more antibodies are specific for a neuroreceptor, preferably a neuroreceptor as defined herein above.

Preferably, the biopolymer scaffold is autologous with respect to the individual, preferably wherein the biopolymer scaffold is an autologous protein (i.e. murine albumin is used when the individual is a mouse).

In a further aspect, the present invention relates to a peptide, wherein the peptide is defined as disclosed herein for any one of the at least two peptides of the inventive compound, P, P₁, P₂, P_a, or P_b. Preferably, the peptide comprises a 6-amino-acid fragment, preferably a 7-, more preferably an 8-, even more preferably a 9-, even more preferably a 10-, even more preferably an 11-, yet even more preferably a 12-, most preferably a 13-amino-acid fragment, of an amino-acid sequence, identified by a UniProt accession code selected from the group consisting of: P02708, P07510, P07550, P08172, P08173, P08588, P08908, P08912, P08913, P11229, P11230, P13945, P17787, P18089, P18825, P20309, P25098, P25100, P30532, P30926, P32297, P35348, P35368, P35626, P36544, P43681, Q04844, Q05901, Q07001, Q15822, Q15825, Q9GZZ6, Q9UGM1, A0A0G2JKS1, A5X5Y0, A6NL88, A8MPY1, B4DS77, B8ZZ34, O00222, O00591, O14490, O14764, O15303, O15399, O43424, O43653, O60359, O60391, O60403, O60404, O60936, O75311, O75916, O76027, O94772, O95264, O95502, O95868, O95886, P01579, P05026, P05067, P06850, P07196, P07384, P0C7T3, P0C8F1, P0DP57, P0DP58, P12931, P13500, P14416, P14867, P15382, P16066, P17342,

P18505, P18507, P19634, P20594, P21452, P21728, P21917, P21918, P23415, P23416, P24046, P24387, P25021, P25101, P28221, P28222, P28223, P28335, P28472, P28476, P28566, P29274, P29275, P29323, P30411, P30542, P30556, P30939, P31644, P32418, P34903, P34969, P35367, P35372, P35462, P35609, P37288, P39086, P41594, P41595, P41597, P42261, P42262, P42263, P43119, P46098, P47869, P47870, P47898, P47901, P47972, P48058, P48067, P48167, P48169, P48549, P49354, P50052, P50406, P53355, P55000, P62955, P63252, P78334, P78352, P78509, Q00535, Q05586, Q06413, Q07699, Q12879, Q12959, Q13002, Q13003, Q13224, Q13255, Q13387, Q13639, Q13702, Q13936, Q13972, Q14289, Q14416, Q14500, Q14571, Q14573, Q14643, Q14831, Q14832, Q14833, Q14957, Q15700, Q15818, Q16099, Q16445, Q16478, Q16553, Q16602, Q401N2, Q494W8, Q5SQ64, Q6PI25, Q6TFL4, Q6UXU4, Q6ZSJ9, Q70Z44, Q86Y78, Q86YM7, Q8N1C3, Q8N2G4, Q8N2Q7, Q8N4C8, Q8NC67, Q8NFZ4, Q8NG75, Q8NGA5, Q8NGA6, Q8NGC8, Q8NGC9, Q8NGG2, Q8NGG3, Q8NGH5, Q8NGH8, Q8NGN1, Q8NGS4, Q8NGY7, Q8NHC4, Q8NI32, Q8TBE1, Q8TCU5, Q8TDF5, Q8WXA2, Q8WXA8, Q8WXS5, Q92736, Q92796, Q96G91, Q96NW7, Q96P66, Q99928, Q99996, Q9BUH8, Q9BXM7, Q9BYB0, Q9GZV3, Q9H3N8, Q9NPA1, Q9NZ94, Q9P1A6, Q9UBK2, Q9UBN1, Q9UBS5, Q9UF02, Q9ULK0, Q9UN88, Q9UPX8, Q9Y2H0, Q9Y4A9, Q9Y566, Q9Y5N1, Q9Y691, Q9Y698, P37088, P51168, P51170, P51172, O94759, Q16515, O60741, Q9NZQ8, P78348, Q8TDD5, Q9NY37, Q13002, P39086, P48664, A6NGN9, O00305, O00555, O15146, O43448, O43497, O43525, O43526, O60840, O75096, O95180, O95259, O95970, P06213, P16389, P16473, P17658, P22001, P22459, P22460, P24530, P42658, P43146, P48547, P49418, P51787, P54284, P54289, P56696, Q00975, Q01668, Q02246, Q02641, Q03721, Q05329, Q06432, Q08289, Q09470, Q12809, Q13018, Q13303, Q13698, Q14003, Q14721, Q14722, Q15878, Q6PIL6, Q6PIU1, Q6X4W1, Q7Z3S7, Q7Z429, Q8IZS8, Q8NCM2, Q8TAE7, Q8TDN1, Q8TDN2, Q8WWG9, Q92953, Q96KK3, Q96L42, Q96PR1, Q96RP8, Q9BQ31, Q9BXT2, Q9H252, Q9H3M0, Q9NR82, Q9NS40, Q9NS61, Q9NSA2, Q9NY47, Q9NZI2, Q9NZV8, Q9P0X4, Q9UHC6, Q9UIX4, Q9UJ90, Q9UJ96, Q9UK17, Q9ULD8, Q9ULS6, Q9UQ05, Q9Y2W7, Q9Y6H6, Q9Y6J6, P48058, P55087, Q9BPU6, P52799, P15328, Q05329, Q16653, Q9Y4C0, Q5F0I5, Q99719, P17600, Q13148, P01266, Q9Y6A1, Q9Y6A1, and P07202, optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid. Even more preferably, said amino-acid fragment comprises at least 4, preferably at least 5 or even at least 6, more

preferably at least 7 or even at least 8, yet more preferably at least 9, even more preferably at least 10, yet even more preferably at least 11, especially at least 12 or even 13 consecutive amino acids of a sequence identified by any one of SEQ ID NOs: 45-3536 (with the proviso that the UniProt accession code of said amino-acid sequence and the UniProt accession code of the SEQ ID NO given in Table 1 is the same), preferably any one of SEQ ID NOs: 45-863 (with the proviso that the UniProt accession code of said amino-acid sequence and the UniProt accession code of the SEQ ID NO given in Table 1 is the same), especially any one of SEQ ID NOs: 45-201 (with the proviso that the UniProt accession code of said amino-acid sequence and the UniProt accession code of the SEQ ID NO given in Table 1 is the same), optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

In certain embodiments, such peptides may be used as probes for the diagnostic typing and analysis of autoantibody-mediated conditions such as disclosed herein. The peptides can e.g. be used as part of a diagnostic autoantibody-mediated condition typing or screening device or kit or procedure, as a companion diagnostic, for patient stratification or for monitoring autoantibody levels in the course of therapeutic treatments.

In a further aspect, the invention relates to a method for detecting and/or quantifying autoantibodies in a biological sample comprising the steps of

- bringing the sample into contact with the peptide defined as disclosed herein (e.g. for P, P₁, P₂, P_a, or P_b), and
- detecting the presence and/or concentration of autoantibodies in the sample.

The skilled person is familiar with methods for detecting and/or quantifying antibodies in biological samples. The method can e.g. be a sandwich assay, preferably an enzyme-linked immunosorbent assay (ELISA), or a surface plasmon resonance (SPR) assay.

In a preference, the peptide (especially at least 10, more preferably at least 100, even more preferably at least 1000, especially at least 10000 different peptides of the invention)

are immobilized on a solid support, preferably an ELISA plate or an SPR chip or a biosensor-based diagnostic device with an electrochemical, fluorescent, magnetic, electronic, gravimetric or optical biotransducer. Alternatively, or in addition thereto, the peptide (especially at least 10, more preferably at least 100, even more preferably at least 1000, especially at least 10000 different peptides of the invention) may be coupled to a reporter or reporter fragment, such as a reporter fragment suitable for a protein-fragment complementation assay (PCA); see e.g. Li et al, 2019, or Kanulainen et al, 2021.

Preferably, the sample is obtained from a mammal, preferably a human. Preferably the sample is a blood sample, preferably a whole blood, serum, or plasma sample.

The invention further relates to the use of a peptide defined as disclosed herein (e.g. for P, P₁, P₂, P_a, or P_b) in a diagnostic assay, preferably ELISA, preferably as disclosed herein above.

A further aspect of the invention relates to a diagnostic device comprising the peptide defined as disclosed herein (e.g. for P, P₁, P₂, P_a, or P_b), preferably immobilized on a solid support. In a preference, the solid support is an ELISA plate or a surface plasmon resonance chip. In another preference, the diagnostic device is a biosensor-based diagnostic device with an electrochemical, fluorescent, magnetic, electronic, gravimetric or optical biotransducer.

In another preferred embodiment, the diagnostic device is a lateral flow assay.

The invention further relates to a diagnostic kit comprising a peptide defined as disclosed herein (e.g. for P, P₁, P₂, P_a, or P_b), preferably a diagnostic device as defined herein. Preferably the diagnostic kit further comprises one or more selected from the group of a buffer, a reagent, instructions. Preferably the diagnostic kit is an ELISA kit.

A further aspect relates to an apheresis device comprising the peptide defined as disclosed herein (e.g. for P, P₁, P₂, P_a, or P_b). Preferably the peptide is immobilized on a solid carrier. It is especially preferred if the apheresis device comprises at least two, preferably at least three, more preferably at least

four different peptides defined as disclosed herein (e.g. for P, P₁, P₂, P_a, or P_b). In a preferred embodiment the solid carrier comprises the inventive compound.

Preferably, the solid carrier is capable of being contacted with blood or plasma flow. Preferably, the solid carrier is a sterile and pyrogen-free column.

In the context of the present invention, for improved bioavailability, it is preferred that the inventive compound has a solubility in water at 25°C of at least 0.1 µg/ml, preferably at least 1 µg/ml, more preferably at least 10 µg/ml, even more preferably at least 100 µg/ml, especially at least 1000 µg/ml.

The term "preventing" or "prevention" as used herein means to stop a disease state or condition from occurring in a patient or subject completely or almost completely or at least to a (preferably significant) extent, especially when the patient or subject or individual is predisposed to such a risk of contracting a disease state or condition.

The pharmaceutical composition of the present invention is preferably provided as a (typically aqueous) solution, (typically aqueous) suspension or (typically aqueous) emulsion. Excipients suitable for the pharmaceutical composition of the present invention are known to the person skilled in the art, upon having read the present specification, for example water (especially water for injection), saline, Ringer's solution, dextrose solution, buffers, Hank solution, vesicle forming compounds (e.g. lipids), fixed oils, ethyl oleate, 5% dextrose in saline, substances that enhance isotonicity and chemical stability, buffers and preservatives. Other suitable excipients include any compound that does not itself induce the production of antibodies in the patient (or individual) that are harmful for the patient (or individual). Examples are well tolerable proteins, polysaccharides, polylactic acids, polyglycolic acid, polymeric amino acids and amino acid copolymers. This pharmaceutical composition can (as a drug) be administered via appropriate procedures known to the skilled person (upon having read the present specification) to a patient or individual in need thereof (i.e. a patient or individual having or having the

risk of developing the diseases or conditions mentioned herein). The preferred route of administration of said pharmaceutical composition is parenteral administration, in particular through intraperitoneal, subcutaneous, intramuscular and/or intravenous administration. For parenteral administration, the pharmaceutical composition of the present invention is preferably provided in injectable dosage unit form, e.g. as a solution (typically as an aqueous solution), suspension or emulsion, formulated in conjunction with the above-defined pharmaceutically acceptable excipients. The dosage and method of administration, however, depends on the individual patient or individual to be treated. Said pharmaceutical composition can be administered in any suitable dosage known from other biological dosage regimens or specifically evaluated and optimised for a given individual. For example, the active agent may be present in the pharmaceutical composition in an amount from 1 mg to 10 g, preferably 50 mg to 2 g, in particular 100 mg to 1 g. Usual dosages can also be determined on the basis of kg body weight of the patient, for example preferred dosages are in the range of 0.1 mg to 100 mg/kg body weight, especially 1 to 10 mg/kg body weight (per administration session). The administration may occur e.g. once daily, once every other day, once per week or once every two weeks. As the preferred mode of administration of the inventive pharmaceutical composition is parenteral administration, the pharmaceutical composition according to the present invention is preferably liquid or ready to be dissolved in liquid such sterile, de-ionised or distilled water or sterile isotonic phosphate-buffered saline (PBS). Preferably, 1000 µg (dry-weight) of such a composition comprises or consists of 0.1-990 µg, preferably 1-900µg, more preferably 10- 200µg compound, and optionally 1-500 µg, preferably 1-100 µg, more preferably 5-15 µg (buffer) salts (preferably to yield an isotonic buffer in the final volume), and optionally 0.1-999.9 µg, preferably 100-999.9 µg, more preferably 200-999 µg other excipients. Preferably, 100 mg of such a dry composition is dissolved in sterile, de-ionised/distilled water or sterile isotonic phosphate-buffered saline (PBS) to yield a final volume of 0.1-100 ml, preferably 0.5-20 ml, more preferably 1-10 ml.

It is evident to the skilled person that active agents and drugs described herein can also be administered in salt-form (i.e. as a pharmaceutically acceptable salt of the active agent). Accordingly, any mention of an active agent herein shall also include any pharmaceutically acceptable salt forms thereof.

Methods for chemical synthesis of peptides used for the compound of the present invention are well-known in the art. Of course, it is also possible to produce the peptides using recombinant methods. The peptides can be produced in microorganisms such as bacteria, yeast or fungi, in eukaryotic cells such as mammalian or insect cells, or in a recombinant virus vector such as adenovirus, poxvirus, herpesvirus, Simliki forest virus, baculovirus, bacteriophage, sindbis virus or sendai virus. Suitable bacteria for producing the peptides include *E. coli*, *B. subtilis* or any other bacterium that is capable of expressing such peptides. Suitable yeast cells for expressing the peptides of the present invention include *Saccharomyces cerevisiae*, *Schizosaccharomyces pombe*, *Candida*, *Pichiapastoris* or any other yeast capable of expressing peptides. Corresponding means and methods are well known in the art. Also, methods for isolating and purifying recombinantly produced peptides are well known in the art and include e.g. gel filtration, affinity chromatography, ion exchange chromatography etc.

Beneficially, cysteine residues are added to the peptides at the N- and/or C-terminus to facilitate coupling to the biopolymer scaffold, especially.

To facilitate isolation of said peptides, fusion polypeptides may be made wherein the peptides are translationally fused (covalently linked) to a heterologous polypeptide which enables isolation by affinity chromatography. Typical heterologous polypeptides are His-Tag (e.g. His₆; 6 histidine residues), GST-Tag (Glutathione-S-transferase) etc. The fusion polypeptide facilitates not only the purification of the peptides but can also prevent the degradation of the peptides during the purification steps. If it is desired to remove the heterologous polypeptide after purification, the fusion polypeptide may comprise a cleavage site at the junction between the peptide and the heterologous polypeptide. The

cleavage site may consist of an amino acid sequence that is cleaved with an enzyme specific for the amino acid sequence at the site (e.g. proteases).

The coupling/conjugation chemistry used to link the peptides / peptide n-mers to the biopolymer scaffold (e.g. via heterobifunctional compounds such as GMBS and of course also others as described in "Bioconjugate Techniques", Greg T. Hermanson) or used to conjugate the spacer to the peptides in the context of the present invention can also be selected from reactions known to the skilled in the art. The biopolymer scaffold itself may be recombinantly produced or obtained from natural sources.

Herein, the term "specific for" - as in "molecule A specific for molecule B" - means that molecule A has a binding preference for molecule B compared to other molecules in an individual's body. Typically, this entails that molecule A (such as an antibody) has a dissociation constant (also called "affinity") in regard to molecule B (such as the antigen, specifically the binding epitope thereof) that is lower than (i.e. "stronger than") 1000 nM, preferably lower than 100 nM, more preferably lower than 50 nM, even more preferably lower than 10 nM, especially lower than 5 nM.

Herein, "UniProt" refers to the Universal Protein Resource. UniProt is a comprehensive resource for protein sequence and annotation data. UniProt is a collaboration between the European Bioinformatics Institute (EMBL-EBI), the SIB Swiss Institute of Bioinformatics and the Protein Information Resource (PIR). Across the three institutes more than 100 people are involved through different tasks such as database curation, software development and support. Website: <https://www.uniprot.org/>

Entries in the UniProt databases are identified by their accession codes (referred to herein e.g. as "UniProt accession code" or briefly as "UniProt" followed by the accession code), usually a code of six alphanumeric letters (e.g. "Q1HVF7"). If not specified otherwise, the accession codes used herein refer to entries in the Protein Knowledgebase (UniProtKB) of UniProt. If not stated otherwise, the UniProt database state for all

entries referenced herein is of 22 September 2020 (UniProt/UniProtKB Release 2020_04).

In the context of the present application, sequence variants (designated as "natural variant" in UniProt) are expressly included when referring to a UniProt database entry.

"Percent (%) amino acid sequence identity" or "X% identical" (such as "70% identical") with respect to a reference polypeptide or protein sequence is defined as the percentage of amino acid residues in a candidate sequence that are identical with the amino acid residues in the reference polypeptide sequence, after aligning the sequences and introducing gaps, if necessary, to achieve the maximum percent sequence identity, and not considering any conservative substitutions as part of the sequence identity. Alignment for purposes of determining percent amino acid sequence identity can be achieved in various ways that are within the skill in the art, for instance, using publicly available computer software such as BLAST, BLAST-2, ALIGN, ALIGN-2, Megalign (DNASTAR) or the "needle" pairwise sequence alignment application of the EMBOSS software package. Those skilled in the art can determine appropriate parameters for aligning sequences, including any algorithms needed to achieve maximal alignment over the full length of the sequences being compared. For purposes herein, however, % amino acid sequence identity values are calculated using the sequence alignment of the computer programme "needle" of the EMBOSS software package (publicly available from European Molecular Biology Laboratory; Rice et al., 2000).

The needle programme can be accessed under the web site http://www.ebi.ac.uk/Tools/psa/emboss_needle/ or downloaded for local installation as part of the EMBOSS package from <http://emboss.sourceforge.net/>. It runs on many widely-used UNIX operating systems, such as Linux.

To align two protein sequences, the needle programme is preferably run with the following parameters:

Commandline: needle -auto -stdout -asequence
SEQUENCE_FILE_A -bsequence SEQUENCE_FILE_B -datafile EBLOSUM62 -
gapopen 10.0 -gapextend 0.5 -endopen 10.0 -endextend 0.5 -

```
aformat3 pair -sprotein1 -sprotein2 (Align_format: pair
Report_file: stdout)
```

The % amino acid sequence identity of a given amino acid sequence A to, with, or against a given amino acid sequence B (which can alternatively be phrased as a given amino acid sequence A that has or comprises a certain % amino acid sequence identity to, with, or against a given amino acid sequence B) is calculated as follows:

100 times the fraction X/Y

where X is the number of amino acid residues scored as identical matches by the sequence alignment program needle in that program's alignment of A and B, and where Y is the total number of amino acid residues in B. It will be appreciated that where the length of amino acid sequence A is not equal to the length of amino acid sequence B, the % amino acid sequence identity of A to B will not equal the % amino acid sequence identity of B to A. In cases where "the sequence of A is more than N% identical to the entire sequence of B", Y is the entire sequence length of B (i.e. the entire number of amino acid residues in B). Unless specifically stated otherwise, all % amino acid sequence identity values used herein are obtained as described in the immediately preceding paragraph using the needle computer program.

The present invention further relates to the following embodiments:

Embodiment 1. A compound comprising a biopolymer scaffold and at least two peptides with a sequence length of 6-13 amino acids, wherein each of the peptides independently comprises a 6-amino-acid fragment, preferably a 7-, more preferably an 8-, even more preferably a 9-, even more preferably a 10-, even more preferably an 11-, yet even more preferably a 12-, most preferably a 13-amino-acid fragment, of an amino-acid sequence, preferably of a (preferably human) neuroreceptor, identified by a UniProt accession code selected from the group consisting of:

P02708, P07510, P07550, P08172, P08173, P08588, P08908, P08912, P08913, P11229, P11230, P13945, P17787, P18089, P18825, P20309, P25098, P25100, P30532, P30926, P32297, P35348, P35368, P35626, P36544, P43681, Q04844, Q05901, Q07001, Q15822, Q15825,

Q9GZZ6, Q9UGM1, A0A0G2JKS1, A5X5Y0, A6NL88, A8MPY1, B4DS77,
B8ZZ34, O00222, O00591, O14490, O14764, O15303, O15399, O43424,
O43653, O60359, O60391, O60403, O60404, O60936, O75311, O75916,
O76027, O94772, O95264, O95502, O95868, O95886, P01579, P05026,
P05067, P06850, P07196, P07384, P0C7T3, P0C8F1, P0DP57, P0DP58,
P12931, P13500, P14416, P14867, P15382, P16066, P17342, P18505,
P18507, P19634, P20594, P21452, P21728, P21917, P21918, P23415,
P23416, P24046, P24387, P25021, P25101, P28221, P28222, P28223,
P28335, P28472, P28476, P28566, P29274, P29275, P29323, P30411,
P30542, P30556, P30939, P31644, P32418, P34903, P34969, P35367,
P35372, P35462, P35609, P37288, P39086, P41594, P41595, P41597,
P42261, P42262, P42263, P43119, P46098, P47869, P47870, P47898,
P47901, P47972, P48058, P48067, P48167, P48169, P48549, P49354,
P50052, P50406, P53355, P55000, P62955, P63252, P78334, P78352,
P78509, Q00535, Q05586, Q06413, Q07699, Q12879, Q12959, Q13002,
Q13003, Q13224, Q13255, Q13387, Q13639, Q13702, Q13936, Q13972,
Q14289, Q14416, Q14500, Q14571, Q14573, Q14643, Q14831, Q14832,
Q14833, Q14957, Q15700, Q15818, Q16099, Q16445, Q16478, Q16553,
Q16602, Q401N2, Q494W8, Q5SQ64, Q6PI25, Q6TFL4, Q6UXU4, Q6ZSJ9,
Q70Z44, Q86Y78, Q86YM7, Q8N1C3, Q8N2G4, Q8N2Q7, Q8N4C8, Q8NC67,
Q8NFZ4, Q8NG75, Q8NGA5, Q8NGA6, Q8NGC8, Q8NGC9, Q8NGG2, Q8NGG3,
Q8NGH5, Q8NGH8, Q8NGN1, Q8NGS4, Q8NGY7, Q8NHC4, Q8NI32, Q8TBE1,
Q8TCU5, Q8TDF5, Q8WXA2, Q8WXA8, Q8WXS5, Q92736, Q92796, Q96G91,
Q96NW7, Q96P66, Q99928, Q99996, Q9BUH8, Q9BXM7, Q9BYB0, Q9GZV3,
Q9H3N8, Q9NPA1, Q9NZ94, Q9P1A6, Q9UBK2, Q9UBN1, Q9UBS5, Q9UF02,
Q9ULK0, Q9UN88, Q9UPX8, Q9Y2H0, Q9Y4A9, Q9Y566, Q9Y5N1, Q9Y691,
Q9Y698, P37088, P51168, P51170, P51172, O94759, Q16515, O60741,
Q9NZQ8, P78348, Q8TDD5, Q9NY37, Q13002, P39086, P48664, A6NGN9,
O00305, O00555, O15146, O43448, O43497, O43525, O43526, O60840,
O75096, O95180, O95259, O95970, P06213, P16389, P16473, P17658,
P22001, P22459, P22460, P24530, P42658, P43146, P48547, P49418,
P51787, P54284, P54289, P56696, Q00975, Q01668, Q02246, Q02641,
Q03721, Q05329, Q06432, Q08289, Q09470, Q12809, Q13018, Q13303,
Q13698, Q14003, Q14721, Q14722, Q15878, Q6PIL6, Q6PIU1, Q6X4W1,
Q7Z3S7, Q7Z429, Q8IZS8, Q8NCM2, Q8TAE7, Q8TDN1, Q8TDN2, Q8WWG9,
Q92953, Q96KK3, Q96L42, Q96PR1, Q96RP8, Q9BQ31, Q9BXT2, Q9H252,
Q9H3M0, Q9NR82, Q9NS40, Q9NS61, Q9NSA2, Q9NY47, Q9NZI2, Q9NZV8,
Q9P0X4, Q9UHC6, Q9UIX4, Q9UJ90, Q9UJ96, Q9UK17, Q9ULD8, Q9ULS6,
Q9UQ05, Q9Y2W7, Q9Y6H6, Q9Y6J6, P48058, P55087, Q9BPU6, P52799,

P15328, Q05329, Q16653, Q9Y4C0, Q5F0I5, Q99719, P17600, Q13148, P01266, P07202, and Q9Y6A1, (preferably identified by an UniProt accession code selected from Table 1, Table 2 or Table 3 below, in particular Table 1 or Table 3),

optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

Embodiment 2. The compound of embodiment 1, wherein said amino-acid sequence is an amino acid sequence, preferably of a (preferably human) neuroreceptor of the autonomic nervous system, identified by a UniProt accession code selected from the group consisting of: P02708, P07510, P07550, P08172, P08173, P08588, P08908, P08912, P08913, P11229, P11230, P13945, P17787, P18089, P18825, P20309, P25098, P25100, P30532, P30926, P32297, P35348, P35368, P35626, P36544, P43681, Q04844, Q05901, Q07001, Q15822, Q15825, Q9GZZ6, Q9UGM1; P37088, P51168, P51170, P51172, O94759, Q16515, O60741, Q9NZQ8, P78348, Q8TDD5, Q9NY37, Q13002, P39086, and P48664.

Embodiment 3. The compound of embodiment 1 or 2, wherein said amino acid sequence is an amino acid sequence of a (preferably human) neuroreceptor selected from the group consisting of muscarinic, and nicotinic cholinergic receptors, alpha- and beta- adrenergic receptors, serotonin receptors, angiotensin- and endothelin receptors.

Embodiment 4. The compound of any one of embodiments 1 to 3, wherein said amino-acid sequence is an amino acid sequence, preferably of a (preferably human) neuroreceptor selected from the group consisting of beta-1 adrenergic receptor, beta-2 adrenergic receptor, M3 muscarinic acetylcholine receptor, and M4 muscarinic acetylcholine receptor, identified by a UniProt accession code selected from the group consisting of: P08588, P07550, P20309, and P08173.

Embodiment 5. The compound of any one of embodiments 1 to 4, wherein said amino-acid sequence is an amino acid sequence identified by a UniProt accession code selected from the group consisting of: P02708, P07510, P07550, P08172, P08173, P08588, P08908, P08912, P08913, P11229, P11230, P13945, P17787, P18089, P18825, P20309, P25098, P25100, P30532, P30926, P32297, P35348,

P35368, P35626, P36544, P43681, Q04844, Q05901, Q07001, Q15822, Q15825, Q9GZZ6, Q9UGM1, A0A0G2JKS1, A5X5Y0, A6NL88, A8MPY1, B4DS77, B8ZZ34, O00222, O00591, O14490, O14764, O15303, O15399, O43424, O43653, O60359, O60391, O60403, O60404, O60936, O75311, O75916, O76027, O94772, O95264, O95502, O95868, O95886, P01579, P05026, P05067, P06850, P07196, P07384, P0C7T3, P0C8F1, P0DP57, P0DP58, P12931, P13500, P14416, P14867, P15382, P16066, P17342, P18505, P18507, P19634, P20594, P21452, P21728, P21917, P21918, P23415, P23416, P24046, P24387, P25021, P25101, P28221, P28222, P28223, P28335, P28472, P28476, P28566, P29274, P29275, P29323, P30411, P30542, P30556, P30939, P31644, P32418, P34903, P34969, P35367, P35372, P35462, P35609, P37288, P39086, P41594, P41595, P41597, P42261, P42262, P42263, P43119, P46098, P47869, P47870, P47898, P47901, P47972, P48058, P48067, P48167, P48169, P48549, P49354, P50052, P50406, P53355, P55000, P62955, P63252, P78334, P78352, P78509, Q00535, Q05586, Q06413, Q07699, Q12879, Q12959, Q13002, Q13003, Q13224, Q13255, Q13387, Q13639, Q13702, Q13936, Q13972, Q14289, Q14416, Q14500, Q14571, Q14573, Q14643, Q14831, Q14832, Q14833, Q14957, Q15700, Q15818, Q16099, Q16445, Q16478, Q16553, Q16602, Q401N2, Q494W8, Q5SQ64, Q6PI25, Q6TFL4, Q6UXU4, Q6ZSJ9, Q70Z44, Q86Y78, Q86YM7, Q8N1C3, Q8N2G4, Q8N2Q7, Q8N4C8, Q8NC67, Q8NFZ4, Q8NG75, Q8NGA5, Q8NGA6, Q8NGC8, Q8NGC9, Q8NGG2, Q8NGG3, Q8NGH5, Q8NGH8, Q8NGN1, Q8NGS4, Q8NGY7, Q8NHC4, Q8NI32, Q8TBE1, Q8TCU5, Q8TDF5, Q8WXA2, Q8WXA8, Q8WXS5, Q92736, Q92796, Q96G91, Q96NW7, Q96P66, Q99928, Q99996, Q9BUH8, Q9BXM7, Q9BYB0, Q9GZV3, Q9H3N8, Q9NPA1, Q9NZ94, Q9P1A6, Q9UBK2, Q9UBN1, Q9UBS5, Q9UF02, Q9ULK0, Q9UN88, Q9UPX8, Q9Y2H0, Q9Y4A9, Q9Y566, Q9Y5N1, Q9Y691, Q9Y698, P37088, P51168, P51170, P51172, O94759, Q16515, O60741, Q9NZQ8, P78348, Q8TDD5, Q9NY37, Q13002, P39086 and P48664.

Embodiment 6. The compound of any one of embodiments 1 to 4, wherein said amino-acid sequence is an amino acid sequence identified by a UniProt accession code selected from the group consisting of: P02708, P07510, P07550, P08172, P08173, P08588, P08908, P08912, P08913, P11229, P11230, P13945, P17787, P18089, P18825, P20309, P25098, P25100, P30532, P30926, P32297, P35348, P35368, P35626, P36544, P43681, Q04844, Q05901, Q07001, Q15822, Q15825, Q9GZZ6, Q9UGM1, A0A0G2JKS1, A5X5Y0, A6NL88, A8MPY1, B4DS77, B8ZZ34, O00222, O00591, O14490, O14764, O15303, O15399,

O43424, O43653, O60359, O60391, O60403, O60404, O60936, O75311, O75916, O76027, O94772, O95264, O95502, O95868, O95886, P01579, P05026, P05067, P06850, P07196, P07384, P0C7T3, P0C8F1, P0DP57, P0DP58, P12931, P13500, P14416, P14867, P15382, P16066, P17342, P18505, P18507, P19634, P20594, P21452, P21728, P21917, P21918, P23415, P23416, P24046, P24387, P25021, P25101, P28221, P28222, P28223, P28335, P28472, P28476, P28566, P29274, P29275, P29323, P30411, P30542, P30556, P30939, P31644, P32418, P34903, P34969, P35367, P35372, P35462, P35609, P37288, P39086, P41594, P41595, P41597, P42261, P42262, P42263, P43119, P46098, P47869, P47870, P47898, P47901, P47972, P48058, P48067, P48167, P48169, P48549, P49354, P50052, P50406, P53355, P55000, P62955, P63252, P78334, P78352, P78509, Q00535, Q05586, Q06413, Q07699, Q12879, Q12959, Q13002, Q13003, Q13224, Q13255, Q13387, Q13639, Q13702, Q13936, Q13972, Q14289, Q14416, Q14500, Q14571, Q14573, Q14643, Q14831, Q14832, Q14833, Q14957, Q15700, Q15818, Q16099, Q16445, Q16478, Q16553, Q16602, Q401N2, Q494W8, Q5SQ64, Q6PI25, Q6TFL4, Q6UXU4, Q6ZSJ9, Q70Z44, Q86Y78, Q86YM7, Q8N1C3, Q8N2G4, Q8N2Q7, Q8N4C8, Q8NC67, Q8NFZ4, Q8NG75, Q8NGA5, Q8NGA6, Q8NGC8, Q8NGC9, Q8NGG2, Q8NGG3, Q8NGH5, Q8NGH8, Q8NGN1, Q8NGS4, Q8NGY7, Q8NHC4, Q8NI32, Q8TBE1, Q8TCU5, Q8TDF5, Q8WXA2, Q8WXA8, Q8WXS5, Q92736, Q92796, Q96G91, Q96NW7, Q96P66, Q99928, Q99996, Q9BUH8, Q9BXM7, Q9BYB0, Q9GZV3, Q9H3N8, Q9NPA1, Q9NZ94, Q9P1A6, Q9UBK2, Q9UBN1, Q9UBS5, Q9UF02, Q9ULK0, Q9UN88, Q9UPX8, Q9Y2H0, Q9Y4A9, Q9Y566, Q9Y5N1, Q9Y691, Q9Y698, P37088, P51168, P51170, P51172, O94759, Q16515, O60741, Q9NZQ8, P78348, Q8TDD5, Q9NY37, Q13002, P39086, P48664, A6NGN9, O00305, O00555, O15146, O43448, O43497, O43525, O43526, O60840, O75096, O95180, O95259, O95970, P06213, P16389, P16473, P17658, P22001, P22459, P22460, P24530, P42658, P43146, P48547, P49418, P51787, P54284, P54289, P56696, Q00975, Q01668, Q02246, Q02641, Q03721, Q05329, Q06432, Q08289, Q09470, Q12809, Q13018, Q13303, Q13698, Q14003, Q14721, Q14722, Q15878, Q6PIL6, Q6PIU1, Q6X4W1, Q7Z3S7, Q7Z429, Q8IZS8, Q8NCM2, Q8TAE7, Q8TDN1, Q8TDN2, Q8WWG9, Q92953, Q96KK3, Q96L42, Q96PR1, Q96RP8, Q9BQ31, Q9BXT2, Q9H252, Q9H3M0, Q9NR82, Q9NS40, Q9NS61, Q9NSA2, Q9NY47, Q9NZI2, Q9NZV8, Q9P0X4, Q9UHC6, Q9UIX4, Q9UJ90, Q9UJ96, Q9UK17, Q9ULD8, Q9ULS6, Q9UQ05, Q9Y2W7, Q9Y6H6 and Q9Y6J6.

Embodiment 7. The compound of any one of embodiments 1 to 4, wherein said amino-acid sequence is an amino acid sequence

identified by a UniProt accession code selected from the group consisting of: O00555, O43497, O95180, P02708, P18505, P31644, P41594, P42263, Q00975, Q01668, Q05586, Q13224, Q13936, Q14957, Q15878, Q16445, Q8TCU5, Q9P0X4, A6NGN9, O15399, O60840, P14416, P16473, P23415, P34903, P42261, P42262, P42658, P47869, Q09470, Q12879, Q13255, Q9UHC6, O15146, O95970, P14867, P28472, P47870, P48169, and P49418.

Embodiment 8. The compound of any one of embodiments 1 to 4, wherein said amino-acid sequence is an amino acid sequence identified by a UniProt accession code selected from the group consisting of: P02708, P18505, P31644, P41594, P42263, Q05586, Q13224, Q13936, Q14957, Q16445, Q8TCU5, O15399, P14416, P23415, P34903, P42261, P42262, P47869, Q12879, Q13255, P14867, P28472, P47870, and P48169.

Embodiment 9. The compound of any one of embodiments 1 to 8, wherein, for at least one of the peptides (preferably for each of the peptides), said amino-acid fragment comprises at least 4, preferably at least 5 or even at least 6, more preferably at least 7 or even at least 8, yet more preferably at least 9, even more preferably at least 10, yet even more preferably at least 11, especially at least 12 or even 13 consecutive amino acids of a sequence identified by any one of SEQ ID NOs: 45-3536 (with the proviso that the UniProt accession code of said amino-acid sequence and the UniProt accession code of the SEQ ID NO given in Table 1 is the same), preferably any one of SEQ ID NOs: 45-863 (with the proviso that the UniProt accession code of said amino-acid sequence and the UniProt accession code of the SEQ ID NO given in Table 1 is the same), especially any one of SEQ ID NOs: 45-201 (with the proviso that the UniProt accession code of said amino-acid sequence and the UniProt accession code of the SEQ ID NO given in Table 1 is the same), optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

Embodiment 10. The compound of any one of embodiments 1 to 9, wherein, for at least one of the peptides (preferably for each of the peptides), said amino-acid fragment comprises at least 4, preferably at least 5 or even at least 6, more preferably at least 7 or even at least 8, yet more preferably at least 9, even more preferably at least 10, yet even more preferably at least

11, especially at least 12 or even 13 consecutive amino acids of a sequence listed in Table 3 (with the proviso that the UniProt accession code of said amino-acid sequence and the UniProt accession code of said sequence listed in Table 3 is the same), optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

Embodiment 11. The compound of any one of embodiments 1 to 10, wherein at most three, preferably at most two, more preferably at most one amino acid of said fragment is independently substituted by any other amino acid.

Embodiment 12. The compound of any one of embodiments 1 to 10, wherein three amino acids of said fragment are independently substituted by any other amino acid.

Embodiment 13. The compound of any one of embodiments 1 to 10, wherein two amino acids of said fragment are independently substituted by any other amino acid.

Embodiment 14. The compound of any one of embodiments 1 to 10, wherein one amino acid of said fragment is substituted by any other amino acid.

Embodiment 15. The compound of any one of embodiments 1 to 14, wherein the biopolymer scaffold is a human protein.

Embodiment 16. The compound of any one of embodiments 1 to 15, wherein the at least two peptides comprise a peptide P_1 and a peptide P_2 , wherein P_1 and P_2 independently comprise a 6-amino-acid fragment, preferably a 7-, more preferably an 8-, more preferably a 9-, even more preferably a 10-, yet even more preferably an 11-, especially a 12-, most preferably a 13-amino-acid fragment, of an amino acid sequence as defined in any one of embodiments 1 to 14, wherein P_1 and P_2 are present in form of a peptide dimer $P_1 - S - P_2$, wherein S is a non-peptide spacer, wherein the peptide dimer is covalently bound to the biopolymer scaffold, preferably via a linker.

Embodiment 17. The compound of any one of embodiments 1 to 16, wherein the biopolymer scaffold is selected from human globulins and human albumin.

Embodiment 18. The compound of any one of embodiments 1 to 17, wherein at least one of the at least two peptides is circularized.

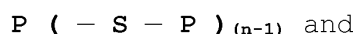
Embodiment 19. The compound of any one of embodiments 1 to 18, wherein each of the at least two peptides is circularized.

Embodiment 20. The compound of any one of embodiments 1 to 19, wherein the compound is non-immunogenic in humans.

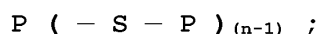
Embodiment 21. The compound of any one of embodiments 1 to 20, wherein the biopolymer scaffold is selected from human transferrin and human albumin.

Embodiment 22. A compound, preferably the compound of any one of embodiments 1 to 21, comprising

- a biopolymer scaffold and at least
- a first peptide n-mer of the general formula:



- a second peptide n-mer of the general formula:



wherein, independently for each occurrence, P is a peptide as defined in any one of embodiments 1 to 14, and S is a non-peptide spacer,

wherein, independently for each of the peptide n-mers, n is an integer of at least 1, preferably of at least 2, more preferably of at least 3, especially of at least 4,

wherein each of the peptide n-mers is bound to the biopolymer scaffold, preferably via a linker each.

Embodiment 23. The compound of embodiment 22, wherein at least one occurrence of P is a circularized peptide, preferably wherein at least 10% of all occurrences of P are circularized peptides, more preferably wherein at least 25% of all occurrences of P are circularized peptides, yet more preferably wherein at least 50% of all occurrences of P are circularized peptides, even more preferably wherein at least 75% of all occurrences of P are circularized peptides, yet even more preferably wherein at least 90% of all occurrences of P are circularized peptides or even wherein at least 95% of all

occurrences of P are circularized peptides, especially wherein all of the occurrences of P are circularized peptides.

Embodiment 24. The compound of embodiment 22 or 23, wherein, independently for each of the peptide n-mers, n is at least 2, more preferably at least 3, especially at least 4.

Embodiment 25. The compound of any one of embodiments 22 to 24, wherein, independently for each of the peptide n-mers, n is less than 10, preferably less than 9, more preferably less than 8, even more preferably less than 7, yet even more preferably less than 6, especially less than 5.

Embodiment 26. The compound of any one of embodiments 22 to 25, wherein, for each of the peptide n-mers, n is 2.

Embodiment 27. The compound of any one of embodiments 22 to 26, wherein at least one occurrence of P is P_a and/or at least one occurrence of P is P_b ,

wherein P_a and P_b each independently is a peptide as defined in any one of embodiments 1 to 14.

Embodiment 28. The compound of any one of embodiments 22 to 27, wherein, independently for each occurrence, P is P_a or P_b .

Embodiment 29. The compound of any one of embodiments 22 to 28, wherein, in the first peptide n-mer, each occurrence of P is P_a and, in the second peptide n-mer, each occurrence of P is P_b .

Embodiment 30. The compound of any one of embodiments 22 to 29, wherein

the first peptide n-mer is $P_a - S - P_a$ and the second peptide n-mer is $P_a - S - P_a$; or

the first peptide n-mer is $P_a - S - P_a$ and the second peptide n-mer is $P_b - S - P_b$;

the first peptide n-mer is $P_b - S - P_b$ and the second peptide n-mer is $P_b - S - P_b$;

the first peptide n-mer is $P_a - S - P_b$ and the second peptide n-mer is $P_a - S - P_b$;

the first peptide n-mer is $P_a - S - P_b$ and the second peptide n-mer is $P_a - S - P_a$; or

the first peptide n-mer is $P_a - S - P_b$ and the second peptide n-mer is $P_b - S - P_b$.

Embodiment 31. A compound comprising

- a biopolymer scaffold and at least
- a first peptide n-mer which is a peptide dimer of the formula $P_a - S - P_a$ or $P_a - S - P_b$,

wherein P_a and P_b each independently is a peptide as defined in any one of embodiments 1 to 14, and S is a non-peptide spacer,

wherein the first peptide n-mer is bound to the biopolymer scaffold, preferably via a linker.

Embodiment 32. The compound of embodiment 31, further comprising a second peptide n-mer which is a peptide dimer of the formula $P_b - S - P_b$ or $P_a - S - P_b$,

wherein the second peptide n-mer is bound to the biopolymer scaffold, preferably via a linker.

Embodiment 33. The compound of any one of embodiments 22 to 30 and 32, wherein the first peptide n-mer is different from the second peptide n-mer.

Embodiment 34. The compound of any one of embodiments 27 to 33, wherein the peptide P_a is different from the peptide P_b , preferably wherein the peptide P_a and the peptide P_b are two different epitopes of the same antigen or two different epitope parts of the same epitope.

Embodiment 35. The compound of any one of embodiments 27 to 34, wherein the peptide P_a and the peptide P_b comprise the same amino-acid sequence fragment, wherein the amino-acid sequence fragment has a length of at least 2 amino acids, preferably at least 3 amino acids, more preferably at least 4 amino acids, yet more preferably at least 5 amino acids, even more preferably at least 6 amino acids, yet even more preferably at least 7 amino acids, especially at least 8 amino acids or even at least 9 amino acids.

Embodiment 36. The compound of any one of embodiments 27 to 35, wherein P_a and/or P_b is circularized.

Embodiment 37. The compound of any one of embodiments 22 to 36, wherein the compound comprises a plurality of said first peptide n-mer and/or a plurality of said second peptide n-mer.

Embodiment 38. The compound of any one of embodiments 1 to 37, wherein the biopolymer scaffold is a protein, preferably a mammalian protein such as a human protein, a non-human primate protein, a sheep protein, a pig protein, a dog protein or a rodent protein.

Embodiment 39. The compound of any one of embodiments 1 to 38, wherein the biopolymer scaffold is a globulin.

Embodiment 40. The compound of any one of embodiments 1 to 39, wherein the biopolymer scaffold is selected from the group consisting of immunoglobulins, alpha1-globulins, alpha2-globulins and beta-globulins.

Embodiment 41. The compound of any one of embodiments 1 to 40, wherein the biopolymer scaffold is selected from the group consisting of immunoglobulin G, haptoglobin and transferrin.

Embodiment 42. The compound of any one of embodiments 1 to 41, wherein the biopolymer scaffold is haptoglobin.

Embodiment 43. The compound of any one of embodiments 1 to 38, wherein the biopolymer scaffold is an albumin.

Embodiment 44. The compound of embodiment 38, wherein the biopolymer scaffold is an anti-CD163 antibody (i.e. an antibody specific for a CD163 protein) or CD163-binding fragment thereof.

Embodiment 45. The compound of embodiment 44, wherein the anti-CD163 antibody or CD163-binding fragment thereof is specific for human CD163 and/or is specific for the extracellular region of CD163, preferably for an SRCR domain of CD163, more preferably for any one of SRCR domains 1-9 of CD163, even more preferably for any one of SRCR domains 1-3 of CD163, especially for SRCR domain 1 of CD163.

Embodiment 46. The compound of embodiment 44 or 45, wherein the anti-CD163 antibody or CD163-binding fragment thereof is specific for one of the following peptides:

a peptide consisting of 7-25, preferably 8-20, even more preferably 9-15, especially 10-13 amino acids, wherein the peptide comprises the amino acid sequence
CSGRVEVKVQEEWGTVCNNGWSMEA (SEQ ID NO: 3) or a 7-24 amino-acid fragment thereof,

a peptide consisting of 7-25, preferably 8-20, even more preferably 9-15, especially 10-13 amino acids, wherein the peptide comprises the amino acid sequence DHVSCRGNESALWDCKHDGWG (SEQ ID NO: 13) or a 7-20 amino-acid fragment thereof, or

a peptide consisting of 7-25, preferably 8-20, even more preferably 9-15, especially 10-13 amino acids, wherein the peptide comprises the amino acid sequence SSLGGTDKELRLVDGENKCS (SEQ ID NO: 24) or a 7-19 amino-acid fragment thereof.

Embodiment 47. The compound of embodiment 44 or 45, wherein the anti-CD163 antibody or CD163-binding fragment thereof is specific for a peptide comprising the amino acid sequence ESALW (SEQ ID NO: 14) or ALW.

Embodiment 48. The compound of embodiment 44 or 45, wherein the anti-CD163 antibody or CD163-binding fragment thereof is specific for a peptide comprising the amino acid sequence GRVEVKVQEEW (SEQ ID NO: 4), WGTVCNNGWS (SEQ ID NO: 5) or WGTVCNNGW (SEQ ID NO: 6).

Embodiment 49. The compound of embodiment 44 or 45, wherein the anti-CD163 antibody or CD163-binding fragment thereof is specific for a peptide comprising the amino acid sequence SSLGGTDKELR (SEQ ID NO: 25) or SSLGG (SEQ ID NO: 26).

Embodiment 50. The compound of any one of embodiments 1 to 49, wherein the compound is non-immunogenic in a mammal, preferably in a human, in a non-human primate, in a sheep, in a pig, in a dog or in a rodent.

Embodiment 51. The compound of any one of embodiments 1 to 50, wherein the compound is for intracorporeal sequestration (or intracorporeal depletion) of at least one antibody in an individual, preferably in the bloodstream of the individual and/or for reduction of the titre of at least one antibody in the individual, preferably in the bloodstream of the individual.

Embodiment 52. The compound of any one of embodiments 1 to 51, wherein the compound further comprises at least

a third peptide n-mer of the general formula:



wherein, independently for each occurrence, P is a peptide as defined in any one of embodiments 1 to 14, and S is a non-peptide spacer,

preferably wherein each occurrence of P is P_c , wherein P_c is a peptide as defined in any one of embodiments 1 to 14,

preferably wherein P_c is circularized.

Embodiment 53. The compound of embodiment 52, wherein the compound further comprises at least

a fourth peptide n-mer of the general formula:



wherein, independently for each occurrence, P is a peptide as defined in any one of embodiments 1 to 14, and S is a non-peptide spacer,

preferably wherein each occurrence of P is P_d , wherein P_d is a peptide as defined in any one of embodiments 1 to 14,

preferably wherein P_d is circularized;

Embodiment 54. The compound of embodiment 53, wherein the compound further comprises at least

a fifth peptide n-mer of the general formula:



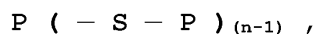
wherein, independently for each occurrence, P is a peptide as defined in any one of embodiments 1 to 14, and S is a non-peptide spacer,

preferably wherein each occurrence of P is P_e , wherein P_e is a peptide as defined in any one of embodiments 1 to 14,

preferably wherein P_e is circularized;

Embodiment 55. The compound of embodiment 54, wherein the compound further comprises at least

a sixth peptide n-mer of the general formula:



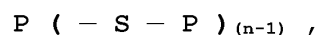
wherein, independently for each occurrence, P is a peptide as defined in any one of embodiments 1 to 14, and S is a non-peptide spacer,

preferably wherein each occurrence of P is P_f , wherein P_f is a peptide as defined in any one of embodiments 1 to 14,

preferably wherein P_f is circularized;

Embodiment 56. The compound of embodiment 55, wherein the compound further comprises at least

a seventh peptide n-mer of the general formula:



wherein, independently for each occurrence, P is a peptide as defined in any one of embodiments 1 to 14, and S is a non-peptide spacer,

preferably wherein each occurrence of P is P_g , wherein P_g is a peptide as defined in any one of embodiments 1 to 14,

preferably wherein P_g is circularized;

Embodiment 57. The compound of embodiment 56, wherein the compound further comprises at least

an eighth peptide n-mer of the general formula:



wherein, independently for each occurrence, P is a peptide as defined in any one of embodiments 1 to 14, and S is a non-peptide spacer,

preferably wherein each occurrence of P is P_h , wherein P_h is a peptide as defined in any one of embodiments 1 to 14,

preferably wherein P_h is circularized;

Embodiment 58. The compound of embodiment 57, wherein the compound further comprises at least

a ninth peptide n-mer of the general formula:



wherein, independently for each occurrence, P is a peptide as defined in any one of embodiments 1 to 14, and S is a non-peptide spacer,

preferably wherein each occurrence of P is P_i , wherein P_i is a peptide as defined in any one of embodiments 1 to 14,

preferably wherein P_i is circularized;

Embodiment 59. The compound of embodiment 58, wherein the compound further comprises at least

a tenth peptide n-mer of the general formula:



wherein, independently for each occurrence, P is a peptide as defined in any one of embodiments 1 to 14, and S is a non-peptide spacer,

preferably wherein each occurrence of P is P_j , wherein P_j is a peptide as defined in any one of embodiments 1 to 14,

preferably wherein P_j is circularized.

Embodiment 60. The compound of any one of embodiments 22 to 59, wherein each of the peptide n-mers is covalently bound to the biopolymer scaffold, preferably via a linker each.

Embodiment 61. The compound of any one of embodiments 1 to 60, wherein at least one of said linkers is selected from disulphide bridges and PEG molecules.

Embodiment 62. The compound of any one of embodiments 1 to 61, wherein at least one of the spacers S is selected from PEG molecules or glycans.

Embodiment 63. The compound of any one of embodiments 1 to 62, wherein the first peptide n-mer is $P_a - S - P_b$ and the second peptide n-mer is $P_a - S - P_b$.

Embodiment 64. The compound of any one of embodiments 1 to 63, wherein the peptide P_a and the peptide P_b comprise the same amino-acid sequence fragment, wherein the amino-acid sequence fragment has a length of at least 5 amino acids, even more preferably at least 6 amino acids, yet even more preferably at least 7 amino acids, especially at least 8 amino acids or even at least 9 amino acids.

Embodiment 65. The compound of any one of embodiments 1 to 64, wherein the compound is for the sequestration (or depletion) of an antibody specific for a (human) neuroreceptor, preferably wherein the neuroreceptor is defined as in any one of embodiments 1 to 8.

Embodiment 66. A pharmaceutical composition comprising the compound of any one of embodiments 1 to 65 and at least one pharmaceutically acceptable excipient.

Embodiment 67. The pharmaceutical composition of embodiment 66, wherein the molar ratio of the peptides to scaffold in the composition is from 2:1 to 100:1, preferably from 3:1 to 90:1,

more preferably from 4:1 to 80:1, even more preferably from 5:1 to 70:1, yet even more preferably from 6:1 to 60:1, especially from 7:1 to 50:1 or even from 8:10 to 40:1.

Embodiment 68. The pharmaceutical composition of embodiment 66 or 67, wherein the composition is prepared for intraperitoneal, subcutaneous, intramuscular and/or intravenous administration and/or wherein the composition is for repeated administration.

Embodiment 69. The pharmaceutical composition of any one of embodiments 66 to 68, or the compound of any one of embodiments 22 to 65, wherein the molar ratio of peptide P to biopolymer scaffold in the composition is from 2:1 to 100:1, preferably from 3:1 to 90:1, more preferably from 4:1 to 80:1, even more preferably from 5:1 to 70:1, yet even more preferably from 6:1 to 60:1, especially from 7:1 to 50:1 or even from 8:10 to 40:1.

Embodiment 70. The pharmaceutical composition of any one of embodiments 66 to 69, or the compound of any one of embodiments 27 to 65 wherein the molar ratio of peptide P_a to biopolymer scaffold in the composition is from 2:1 to 100:1, preferably from 3:1 to 90:1, more preferably from 4:1 to 80:1, even more preferably from 5:1 to 70:1, yet even more preferably from 6:1 to 60:1, especially from 7:1 to 50:1 or even from 8:10 to 40:1.

Embodiment 71. The pharmaceutical composition of any one of embodiments 66 to 70, or the compound of any one of embodiments 27 to 65, wherein the molar ratio of peptide P_b to biopolymer scaffold in the composition is from 2:1 to 100:1, preferably from 3:1 to 90:1, more preferably from 4:1 to 80:1, even more preferably from 5:1 to 70:1, yet even more preferably from 6:1 to 60:1, especially from 7:1 to 50:1 or even from 8:10 to 40:1.

Embodiment 72. The pharmaceutical composition of any one of embodiments 66 to 71 for use in therapy.

Embodiment 73. The pharmaceutical composition of any one of embodiments 66 to 71 for use in prevention or treatment of an autoantibody-mediated condition, preferably selected from Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS), postural orthostatic tachycardia syndrome (POTS), Autoimmune Autonomic Ganglionopathy (AAG), Idiopathic Dilated Cardiomyopathy (IDC), and Chronic Chagas heart disease (cChHD), or from encephalitis such as limbic encephalitis or

paraneoplastic striatal encephalitis or Anti-mGluR1 encephalitis or Anti-mGluR5 encephalitis or acute disseminated encephalomyelitis (ADEM) or NMDAR encephalitis, paraneoplastic syndrome, stiff man syndrome, autoimmune channelopathies, neuromyelitis optica, neuromyotonia, Morvan's syndrome, neuropathic pain, myelitis, optic neuritis, retinitis, parkinsonism, chorea, psychosis, dystonia, mutism, movement disorders, confusion, hallucinations, prodromal diarrhoea, memory loss, hyperexcitability, encephalitis psychiatric syndrome, narcolepsy, autism spectrum disorders, seizures, status epilepticus, chronic epilepsy, myoclonus, encephalomyelitis, myoclonus, parasomnia, sleep apnoea, cognitive impairment, gait abnormalities, faciobrachial dystonic seizures, paraneoplastic syndrome, cerebellar ataxia, dysautonomia, Tourette, ADHD, cerebellar ataxia, oscillopsia, amyotrophic lateral sclerosis (ALS), thyroid disorder and headache with neurological deficits and lymphocytosis (HaNDL), in an individual.

Embodiment 74. The pharmaceutical composition for use according to embodiment 72 or 73, wherein the pharmaceutical composition is administered at least twice within a 96-hour window, preferably within a 72-hour window, more preferably within a 48-hour window, even more preferably within a 36-hour window, yet even more preferably within a 24-hour window, especially within a 18-hour window or even within a 12-hour window.

Embodiment 75. The pharmaceutical composition for use according to any one of embodiments 72 to 74, wherein the composition is administered at a dose of 1-1000 mg, preferably 2-500 mg, more preferably 3-250 mg, even more preferably 4-100 mg, especially 5-50 mg, compound per kg body weight of the individual.

Embodiment 76. The pharmaceutical composition for use according to any one of embodiments 72 to 75, wherein the composition is administered intraperitoneally, subcutaneously, intramuscularly or intravenously.

Embodiment 77. The pharmaceutical composition for use according to any one of embodiments 72 to 76, wherein one or more antibodies are present in the individual which are specific for

at least one occurrence of peptide P, or for peptide P_a and/or peptide P_b.

Embodiment 78. The pharmaceutical composition for use according to any one of embodiments 72 to 77, wherein one or more antibodies are present in the individual which are specific for a neuroreceptor, preferably wherein the neuroreceptor is defined as in any one of embodiments 1 to 8.

Embodiment 79. The pharmaceutical composition for use according to any one of embodiments 72 to 78, wherein the composition is non-immunogenic in the individual.

Embodiment 80. The pharmaceutical composition for use according to any one of embodiments 72 to 79, wherein the composition is administered at a dose of 1-1000 mg, preferably 2-500 mg, more preferably 3-250 mg, even more preferably 4-100 mg, especially 5-50 mg, compound per kg body weight of the individual.

Embodiment 81. A method of ameliorating or treating an autoantibody-mediated condition, selected from CFS/ME, POTS, AAG, IDC, and cChHD, in an individual in need thereof, comprising

obtaining a pharmaceutical composition as defined in any one of embodiments 66 to 71; and

administering an effective amount of the pharmaceutical composition to the individual.

Embodiment 82. The method according to embodiment 81, wherein the method is defined as in any one of embodiments 72 to 80.

Embodiment 83. A method of sequestering (or depleting) one or more antibodies present in an individual, comprising

obtaining a pharmaceutical composition as defined in any one of embodiments 66 to 71, wherein the composition is non-immunogenic in the individual and wherein the one or more antibodies present in the individual are specific for at least one occurrence of P, or for peptide P_a and/or peptide P_b; and

administering the pharmaceutical composition to the individual.

Embodiment 84. The method of embodiment 83, wherein the one or more antibodies are specific for a neuroreceptor, preferably

wherein the neuroreceptor is defined as in any one of embodiments 1 to 8.

Embodiment 85. The method of embodiment 83 or 84, wherein the individual is a non-human animal, preferably a non-human primate, a sheep, a pig, a dog or a rodent, in particular a mouse.

Embodiment 86. The method of any one of embodiments 83 to 85, wherein the biopolymer scaffold is autologous with respect to the individual, preferably wherein the biopolymer scaffold is an autologous protein.

Embodiment 87. The method of any one of embodiments 83 to 86, wherein the composition is administered intraperitoneally, subcutaneously, intramuscularly or intravenously.

Embodiment 88. A peptide (preferably with a sequence length of 6-13 amino acids), wherein the peptide comprises a 6-amino-acid fragment, preferably a 7-, more preferably an 8-, even more preferably a 9-, even more preferably a 10-, even more preferably an 11-, yet even more preferably a 12-, most preferably a 13-amino-acid fragment, of an amino-acid sequence identified by a UniProt accession code selected from the group consisting of:

P02708, P07510, P07550, P08172, P08173, P08588, P08908, P08912, P08913, P11229, P11230, P13945, P17787, P18089, P18825, P20309, P25098, P25100, P30532, P30926, P32297, P35348, P35368, P35626, P36544, P43681, Q04844, Q05901, Q07001, Q15822, Q15825, Q9GZZ6, Q9UGM1, A0A0G2JKS1, A5X5Y0, A6NL88, A8MPY1, B4DS77, B8ZZ34, O00222, O00591, O14490, O14764, O15303, O15399, O43424, O43653, O60359, O60391, O60403, O60404, O60936, O75311, O75916, O76027, O94772, O95264, O95502, O95868, O95886, P01579, P05026, P05067, P06850, P07196, P07384, P0C7T3, P0C8F1, P0DP57, P0DP58, P12931, P13500, P14416, P14867, P15382, P16066, P17342, P18505, P18507, P19634, P20594, P21452, P21728, P21917, P21918, P23415, P23416, P24046, P24387, P25021, P25101, P28221, P28222, P28223, P28335, P28472, P28476, P28566, P29274, P29275, P29323, P30411, P30542, P30556, P30939, P31644, P32418, P34903, P34969, P35367, P35372, P35462, P35609, P37288, P39086, P41594, P41595, P41597, P42261, P42262, P42263, P43119, P46098, P47869, P47870, P47898, P47901, P47972, P48058, P48067, P48167, P48169, P48549, P49354, P50052,

P50406, P53355, P55000, P62955, P63252, P78334, P78352, P78509, Q00535, Q05586, Q06413, Q07699, Q12879, Q12959, Q13002, Q13003, Q13224, Q13255, Q13387, Q13639, Q13702, Q13936, Q13972, Q14289, Q14416, Q14500, Q14571, Q14573, Q14643, Q14831, Q14832, Q14833, Q14957, Q15700, Q15818, Q16099, Q16445, Q16478, Q16553, Q16602, Q401N2, Q494W8, Q5SQ64, Q6PI25, Q6TFL4, Q6UXU4, Q6ZSJ9, Q70Z44, Q86Y78, Q86YM7, Q8N1C3, Q8N2G4, Q8N2Q7, Q8N4C8, Q8NC67, Q8NFFZ4, Q8NG75, Q8NGA5, Q8NGA6, Q8NGC8, Q8NGC9, Q8NGG2, Q8NGG3, Q8NGH5, Q8NGH8, Q8NGN1, Q8NGS4, Q8NGY7, Q8NHC4, Q8NI32, Q8TBE1, Q8TCU5, Q8TDF5, Q8WXA2, Q8WXA8, Q8WXS5, Q92736, Q92796, Q96G91, Q96NW7, Q96P66, Q99928, Q99996, Q9BUH8, Q9BXM7, Q9BYB0, Q9GZV3, Q9H3N8, Q9NPA1, Q9NZ94, Q9P1A6, Q9UBK2, Q9UBN1, Q9UBS5, Q9UF02, Q9ULK0, Q9UN88, Q9UPX8, Q9Y2H0, Q9Y4A9, Q9Y566, Q9Y5N1, Q9Y691, Q9Y698, P37088, P51168, P51170, P51172, O94759, Q16515, O60741, Q9NZQ8, P78348, Q8TDD5, Q9NY37, Q13002, P39086, P48664, A6NGN9, O00305, O00555, O15146, O43448, O43497, O43525, O43526, O60840, O75096, O95180, O95259, O95970, P06213, P16389, P16473, P17658, P22001, P22459, P22460, P24530, P42658, P43146, P48547, P49418, P51787, P54284, P54289, P56696, Q00975, Q01668, Q02246, Q02641, Q03721, Q05329, Q06432, Q08289, Q09470, Q12809, Q13018, Q13303, Q13698, Q14003, Q14721, Q14722, Q15878, Q6PIL6, Q6PIU1, Q6X4W1, Q7Z3S7, Q7Z429, Q8IZS8, Q8NCM2, Q8TAE7, Q8TDN1, Q8TDN2, Q8WWG9, Q92953, Q96KK3, Q96L42, Q96PR1, Q96RP8, Q9BQ31, Q9BXT2, Q9H252, Q9H3M0, Q9NR82, Q9NS40, Q9NS61, Q9NSA2, Q9NY47, Q9NZI2, Q9NZV8, Q9P0X4, Q9UHC6, Q9UIX4, Q9UJ90, Q9UJ96, Q9UK17, Q9ULD8, Q9ULS6, Q9UQ05, Q9Y2W7, Q9Y6H6, Q9Y6J6, P48058, P55087, Q9BPU6, P52799, P15328, Q05329, Q16653, Q9Y4C0, Q5F0I5, Q99719, P17600, Q13148, P01266, Q9Y6A1 and P07202,

optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

Embodiment 89. The peptide of embodiment 88, wherein the peptide is further defined as in any one of embodiments 1 to 14.

Embodiment 90. A peptide, preferably with a sequence length of 7-14 amino-acids, comprising, preferably consisting of, at least 7 or even at least 8, yet more preferably at least 9, even more preferably at least 10, yet even more preferably at least 11, especially at least 12 or even 13 consecutive amino acids of a sequence identified by any one of SEQ ID NOs: 45-3536,

preferably any one of SEQ ID NOs: 45-863, especially any one of SEQ ID NOs: 45-201, optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

Embodiment 91. A peptide, preferably with a sequence length of 7-14 amino-acids, comprising, preferably consisting of, the sequence identified by any one of SEQ ID NOs: 45-3536, preferably any one of SEQ ID NOs: 45-863, especially any one of SEQ ID NOs: 45-201, optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

Embodiment 92. The peptide of any one of embodiments 88 to 91, wherein the peptide is linear or circularized.

Embodiment 93. A method for detecting and/or quantifying autoantibodies in a biological sample comprising the steps of

- bringing the sample into contact with the peptide of any one of embodiments 88 to 92, and
- detecting the presence and/or concentration of autoantibodies in the sample.

Embodiment 94. The method of embodiment 93, wherein the peptide is immobilized on a solid support, in particular a biosensor-based diagnostic device with an electrochemical, fluorescent, magnetic, electronic, gravimetric or optical biotransducer and/or wherein the peptide is coupled to a reporter or reporter fragment, such as a reporter fragment suitable for a PCA.

Embodiment 95. The method of embodiment 93 or 94, wherein the method is a sandwich assay, preferably an enzyme-linked immunosorbent assay (ELISA).

Embodiment 96. The method of any one of embodiments 93 to 95, wherein the sample is obtained from a mammal, preferably a human.

Embodiment 97. The method of any one of embodiments 93 to 96, wherein the sample is a blood sample, preferably whole blood, serum, or plasma.

Embodiment 98. Use of the peptide according to any one of embodiments 88 to 92 in an enzyme-linked immunosorbent assay

(ELISA), preferably for a method as defined in any one of embodiments 93 to 97.

Embodiment 99. A diagnostic device comprising the peptide according to any one of embodiments 88 to 92, wherein the peptide is immobilized on a solid support and/or wherein the peptide is coupled to a reporter or reporter fragment, such as a reporter fragment suitable for a PCA.

Embodiment 100. The diagnostic device according to embodiment 99, wherein the solid support is an ELISA plate or a surface plasmon resonance chip.

Embodiment 101. The diagnostic device according to embodiment 99, wherein the diagnostic device is a lateral flow assay device or a biosensor-based diagnostic device with an electrochemical, fluorescent, magnetic, electronic, gravimetric or optical biotransducer.

Embodiment 102. A diagnostic kit comprising a peptide according to any one of embodiments 88 to 92, preferably a diagnostic device according to any one of embodiment 99 to 101, and preferably one or more selected from the group of a buffer, a reagent, and instructions.

Embodiment 103. An apheresis device comprising the peptide according to any one of embodiments 88 to 92, preferably immobilized on a solid carrier.

Embodiment 104. The apheresis device according to embodiment 103, wherein the solid carrier is capable of being contacted with blood or plasma flow.

Embodiment 105. The apheresis device according to embodiment 103 or 104, wherein the solid carrier comprises the compound according to any one of embodiments 1 to 65.

Embodiment 106. The apheresis device according to any one of embodiment 103 to 105, wherein the solid carrier is a sterile and pyrogen-free column.

Embodiment 107. The apheresis device according to any one of embodiments 103 to 106, wherein the apheresis device comprises at least two, preferably at least three, more preferably at least four different peptides according to any one of embodiments 88 to 92.

The present invention is further illustrated by the following figures and examples, without being restricted thereto.

In the context of the following figures and examples the compound on which the inventive approach is based is also referred to as "Selective Antibody Depletion Compound" (SADC).

Fig. 1: SADCs successfully reduce the titre of undesired antibodies. Each compound was applied at time point 0 by i.p. injection into Balb/c mice pre-immunized by peptide immunization against a defined antigen. Each top panel shows anti-peptide titers (0.5x dilution steps; X-axis shows log(X) dilutions) against OD values (y-axis) according to a standard ELISA detecting the corresponding antibody. Each bottom panel shows titers LogIC50 (y-axis) before injection of each compound of the invention (i.e. titers at -48h and -24h) and after application of each compound of the invention (i.e. titers +24h, +48h and +72h after injection; indicated on the x-axis). **(A)** Compound with albumin as the biopolymer scaffold that binds to antibodies directed against EBNA1 (associated with pre-eclampsia). The mice were pre-immunized with a peptide vaccine carrying the EBNA-1 model epitope. **(B)** Compound with albumin as the biopolymer scaffold that binds to antibodies directed against a peptide derived from the human AChR protein MIR (associated with myasthenia gravis). The mice were pre-immunized with a peptide vaccine carrying the AChR MIR model epitope. **(C)** Compound with immunoglobulin as the biopolymer scaffold that binds to antibodies directed against EBNA1 (associated with pre-eclampsia). The mice were pre-immunized with a peptide vaccine carrying the EBNA-1 model epitope. **(D)** Compound with haptoglobin as the biopolymer scaffold that binds to antibodies directed against EBNA1 (associated with pre-eclampsia). The mice were pre-immunized with a peptide vaccine carrying the EBNA-1 model epitope. **(E)** Demonstration of selectivity using the same immunoglobulin-based compound of the invention binding to antibodies directed against EBNA1 that was used in the experiment shown in panel C. The mice were pre-immunized with an

unrelated amino acid sequence. No titre reduction occurred, demonstrating selectivity of the compound.

Fig. 2: SADCs are non-immunogenic and do not induce antibody formation after repeated injection into mice. Animals C1-C4 as well as animals C5-C8 were treated i.p. with two different compounds of the invention. Control animal C was vaccinated with a KLH-peptide derived from the human AChR protein MIR. Using BSA-conjugated peptide probes T3-1, T9-1 and E005 (grey bars, as indicated in the graph), respectively, for antibody titer detection by standard ELISA at a dilution of 1:100, it could be demonstrated that antibody induction was absent in animals treated with a compound of the invention, when compared to the vaccine-treated control animal C (y-axis, OD450 nm).

Fig. 3: Successful in vitro depletion of antibodies using SADCs carrying multiple copies of monovalent or divalent peptides. SADCs with mono- or divalent peptides were very suitable to adsorb antibodies and thereby deplete them. "Monovalent" means that peptide monomers are bound to the biopolymer scaffold (i.e. $n=1$) whereas "divalent" means that peptide dimers are bound to the biopolymer scaffold (i.e. $n=2$). In the present case, the divalent peptides were "homodivalent", i.e. the peptide n -mer of the SADC is E006 - spacer - E006).

Fig. 4: Rapid, selective antibody depletion in mice using various SADC biopolymer scaffolds. Treated groups exhibited rapid and pronounced antibody reduction already at 24hrs (in particular SADC-TF) when compared to the mock treated control group SADC-CTL (containing an unrelated peptide). SADC with albumin scaffold - SADC-ALB, SADC with immunoglobulin scaffold - SADC-IG, SADC with haptoglobin scaffold - SADC-HP, and SADC with transferrin scaffold - SADC-TF.

Fig. 5: Detection of SADCs in plasma via their peptide moieties 24hrs after SADC injection. Both haptoglobin-scaffold-based SADCs (SADC-HP and SADC-CTL) exhibited a relatively shorter plasma half life which represents an advantage over SADCs with other biopolymer scaffolds such as SADC-ALB, SADC-IG oder SADC-TF. SADC with albumin scaffold - SADC-ALB, SADC with immunoglobulin scaffold - SADC-IG, SADC with haptoglobin

scaffold - SADC-HP, and SADC with transferrin scaffold - SADC-TF.

Fig. 6: Detection of SADC-IgG complexes in plasma 24hrs after SADC injection. Haptoglobin based SADCs were subject to accelerated clearance when compared to SADCs with other biopolymer scaffolds. SADC with albumin scaffold - SADC-ALB, SADC with immunoglobulin scaffold - SADC-IG, SADC with haptoglobin scaffold - SADC-HP, and SADC with transferrin scaffold - SADC-TF.

Fig. 7: In vitro analysis of SADC-IgG complex formation. Animals SADC-TF and -ALB showed pronounced immunocomplex formation and binding to Clq as reflected by the strong signals and by sharp signal lowering in case 1000ng/ml SADC-TF due to the transition from antigen-antibody equilibrium to antigen excess. In contrast, in vitro immunocomplex formation with SADC-HP or SADC-IG were much less efficient when measured in the present assay. These findings corroborate the finding that haptoglobin scaffolds are advantageous over other SADC biopolymer scaffolds because of the reduced propensity to activate the complement system. SADC with albumin scaffold - SADC-ALB, SADC with immunoglobulin scaffold - SADC-IG, SADC with haptoglobin scaffold - SADC-HP, and SADC with transferrin scaffold - SADC-TF.

Fig. 8: Determination of IgG capturing by SADCs in vitro. SADC-HP showed markedly less antibody binding capacity in vitro when compared to SADC-TF or SADC-ALB. SADC with albumin scaffold - SADC-ALB, SADC with immunoglobulin scaffold - SADC-IG, SADC with haptoglobin scaffold - SADC-HP, and SADC with transferrin scaffold - SADC-TF.

Fig. 9: Blood clearance of an anti-CD163-antibody-based biopolymer scaffold. In a mouse model, mAb E10B10 (specific for murine CD163) is much more rapidly cleared from circulation than mAb Mac2-158 (specific for human CD163 but not for murine CD163, thus serving as negative control in this experiment).

EXAMPLES

Examples 1-10 relate to the general working principle of SADCs, demonstrating the selective removal of antibodies. Example 11 relates to the specific application of this therapeutic concept to CFS/ME, POTS, AAG, IDC, and cChHD.

Example 1: SADCs effectively reduce the titre of undesired antibodies.

Animal models: In order to provide *in vivo* models with measurable titers of prototypic undesired antibodies in human indications, BALB/c mice were immunized using standard experimental vaccination with KLH-conjugated peptide vaccines derived from established human autoantigens or anti-drug antibodies. After titer evaluation by standard peptide ELISA, immunized animals were treated with the corresponding test SADCs to demonstrate selective antibody lowering by SADC treatment. All experiments were performed in compliance with the guidelines by the corresponding animal ethics authorities.

Immunization of mice with model antigens: Female BALB/c mice (aged 8-10 weeks) were supplied by Janvier (France), maintained under a 12h light/12h dark cycle and given free access to food and water. Immunizations were performed by s.c. application of KLH carrier-conjugated peptide vaccines injected 3 times in biweekly intervals. KLH conjugates were generated with peptide T3-2 (SEQ ID NO. 33: CGRPQKRPSCIGCKG), which represents an example for molecular mimicry between a viral antigen (EBNA-1) and an endogenous human receptor antigen, namely the placental GPR50 protein, that was shown to be relevant to preeclampsia (Elliott et al.). In order to confirm the generality of this approach, a larger antigenic peptide derived from the autoimmune condition myasthenia gravis was used for immunization of mice with a human autoepitope. In analogy to peptide T3-2, animals were immunized with peptide T1-1 (SEQ ID NO. 34: LKWNPDYGGVKKIHIPSEKGC), derived from the MIR (main immunogenic region) of the human AChR protein which plays a fundamental role in pathogenesis of the disease (Luo et al.). The T1-1 peptide was used for immunizing mice with a surrogate partial model

epitope of the human AChR autoantigen. The peptide T8-1 (SEQ ID NO. 35: DHTLYTPYHTHPG) was used to immunize control mice to provide a control titer for proof of selectivity of the system. For vaccine conjugate preparation, KLH carrier (Sigma) was activated with sulfo-GMBS (Cat. Nr. 22324 Thermo), according to the manufacturer's instructions, followed by addition of either N- or C-terminally cysteinylated peptides T3-2 and T1-1 and final addition of Alhydrogel® before injection into the flank of the animals. The doses for vaccines T3-2 and T1-1 were 15µg of conjugate in a volume of 100ul per injection containing Alhydrogel® (InvivoGen VAC-Alu-250) at a final concentration of 1% per dose.

Generation of prototypic SADCs: For testing selective antibody lowering activity by SADCs of T3-2 and T1-1 immunized mice, SADCs were prepared with mouse serum albumin (MSA) or mouse immunoglobulin (mouse-Ig) as biopolymer scaffold in order to provide an autologous biopolymer scaffold, that will not induce any immune reaction in mice, or non-autologous human haptoglobin as biopolymer scaffold (that did not induce an allogenic reaction after one-time injection within 72 hours). N-terminally cysteinylated SADC peptide E049 (SEQ ID NO. 36: GRPQKRPSICIG) and/or C-terminally cysteinylated SADC peptide E006 (SEQ ID NO. 37: VKKIHIPSEKKG) were linked to the scaffold using sulfo-GMBS (Cat. Nr. 22324 Thermo)-activated MSA (Sigma; Cat. Nr. A3559) or -mouse-Ig (Sigma, I5381) or -human haptoglobin (Sigma H0138) according to the instructions of the manufacturer, thereby providing MSA-, Ig- and haptoglobin-based SADCs with the corresponding cysteinylated peptides, that were covalently attached to the lysines of the corresponding biopolymer scaffold. Beside conjugation of the cysteinylated peptides to the lysines via a bifunctional amine-to-sulphydryl crosslinker, a portion of the added cysteinylated SADC peptides directly reacted with sulphydryl groups of cysteins of the albumin scaffold protein, which can be detected by treating the conjugates with DTT followed by subsequent detection of free peptides using mass spectrometry or any other analytical method that detects free peptide. Finally, these SADC conjugates were dialysed against water using Pur-A-Lyzer™ (Sigma) and

subsequently lyophilized. The lyophilized material was resuspended in PBS before injection into animals.

In vivo functional testing of SADCs: Prototypic SADCs, SADC-E049 and SADC-E006 were injected intraperitoneally (i.p.; as a surrogate for an intended intravenous application in humans and larger animals) into the mice that had previously been immunized with peptide vaccine T3-2 (carrying the EBNA-1 model epitope) and peptide vaccine T1-1 (carrying the AChR MIR model epitope). The applied dose was 30µg SADC conjugate in a volume of 50µl PBS. Blood takes were performed by submandibular vein puncture, before (-48h, -24h) and after (+24h,+48h,+72h, etc.) i.p. SADC injections, respectively, using capillary micro-hematocrit tubes. Using ELISA analysis (see below), it was found that both prototypic SADCs were able to clearly reduce the titers over a period of at least 72 hrs in the present animal model. It could therefore be concluded that SADCs can be used to effectively reduce titers *in vivo*.

Titer analysis: Peptide ELISAs were performed according to standard procedures using 96-well plates (Nunc Medisorp plates; Thermofisher, Cat Nr 467320) coated for 1h at RT with BSA-coupled peptides (30nM, dissolved in PBS) and incubated with the appropriate buffers while shaking (blocking buffer, 1% BSA, 1x PBS; washing buffer, 1xPBS / 0,1% Tween; dilution buffer, 1xPBS / 0.1% BSA / 0,1% Tween). After serum incubation (dilutions starting at 1:50 in PBS; typically in 1:3 or 1:2 titration steps), bound antibodies were detected using Horseradish Peroxidase-conjugated goat anti-mouse IgG (Fc) from Jackson immunoresearch (115-035-008). After stopping the reaction, plates were measured at 450nm for 20min using TMB. EC50 were calculated from readout values using curve fitting with a 4-parameter logistic regression model (GraphPad Prism) according to the procedures recommended by the manufacturer. Constraining parameters for ceiling and floor values were set accordingly, providing curve fitting quality levels of $R^2 > 0.98$.

Figure 1A shows an *in vivo* proof of concept in a mouse model for *in vivo* selective plasma-lowering activity of a prototypic albumin-based SADC candidate that binds to antibodies directed against EBNA1, as a model for autoantibodies and mimicry in preeclampsia (Elliott et al.). For these mouse experiments,

mouse albumin was used, in order to avoid any reactivity against a protein from a foreign species. Antibody titers were induced in 6 months old Balb/c mice by standard peptide vaccination. The bottom panel demonstrates that titers LogIC₅₀ (y-axis) before SADC injection (i.e. titers at -48h and -24h) were higher than titers LogIC₅₀ after SADC application (i.e. titers +24h, +48h and +72h after injection; indicated on the x-axis).

A similar example is shown in Figure 1B, using an alternative example of a peptidic antibody binding moiety for a different disease indication. Antibody lowering activity of an albumin-based SADC in a mouse model that was pre-immunized with a different peptide derived from the human AChR protein MIR region (Luo et al.) in order to mimic the situation in myasthenia gravis. The induced antibody titers against the AChR-MIR region were used as surrogate for anti-AChR-MIR autoantibodies known to play a causative role in myasthenia gravis (reviewed by Vincent et al.). A clear titer reduction was seen after SADC application.

Figures 1C and 1D demonstrate the functionality of SADC variants comprising alternative biopolymer scaffolds. Specifically, Figure 1C shows that an immunoglobulin scaffold can be successfully used whereas Figure 1D demonstrates the use of a haptoglobin-scaffold for constructing an SADC. Both examples show an *in vivo* proof of concept for selective antibody lowering by an SADC, carrying covalently bound example peptide E049.

The haptoglobin-based SADC was generated using human Haptoglobin as a surrogate although the autologous scaffold protein would be preferred. In order to avoid formation of anti-human-haptoglobin antibodies, only one single SADC injection per mouse of the non-autologous scaffold haptoglobin was used for the present experimental conditions. As expected, under the present experimental conditions (i.e. one-time application), no antibody reactivity was observed against the present surrogate haptoglobin homologue.

Figure 1E demonstrates the selectivity of the SADC system. The immunoglobulin-based SADC carrying the peptide E049 (i.e. the same as in Figure 1C) cannot reduce the Ig-titer that was

induced by a peptide vaccine with an unrelated, irrelevant aminoacid sequence, designated peptide T8-1 (SEQ ID NO. 35: DHTLYTPYHTHPG). The example shows an *in vivo* proof of concept for the selectivity of the system. The top panel shows anti-peptide T8-1 titers (0,5x dilution steps starting from 1:50 to 1:102400; X-axis shows log(X) dilutions) against OD values (y-axis) according to a standard ELISA. T8-1-titers are unaffected by administration of SADC-Ig-E049 after application. The bottom panel demonstrates that the initial titers LogIC50 (y-axis) before SADC injection (i.e. titers at -48h and -24h) are unaffected by administration of SADC-Ig-E049 (arrow) when compared to the titers LogIC50 after SADC application (i.e. titers +24h, +48h and +72h; as indicated on the x-axis), thereby demonstrating the selectivity of the system.

Example 2: Immunogenicity of SADCs.

In order to exclude immunogenicity of SADCs, prototypic candidate SADCs were tested for their propensity to induce antibodies upon repeated injection. Peptides T3-1 and T9-1 were used for this test. T3-1 is a 10-amino acid peptide derived from a reference epitope of the Angiotensin receptor, against which agonistic autoantibodies are formed in a pre-eclampsia animal model (Zhou et al.); T9-1 is a 12-amino acid peptide derived from a reference anti-drug antibody epitope of human IFN gamma (Lin et al.). These control SADC conjugates were injected 8 x every two weeks i.p. into naïve, non-immunized female BALB/c mice starting at an age of 8-10 weeks.

Animals C1-C4 were treated i.p. (as described in example 1) with SADC T3-1. Animals C5-C8 were treated i.p. with an SADC carrying the peptide T9-1. As a reference signal for ELISA analysis, plasma from a control animal that was vaccinated 3 times with KLH-peptide T1-1 (derived from the AChR-MIR, explained in Example 1) was used. Using BSA-conjugated peptide probes T3-1, T9-1 and E005 (SEQ ID NO. 38: GGVKKIHIPSEK), respectively, for antibody titer detection by standard ELISA at a dilution of 1:100, it could be demonstrated that antibody induction was absent in SADC-treated animals, when compared to the vaccine-treated control animal C (see Figure 2). The plasmas

were obtained by submandibular blood collection, 1 week after the 3rd vaccine injection (control animal C) and after the last of 8 consecutive SADC injections in 2-weeks intervals (animals C1-C8), respectively. Thus it was demonstrated that SADCs are non-immunogenic and do not induce antibody formation after repeated injection into mice.

Example 3: Successful in vitro depletion of antibodies using SADCs carrying multiple copies of monovalent or divalent peptides.

Plasma of E006-KLH (VKKIHIPSEKG (SEQ ID NO: 37) with C-terminal cysteine, conjugated to KLH) vaccinated mice was diluted 1:3200 in dilution buffer (PBS + 0.1% w/v BSA + 0.1% Tween20) and incubated (100 μ l, room temperature) sequentially (10 min/well) four times on single wells of a microtiter plate that was coated with 2.5 μ g/ml (250 ng/well) of SADC or 5 μ g/ml (500 ng/well) albumin as negative control.

In order to determine the amount of free, unbound antibody present before and after incubation on SADC coated wells, 50 μ l of the diluted serum were taken before and after the depletion and quantified by standard ELISA using E006-BSA coated plates (10 nM peptide) and detection by goat anti mouse IgG bio (Southern Biotech, diluted 1:2000). Subsequently, the biotinylated antibody was detected with Streptavidin-HRP (Thermo Scientific, diluted 1:5000) using TMB as substrate. Development of the signal was stopped with 0.5 M sulfuric acid.

ELISA was measured at OD450nm (y-axis). As a result, the antibody was efficiently adsorbed by either coated mono- or divalent SADCs containing peptide E006 with C-terminal cysteine (sequence VKKIHIPSEKGC, SEQ ID NO: 39) (before=non-depleted starting material; mono- divalent corresponds to peptides displayed on the SADC surface; neg. control was albumin; indicated on the x-axis). See Fig. 3. ("Monovalent" means that peptide monomers are bound to the biopolymer scaffold (i.e. n=1) whereas "divalent" means that peptide dimers are bound to the biopolymer scaffold (i.e. n=2). In the present case, the divalent peptides were "homodivalent", i.e. the peptide n-mer of the SADC is E006 - S - E006.)

This demonstrates that SADCs with mono- or divalent peptides are very suitable to adsorb antibodies and thereby deplete them.

Example 4: Generation of mimotope-based SADCs

Linear and circular peptides derived from wild-type or modified peptide amino acid sequences can be used for the construction of specific SADCs for the selective removal of harmful, disease-causing or otherwise unwanted antibodies directed against a particular epitope. In case of a particular epitope, linear peptides or constrained peptides such as cyclopeptides containing portions of an epitope or variants thereof, where for example, one or several amino acids have been substituted or chemically modified in order to improve affinity to an antibody (mimotopes), can be used for constructing SADCs. A peptide screen can be performed with the aim of identifying peptides with optimized affinity to a disease-inducing autoantibody. The flexibility of structural or chemical peptide modification provided a solution to minimize the risk of immunogenicity, in particular of binding of the peptide to HLA and thus the risk of unwanted immune stimulation.

Therefore, wild-type as well as modified linear and circular peptide sequences were derived from a known epitope associated with an autoimmune disease. Peptides of various length and positions were systematically permuted by amino acid substitutions and synthesized on a peptide array. This allowed screening of 60000 circular and linear wild-type and mimotope peptides derived from these sequences. The peptide arrays were incubated with an autoantibody known to be involved in the autoimmune disease. This autoantibody was therefore used to screen the 60000 peptides and 100 circular and 100 linear peptide hits were selected based on their relative binding strength to the autoantibody. Of these 200 peptides, 51 sequences were identical between the circular and the linear peptide group. All of the best peptides identified had at least one amino acid substitution when aligned to the original sequences, respectively and are therefore regarded as mimotopes. It also turned out that higher binding strengths can be achieved with circularized peptides.

These newly identified peptides, preferentially those with high relative binding values, are used to generate SADCs that are able to remove autoantibodies directed against this particular epitope or to develop further mimotopes and derivatives based on their sequences.

Example 5: Rapid, selective antibody depletion in mice using various SADC biopolymer scaffolds.

10 µg of model undesired antibody mAB anti V5 (Thermo Scientific) was injected i.p. into female Balb/c mice (5 animals per treatment group; aged 9-11 weeks) followed by intravenous injection of 50 µg SADC (different biopolymer scaffolds with tagged V5 peptides bound, see below) 48hrs after the initial antibody administration. Blood was collected at 24hrs intervals from the submandibular vein. Blood samples for time point 0 hrs were taken just before SADC administration.

Blood was collected every 24 hrs until time point 120 hrs after the SADC administration (x-axis). The decay and reduction of plasma anti-V5 IgG levels after SADC administration was determined by anti V5 titer readout using standard ELISA procedures in combination with coated V5-peptide-BSA (peptide sequence IPNPLLGLDC - SEQ ID NO: 40) and detection by goat anti mouse IgG bio (Southern Biotech, diluted 1:2000) as shown in Fig. 4. In addition, SADC levels (see Example 6) and immunocomplex formation (see Example 7) were analyzed.

EC50[OD450] values were determined using 4 parameter logistic curve fitting and relative signal decay between the initial level (set to 1 at time point 0) and the following time points (x-axis) was calculated as ratio of the EC50 values (y-axis, fold signal reduction EC50). All SADC peptides contained tags for direct detection of SADC and immunocomplexes from plasma samples; peptide sequences used for SADCs were: IPNPLLGLDGGSGDYKDDDDKGK (SEQ ID NO: 41)-(BiotinAca)GC (SADC with albumin scaffold - SADC-ALB, SADC with immunoglobulin scaffold - SADC-IG, SADC with haptoglobin scaffold - SADC-HP, and SADC with transferrin scaffold - SADC-TF) and unrelated peptide VKKIHIPSEKGGSGDYKDDDDKGK (SEQ ID NO: 42)-(BiotinAca)GC as negative control SADC (SADC-CTR).

The SADC scaffolds for the different treatment groups of 5 animals are displayed in black/grey shades (see inset of Fig. 4).

Treated groups exhibited rapid and pronounced antibody reduction already at 24hrs (in particular SADC-TF) when compared to the mock treated control group SADC-CTL. SADC-CTR was used as reference for a normal antibody decay since it has no antibody lowering activity because its peptide sequence is not recognized by the administered anti V5 antibody. The decay of SADC-CTR is thus marked with a trend line, emphasizing the antibody level differences between treated and mock treated animals.

In order to determine the effectivity of selective antibody lowering under these experimental conditions, a two-way ANOVA test was performed using a Dunnett's multiple comparison test. 48 hrs after SADC administration, the antibody EC50 was highly significantly reduced in all SADC groups ($p < 0.0001$) compared to the SADC-CTR reference group (trend line). At 120 hrs after SADC administration, antibody decrease was highly significant in the SADC-ALB and SADC-TF groups (both $p < 0.0001$) and significant in the SADC-HP group ($p = 0.0292$), whereas the SADC-IG group showed a trend towards an EC50 reduction ($p = 0.0722$) 120 hrs after SADC administration. Of note, selective antibody reduction was highly significant ($p < 0.0001$) in the SADC-ALB and SADC-TF groups at all tested time-points after SADC administration.

It is concluded that all SADC biopolymer scaffolds were able to selectively reduce antibody levels. Titer reduction was most pronounced with SADC-ALB and SADC-TF and no rebound or recycling of antibody levels was detected towards the last time points suggesting that undesired antibodies are degraded as intended.

Example 6: Detection of SADCs in plasma 24hrs after SADC injection.

Plasma levels of different SADC variants at 24hrs after i.v. injection into Balb/c mice. Determination of Plasma levels (y-axis) of SADC-ALB, -IG, -HP, -TF and the negative control SADC-CTR (x-axis), were detected in the plasmas from the animals already described in example 5. Injected plasma SADC levels were detected by standard ELISA whereby SADCs were captured via their

biotin moieties of their peptides in combination with streptavidin coated plates (Thermo Scientific). Captured SADCs were detected by mouse anti Flag-HRP antibody (Thermo Scientific, 1:2,000 diluted) detecting the Flag-tagged peptides (see also example 7):

Assuming a theoretical amount in the order of 25 µg/ml in blood after injecting 50 µg SADC i.v., the detectable amount of SADC ranged between 799 and 623 ng/ml for SADC-ALB or SADC-IG and up to approximately 5000 ng/ml for SADC-TF, 24 hrs after SADC injection. However surprisingly and in contrast, SADC-HP and control SADC-CTR (which is also a SADC-HP variant, however carrying the in this case unrelated negative control peptide E006, see previous examples), had completely disappeared from circulation 24hrs after injection, and were not detectable anymore. See Fig. 5.

This demonstrates that both Haptoglobin scaffold-based SADCs tested in the present example ((namely SADC-HP and SADC-CTR) exhibit a relatively shorter plasma half-life which represents an advantage over SADCs such as SADC-ALB, SADC-IG oder SADC-TF in regard of their potential role in complement-dependent vascular and renal damage due to the in vivo risk of immunocomplex formation. Another advantage of SADC-HP is the accelerated clearance rate of their unwanted target antibody from blood in cases where a rapid therapeutic effect is needed. The present results demonstrate that Haptoglobin-based SADC scaffolds (as represented by SADC-HP and SADC-CTR) are subject to rapid clearance from the blood, regardless of whether SADC-binding antibodies are present in the blood, thereby minimizing undesirable immunocomplex formation and showing rapid and efficient clearance. Haptoglobin-based SADCs such as SADC-HP in the present example thus provide a therapeutically relevant advantage over other SADC biopolymer scaffolds, such as demonstrated by SADC-TF or SADC-ALB, both of which are still detectable 24hrs after injection under the described conditions, in contrast to SADC-HP or SADC-CTR which both are completely cleared 24hrs after injection.

Example 7: Detection of SADC-IgG complexes in plasma 24hrs after SADC injection.

In order to determine the amount IgG bound to SADCs in vivo, after i.v. injection of 10 µg anti V5 IgG (Thermo Scientific) followed by injection of SADC-ALB, -HP, -TF and -CTR (50 µg) administered i.v. 48h after antibody injection, plasma was collected from the submandibular vein, 24hrs after SADC injection, and incubated on streptavidin plates for capturing SADCs from plasma via their biotinylated SADC-V5-peptide [IPNPLLGLDGGSGDYKDDDDKGGK (SEQ ID NO: 41) (BiotinAca)GC or in case of SADC-CTR the negative control peptide VKKIHIPSEKGGSGDYKDDDDKGGK (SEQ ID NO: 42) (BiotinAca)GC]. IgG bound to the streptavidin-captured SADCs was detected by ELISA using a goat anti mouse IgG HRP antibody (Jackson Immuno Research, diluted 1:2,000) for detection of the SADC-antibody complexes present in plasma 24hrs after SADC injection. OD450nm values (y-axis) obtained for a negative control serum from untreated animals were subtracted from the OD450nm values of the test groups (x-axis) for background correction.

As shown in Fig. 6, pronounced anti-V5 antibody signals were seen in case of SADC-ALB and SADC-TF injected mice (black bars represent background corrected OD values at a dilution of 1:25, mean value of 5 mice; standard deviation error bars), whereas no antibody signal could be detected in plasmas from SADC-HP or control SADC-CTR injected animals (SADC-CTR is a negative control carrying the irrelevant peptide bio-FLG-E006 [VKKIHIPSEKGGSGDYKDDDDKGGK (SEQ ID NO: 42) (BiotinAca)GC] that is not recognized by any anti V5 antibody). This demonstrates the absence of detectable amounts of SADC-HP/IgG complexes in the plasma 24hrs after i.v. SADC application.

SADC-HP is therefore subject to accelerated clearance in anti V5 pre-injected mice when compared to SADC-ALB or SADC-TF.

Example 8: In vitro analysis of SADC-immunoglobulin complex formation

SADC-antibody complex formation was analyzed by pre-incubating 1 µg/ml of human anti V5 antibody (anti V5 epitope tag [SV5-P-K], human IgG3, Absolute Antibody) with increasing

concentrations of SADC-ALB, -IG, -HP, -TF and -CTR (displayed on the x-axis) in PBS +0.1% w/v BSA + 0.1% v/v Tween20 for 2 hours at room temperature in order to allow for immunocomplex formation in vitro. After complex formation, samples were incubated on ELISA plates that had previously been coated with 10 µg/ml of human C1q (CompTech) for 1 h at room temperature, in order to allow capturing of in vitro formed immunocomplexes. Complexes were subsequently detected by ELISA using anti human IgG (Fab specific)-Peroxidase (Sigma, diluted 1:1,000). Measured signals at OD450 nm (y-axis) reflect Antibody-SADC complex formation in vitro.

As shown in Fig. 7, SADC-TF and -ALB showed pronounced immunocomplex formation and binding to C1q as reflected by the strong signals and by sharp signal lowering in case 1000ng/ml SADC-TF due to the transition from antigen-antibody equilibrium to antigen excess. In contrast, in vitro immunocomplex formation with SADC-HP or SADC-IG were much less efficient when measured in the present assay.

Together with the in vivo data (previous examples), these findings corroborate the finding that haptoglobin scaffolds are advantageous over other SADC biopolymer scaffolds because of the reduced propensity to activate the complement system. In contrast, SADC-TF or SADC-ALB show higher complexation, and thereby carry a certain risk of activating the C1 complex with initiation of the classical complement pathway (a risk which may be tolerable in some settings, however).

Example 9: Determination of IgG capturing by SADCs in vitro

Immunocomplexes were allowed to form in vitro, similar to the previous example, using 1 µg/ml mouse anti V5 antibody (Thermo Scientific) in combination with increasing amounts of SADCs (displayed on the x-axis). SADC-antibody complexes were captured on a streptavidin coated ELISA plate via the biotinylated SADC-peptides (see previous examples), followed by detection of bound anti-V5 using anti mouse IgG-HRP (Jackson Immuno Research, diluted 1:2,000).

Under these assay conditions, SADC-HP showed markedly less antibody binding capacity in vitro when compared to SADC-TF or

SADC-ALB (see Fig. 8, A). The calculated EC50 values for IgG detection on SADCs were 7.0 ng/ml, 27.9 ng/ml and 55.5 ng/ml for SADC-TF, -ALB and -HP, respectively (see Fig. 8, B).

This *in vitro* finding is consistent with the observation (see previous examples) that SADC-HP has a lower immunocomplex formation capacity when compared to SADC-TF or SADC-ALB which is regarded as a safety advantage with respect to its therapeutic use for the depletion of unwanted antibodies.

Example 10: In-vivo function of anti-CD163-antibody-based SADC biopolymer scaffold

Rapid *in vivo* blood clearance of anti-mouse-CD163 mAb E10B10 (as disclosed in WO 2011/039510 A2). mAb E10B10 was resynthesized with a mouse IgG2a backbone. 50 µg mAb E10B10 and Mac2-158 (human-specific anti-CD163 mAb as disclosed in WO 2011/039510 A2, used as negative control in this example since it does not bind to mouse CD163) were injected i.v. into mice and measured after 12, 24, 36, 48, 72, 96 hours in an ELISA to determine the blood clearance.

mAb E10B10 was much more rapidly cleared from circulation than control mAb Mac2-158 was, as shown in Fig. 9, since E10B10 binds to the mouse CD163 whereas Mac2-158 is human-specific, although both were expressed as mouse IgG2a isotypes for direct comparison.

In conclusion, anti-CD163 antibodies are highly suitable as SADC scaffold because of their clearance profile. SADCs with such scaffolds will rapidly clear undesirable antibodies from circulation.

Detailed methods: 50 µg of biotinylated monoclonal antibodies E10B10 and biotinylated Mac2-158 were injected i.v. into mice and measured after 12, 24, 36, 48, 72, 96 hours to determine the clearance by ELISA: Streptavidin plates were incubated with plasma samples diluted in PBS + 0.1%BSA + 0.1% Tween20 for 1 h at room temperature (50 µl/well). After washing (3x with PBS + 0.1% Tween20), bound biotinylated antibodies were detected with anti-mouse IgG+IgM-HRP antibody at a 1:1000 dilution. After washing, TMB substrate was added and development of the substrate was stopped with TMB Stop Solution. The signal

at OD450 nm was read. The EC50 values were calculated by non-linear regression using 4 parametric curve fitting with constrained curves and least squares regression. EC50 values at time-point T12 (this was the first measured time-point after antibody injection) was set at 100%, all other EC50 values were compared to the levels at T12.

Example 11: Administration of SADCs to ME/CFS, POTS, AAG, IDC, and cChHD patients.

SADCs are prepared essentially as described in Example 1, using human transferrin as biopolymer scaffold.

N-terminally cysteinylated peptides RATHQEAINCYA (SEQ ID NO: 43) and YANETC (SEQ ID NO: 44), both derived from the second extra-cellular loop of human beta-2 adrenergic receptor (UniProt accession code P07550; cf. Magnusson et al., 1989), are linked to the scaffold using sulfo-GMBS-activated human transferrin, thereby providing transferrin-based SADCs with the corresponding cysteinylated peptides, that are thereby covalently attached to the lysines of the corresponding biopolymer scaffold. These SADC conjugates are purified and resuspended in PBS.

To three ME/CFS patients 150 mg, 250 mg, and 500 mg, respectively, of resuspended SADC conjugate is administered intravenously, in order to reduce autoantibodies against beta-2 adrenergic receptors in the plasma of the patients and thereby ameliorate the symptoms of ME/CFS. The same procedure is carried out for three POTS patients, three AAG patients, three IDC patients, and three cChHD patients.

Example 12: Peptide microarray screen for autoantibody-binding peptides.

A screening for autoantibodies against peptides on microarrays containing 72886 cyclic (and, to a lesser extent, linear) peptides (derived from 184 human neuroreceptors as well as proteins involved in neurological or neuropsychiatric conditions) with a sequence length between 7 and 14 amino-acids, was performed to identify peptide stretches from antigenic protein sequences that are recognized by autoantibodies. IgG was

prepared from blood obtained from 30 human donors (including ME/CFS patients) by protein G purification. Each IgG sample was incubated with peptide microarrays and Ig binding signals were detected by fluorescence. All antibody binding signals to the peptides on the arrays were background subtracted and ranked for each sample and a deduplicated aggregate of the respective top 250 peptide hits for each donor with the corresponding protein sequence of origin (as obtained from UniProt) was compiled (designated as group III). Further, the deduplicated aggregate of the respective top 50 peptide hits for each donor was compiled and designated as group II. Finally, the deduplicated aggregate of the respective top 50 peptide hits for each donor was compiled and designated as group I.

Altogether, group I contains 157 distinct peptide hits, group II contains 819 distinct peptide hits and group III contains 3492 distinct peptide hits. Evidently, group I is a subset of group II which in turn is a subset of group III. Groups I-III correspond to 0,2%, 1,1% and 4.8%, respectively, of all peptides screened.

The peptide hits belonging to groups I-III are listed in Table 1, in the general description above.

Thus, all listed peptides, preferably peptides belonging to group II, even more preferably belonging to group I, provide sequences from which (optionally shorter) peptide sequences can be derived for antibody depletion according to the present invention. Furthermore, also other peptide sequences (or fragments) from the proteins from which the peptides of Table 1 were derived (preferably from group II, more preferably however from group I), are well suited to be used for SADCs according to the present invention. These peptides and fragments thereof are also highly suitable for autoantibody profiling for diagnostic or predictive purposes.

Example 13: Peptide microarray screen for autoantibody-binding peptides based solely on linear peptides.

In a manner similar to example 12, blood samples from human donors were screened with a peptide microarray based solely on a selection of 62 linear peptides from human neuroreceptors listed

herein. This screen provided 52 positive IgG binding hits, i.e. confirmed autoantigenic hits.

Non-patent references

Armstrong, Jonathan K. "The occurrence, induction, specificity and potential effect of antibodies against poly (ethylene glycol)." *Pegylated protein drugs: Basic science and clinical applications*. Birkhäuser Basel, 2009. 147-168.

Bornholz, Beatrice, et al. "Diagnostic and therapeutic aspects of β 1-adrenergic receptor autoantibodies in human heart disease." *Autoimmunity Reviews* 13.9 (2014): 954-962.

Bynke, Annie, et al. "Autoantibodies to beta-adrenergic and muscarinic cholinergic receptors in Myalgic Encephalomyelitis (ME) patients-A validation study in plasma and cerebrospinal fluid from two Swedish cohorts." *Brain, Behavior, & Immunity-Health* 7 (2020): 100107.

Carter, John Mark, and Larry Loomis-Price. "B cell epitope mapping using synthetic peptides." *Current protocols in immunology* 60.1 (2004): 9-4.

Cortes Rivera, Mateo, et al. "Myalgic encephalomyelitis/chronic fatigue syndrome: a comprehensive review." *Diagnostics* 9.3 (2019): 91.

Dijkstra, C. D., et al. "The heterogeneity of mononuclear phagocytes in lymphoid organs: distinct macrophage subpopulations in rat recognized by monoclonal antibodies ED1, ED2 and ED3." *Microenvironments in the Lymphoid System*. Springer, Boston, MA, 1985. 409-419.

Düngen, Hans-Dirk, et al. " β 1-Adrenoreceptor autoantibodies in heart failure: physiology and therapeutic implications." *Circulation: Heart Failure* 13.1 (2020): e006155.

Elliott, Serra E., et al. "A pre-eclampsia-associated Epstein-Barr virus antibody cross-reacts with placental GPR50." *Clinical Immunology* 168 (2016): 64-71.

Erlandsson, Ann, et al. "In vivo clearing of idiotypic antibodies with antiidiotypic antibodies and their derivatives." *Molecular immunology* 43.6 (2006): 599-606.

Etzerodt, Anders, et al. "Efficient intracellular drug-targeting of macrophages using stealth liposomes directed to the hemoglobin scavenger receptor CD163." *Journal of controlled release* 160.1 (2012): 72-80.

Fabriek, Babs O., et al. "The macrophage scavenger receptor CD163 functions as an innate immune sensor for bacteria." *Blood* 113.4 (2009): 887-892.

Galli, Jonathan, and John Greenlee. "Paraneoplastic diseases of the central nervous system." *F1000Research* 9 (2020).

Garces, Jorge Carlos, et al. "Antibody-mediated rejection: a review." *The Ochsner Journal* 17.1 (2017): 46.

Gardoni, Fabrizio, et al. "NMDA and AMPA receptor autoantibodies in brain disorders: from molecular mechanisms to clinical features." *Cells* 10.1 (2021): 77.

Garza, Madeline, and Amanda L. Piquet. "Update in Autoimmune Movement Disorders: Newly Described Antigen Targets in Autoimmune and Paraneoplastic Cerebellar Ataxia." *Frontiers in Neurology* (2021): 1451.

Gazarian, Karlen, et al. "Mimotope peptides selected from phage display combinatorial library by serum antibodies of pigs experimentally infected with *Taenia solium* as leads to developing diagnostic antigens for human neurocysticercosis." *Peptides* 38.2 (2012): 381-388.

Gfeller, David, et al. "Current tools for predicting cancer-specific T cell immunity." *Oncoimmunology* 5.7 (2016): e1177691.

Giannoccaro, Maria Pia, Sukhvir K. Wright, and Angela Vincent. "In vivo mechanisms of antibody-mediated neurological disorders: animal models and potential implications." *Frontiers in neurology* 10 (2020): 1394.

Golden, Elisabeth P., and Steven Vernino. "Autoimmune autonomic neuropathies and ganglionopathies: epidemiology, pathophysiology, and therapeutic advances." *Clinical Autonomic Research* 29.3 (2019): 277-288.

Granfeldt, Asger, et al. "Targeting dexamethasone to macrophages in a porcine endotoxemic model." *Critical Care Medicine* 41.11 (2013): e309-e318.

Graversen, Jonas H., et al. "Targeting the hemoglobin scavenger receptor CD163 in macrophages highly increases the anti-inflammatory potency of dexamethasone." *Molecular Therapy* 20.8 (2012): 1550-1558.

Gunning III, William T., et al. "Postural orthostatic tachycardia syndrome is associated with elevated G-protein coupled receptor autoantibodies." *Journal of the American Heart Association* 8.18 (2019): e013602.

Gurda, Brittney L., et al. "Mapping a neutralizing epitope onto the capsid of adeno-associated virus serotype 8." *Journal of virology* 86.15 (2012): 7739-7751.

Hansen, Lajla Bruntse, Soren Buus, and Claus Schafer-Nielsen. "Identification and mapping of linear antibody epitopes in human serum albumin using high-density peptide arrays." *PLoS One* 8.7 (2013): e68902.

Hansen, Niels, and Charles Timäus. "Autoimmune encephalitis with psychiatric features in adults: historical evolution and prospective challenge." *Journal of Neural Transmission* 128.1 (2021): 1-14.

Homma, Masayuki, et al. "A Novel Fusion Protein, AChR-Fc, Ameliorates Myasthenia Gravis by Neutralizing Antiacetylcholine Receptor Antibodies and Suppressing Acetylcholine Receptor-Reactive B Cells." *Neurotherapeutics* 14.1 (2017): 191-198.

Howard Jr, James F. "Myasthenia gravis: the role of complement at the neuromuscular junction." *Annals of the New York Academy of Sciences* 1412.1 (2018): 113-128.

Howarth, M., & Brune, K. D. (2018). New routes and opportunities for modular construction of particulate vaccines: stick, click and glue. *Frontiers in immunology*, 9, 1432.

Imamura, Michie, et al. "Ganglionic acetylcholine receptor antibodies and autonomic dysfunction in autoimmune rheumatic diseases." *International journal of molecular sciences* 21.4 (2020): 1332.

Jacob, Giris, et al. "Vagal and sympathetic function in neuropathic postural tachycardia syndrome." *Hypertension* 73.5 (2019): 1087-1096.

Jansson, Liselotte, et al. "Immunotherapy With Apitopes Blocks the Immune Response to TSH Receptor in HLA-DR Transgenic Mice." *Endocrinology* 159.9 (2018): 3446-3457.

Jensen, Kamilla Kjærgaard, et al. "Improved methods for predicting peptide binding affinity to MHC class II molecules." *Immunology* 154.3 (2018): 394-406.

Jurtz, Vanessa, et al. "NetMHCpan-4.0: improved peptide-MHC class I interaction predictions integrating eluted ligand and peptide binding affinity data." *The Journal of Immunology* 199.9 (2017): 3360-3368.

Kainulainen, Markus H., et al. "High-throughput quantitation of SARS-CoV-2 antibodies in a single-dilution homogeneous assay." *Scientific reports* 11.1 (2021): 1-9.

Kaur, Divpreet, et al. "Autonomic neuropathies." *Muscle & Nerve* 63.1 (2021): 10-21. Epub 2020 Sep 14.

Kim, Do-Young, et al. "Systematic review of randomized controlled trials for chronic fatigue syndrome/myalgic encephalomyelitis (CFS/ME)." *Journal of translational medicine* 18.1 (2020): 1-12.

Kim, June-Bum. "Channelopathies." *Korean journal of pediatrics* 57.1 (2014): 1.

Koşaloğlu-Yalçın, Zeynep, et al. "Predicting T cell recognition of MHC class I restricted neoepitopes." *Oncoimmunology* 7.11 (2018): e1492508.

Labovsky, Vivian, et al. "Anti-β1-adrenergic receptor autoantibodies in patients with chronic Chagas heart disease." *Clinical & Experimental Immunology* 148.3 (2007): 440-449.

Lazaridis, Konstantinos, et al. "Specific removal of autoantibodies by extracorporeal immunoadsorption ameliorates experimental autoimmune myasthenia gravis." *Journal of neuroimmunology* 312 (2017): 24-30.

Leung, Nicki YH, et al. "Screening and identification of mimotopes of the major shrimp allergen tropomyosin using one-bead-one-compound peptide libraries." *Cellular & molecular immunology* 14.3 (2017): 308-318.

Li, Peipei, Li Wang, and Li-jun Di. "Applications of protein fragment complementation assays for analyzing biomolecular interactions and biochemical networks in living cells." *Journal of proteome research* 18.8 (2019): 2987-2998.

Lim, Sung In, and Inchan Kwon. "Bioconjugation of therapeutic proteins and enzymes using the expanded set of genetically encoded amino acids." *Critical reviews in biotechnology* 36.5 (2016): 803-815.

Lin, Chia-Hao, et al. "Identification of a major epitope by anti-interferon- γ autoantibodies in patients with mycobacterial disease." *Nature medicine* 22.9 (2016): 994.

Lorentz, Kristen M., et al. "Engineered binding to erythrocytes induces immunological tolerance to *E. coli* asparaginase." *Science advances* 1.6 (2015): e1500112.

Low PA, Engstrom JW. Disorders of the autonomic nervous system. In: Kasper D, Fauci A, Hauser S, et al, eds. *Harrison's Principles of Internal Medicine*. 19th ed. New York (2017)

Luo, Jie, et al. "Main immunogenic region structure promotes binding of conformation-dependent myasthenia gravis autoantibodies, nicotinic acetylcholine receptor conformation maturation, and agonist sensitivity." *Journal of Neuroscience* 29.44 (2009): 13898-13908.

Luo, Jie, and Jon Lindstrom. "AChR-specific immunosuppressive therapy of myasthenia gravis." *Biochemical pharmacology* 97.4 (2015): 609-619.

Madsen, Mette, et al. "Molecular Characterization of the Haptoglobin· Hemoglobin Receptor CD163 ligand binding properties of the scavenger receptor cysteine-rich domain region." *Journal of Biological Chemistry* 279.49 (2004): 51561-51567.

Magnusson, Y., et al. "Antigenic analysis of the second extra-cellular loop of the human beta-adrenergic receptors." *Clinical and experimental immunology* 78.1 (1989): 42.

Majowicz, Anna, et al. "Seroprevalence of pre-existing NABs against AAV1, 2, 5, 6 and 8 in the South African Hemophilia B patient population." (2019): 3353-3353.

Masood et al, "Morvan syndrome", In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; 2021.

Matsui, Shinobu, et al. "Peptides derived from cardiovascular G-protein-coupled receptors induce morphological cardiomyopathic changes in immunized rabbits." *Journal of molecular and cellular cardiology* 29.2 (1997): 641-655.

Mazor, Ronit, et al. "Tolerogenic nanoparticles restore the antitumor activity of recombinant immunotoxins by mitigating immunogenicity." *Proceedings of the National Academy of Sciences* 115.4 (2018): E733-E742.

McKeon, Andrew, and Eduardo E. Benarroch. "Autoimmune autonomic disorders." *Handbook of clinical neurology* 133 (2016): 405-416.

Meister, Daniel, S. Maryamdokht Taimoory, and John F. Trant. "Unnatural amino acids improve affinity and modulate immunogenicity: Developing peptides to treat MHC type II autoimmune disorders." *Peptide Science* 111.1 (2019): e24058.

Meyer, Carlotta, and Harald Heidecke. "Antibodies against GPCR." *Front Biosci (Landmark Ed)* 23.552 (2018): 2177-2194.

Mingozzi, Federico, et al. "Overcoming preexisting humoral immunity to AAV using capsid decoys." *Science translational medicine* 5.194 (2013): 194ra92-194ra92.

Mingozzi, Federico, and Katherine A. High. "Overcoming the host immune response to adeno-associated virus gene delivery vectors: the race between clearance, tolerance, neutralization, and escape." *Annual review of virology* 4 (2017): 511-534.

Morimoto et. al., *Bioconjugate Chemistry* 25 (8) (2014): 1479-1491

Moussa, Ehab M., et al. "Immunogenicity of therapeutic protein aggregates." *Journal of pharmaceutical sciences* 105.2 (2016): 417-430.

Müller, Johannes, et al. "Immunoglobulin adsorption in patients with idiopathic dilated cardiomyopathy." *Circulation* 101.4 (2000): 385-391.

Müller, Manuel M. "Post-translational modifications of protein backbones: unique functions, mechanisms, and challenges." *Biochemistry* 57.2 (2017): 177-185.

Nagatomo, Yuji, and WH Wilson Tang. "Autoantibodies and cardiovascular dysfunction: cause or consequence?." *Current heart failure reports* 11.4 (2014): 500-508.

Nakane, Shunya, et al. "Autoimmune autonomic ganglionopathy: an update on diagnosis and treatment." *Expert review of neurotherapeutics* 18.12 (2018): 953-965.

Siang Ong, Yong, et al. "Recent advances in synthesis and identification of cyclic peptides for bioapplications." *Current topics in medicinal chemistry* 17.20 (2017): 2302-2318.

Palma, Jose-Alberto, et al. "Autoantibodies blocking M3 muscarinic receptors cause postganglionic cholinergic dysautonomia." *Annals of neurology* 88.6 (2020): 1237-1243.

Peters, Bjoern, et al. "A community resource benchmarking predictions of peptide binding to MHC-I molecules." *PLoS computational biology* 2.6 (2006): e65.

Pishesha, Novalia, et al. "Engineered erythrocytes covalently linked to antigenic peptides can protect against autoimmune disease." *Proceedings of the National Academy of Sciences* (2017): 201701746.

Prüss, Harald. "Autoantibodies in neurological disease." *Nature Reviews Immunology* (2021): 1-16.

Rey et al., *Clinical Immunology* 96 (3) (2000): 269-279

Rice et al., *EMBOSS: the European Molecular Biology Open Software Suite*, *Trends Genet.* 2000 Jun;16(6):276-7

Ruff, Robert L., and Robert P. Lisak. "Nature and action of antibodies in myasthenia gravis." *Neurologic clinics* 36.2 (2018): 275-291.

Rummler, Silke, et al. "Current techniques for AB0-incompatible living donor liver transplantation." *World journal of transplantation* 6.3 (2016): 548.

Runcie, Karie, et al. "Bi-specific and tri-specific antibodies-the next big thing in solid tumor therapeutics." *Molecular Medicine* 24.1 (2018): 50.

Ruzieh, Mohammed, et al. "The role of autoantibodies in the syndromes of orthostatic intolerance: a systematic review." *Scandinavian Cardiovascular Journal* 51.5 (2017): 243-247.

Ryan, Brent J., Ahuva Nissim, and Paul G. Winyard. "Oxidative post-translational modifications and their involvement in the pathogenesis of autoimmune diseases." *Redox biology* 2 (2014): 715-724.

Scheibenbogen, Carmen, et al. "Immunoadsorption to remove β 2 adrenergic receptor antibodies in Chronic Fatigue Syndrome CFS/ME." PLoS One 13.3 (2018): e0193672.

Schimke, Ingolf, et al. "Reduced oxidative stress in parallel to improved cardiac performance one year after selective removal of anti-beta 1-adrenoreceptor autoantibodies in patients with idiopathic dilated cardiomyopathy: data of a preliminary study." Journal of Clinical Apheresis: The Official Journal of the American Society for Apheresis 20.3 (2005): 137-142.

Shanmugam, Arulkumaran, et al. "Identification of PSA peptide mimotopes using phage display peptide library." Peptides 32.6 (2011): 1097-1102.

Shoenfeld, Yehuda, et al. "Complex syndromes of chronic pain, fatigue and cognitive impairment linked to autoimmune dysautonomia and small fiber neuropathy." Clinical Immunology 214 (2020): 108384.

Skytthe, Maria K., Jonas Heilskov Graversen, and Søren K. Moestrup. "Targeting of CD163+ Macrophages in Inflammatory and Malignant Diseases." International Journal of Molecular Sciences 21.15 (2020): 5497.

Sørensen, Karen Kristine, et al. "Liver sinusoidal endothelial cells." Comprehensive Physiology 5.4 (2011): 1751-1774.

Sotzny, Franziska, et al. "Myalgic encephalomyelitis/chronic fatigue syndrome-evidence for an autoimmune disease." Autoimmunity reviews 17.6 (2018): 601-609.

Spiess, Christoph, Qianting Zhai, and Paul J. Carter. "Alternative molecular formats and therapeutic applications for bispecific antibodies." Molecular immunology 67.2 (2015): 95-106.

Taddeo, Adriano, et al. "Selection and depletion of plasma cells based on the specificity of the secreted antibody." European journal of immunology 45.1 (2015): 317-319.

Teschner, Sven, et al. "ABO-incompatible kidney transplantation using regenerative selective immunoglobulin adsorption." Journal of clinical apheresis 27.2 (2012): 51-60.

Tetala, Kishore KR, et al. "Selective depletion of neuropathy-related antibodies from human serum by monolithic affinity columns containing ganglioside mimics." *Journal of medicinal chemistry* 54.10 (2011): 3500-3505.

Thornton, Kristen, and Marlon O. Mitchell. "Autonomic dysfunction: A guide for FPs." *Journal of Family Practice* 66.9 (2017): 539-544.

Vincent, Angela, et al. "Serological and experimental studies in different forms of myasthenia gravis." *Annals of the New York Academy of Sciences* 1413.1 (2018): 143-153.

Vincent, Angela. "Antibodies and receptors: from neuromuscular junction to central nervous system." *Neuroscience* 439 (2020): 48-61.

Vuorela, A., et al. "Enhanced influenza A H1N1 T cell epitope recognition and cross-reactivity to protein-O-mannosyltransferase 1 in Pandemrix-associated narcolepsy type 1." *Nature communications* 12.1 (2021): 1-17.

Wallukat, Gerd, et al. "Patients with preeclampsia develop agonistic autoantibodies against the angiotensin AT 1 receptor." *The Journal of clinical investigation* 103.7 (1999): 945-952.

Wallukat, G., J. Müller, and R. Hetzer. "Specific removal of beta1-adrenergic autoantibodies from patients with idiopathic dilated cardiomyopathy: Letter to the editor." *N Engl J Med* 347.22 (2002): 1806.

Wells, Rachel, et al. "Plasma exchange therapy in postural tachycardia syndrome: a novel long-term approach?." *The American journal of medicine* 133.4 (2020): e157-e159.

Zhao, Sean, and Vu H. Tran. "Postural Orthostatic Tachycardia Syndrome." *StatPearls* [Internet]. StatPearls Publishing, 2020.

Zhou, Cissy C., et al. "Angiotensin receptor agonistic autoantibodies induce pre-eclampsia in pregnant mice." *Nature medicine* 14.8 (2008): 855.

Zong, Shenghua, et al. "Neuronal surface autoantibodies in neuropsychiatric disorders: are there implications for depression?." *Frontiers in immunology* 8 (2017): 752.

Claims

1. A compound comprising a biopolymer scaffold and at least two peptides with a sequence length of 6-13 amino acids, wherein each of the peptides independently comprises a 6-amino-acid fragment, preferably a 7-, more preferably an 8-, even more preferably a 9-, even more preferably a 10-, even more preferably an 11-, yet even more preferably a 12-, most preferably a 13-amino-acid fragment, of an amino-acid sequence of a neuroreceptor, identified by a UniProt accession code selected from the group consisting of:

P02708, P07510, P07550, P08172, P08173, P08588, P08908, P08912, P08913, P11229, P11230, P13945, P17787, P18089, P18825, P20309, P25098, P25100, P30532, P30926, P32297, P35348, P35368, P35626, P36544, P43681, Q04844, Q05901, Q07001, Q15822, Q15825, Q9GZZ6, Q9UGM1, A0A0G2JKS1, A5X5Y0, A6NL88, A8MPY1, B4DS77, B8ZZ34, O00222, O00591, O14490, O14764, O15303, O15399, O43424, O43653, O60359, O60391, O60403, O60404, O60936, O75311, O75916, O76027, O94772, O95264, O95502, O95868, O95886, P01579, P05026, P05067, P06850, P07196, P07384, P0C7T3, P0C8F1, P0DP57, P0DP58, P12931, P13500, P14416, P14867, P15382, P16066, P17342, P18505, P18507, P19634, P20594, P21452, P21728, P21917, P21918, P23415, P23416, P24046, P24387, P25021, P25101, P28221, P28222, P28223, P28335, P28472, P28476, P28566, P29274, P29275, P29323, P30411, P30542, P30556, P30939, P31644, P32418, P34903, P34969, P35367, P35372, P35462, P35609, P37288, P39086, P41594, P41595, P41597, P42261, P42262, P42263, P43119, P46098, P47869, P47870, P47898, P47901, P47972, P48058, P48067, P48167, P48169, P48549, P49354, P50052, P50406, P53355, P55000, P62955, P63252, P78334, P78352, P78509, Q00535, Q05586, Q06413, Q07699, Q12879, Q12959, Q13002, Q13003, Q13224, Q13255, Q13387, Q13639, Q13702, Q13936, Q13972, Q14289, Q14416, Q14500, Q14571, Q14573, Q14643, Q14831, Q14832, Q14833, Q14957, Q15700, Q15818, Q16099, Q16445, Q16478, Q16553, Q16602, Q401N2, Q494W8, Q5SQ64, Q6PI25, Q6TFL4, Q6UXU4, Q6ZSJ9, Q70Z44, Q86Y78, Q86YM7, Q8N1C3, Q8N2G4, Q8N2Q7, Q8N4C8, Q8NC67, Q8NFZ4, Q8NG75, Q8NGA5, Q8NGA6, Q8NGC8, Q8NGC9, Q8NGG2, Q8NGG3, Q8NGH5, Q8NGH8, Q8NGN1, Q8NGS4, Q8NGY7, Q8NHC4, Q8NI32, Q8TBE1, Q8TCU5, Q8TDF5, Q8WXA2, Q8WXA8, Q8WXS5, Q92736, Q92796, Q96G91,

Q96NW7, Q96P66, Q99928, Q99996, Q9BUH8, Q9BXM7, Q9BYB0, Q9GZV3, Q9H3N8, Q9NPA1, Q9NZ94, Q9P1A6, Q9UBK2, Q9UBN1, Q9UBS5, Q9UF02, Q9ULK0, Q9UN88, Q9UPX8, Q9Y2H0, Q9Y4A9, Q9Y566, Q9Y5N1, Q9Y691, Q9Y698, P37088, P51168, P51170, P51172, O94759, Q16515, O60741, Q9NZQ8, P78348, Q8TDD5, Q9NY37, Q13002, P39086, P48664, A6NGN9, O00305, O00555, O15146, O43448, O43497, O43525, O43526, O60840, O75096, O95180, O95259, O95970, P06213, P16389, P16473, P17658, P22001, P22459, P22460, P24530, P42658, P43146, P48547, P49418, P51787, P54284, P54289, P56696, Q00975, Q01668, Q02246, Q02641, Q03721, Q05329, Q06432, Q08289, Q09470, Q12809, Q13018, Q13303, Q13698, Q14003, Q14721, Q14722, Q15878, Q6PIL6, Q6PIU1, Q6X4W1, Q7Z3S7, Q7Z429, Q8IZS8, Q8NCM2, Q8TAE7, Q8TDN1, Q8TDN2, Q8WWG9, Q92953, Q96KK3, Q96L42, Q96PR1, Q96RP8, Q9BQ31, Q9BXT2, Q9H252, Q9H3M0, Q9NR82, Q9NS40, Q9NS61, Q9NSA2, Q9NY47, Q9NZI2, Q9NZV8, Q9POX4, Q9UHC6, Q9UIX4, Q9UJ90, Q9UJ96, Q9UK17, Q9ULD8, Q9ULS6, Q9UQ05, Q9Y2W7, Q9Y6H6, Q9Y6J6, P48058, P55087, Q9BPU6, P52799, P15328, Q05329, Q16653, Q9Y4C0, Q5F0I5, Q99719, P17600, Q13148, P01266, P07202, and Q9Y6A1,

optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

2. The compound of claim 1, wherein said amino-acid sequence is an amino acid sequence of a neuroreceptor of the autonomic nervous system, identified by a UniProt accession code selected from the group consisting of: P02708, P07510, P07550, P08172, P08173, P08588, P08908, P08912, P08913, P11229, P11230, P13945, P17787, P18089, P18825, P20309, P25098, P25100, P30532, P30926, P32297, P35348, P35368, P35626, P36544, P43681, Q04844, Q05901, Q07001, Q15822, Q15825, Q9GZZ6, Q9UGM1; P37088, P51168, P51170, P51172, O94759, Q16515, O60741, Q9NZQ8, P78348, Q8TDD5, Q9NY37, Q13002, P39086, and P48664.

3. The compound of claim 1 or 2, wherein said amino acid sequence is an amino acid sequence of a neuroreceptor selected from the group consisting of muscarinic, and nicotinic cholinergic receptors, alpha- and beta- adrenergic receptors, serotonin receptors, angiotensin- and endothelin receptors.

4. The compound of any one of claims 1 to 3, wherein said amino-acid sequence is an amino acid sequence of a neuroreceptor selected from the group consisting of beta-1 adrenergic receptor, beta-2 adrenergic receptor, M3 muscarinic acetylcholine receptor, and M4 muscarinic acetylcholine receptor, identified by a UniProt accession code selected from the group consisting of: P08588, P07550, P20309, and P08173.

5. The compound of any one of claims 1 to 4, wherein, for at least one of the peptides, said amino-acid fragment comprises at least 4, preferably at least 5 or even at least 6, more preferably at least 7 or even at least 8, yet more preferably at least 9, even more preferably at least 10, yet even more preferably at least 11, especially at least 12 or even 13 consecutive amino acids of a sequence identified by any one of SEQ ID NOs: 45-3536, preferably any one of SEQ ID NOs: 45-863, especially any one of SEQ ID NOs: 45-201, optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

6. The compound of any one of claims 1 to 5, wherein the at least two peptides comprise a peptide P_1 and a peptide P_2 , wherein P_1 and P_2 independently comprise a 6-amino-acid fragment, preferably a 7-, more preferably an 8-, more preferably a 9-, even more preferably a 10-, yet even more preferably an 11-, especially a 12-, most preferably a 13-amino-acid fragment, of an amino acid sequence as defined in any one of claims 1 to 4, wherein P_1 and P_2 are present in form of a peptide dimer $P_1 - S - P_2$, wherein S is a non-peptide spacer, wherein the peptide dimer is covalently bound to the biopolymer scaffold, preferably via a linker;

preferably wherein, for peptide P_1 and/or peptide P_2 , said amino-acid fragment comprises at least 4, preferably at least 5 or even at least 6, more preferably at least 7 or even at least 8, yet more preferably at least 9, even more preferably at least 10, yet even more preferably at least 11, especially at least 12 or even 13 consecutive amino acids of a sequence identified by

any one of SEQ ID NOs: 45-3536, preferably any one of SEQ ID NOs: 45-863, especially any one of SEQ ID NOs: 45-201, optionally wherein at most three, preferably at most two, more preferably at most one amino acid is independently substituted by any other amino acid.

7. The compound of any one of claims 1 to 6, wherein the biopolymer scaffold is selected from human globulins and human albumin.

8. The compound of any one of claims 1 to 7, wherein at least one of the at least two peptides, preferably each of the at least two peptides, is circularized.

9. The compound of any one of claims 1 to 8, wherein the compound is non-immunogenic in humans.

10. The compound of any one of claims 1 to 9, wherein the biopolymer scaffold is human transferrin.

11. A pharmaceutical composition comprising the compound of any one of claims 1 to 10 and at least one pharmaceutically acceptable excipient.

12. The pharmaceutical composition of claim 11, wherein the molar ratio of the peptides to scaffold in the composition is from 2:1 to 100:1, preferably from 3:1 to 90:1, more preferably from 4:1 to 80:1, even more preferably from 5:1 to 70:1, yet even more preferably from 6:1 to 60:1, especially from 7:1 to 50:1 or even from 8:10 to 40:1.

13. The pharmaceutical composition of claim 11 or 12, for use in prevention or treatment of an autoantibody-mediated condition, preferably selected from Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS), postural orthostatic tachycardia syndrome (POTS), Autoimmune Autonomic Ganglionopathy (AAG),

Idiopathic Dilated Cardiomyopathy (IDC), Chronic Chagas heart disease (cChHD), encephalitis such as limbic encephalitis or paraneoplastic striatal encephalitis or Anti-mGluR1 encephalitis or Anti-mGluR5 encephalitis or acute disseminated encephalomyelitis (ADEM) or NMDAR encephalitis, paraneoplastic syndrome, stiff man syndrome, autoimmune channelopathies, neuromyelitis optica, neuromyotonia, Morvan's syndrome, neuropathic pain, myelitis, optic neuritis, retinitis, parkinsonism, chorea, psychosis, dystonia, mutism, movement disorders, confusion, hallucinations, prodromal diarrhoea, memory loss, hyperexcitability, encephalitis psychiatric syndrome, narcolepsy, autism spectrum disorders, seizures, status epilepticus, chronic epilepsy, myoclonus, encephalomyelitis, myoclonus, parasomnia, sleep apnoea, cognitive impairment, gait abnormalities, faciobrachial dystonic seizures, paraneoplastic syndrome, cerebellar ataxia, dysautonomia, Tourette, ADHD, cerebellar ataxia, oscillopsia, amyotrophic lateral sclerosis (ALS), thyroid disorder and headache with neurological deficits and lymphocytosis (HaNDL), in an individual.

14. The pharmaceutical composition for use according to claim 13, wherein the composition is administered at a dose of 1-1000 mg, preferably 2-500 mg, more preferably 3-250 mg, even more preferably 4-100 mg, especially 5-50 mg, compound per kg body weight of the individual.

15. The pharmaceutical composition for use according to claim 13 or 14, wherein the composition is administered intraperitoneally, subcutaneously, intramuscularly or intravenously.

16. A method of ameliorating or treating an autoimmune disease or autoantibody-mediated condition, preferably ME/CFS, in an individual in need thereof, comprising

obtaining a pharmaceutical composition as defined in claim 11 or 12; and

administering an effective amount of the pharmaceutical composition to the individual.