HUMAN MONOCLONAL ANTIBODY WITH SPECIFICITY FOR DENGUE VIRUS SEROTYPE 1 E PROTEIN AND USES THEREOF

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application No. 61/423,085, filed December 14, 2010, the disclosure of which is hereby incorporate by reference in its entirety for all purposes.

SEQUENCE LISTING

[0001.1] The instant application contains a Sequence Listing which has been submitted in ASCII format via EFS-Web and is hereby incorporated by reference in its entirety.

FIELD

[0002] The invention relates to human neutralizing monoclonal antibodies to Dengue virus, in particular, serotype 1. The invention further relates to compositions and methods for the treatment or prevention of infection by Dengue virus in a vertebrate subject. Methods are provided for administering antibodies to the vertebrate subject in an amount effective to reduce, eliminate, or prevent relapse from infection.

BACKGROUND

[0003] Dengue is the most significant mosquito-borne viral disease affecting humans. At present close to 2.5 billion people living in more than 100 dengue endemic countries in the tropical/sub-tropical belt are considered to be at risk of dengue infection. The urban dwelling mosquito species, *Aedes aegypti* is the principal transmitter of the virus to humans. Infection with dengue virus can result in a spectrum of clinical manifestations ranging from asymptomatic infection through dengue fever (DF), an acute febrile disease, to dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS) which are severe, life-threatening complications typified by vascular leakage. Current treatment is limited to the use of analgesics to alleviate the symptoms and there are no vaccines available. Dengue diseases affect 50 million people yearly, with frequent and recurrent epidemics. The 1990's saw a return of dengue diseases in various areas of the world despite stringent mosquito controls, peaking with the largest ever outbreak in 2005 in Singapore. Over 80% of the reported cases were young adults with an associated impact on their ability to work plus significant healthcare costs for their treatment. Hence, alternatives to dengue vaccines, such as passive antibody therapies and/or antivirals are needed urgently to help control dengue associated diseases in the immediate term. These proposed therapeutics have the potential to help large numbers of infected individuals even if only applied to individuals at risk of developing the severe forms of disease (around 10% of the total). With the increasing prevalence of dengue

SEQUENCE LISTING

<110> NATIONAL UNIVERSITY OF SINGAPORE
DSO NATIONAL LABORATORIES

<120> HUMAN MONOCLONAL ANTIBODY WITH SPECIFICITY FOR DENGUE VIRUS SEROTYPE 1 E PROTEIN AND USES THEREOF

<130> 26737-19972 PCT

<140> PCT/SG2011/000436
<141> 2011-12-14

<150> 61/423,085
<151> 2010-12-14

<160> 42

<170> PatentIn version 3.5

<210> 1
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Gln Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Leu Leu His Ser
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Asp Gly Arg Thr Ser Leu Asp Trp Phe Leu Leu Arg Pro Gly Gln Phe
        35                  40                  45

Pro Gln Val Lys Ile Ser Glu Leu Ser Arg Arg Phe Ser Gly Val Pro
    50                  55                  60

Asp Arg Val Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65                  70                  75                  80

Ser Arg Gly Glu Ala Glu Asp Val Arg Ala Phe Tyr Cys Ile Tyr Gly
                85                  90                  95

Ile Tyr Val Gly Arg Ser Ala Lys Gly Pro Ser Trp Arg Ser Asn
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1 5 10 15

Gln Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Leu Leu His Ser
20 25 30

Asp Gly Arg Thr Ser Leu Asp Trp Phe Leu Leu Arg Pro Gly Gln Phe
35 40 45

Pro Gln Val Lys Ile Ser Glu Leu Ser Arg Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Val Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Gly Glu Ala Glu Asp Val Arg Ala Phe Tyr Cys Ile Tyr Gly
85 90 95

Ile Tyr Val Gly Arg Ser Ala Lys Gly Pro Ser Trp Arg Ser Asn
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Gln Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Leu Leu His Ser
20 25 30

Asp Gly Arg Thr Ser Leu Asp Trp Phe Leu Leu Arg Pro Gly Gln Phe
35 40 45

Pro Gln Val Lys Ile Ser Glu Leu Ser Arg Arg Phe Ser Gly Val Pro
50 55 60

Asp Arg Val Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Gly Glu Ala Glu Asp Val Arg Ala Phe Tyr Cys Ile Tyr Gly
85 90 95

Ile Tyr Val Gly Arg Ser Ala Lys Gly Pro Ser Trp Arg Ser Asn
100 105 110

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Glu Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Leu Leu His Thr
20 25 30

Asn Gly Asn Asn Tyr Leu Asp Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Gln Leu Leu Ile Tyr Leu Gly Ser Asn Arg Ala Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Val Gly Val Tyr Tyr Cys Val Gln Ala
85 90 95

Leu Gln Thr Lys Thr Thr Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

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1 5 10 15

Glu Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Leu Leu His Thr
20 25 30

Asn Gly Asn Asn Tyr Leu Asp Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Gln Leu Leu Ile Tyr Leu Gly Ser Asn Arg Ala Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Val Gly Val Tyr Tyr Cys Val Gln Ala
85 90 95

Leu Gln Thr Lys Thr Thr Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

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1 5 10 15

Glu Pro Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Leu Leu His Thr
20 25 30

Asn Gly Asn Asn Tyr Leu Asp Trp Tyr Leu Gln Lys Pro Gly Gln Ser
35 40 45

Pro Gln Leu Leu Ile Tyr Leu Gly Ser Asn Arg Ala Ser Gly Val Pro
50 55 60

Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Lys Ile
65 70 75 80

Ser Arg Val Glu Ala Glu Asp Val Gly Val Tyr Tyr Cys Val Gln Ala
85 90 95

Leu Gln Thr Lys Thr Thr Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys
100 105 110

Arg

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Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Gln Asn Val Tyr Ser Tyr
20 25 30

Leu Gly Trp Tyr Gln His Lys Pro Gly Arg Ser Pro Arg Leu Leu Ile
35 40 45

Phe Gly Val Thr Ser Arg Ala Thr Gly Val Pro Asp Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Arg Leu Glu Pro
65 70 75 80

Glu Asp Phe Ala Val Tyr Tyr Cys Gln Gln Tyr Ala Gly Ser Ala Tyr
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
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1 5 10 15

Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Gln Asn Val Tyr Ser Tyr
20 25 30

Leu Gly Trp Tyr Gln His Lys Pro Gly Arg Ser Pro Arg Leu Leu Ile
35 40 45

Phe Gly Val Thr Ser Arg Ala Thr Gly Val Pro Asp Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Arg Leu Glu Pro
65 70 75 80

Glu Asp Phe Ala Val Tyr Tyr Cys Gln Gln Tyr Ala Gly Ser Ala Tyr
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105

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1 5 10 15

Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Gln Asn Val Tyr Ser Tyr
20 25 30

Leu Gly Trp Tyr Gln His Lys Pro Gly Arg Ser Pro Arg Leu Leu Ile
35 40 45

Phe Gly Val Thr Ser Arg Ala Thr Gly Val Pro Asp Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Arg Leu Glu Pro
65 70 75 80

Glu Asp Phe Ala Val Tyr Tyr Cys Gln Gln Tyr Ala Gly Ser Ala Tyr
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys
100 105

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<212> PRT
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1 5 10 15

Glu Arg Ala Thr Ile Asn Cys Lys Ser Ser Gln Ser Val Leu His Ser
20 25 30

Ser Asn Asn Lys Asn Tyr Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln
35 40 45

Pro Pro Lys Leu Leu Ile Tyr Trp Ala Ser Thr Arg Glu Ser Gly Val
50 55 60

Pro Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr
65 70 75 80

Ile Ser Ser Leu Gln Ala Glu Asp Val Ala Val Tyr Tyr Cys Gln Gln
85 90 95

Tyr Tyr Ser Ala Pro His Lys Phe Gly Gln Gly Thr Lys Leu Glu Ile
100 105 110

Lys

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1 5 10 15

Glu Arg Ala Thr Ile Asn Cys Lys Ser Ser Gln Ser Val Leu His Ser
20 25 30

Ser Asn Asn Lys Asn Tyr Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln
35 40 45

Pro Pro Lys Leu Leu Ile Tyr Trp Ala Ser Thr Arg Glu Ser Gly Val
50 55 60

Pro Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr
65 70 75 80

Ile Ser Ser Leu Gln Ala Glu Asp Val Ala Val Tyr Tyr Cys Gln Gln
85 90 95

Tyr Tyr Ser Ala Pro His Lys Phe Gly Gln Gly Thr Lys Leu Glu Ile
100 105 110

Lys

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1 5 10 15

Glu Arg Ala Thr Ile Asn Cys Lys Ser Ser Gln Ser Val Leu His Ser
20 25 30

Ser Asn Asn Lys Asn Tyr Leu Ala Trp Tyr Gln Gln Lys Pro Gly Gln
35 40 45

Pro Pro Lys Leu Leu Ile Tyr Trp Ala Ser Thr Arg Glu Ser Gly Val
50 55 60

Pro Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr
65 70 75 80

Ile Ser Ser Leu Gln Ala Glu Asp Val Ala Val Tyr Tyr Cys Gln Gln
85 90 95

Tyr Tyr Ser Ala Pro His Lys Phe Gly Gln Gly Thr Lys Leu Glu Ile
100 105 110

Lys

<210> 13
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<212> PRT
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1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Asn Phe Thr Asp Tyr
20 25 30

Tyr Val His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Ala Trp Ile Asn Pro Asn Ser Gly Gly Ser Lys Tyr Ala Gln Met Phe
50 55 60

Gln Gly Arg Ile Ser Leu Thr Arg Asp Thr Ser Ile Ser Thr Ala Tyr
65 70 75 80

Leu Glu Leu Phe Ser Leu Thr Ser Asp Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Asp Leu Thr Ala Phe Asp Val Trp Gly Gln Gly Thr Leu Val Thr
100 105 110

Val Ser Ser Gly Thr Thr Val Thr Val Ser Ser
115 120

<210> 14
<211> 122

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1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Ser Phe Ser Ser Tyr
20 25 30

Gly Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Val Ile Trp Tyr Asp Gly Ser Lys Thr Tyr Tyr Gly Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Lys Asp Asn Ser Lys Lys Met Val Asn
65 70 75 80

Leu Gln Met Asp Ser Leu Gly Val Glu Asp Thr Ala Phe Tyr Tyr Cys
85 90 95

Ala Arg Gly Ile Ala Gly Gly Trp Ala Phe Trp Gly Ile Asp Leu Trp
100 105 110

Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 15
<211> 122
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1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Asp Asp Tyr
20 25 30

Gly Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Gly Ile Asn Trp Asn Gly Gly Ser Thr Gly Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Phe Tyr Tyr Cys
85 90 95

Ala Arg Glu Tyr Gly Ser Gly Ser Tyr Ile Asn Trp Phe Asp Pro Trp
100 105 110

Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

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1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Asn Phe Thr Asp Tyr
20 25 30

Tyr Val His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Ala Trp Ile Asn Pro Asn Ser Gly Gly Ser Lys Tyr Ala Gln Met Phe
50 55 60

Gln Gly Arg Ile Ser Leu Thr Arg Asp Thr Ser Ile Ser Thr Ala Tyr
65 70 75 80

Leu Glu Leu Phe Ser Leu Thr Ser Asp Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Asp Leu Thr Ala Phe Asp Val Trp Gly Gln Gly Thr Leu Val Thr
100 105 110

Val Ser Ser Gly Thr Thr Val Thr Val Ser Ser
115 120

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1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Ser Phe Ser Ser Tyr
20 25 30

Gly Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Val Ile Trp Tyr Asp Gly Ser Lys Thr Tyr Tyr Gly Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Lys Asp Asn Ser Lys Lys Met Val Asn
65 70 75 80

Leu Gln Met Asp Ser Leu Gly Val Glu Asp Thr Ala Phe Tyr Tyr Cys
85 90 95

Ala Arg Gly Ile Ala Gly Gly Trp Ala Phe Trp Gly Ile Asp Leu Trp
100 105 110

Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

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1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Asp Asp Tyr
20 25 30

Gly Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Gly Ile Asn Trp Asn Gly Gly Ser Thr Gly Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Phe Tyr Tyr Cys
85 90 95

Ala Arg Glu Tyr Gly Ser Gly Ser Tyr Ile Asn Trp Phe Asp Pro Trp
100 105 110

Gly Gln Gly Thr Leu Val Thr Val Ser Ser
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1 5 10 15

Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Asn Phe Thr Asp Tyr
20 25 30

Tyr Val His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
35 40 45

Ala Trp Ile Asn Pro Asn Ser Gly Gly Ser Lys Tyr Ala Gln Met Phe
50 55 60

Gln Gly Arg Ile Ser Leu Thr Arg Asp Thr Ser Ile Ser Thr Ala Tyr
65 70 75 80

Leu Glu Leu Phe Ser Leu Thr Ser Asp Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Asp Leu Thr Ala Phe Asp Val Trp Gly Gln Gly Thr Leu Val Thr
100 105 110

Val Ser Ser Gly Thr Thr Val Thr Val Ser Ser
115 120

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Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Ser Phe Ser Ser Tyr
20 25 30

Gly Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Val Ile Trp Tyr Asp Gly Ser Lys Thr Tyr Tyr Gly Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Lys Asp Asn Ser Lys Lys Met Val Asn
65 70 75 80

Leu Gln Met Asp Ser Leu Gly Val Glu Asp Thr Ala Phe Tyr Tyr Cys
85 90 95

Ala Arg Gly Ile Ala Gly Gly Trp Ala Phe Trp Gly Ile Asp Leu Trp
100 105 110

Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

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1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Asp Asp Tyr
20 25 30

Gly Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Gly Ile Asn Trp Asn Gly Gly Ser Thr Gly Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Phe Tyr Tyr Cys
85 90 95

Ala Arg Glu Tyr Gly Ser Gly Ser Tyr Ile Asn Trp Phe Asp Pro Trp
100 105 110

Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 22
<211> 123
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<213> Artificial Sequence

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<223> Description of Artificial Sequence: Synthetic polypeptide

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Ser Val Lys Val Ser Cys Lys Ala Ser Gly Tyr Asn Phe Thr Asp Tyr
            20                  25                  30

Tyr Val His Trp Val Arg Gln Ala Pro Gly Gln Gly Leu Glu Trp Met
        35                  40                  45

Ala Trp Ile Asn Pro Asn Ser Gly Gly Ser Lys Tyr Ala Gln Met Phe
    50                  55                  60

Gln Gly Arg Ile Ser Leu Thr Arg Asp Thr Ser Ile Ser Thr Ala Tyr
65                  70                  75                  80

Leu Glu Leu Phe Ser Leu Thr Ser Asp Asp Thr Ala Val Tyr Tyr Cys
                85                  90                  95

Ala Asp Leu Thr Ala Phe Asp Val Trp Gly Gln Gly Thr Leu Val Thr
            100                 105                 110

Val Ser Ser Gly Thr Thr Val Thr Val Ser Ser
        115                 120
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<223> Description of Artificial Sequence: Synthetic polypeptide

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1               5                  10                  15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Ser Phe Ser Ser Tyr
            20                  25                  30

Gly Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
        35                  40                  45

Ala Val Ile Trp Tyr Asp Gly Ser Lys Thr Tyr Tyr Gly Asp Ser Val
    50                  55                  60

Lys Gly Arg Phe Thr Ile Ser Lys Asp Asn Ser Lys Lys Met Val Asn
65                  70                  75                  80

Leu Gln Met Asp Ser Leu Gly Val Glu Asp Thr Ala Phe Tyr Tyr Cys
                85                  90                  95
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Ala Arg Gly Ile Ala Gly Gly Trp Ala Phe Trp Gly Ile Asp Leu Trp
100 105 110

Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

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1 5 10 15

Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Asp Asp Tyr
20 25 30

Gly Met Ser Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ser Gly Ile Asn Trp Asn Gly Gly Ser Thr Gly Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Ser Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Phe Tyr Tyr Cys
85 90 95

Ala Arg Glu Tyr Gly Ser Gly Ser Tyr Ile Asn Trp Phe Asp Pro Trp
100 105 110

Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 25
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<220>
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tcc ctg aga ctc tcc tgt gca gcg tct gga ttc agc ttc agc agt tat 96
Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Ser Phe Ser Ser Tyr
20 25 30

ggc atg cac tgg gtc cgc cag gcc cca ggc aag ggg ctg gag tgg gtg 144
Gly Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

gca gtg ata tgg tat gat gga agt aaa acg tat tat gga gac tcc gtg 192
Ala Val Ile Trp Tyr Asp Gly Ser Lys Thr Tyr Tyr Gly Asp Ser Val
50 55 60

aag ggc cga ttc acc atc tcc aaa gac aat tcc aag aaa atg gtg aat 240
Lys Gly Arg Phe Thr Ile Ser Lys Asp Asn Ser Lys Lys Met Val Asn
65 70 75 80

ctc caa atg gac agc ctg gga gtc gag gac acg gct ttt tat tac tgt 288
Leu Gln Met Asp Ser Leu Gly Val Glu Asp Thr Ala Phe Tyr Tyr Cys
85 90 95

gca aga ggg ata gcc ggt ggc tgg gcg ttt tgg ggg att gac ctc tgg 336
Ala Arg Gly Ile Ala Gly Gly Trp Ala Phe Trp Gly Ile Asp Leu Trp
100 105 110

ggc cag gga acc ctg gtc acc gtc tcc tca 366
Gly Gln Gly Thr Leu Val Thr Val Ser Ser
115 120

<210> 26
<211> 324
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic polynucleotide

<220>
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gaa aga gcc acc ctc tcc tgc agg gcc agc cag aat gtt tac agc tac 96
Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Gln Asn Val Tyr Ser Tyr
20 25 30

tta ggc tgg tac cag cac aaa cct ggc cgg tct ccc agg ctc ctc atc 144
Leu Gly Trp Tyr Gln His Lys Pro Gly Arg Ser Pro Arg Leu Leu Ile
35 40 45

ttt ggt gtc acc agc agg gcc act ggc gtc cca gac agg ttc agt ggc 192
Phe Gly Val Thr Ser Arg Ala Thr Gly Val Pro Asp Arg Phe Ser Gly
50 55 60

agt ggg tct ggg aca gac ttc act ctc acc atc agc aga ctg gag cct 240
Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Arg Leu Glu Pro
65 70 75 80

gaa gat ttt gcg gtg tac tac tgt cag cag tac gct ggc tca gcg tac 288

Glu Asp Phe Ala Val Tyr Tyr Cys Gln Gln Tyr Ala Gly Ser Ala Tyr
85 90 95

act ttt ggc cag ggg acc aag gtg gag atc aaa cgt 324
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100 105

<210> 27
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1 5 10 15

Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Gln Asn Val Tyr Ser Tyr
20 25 30

Leu Gly Trp Tyr Gln His Lys Pro Gly Arg Ser Pro Arg Leu Leu Ile
35 40 45

Phe Gly Val Thr Ser Arg Ala Thr Gly Val Pro Asp Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Arg Leu Glu Pro
65 70 75 80

Glu Asp Phe Ala Val Tyr Tyr Cys Gln Gln Tyr Ala Gly Ser Ala Tyr
85 90 95

Thr Phe Gly Gln Gly Thr Lys Val Glu Ile Lys Arg
100 105

<210> 28
<211> 495
<212> PRT
<213> Dengue virus

<400> 28
Met Arg Cys Val Gly Ile Gly Asn Arg Asp Phe Val Glu Gly Leu Ser
1 5 10 15

Gly Ala Thr Trp Val Asp Val Val Leu Glu His Gly Ser Cys Val Thr
20 25 30

Thr Met Ala Lys Asp Lys Pro Thr Leu Asp Ile Glu Leu Leu Lys Thr
35 40 45

Glu Val Thr Asn Pro Ala Val Leu Arg Lys Leu Cys Ile Glu Ala Lys
50 55 60

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Ile Ser Asn Thr Thr Thr Asp Ser Arg Cys Pro Thr Gln Gly Glu Ala
65                  70                  75                  80

Thr Leu Val Glu Glu Gln Asp Thr Asn Phe Val Cys Arg Arg Thr Phe
                85                  90                  95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Ser
            100                 105                 110

Leu Ile Thr Cys Ala Lys Phe Lys Cys Val Thr Lys Leu Glu Gly Lys
        115                 120                 125

Ile Val Gln Tyr Glu Asn Leu Lys Tyr Ser Val Ile Val Thr Val His
    130                 135                 140

Thr Gly Asp Gln His Gln Val Gly Asn Glu Thr Thr Glu His Gly Thr
145                 150                 155                 160

Ile Ala Thr Ile Thr Pro Gln Ala Pro Thr Ser Glu Ile Gln Leu Thr
                165                 170                 175

Asp Tyr Gly Ala Leu Thr Leu Asp Cys Ser Pro Arg Thr Gly Leu Asp
            180                 185                 190

Phe Asn Glu Met Val Leu Leu Thr Met Lys Glu Lys Ser Trp Leu Val
        195                 200                 205

His Lys Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Thr Ser Gly Ala
    210                 215                 220

Ser Thr Ser Gln Glu Thr Trp Asn Arg Gln Asp Leu Leu Val Thr Phe
225                 230                 235                 240

Lys Thr Ala His Ala Lys Lys Gln Glu Val Val Val Leu Gly Ser Gln
                245                 250                 255

Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Thr
            260                 265                 270

Ser Gly Thr Thr Thr Ile Phe Ala Gly His Leu Lys Cys Arg Leu Lys
        275                 280                 285

Met Asp Lys Leu Thr Leu Lys Gly Met Ser Tyr Val Met Cys Thr Gly
    290                 295                 300

Pro Phe Lys Leu Glu Lys Glu Met Ala Glu Thr Gln His Gly Thr Val
305                 310                 315                 320

Leu Val Gln Val Lys Tyr Glu Gly Thr Asp Ala Pro Cys Lys Ile Pro
                325                 330                 335
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Phe Ser Ser Gln Asp Glu Lys Gly Val Thr Gln Asn Gly Arg Leu Val
340 345 350

Thr Ala Asn Pro Ile Val Thr Asp Lys Glu Lys Pro Ile Asn Ile Glu
355 360 365

Ala Glu Pro Pro Phe Gly Glu Ser Tyr Ile Val Val Gly Ala Gly Glu
370 375 380

Lys Ala Leu Lys Leu Ser Trp Phe Lys Lys Gly Ser Ser Ile Gly Lys
385 390 395 400

Met Phe Glu Ala Thr Ala Arg Gly Ala Arg Arg Met Ala Ile Leu Gly
405 410 415

Asp Thr Ala Trp Asp Phe Gly Ser Ile Gly Gly Val Phe Thr Ser Val
420 425 430

Gly Lys Leu Val His Gln Ile Phe Gly Thr Ala Tyr Gly Val Leu Phe
435 440 445

Ser Gly Val Ser Trp Thr Met Lys Ile Gly Ile Gly Ile Leu Leu Thr
450 455 460

Trp Leu Gly Leu Asn Ser Arg Ser Thr Ser Leu Ser Met Thr Cys Ile
465 470 475 480

Ala Val Gly Met Val Thr Leu Tyr Leu Gly Val Met Val Gln Ala
485 490 495

<210> 29
<211> 495
<212> PRT
<213> Dengue virus

<400> 29
Met Arg Cys Val Gly Ile Gly Asn Arg Asp Phe Val Glu Gly Leu Ser
1 5 10 15

Gly Ala Thr Trp Val Asp Val Val Leu Glu His Gly Ser Cys Val Thr
20 25 30

Thr Met Ala Lys Asp Lys Pro Thr Leu Asp Ile Glu Leu Leu Lys Thr
35 40 45

Glu Val Thr Asn Pro Ala Val Leu Arg Lys Leu Cys Ile Glu Ala Lys
50 55 60

Ile Ser Asn Thr Thr Thr Asp Ser Arg Cys Pro Thr Gln Gly Glu Ala
65 70 75 80

Thr Leu Val Glu Glu Gln Asp Thr Asn Phe Val Cys Arg Arg Thr Phe
85 90 95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Ser
100 105 110

Leu Ile Thr Cys Ala Lys Phe Lys Cys Val Thr Lys Leu Glu Gly Lys
115 120 125

Ile Val Gln Tyr Glu Asn Leu Lys Tyr Ser Val Ile Val Thr Val His
130 135 140

Thr Gly Asp Gln His Gln Val Gly Asn Glu Thr Thr Glu His Gly Thr
145 150 155 160

Thr Ala Thr Ile Thr Pro Gln Ala Pro Thr Ser Glu Ile Gln Leu Thr
165 170 175

Asp Tyr Gly Ala Leu Thr Leu Asp Cys Ser Pro Arg Thr Gly Leu Asp
180 185 190

Phe Asn Glu Met Val Leu Leu Thr Met Glu Lys Lys Ser Trp Leu Val
195 200 205

His Lys Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Thr Ser Gly Ala
210 215 220

Ser Thr Ser Gln Glu Thr Trp Asn Arg Gln Asp Leu Leu Val Thr Phe
225 230 235 240

Lys Thr Ala His Ala Lys Lys Gln Glu Val Val Val Leu Gly Ser Gln
245 250 255

Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Thr
260 265 270

Ser Gly Thr Thr Thr Ile Phe Ala Gly His Leu Lys Cys Arg Leu Lys
275 280 285

Met Asp Lys Leu Thr Leu Lys Gly Met Ser Tyr Val Met Cys Thr Gly
290 295 300

Ser Phe Lys Leu Glu Lys Glu Val Ala Glu Thr Gln His Gly Thr Val
305 310 315 320

Leu Val Gln Val Lys Tyr Glu Gly Thr Asp Ala Pro Cys Lys Ile Pro
325 330 335

Phe Ser Ser Gln Asp Glu Lys Gly Val Thr Gln Asn Gly Arg Leu Ile
340 345 350

Thr Ala Asn Pro Ile Val Thr Asp Lys Glu Lys Pro Val Asn Ile Glu
355 360 365

Ala Glu Pro Pro Phe Gly Glu Ser Tyr Ile Val Val Gly Ala Gly Glu
370 375 380

Lys Ala Leu Lys Leu Ser Trp Phe Lys Lys Gly Ser Ser Ile Gly Lys
385 390 395 400

Met Phe Glu Ala Thr Ala Arg Gly Ala Arg Arg Met Ala Ile Leu Gly
405 410 415

Asp Thr Ala Trp Asp Phe Gly Ser Ile Gly Gly Val Phe Thr Ser Val
420 425 430

Gly Lys Leu Ile His Gln Ile Phe Gly Thr Ala Tyr Gly Val Leu Phe
435 440 445

Ser Gly Val Ser Trp Thr Met Lys Ile Gly Ile Gly Ile Leu Leu Thr
450 455 460

Trp Leu Gly Leu Asn Ser Arg Ser Thr Ser Leu Ser Met Thr Cys Ile
465 470 475 480

Ala Val Gly Met Val Thr Leu Tyr Leu Gly Val Met Val Gln Ala
485 490 495

<210> 30
<211> 495
<212> PRT
<213> Dengue virus

<400> 30
Met Arg Cys Val Gly Ile Gly Ser Arg Asp Phe Val Glu Gly Leu Ser
1 5 10 15

Gly Ala Thr Trp Val Asp Val Val Leu Glu His Gly Ser Cys Val Thr
20 25 30

Thr Met Ala Lys Asp Lys Pro Thr Leu Asp Ile Glu Leu Leu Lys Thr
35 40 45

Glu Val Thr Asn Pro Ala Val Leu Arg Lys Leu Cys Ile Glu Ala Lys
50 55 60

Ile Ser Asn Thr Thr Thr Asp Ser Arg Cys Pro Thr Gln Gly Glu Ala
65 70 75 80

Thr Leu Val Glu Glu Gln Asp Ala Asn Phe Val Cys Arg Arg Thr Phe
85 90 95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Ser
100 105 110

Leu Ile Thr Cys Ala Lys Phe Lys Cys Val Thr Lys Leu Glu Gly Lys
115 120 125

Ile Val Gln Tyr Glu Asn Leu Lys Tyr Ser Val Ile Val Thr Val His
130 135 140

Thr Gly Asp Gln His Gln Val Gly Asn Glu Ser Thr Glu His Gly Thr
145 150 155 160

Thr Ala Thr Ile Thr Pro Gln Ala Pro Thr Thr Glu Ile Gln Leu Thr
165 170 175

Asp Tyr Gly Ala Leu Thr Leu Asp Cys Ser Pro Arg Thr Gly Leu Asp
180 185 190

Phe Asn Glu Met Val Leu Leu Thr Met Lys Glu Lys Ser Trp Leu Val
195 200 205

His Lys Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Thr Ser Gly Ala
210 215 220

Ser Thr Ser Gln Glu Thr Trp Asn Arg Gln Asp Leu Leu Val Thr Phe
225 230 235 240

Lys Thr Ala His Ala Lys Lys Gln Glu Val Val Val Leu Gly Ser Gln
245 250 255

Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Thr
260 265 270

Ser Gly Thr Thr Thr Ile Phe Ala Gly His Leu Lys Cys Arg Leu Lys
275 280 285

Met Asp Lys Leu Thr Leu Lys Gly Met Ser Tyr Val Met Cys Thr Gly
290 295 300

Ser Phe Lys Leu Glu Lys Glu Val Ala Glu Thr Gln His Gly Thr Val
305 310 315 320

Leu Val Gln Ile Lys Tyr Glu Gly Thr Asp Ala Pro Cys Lys Ile Pro
325 330 335

Phe Leu Thr Gln Asp Glu Lys Gly Val Thr Gln Asn Gly Arg Leu Ile
340 345 350

Thr Ala Asn Pro Ile Val Thr Asp Lys Glu Lys Pro Val Asn Ile Glu
355 360 365

Ala Glu Pro Pro Phe Gly Glu Ser Tyr Ile Val Ile Gly Ala Gly Glu
370 375 380

Lys Ala Leu Lys Leu Ser Trp Phe Lys Lys Gly Ser Ser Ile Gly Lys
385 390 395 400

Met Phe Glu Ala Thr Ala Arg Gly Ala Arg Arg Met Ala Ile Leu Gly
405 410 415

Asp Thr Ala Trp Asp Phe Gly Ser Ile Gly Gly Val Phe Thr Ser Val
420 425 430

Gly Lys Leu Val His Gln Ile Phe Gly Thr Ala Tyr Gly Val Leu Phe
435 440 445

Ser Gly Val Ser Trp Thr Met Lys Ile Gly Ile Gly Val Leu Leu Thr
450 455 460

Trp Leu Gly Leu Asn Ser Arg Ser Thr Ser Leu Ser Met Thr Cys Ile
465 470 475 480

Ala Val Gly Leu Val Thr Leu Tyr Leu Gly Val Met Val Gln Ala
485 490 495

<210> 31
<211> 495
<212> PRT
<213> Dengue virus

<400> 31
Met Arg Cys Val Gly Ile Gly Asn Arg Asp Phe Val Glu Gly Leu Ser
1 5 10 15

Gly Ala Thr Trp Val Asp Val Val Leu Glu His Gly Ser Cys Val Thr
20 25 30

Thr Met Ala Lys Asp Lys Pro Thr Leu Asp Ile Glu Leu Leu Lys Thr
35 40 45

Glu Val Thr Asn Pro Ala Val Leu Arg Lys Leu Cys Ile Glu Ala Lys
50 55 60

Ile Ser Asn Thr Thr Thr Asp Ser Arg Cys Pro Thr Gln Gly Glu Ala
65 70 75 80

Thr Leu Val Glu Glu Gln Asp Ala Asn Phe Val Cys Arg Arg Thr Phe
85 90 95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Ser
100 105 110

Leu Ile Thr Cys Ala Lys Phe Lys Cys Val Thr Lys Leu Glu Gly Lys
115 120 125

Ile Val Gln Tyr Glu Asn Leu Lys Tyr Ser Val Ile Val Thr Val His
130 135 140

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Thr Gly Asp Gln His Gln Val Gly Asn Glu Thr Thr Glu His Gly Thr
145                 150                 155                 160

Ile Ala Thr Ile Thr Pro Gln Ala Pro Thr Ser Glu Ile Gln Leu Thr
                165                 170                 175

Asp Tyr Gly Ala Leu Thr Leu Asp Cys Ser Pro Arg Thr Gly Leu Asp
            180                 185                 190

Phe Asn Glu Met Val Leu Leu Thr Met Lys Glu Lys Ser Trp Leu Val
        195                 200                 205

His Lys Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Thr Ser Gly Ala
    210                 215                 220

Ser Thr Pro Gln Glu Thr Trp Asn Arg Glu Asp Leu Leu Val Thr Phe
225                 230                 235                 240

Lys Thr Ala His Ala Lys Lys Gln Glu Val Ala Val Leu Gly Ser Gln
                245                 250                 255

Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Thr
            260                 265                 270

Ser Gly Thr Thr Lys Ile Phe Ala Gly His Leu Lys Cys Arg Leu Lys
        275                 280                 285

Met Asp Lys Leu Thr Leu Lys Gly Met Ser Tyr Val Met Cys Thr Gly
    290                 295                 300

Ser Phe Lys Leu Glu Lys Glu Val Ala Glu Thr Gln His Gly Thr Val
305                 310                 315                 320

Leu Val Gln Val Lys Tyr Glu Gly Thr Asp Ala Pro Cys Lys Ile Pro
                325                 330                 335

Phe Ser Thr Gln Asp Glu Lys Gly Val Thr Gln Asn Gly Arg Leu Ile
            340                 345                 350

Thr Ala Asn Pro Ile Val Thr Asp Lys Glu Lys Pro Val Asn Ile Glu
        355                 360                 365

Ala Glu Pro Pro Phe Gly Glu Ser Tyr Ile Val Val Gly Ala Gly Glu
    370                 375                 380

Lys Ala Leu Lys Leu Ser Trp Phe Lys Lys Gly Ser Ser Ile Gly Lys
385                 390                 395                 400

Met Leu Glu Ala Thr Ala Arg Gly Ala Arg Arg Met Ala Ile Leu Gly
                405                 410                 415
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Asp Thr Ala Trp Asp Phe Gly Ser Ile Gly Gly Val Phe Thr Ser Val
420 425 430

Gly Lys Leu Val His Gln Ile Phe Gly Thr Ala Tyr Gly Val Leu Phe
435 440 445

Ser Gly Val Ser Trp Thr Met Lys Ile Gly Ile Gly Ile Leu Leu Thr
450 455 460

Trp Leu Gly Leu Asn Ser Arg Ser Ala Ser Leu Ser Met Thr Cys Ile
465 470 475 480

Ala Val Gly Met Val Thr Leu Tyr Leu Gly Val Met Val Gln Ala
485 490 495

<210> 32
<211> 495
<212> PRT
<213> Dengue virus

<400> 32
Met Arg Cys Val Gly Ile Gly Ser Arg Asp Phe Val Glu Gly Leu Ser
1 5 10 15

Gly Ala Thr Trp Val Asp Val Val Leu Glu His Gly Ser Cys Val Thr
20 25 30

Thr Met Ala Lys Asp Lys Pro Thr Leu Asp Ile Glu Leu Leu Lys Thr
35 40 45

Glu Val Thr Asn Pro Ala Val Leu Arg Lys Leu Cys Ile Glu Ala Lys
50 55 60

Ile Ser Asn Thr Thr Thr Asp Ser Arg Cys Pro Thr Gln Gly Glu Ala
65 70 75 80

Thr Leu Val Glu Glu Gln Asp Ala Asn Phe Val Cys Arg Arg Thr Phe
85 90 95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Ser
100 105 110

Leu Ile Thr Cys Ala Lys Phe Lys Cys Val Thr Lys Leu Glu Gly Lys
115 120 125

Ile Val Gln Tyr Glu Asn Leu Lys Tyr Ser Val Ile Val Thr Val His
130 135 140

Thr Gly Asp Gln His Gln Val Gly Asn Glu Ser Thr Glu His Gly Thr
145 150 155 160

```
Thr Ala Thr Ile Thr Pro Gln Ala Pro Thr Thr Glu Ile Gln Leu Thr
                165                 170                 175

Asp Tyr Gly Ala Leu Thr Leu Asp Cys Ser Pro Arg Thr Gly Leu Asp
            180                 185                 190

Phe Asn Glu Met Val Leu Leu Thr Met Lys Glu Lys Ser Trp Leu Val
        195                 200                 205

His Lys Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Thr Ser Gly Ala
    210                 215                 220

Ser Thr Ser Gln Glu Thr Trp Asn Arg Gln Asp Leu Leu Val Thr Phe
225                 230                 235                 240

Lys Thr Ala His Ala Lys Lys Gln Glu Val Val Val Leu Gly Ser Gln
                245                 250                 255

Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Thr
            260                 265                 270

Ser Gly Thr Thr Thr Ile Phe Ala Gly His Leu Lys Cys Arg Leu Lys
        275                 280                 285

Met Asp Lys Leu Thr Leu Lys Gly Met Ser Tyr Val Met Cys Thr Gly
    290                 295                 300

Ser Phe Lys Leu Glu Lys Glu Val Ala Glu Thr Gln His Gly Thr Val
305                 310                 315                 320

Leu Val Gln Ile Lys Tyr Glu Gly Thr Asp Ala Pro Cys Lys Ile Pro
                325                 330                 335

Phe Ser Thr Gln Asp Glu Lys Gly Val Thr Gln Asn Gly Arg Leu Ile
            340                 345                 350

Thr Ala Asn Pro Ile Val Thr Asp Lys Glu Lys Pro Val Asn Ile Glu
        355                 360                 365

Ala Glu Pro Pro Phe Gly Glu Ser Tyr Ile Val Ile Gly Ala Gly Glu
    370                 375                 380

Lys Ala Leu Lys Leu Ser Trp Phe Lys Lys Gly Ser Ser Ile Gly Lys
385                 390                 395                 400

Met Phe Glu Ala Thr Ala Arg Gly Ala Arg Arg Met Ala Ile Leu Gly
                405                 410                 415

Asp Thr Ala Trp Asp Phe Gly Ser Ile Gly Gly Val Phe Thr Ser Val
            420                 425                 430
```

Gly Lys Leu Val His Gln Ile Phe Gly Thr Ala Tyr Gly Val Leu Phe
435 440 445

Ser Gly Val Ser Trp Thr Met Lys Ile Gly Ile Gly Val Leu Leu Thr
450 455 460

Trp Leu Gly Leu Asn Ser Arg Ser Thr Ser Leu Ser Met Thr Cys Ile
465 470 475 480

Ala Val Gly Leu Val Thr Leu Tyr Leu Gly Val Met Val Gln Ala
485 490 495

<210> 33
<211> 396
<212> PRT
<213> Dengue virus

<400> 33
Met Arg Cys Val Gly Ile Gly Asn Arg Asp Phe Val Glu Gly Leu Ser
1 5 10 15

Gly Ala Thr Trp Val Asp Val Val Leu Glu His Gly Ser Cys Val Thr
20 25 30

Thr Met Ala Lys Asp Lys Pro Thr Leu Asp Ile Glu Leu Leu Lys Thr
35 40 45

Glu Val Thr Asn Pro Ala Val Leu Arg Lys Leu Cys Ile Glu Ala Lys
50 55 60

Ile Ser Asn Thr Thr Thr Asp Ser Arg Cys Pro Thr Gln Gly Glu Ala
65 70 75 80

Thr Leu Val Glu Glu Gln Asp Ala Asn Phe Val Cys Arg Arg Thr Phe
85 90 95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Ser
100 105 110

Leu Ile Thr Cys Ala Lys Phe Lys Cys Val Thr Lys Leu Glu Gly Lys
115 120 125

Ile Val Gln Tyr Glu Asn Leu Lys Tyr Ser Val Ile Val Thr Val His
130 135 140

Thr Gly Asp Gln His Gln Val Gly Asn Glu Thr Thr Glu His Gly Thr
145 150 155 160

Ile Ala Thr Ile Thr Pro Gln Ala Pro Thr Ser Glu Ile Gln Leu Thr
165 170 175

Asp Tyr Gly Ala Leu Thr Leu Asp Cys Ser Pro Arg Thr Gly Leu Asp
180 185 190

Phe Asn Glu Met Val Leu Leu Thr Met Lys Glu Lys Ser Trp Leu Val
195 200 205

His Lys Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Thr Ser Gly Ala
210 215 220

Ser Thr Pro Gln Glu Thr Trp Asn Arg Glu Asp Leu Leu Val Thr Phe
225 230 235 240

Lys Thr Ala His Ala Lys Lys Gln Glu Val Ala Val Leu Gly Ser Gln
245 250 255

Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Thr
260 265 270

Ser Gly Thr Thr Lys Ile Phe Ala Gly His Leu Lys Cys Arg Leu Lys
275 280 285

Met Asp Lys Leu Thr Leu Lys Gly Met Ser Tyr Val Met Cys Thr Gly
290 295 300

Ser Phe Lys Leu Glu Lys Glu Val Ala Glu Thr Gln His Gly Thr Val
305 310 315 320

Leu Val Gln Val Lys Tyr Glu Gly Thr Asp Ala Pro Cys Lys Ile Pro
325 330 335

Phe Ser Thr Gln Asp Glu Lys Gly Val Thr Gln Asn Gly Arg Leu Ile
340 345 350

Thr Ala Asn Pro Ile Val Thr Asp Lys Glu Lys Pro Val Asn Ile Glu
355 360 365

Ala Glu Pro Pro Phe Gly Glu Ser Tyr Ile Val Val Gly Ala Gly Glu
370 375 380

Lys Ala Leu Lys Leu Ser Trp Phe Lys Lys Gly Ser
385 390 395

<210> 34
<211> 396
<212> PRT
<213> Dengue virus

<400> 34
Met Arg Cys Val Gly Ile Gly Asn Arg Asp Phe Val Glu Gly Leu Ser
1 5 10 15

Gly Ala Thr Trp Val Asp Val Val Leu Glu His Gly Ser Cys Val Thr
20 25 30

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Thr Met Ala Lys Asp Lys Pro Thr Leu Asp Ile Glu Leu Leu Lys Thr
        35                  40                  45

Glu Val Thr Asn Pro Ala Val Leu Arg Lys Leu Cys Ile Glu Ala Lys
    50                  55                  60

Ile Ser Asn Thr Thr Thr Asp Ser Arg Cys Pro Thr Gln Gly Glu Ala
65                  70                  75                  80

Thr Leu Val Glu Glu Gln Asp Ala Asn Phe Val Cys Arg Arg Thr Phe
                85                  90                  95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Ser
            100                 105                 110

Leu Ile Thr Cys Ala Lys Phe Lys Cys Val Thr Lys Leu Glu Gly Lys
        115                 120                 125

Ile Val Gln Tyr Glu Asn Leu Lys Tyr Ser Val Ile Val Thr Val His
    130                 135                 140

Thr Gly Asp Gln His Gln Val Gly Asn Glu Thr Thr Glu His Gly Thr
145                 150                 155                 160

Ile Ala Thr Ile Thr Pro Gln Ala Pro Thr Ser Glu Ile Gln Leu Thr
                165                 170                 175

Asp Tyr Gly Ala Leu Thr Leu Asp Cys Ser Pro Arg Thr Gly Leu Asp
            180                 185                 190

Phe Asn Glu Met Val Leu Leu Thr Met Lys Glu Lys Ser Trp Leu Val
        195                 200                 205

His Lys Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Thr Ser Gly Ala
    210                 215                 220

Ser Thr Pro Gln Glu Thr Trp Asn Arg Glu Asp Leu Leu Val Thr Phe
225                 230                 235                 240

Lys Thr Ala His Ala Lys Lys Gln Glu Val Ala Val Leu Gly Ser Gln
                245                 250                 255

Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Thr
            260                 265                 270

Ser Gly Thr Thr Lys Ile Phe Ala Gly His Leu Lys Cys Arg Leu Lys
        275                 280                 285

Met Asp Lys Leu Thr Leu Lys Gly Met Ser Tyr Val Met Cys Thr Gly
    290                 295                 300
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Ser Phe Lys Leu Glu Lys Glu Val Ala Glu Thr Gln His Gly Thr Val
305 310 315 320

Leu Val Gln Val Lys Tyr Glu Gly Thr Asp Ala Pro Cys Lys Ile Pro
325 330 335

Phe Ser Thr Gln Asp Glu Lys Gly Val Thr Gln Asn Gly Arg Leu Ile
340 345 350

Thr Ala Asn Pro Ile Val Thr Asp Lys Glu Lys Pro Val Asn Ile Glu
355 360 365

Ala Glu Pro Pro Phe Gly Glu Ser Tyr Ile Val Val Gly Ala Gly Glu
370 375 380

Lys Ala Leu Lys Leu Ser Trp Phe Lys Lys Gly Ser
385 390 395

<210> 35
<211> 396
<212> PRT
<213> Dengue virus

<400> 35
Met Arg Cys Val Gly Ile Gly Asn Arg Asp Phe Val Glu Gly Leu Ser
1 5 10 15

Gly Ala Thr Trp Val Asp Val Val Leu Glu His Gly Ser Cys Val Thr
20 25 30

Thr Met Ala Lys Asp Lys Pro Thr Leu Asp Ile Glu Leu Leu Lys Thr
35 40 45

Glu Val Thr Asn Pro Ala Val Leu Arg Lys Leu Cys Ile Glu Ala Lys
50 55 60

Ile Ser Asn Thr Thr Thr Asp Ser Arg Cys Pro Thr Gln Gly Glu Ala
65 70 75 80

Thr Leu Val Glu Glu Gln Asp Thr Asn Phe Val Cys Arg Arg Thr Phe
85 90 95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Ser
100 105 110

Leu Ile Thr Cys Ala Lys Phe Lys Cys Val Thr Lys Leu Glu Gly Lys
115 120 125

Ile Val Gln Tyr Glu Asn Leu Lys Tyr Ser Val Ile Val Thr Val His
130 135 140

Thr Gly Asp Gln His Gln Val Gly Asn Glu Thr Thr Glu His Gly Thr
145 150 155 160

```
Ile Ala Thr Ile Thr Pro Gln Ala Pro Thr Ser Glu Ile Gln Leu Thr
                165                 170                 175

Asp Tyr Gly Ala Leu Thr Leu Asp Cys Ser Pro Arg Thr Gly Leu Asp
            180                 185                 190

Phe Asn Glu Met Val Leu Leu Thr Met Lys Glu Lys Ser Trp Leu Val
        195                 200                 205

His Lys Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Thr Ser Gly Ala
    210                 215                 220

Ser Thr Ser Gln Glu Thr Trp Asn Arg Gln Asp Leu Leu Val Thr Phe
225                 230                 235                 240

Lys Thr Ala His Ala Lys Lys Gln Glu Val Val Val Leu Gly Ser Gln
                245                 250                 255

Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Thr
            260                 265                 270

Ser Gly Thr Thr Thr Ile Phe Ala Gly His Leu Lys Cys Arg Leu Lys
        275                 280                 285

Met Asp Lys Leu Thr Leu Lys Gly Met Ser Tyr Val Met Cys Thr Gly
    290                 295                 300

Pro Phe Lys Leu Glu Lys Glu Met Ala Glu Thr Gln His Gly Thr Val
305                 310                 315                 320

Leu Val Gln Val Lys Tyr Glu Gly Thr Asp Ala Pro Cys Lys Ile Pro
                325                 330                 335

Phe Ser Ser Gln Asp Glu Lys Gly Val Thr Gln Asn Gly Arg Leu Val
            340                 345                 350

Thr Ala Asn Pro Ile Val Thr Asp Lys Glu Lys Pro Ile Asn Ile Glu
        355                 360                 365

Ala Glu Pro Pro Phe Gly Glu Ser Tyr Ile Val Val Gly Ala Gly Glu
    370                 375                 380

Lys Ala Leu Lys Leu Ser Trp Phe Lys Lys Gly Ser
385                 390                 395
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<210> 36
<211> 396
<212> PRT
<213> Dengue virus

<400> 36

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Met Arg Cys Val Gly Ile Gly Asn Arg Asp Phe Val Glu Gly Leu Ser
1               5                  10                  15

Gly Ala Thr Trp Val Asp Val Val Leu Glu His Gly Ser Cys Val Thr
            20                  25                  30

Thr Met Ala Lys Asp Lys Pro Thr Leu Asp Ile Glu Leu Leu Lys Thr
        35                  40                  45

Glu Val Thr Asn Pro Ala Val Leu Arg Lys Leu Cys Ile Glu Ala Lys
    50                  55                  60

Ile Ser Asn Thr Thr Thr Asp Ser Arg Cys Pro Thr Gln Gly Glu Ala
65                  70                  75                  80

Thr Leu Val Glu Glu Gln Asp Thr Asn Phe Val Cys Arg Arg Thr Phe
                85                  90                  95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Ser
            100                 105                 110

Leu Ile Thr Cys Ala Lys Phe Lys Cys Val Thr Lys Leu Glu Gly Lys
        115                 120                 125

Ile Val Gln Tyr Glu Asn Leu Lys Tyr Ser Val Ile Val Thr Val His
    130                 135                 140

Thr Gly Asp Gln His Gln Val Gly Asn Glu Thr Thr Glu His Gly Thr
145                 150                 155                 160

Thr Ala Thr Ile Thr Pro Gln Ala Pro Thr Ser Glu Ile Gln Leu Thr
                165                 170                 175

Asp Tyr Gly Ala Leu Thr Leu Asp Cys Ser Pro Arg Thr Gly Leu Asp
            180                 185                 190

Phe Asn Glu Met Val Leu Leu Thr Met Glu Lys Lys Ser Trp Leu Val
        195                 200                 205

His Lys Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Thr Ser Gly Ala
    210                 215                 220

Ser Thr Ser Gln Glu Thr Trp Asn Arg Gln Asp Leu Leu Val Thr Phe
225                 230                 235                 240

Lys Thr Ala His Ala Lys Lys Gln Glu Val Val Val Leu Gly Ser Gln
                245                 250                 255

Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Thr
            260                 265                 270
```

Ser Gly Thr Thr Thr Ile Phe Ala Gly His Leu Lys Cys Arg Leu Lys
275 280 285

Met Asp Lys Leu Thr Leu Lys Gly Met Ser Tyr Val Met Cys Thr Gly
290 295 300

Ser Phe Lys Leu Glu Lys Glu Val Ala Glu Thr Gln His Gly Thr Val
305 310 315 320

Leu Val Gln Val Lys Tyr Glu Gly Thr Asp Ala Pro Cys Lys Ile Pro
325 330 335

Phe Ser Ser Gln Asp Glu Lys Gly Val Thr Gln Asn Gly Arg Leu Ile
340 345 350

Thr Ala Asn Pro Ile Val Thr Asp Lys Glu Lys Pro Val Asn Ile Glu
355 360 365

Ala Glu Pro Pro Phe Gly Glu Ser Tyr Ile Val Val Gly Ala Gly Glu
370 375 380

Lys Ala Leu Lys Leu Ser Trp Phe Lys Lys Gly Ser
385 390 395

<210> 37
<211> 396
<212> PRT
<213> Dengue virus

<400> 37
Met Arg Cys Val Gly Ile Gly Ser Arg Asp Phe Val Glu Gly Leu Ser
1 5 10 15

Gly Ala Thr Trp Val Asp Val Val Leu Glu His Gly Ser Cys Val Thr
20 25 30

Thr Met Ala Lys Asp Lys Pro Thr Leu Asp Ile Glu Leu Leu Lys Thr
35 40 45

Glu Val Thr Asn Pro Ala Val Leu Arg Lys Leu Cys Ile Glu Ala Lys
50 55 60

Ile Ser Asn Thr Thr Thr Asp Ser Arg Cys Pro Thr Gln Gly Glu Ala
65 70 75 80

Thr Leu Val Glu Glu Gln Asp Ala Asn Phe Val Cys Arg Arg Thr Phe
85 90 95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Ser
100 105 110

Leu Ile Thr Cys Ala Lys Phe Lys Cys Val Thr Lys Leu Glu Gly Lys
115 120 125

```
Ile Val Gln Tyr Glu Asn Leu Lys Tyr Ser Val Ile Val Thr Val His
    130                 135                 140

Thr Gly Asp Gln His Gln Val Gly Asn Glu Ser Thr Glu His Gly Thr
145                 150                 155                 160

Thr Ala Thr Ile Thr Pro Gln Ala Pro Thr Thr Glu Ile Gln Leu Thr
                165                 170                 175

Asp Tyr Gly Ala Leu Thr Leu Asp Cys Ser Pro Arg Thr Gly Leu Asp
            180                 185                 190

Phe Asn Glu Met Val Leu Leu Thr Met Lys Glu Lys Ser Trp Leu Val
        195                 200                 205

His Lys Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Thr Ser Gly Ala
    210                 215                 220

Ser Thr Ser Gln Glu Thr Trp Asn Arg Gln Asp Leu Leu Val Thr Phe
225                 230                 235                 240

Lys Thr Ala His Ala Lys Lys Gln Glu Val Val Val Leu Gly Ser Gln
                245                 250                 255

Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Thr
            260                 265                 270

Ser Gly Thr Thr Thr Ile Phe Ala Gly His Leu Lys Cys Arg Leu Lys
        275                 280                 285

Met Asp Lys Leu Thr Leu Lys Gly Met Ser Tyr Val Met Cys Thr Gly
    290                 295                 300

Ser Phe Lys Leu Glu Lys Glu Val Ala Glu Thr Gln His Gly Thr Val
305                 310                 315                 320

Leu Val Gln Ile Lys Tyr Glu Gly Thr Asp Ala Pro Cys Lys Ile Pro
                325                 330                 335

Phe Ser Thr Gln Asp Glu Lys Gly Val Thr Gln Asn Gly Arg Leu Ile
            340                 345                 350

Thr Ala Asn Pro Ile Val Thr Asp Lys Glu Lys Pro Val Asn Ile Glu
        355                 360                 365

Ala Glu Pro Pro Phe Gly Glu Ser Tyr Ile Val Ile Gly Ala Gly Glu
    370                 375                 380

Lys Ala Leu Lys Leu Ser Trp Phe Lys Lys Gly Ser
385                 390                 395
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<210> 38
<211> 396
<212> PRT
<213> Dengue virus

<400> 38

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Met Arg Cys Val Gly Ile Gly Ser Arg Asp Phe Val Glu Gly Leu Ser
1               5                  10                  15

Gly Ala Thr Trp Val Asp Val Val Leu Glu His Gly Ser Cys Val Thr
            20                  25                  30

Thr Met Ala Lys Asp Lys Pro Thr Leu Asp Ile Glu Leu Leu Lys Thr
        35                  40                  45

Glu Val Thr Asn Pro Ala Val Leu Arg Lys Leu Cys Ile Glu Ala Lys
    50                  55                  60

Ile Ser Asn Thr Thr Thr Asp Ser Arg Cys Pro Thr Gln Gly Glu Ala
65                  70                  75                  80

Thr Leu Val Glu Glu Gln Asp Ala Asn Phe Val Cys Arg Arg Thr Phe
                85                  90                  95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Ser
            100                 105                 110

Leu Ile Thr Cys Ala Lys Phe Lys Cys Val Thr Lys Leu Glu Gly Lys
        115                 120                 125

Ile Val Gln Tyr Glu Asn Leu Lys Tyr Ser Val Ile Val Thr Val His
    130                 135                 140

Thr Gly Asp Gln His Gln Val Gly Asn Glu Ser Thr Glu His Gly Thr
145                 150                 155                 160

Thr Ala Thr Ile Thr Pro Gln Ala Pro Thr Thr Glu Ile Gln Leu Thr
                165                 170                 175

Asp Tyr Gly Ala Leu Thr Leu Asp Cys Ser Pro Arg Thr Gly Leu Asp
            180                 185                 190

Phe Asn Glu Met Val Leu Leu Thr Met Lys Glu Lys Ser Trp Leu Val
        195                 200                 205

His Lys Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Thr Ser Gly Ala
    210                 215                 220

Ser Thr Ser Gln Glu Thr Trp Asn Arg Gln Asp Leu Leu Val Thr Phe
225                 230                 235                 240
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Lys Thr Ala His Ala Lys Lys Gln Glu Val Val Val Leu Gly Ser Gln
245 250 255

Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Thr
260 265 270

Ser Gly Thr Thr Thr Ile Phe Ala Gly His Leu Lys Cys Arg Leu Lys
275 280 285

Met Asp Lys Leu Thr Leu Lys Gly Met Ser Tyr Val Met Cys Thr Gly
290 295 300

Ser Phe Lys Leu Glu Lys Glu Val Ala Glu Thr Gln His Gly Thr Val
305 310 315 320

Leu Val Gln Ile Lys Tyr Glu Gly Thr Asp Ala Pro Cys Lys Ile Pro
325 330 335

Phe Leu Thr Gln Asp Glu Lys Gly Val Thr Gln Asn Gly Arg Leu Ile
340 345 350

Thr Ala Asn Pro Ile Val Thr Asp Lys Glu Lys Pro Val Asn Ile Glu
355 360 365

Ala Glu Pro Pro Phe Gly Glu Ser Tyr Ile Val Ile Gly Ala Gly Glu
370 375 380

Lys Ala Leu Lys Leu Ser Trp Phe Lys Lys Gly Ser
385 390 395

<210> 39
<211> 394
<212> PRT
<213> Dengue virus

<400> 39
Met Arg Cys Val Gly Val Gly Asn Arg Asp Phe Val Glu Gly Leu Ser
1 5 10 15

Gly Ala Thr Trp Val Asp Val Val Leu Glu His Gly Gly Cys Val Thr
20 25 30

Thr Met Ala Lys Asn Lys Pro Thr Leu Asp Ile Glu Leu Gln Lys Thr
35 40 45

Glu Ala Thr Gln Leu Ala Thr Leu Arg Lys Leu Cys Ile Glu Gly Lys
50 55 60

Ile Thr Asn Ile Thr Thr Asp Ser Arg Cys Pro Thr Gln Gly Glu Ala
65 70 75 80

Ile Leu Pro Glu Glu Gln Asp Gln Asn Tyr Val Cys Lys His Thr Tyr
85 90 95

```
Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Ser
            100                 105                 110

Leu Val Thr Cys Ala Lys Phe Gln Cys Leu Glu Ser Ile Glu Gly Lys
        115                 120                 125

Val Val Gln His Glu Asn Leu Lys Tyr Thr Val Ile Ile Thr Val His
    130                 135                 140

Thr Gly Asp Gln His Gln Val Gly Asn Glu Thr Gln Gly Val Thr Ala
145                 150                 155                 160

Glu Ile Thr Ser Gln Ala Ser Thr Ala Glu Ala Ile Leu Pro Glu Tyr
                165                 170                 175

Gly Thr Leu Gly Leu Glu Cys Ser Pro Arg Thr Gly Leu Asp Phe Asn
            180                 185                 190

Glu Met Ile Leu Leu Thr Met Lys Asn Lys Ala Trp Met Val His Arg
        195                 200                 205

Gln Trp Phe Phe Asp Leu Pro Leu Pro Trp Thr Ser Gly Ala Thr Thr
    210                 215                 220

Lys Thr Pro Thr Trp Asn Arg Lys Glu Leu Leu Val Thr Phe Lys Asn
225                 230                 235                 240

Ala His Ala Lys Lys Gln Glu Val Val Val Leu Gly Ser Gln Glu Gly
                245                 250                 255

Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Thr Ser Gly
            260                 265                 270

Gly Thr Ser Ile Phe Ala Gly His Leu Lys Cys Arg Leu Lys Met Asp
        275                 280                 285

Lys Leu Lys Leu Lys Gly Met Ser Tyr Ala Met Cys Leu Asn Thr Phe
    290                 295                 300

Val Leu Lys Lys Glu Val Ser Glu Thr Gln His Gly Thr Ile Leu Ile
305                 310                 315                 320

Lys Val Glu Tyr Lys Gly Glu Asp Ala Pro Cys Lys Ile Pro Phe Ser
                325                 330                 335

Thr Glu Asp Gly Gln Gly Lys Ala His Asn Gly Arg Leu Ile Thr Ala
            340                 345                 350

Asn Pro Val Val Thr Lys Lys Glu Glu Pro Val Asn Ile Glu Ala Glu
        355                 360                 365
```

Pro Pro Phe Gly Glu Ser Asn Ile Val Ile Gly Ile Gly Asp Lys Ala
370 375 380

Leu Lys Ile Asn Trp Tyr Arg Lys Gly Ser
385 390

<210> 40
<211> 396
<212> PRT
<213> Dengue virus

<400> 40
Met Arg Cys Ile Gly Ile Ser Asn Arg Asp Phe Val Glu Gly Val Ser
1 5 10 15

Gly Gly Ser Trp Val Asp Ile Val Leu Glu His Gly Ser Cys Val Thr
20 25 30

Thr Met Ala Lys Asn Lys Pro Thr Leu Asp Phe Glu Leu Ile Lys Thr
35 40 45

Glu Ala Lys Gln Pro Ala Thr Leu Arg Lys Tyr Cys Ile Glu Ala Lys
50 55 60

Leu Thr Asn Thr Thr Thr Asp Ser Arg Cys Pro Thr Gln Gly Glu Pro
65 70 75 80

Ser Leu Asn Glu Glu Gln Asp Lys Arg Phe Val Cys Lys His Ser Met
85 90 95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Gly
100 105 110

Ile Val Thr Cys Ala Met Phe Thr Cys Lys Lys Asn Met Lys Gly Lys
115 120 125

Val Val Gln Pro Glu Asn Leu Glu Tyr Thr Ile Val Ile Thr Pro His
130 135 140

Ser Gly Glu Glu His Ala Val Gly Asn Asp Thr Gly Lys His Gly Lys
145 150 155 160

Glu Ile Lys Ile Thr Pro Gln Ser Ser Ile Thr Glu Ala Glu Leu Thr
165 170 175

Gly Tyr Gly Thr Val Thr Met Glu Cys Ser Pro Arg Thr Gly Leu Asp
180 185 190

Phe Asn Glu Met Val Leu Leu Gln Met Glu Asn Lys Ala Trp Leu Val
195 200 205

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His Arg Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Leu Pro Gly Ala
    210                 215                 220

Asp Thr Gln Gly Ser Asn Trp Ile Gln Lys Glu Thr Leu Val Thr Phe
225                 230                 235                 240

Lys Asn Pro His Ala Lys Lys Gln Asp Val Val Val Leu Gly Ser Gln
                245                 250                 255

Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Met
            260                 265                 270

Ser Ser Gly Asn Leu Leu Phe Thr Gly His Leu Lys Cys Arg Leu Arg
        275                 280                 285

Met Asp Lys Leu Gln Leu Lys Gly Met Ser Tyr Ser Met Cys Thr Gly
    290                 295                 300

Lys Phe Lys Val Val Lys Glu Ile Ala Glu Thr Gln His Gly Thr Ile
305                 310                 315                 320

Val Ile Arg Val Gln Tyr Glu Gly Asp Gly Ser Pro Cys Lys Ile Pro
                325                 330                 335

Phe Glu Ile Met Asp Leu Glu Lys Arg His Val Leu Gly Arg Leu Ile
            340                 345                 350

Thr Val Asn Pro Ile Val Thr Glu Lys Asp Ser Pro Val Asn Ile Glu
        355                 360                 365

Ala Glu Pro Pro Phe Gly Asp Ser Tyr Ile Ile Ile Gly Val Glu Pro
    370                 375                 380

Gly Gln Leu Lys Leu Asn Trp Phe Lys Lys Gly Ser
385                 390                 395


<210> 41
<211> 395
<212> PRT
<213> Dengue virus

<400> 41
Met Arg Cys Val Gly Val Gly Asn Arg Asp Phe Val Glu Gly Val Ser
1               5                   10                  15

Gly Gly Ala Trp Val Asp Leu Val Leu Glu His Gly Gly Cys Val Thr
            20                  25                  30

Thr Met Ala Gln Gly Lys Pro Thr Leu Asp Phe Glu Leu Ile Lys Thr
        35                  40                  45

Thr Ala Lys Glu Val Ala Leu Leu Arg Thr Tyr Cys Ile Glu Ala Ser
    50                  55                  60
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Ile Ser Asn Ile Thr Thr Ala Thr Arg Cys Pro Thr Gln Gly Glu Pro
65                  70                  75                  80

Tyr Leu Lys Glu Glu Gln Asp Gln Gln Tyr Ile Cys Arg Arg Asp Val
                85                  90                  95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Gly
            100                 105                 110

Val Val Thr Cys Ala Lys Phe Ser Cys Ser Gly Lys Ile Thr Gly Asn
        115                 120                 125

Leu Val Gln Ile Glu Asn Leu Glu Tyr Thr Val Val Val Thr Val His
    130                 135                 140

Asn Gly Asp Thr His Ala Val Gly Asn Asp Ile Pro Asn His Gly Val
145                 150                 155                 160

Thr Ala Thr Ile Thr Pro Arg Ser Pro Ser Val Glu Val Lys Leu Pro
                165                 170                 175

Asp Tyr Gly Glu Leu Thr Leu Asp Cys Glu Pro Arg Ser Gly Ile Asp
            180                 185                 190

Phe Asn Glu Met Ile Leu Met Lys Met Lys Lys Lys Thr Trp Leu Val
        195                 200                 205

His Lys Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Ala Ala Gly Ala
    210                 215                 220

Asp Thr Ser Glu Val His Trp Asn Tyr Lys Glu Arg Met Val Thr Phe
225                 230                 235                 240

Lys Val Pro His Ala Lys Arg Gln Asp Val Thr Val Leu Gly Ser Gln
                245                 250                 255

Glu Gly Ala Met His Ser Ala Leu Thr Gly Ala Thr Glu Val Asp Ser
            260                 265                 270

Gly Asp Gly Asn His Met Phe Ala Gly His Leu Lys Cys Lys Val Arg
        275                 280                 285

Met Glu Lys Leu Arg Ile Lys Gly Met Ser Tyr Thr Met Cys Ser Gly
    290                 295                 300

Lys Phe Ser Ile Asp Lys Glu Met Ala Glu Thr Gln His Gly Thr Thr
305                 310                 315                 320

Val Val Lys Val Lys Tyr Glu Gly Ala Gly Ala Pro Cys Lys Val Pro
                325                 330                 335
```

Ile Glu Ile Arg Asp Val Asn Lys Glu Lys Val Gly Arg Ile Ile Ser
340 345 350

Ser Thr Pro Phe Ala Glu Tyr Thr Asn Ser Val Thr Asn Ile Glu Leu
355 360 365

Glu Pro Pro Phe Gly Asp Ser Tyr Ile Val Ile Gly Val Gly Asp Ser
370 375 380

Ala Leu Thr Leu His Trp Phe Arg Lys Gly Ser
385 390 395

<210> 42
<211> 402
<212> PRT
<213> West nile virus

<400> 42
Phe Asn Cys Leu Gly Met Ser Asn Arg Asp Phe Leu Glu Gly Val Ser
1 5 10 15

Gly Ala Thr Trp Val Asp Leu Val Leu Glu Gly Asp Ser Cys Val Thr
20 25 30

Ile Met Ser Lys Asp Lys Pro Thr Ile Asp Val Lys Met Met Asn Met
35 40 45

Glu Ala Ala Asn Leu Ala Glu Val Arg Ser Tyr Cys Tyr Leu Ala Thr
50 55 60

Val Ser Asp Leu Ser Thr Lys Ala Ala Cys Pro Thr Met Gly Glu Ala
65 70 75 80

His Asn Asp Lys Arg Ala Asp Pro Ala Phe Val Cys Arg Gln Gly Val
85 90 95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Ser
100 105 110

Ile Asp Thr Cys Ala Lys Phe Ala Cys Ser Thr Lys Ala Ile Gly Arg
115 120 125

Thr Ile Leu Lys Glu Asn Ile Lys Tyr Glu Val Ala Ile Phe Val His
130 135 140

Gly Pro Thr Thr Val Glu Ser His Gly Asn Tyr Ser Thr Gln Val Gly
145 150 155 160

Ala Thr Gln Ala Gly Arg Leu Ser Ile Thr Pro Ala Ala Pro Ser Tyr
165 170 175

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Thr Leu Lys Leu Gly Glu Tyr Gly Glu Val Thr Val Asp Cys Glu Pro
            180                 185                 190

Arg Ser Gly Ile Asp Thr Asn Ala Tyr Tyr Val Met Thr Val Gly Thr
        195                 200                 205

Lys Thr Phe Leu Val His Arg Glu Trp Phe Met Asp Leu Asn Leu Pro
    210                 215                 220

Trp Ser Ser Ala Gly Ser Thr Val Trp Arg Asn Arg Glu Thr Leu Met
225                 230                 235                 240

Glu Phe Glu Glu Pro His Ala Thr Lys Gln Ser Val Ile Ala Leu Gly
                245                 250                 255

Ser Gln Glu Gly Ala Leu His Gln Ala Leu Ala Gly Ala Ile Pro Val
            260                 265                 270

Glu Phe Ser Ser Asn Thr Val Lys Leu Thr Ser Gly His Leu Lys Cys
        275                 280                 285

Arg Val Lys Met Glu Lys Leu Gln Leu Lys Gly Thr Thr Tyr Gly Val
    290                 295                 300

Cys Ser Lys Ala Phe Lys Phe Leu Gly Thr Pro Ala Asp Thr Gly His
305                 310                 315                 320

Gly Thr Val Val Leu Glu Leu Gln Tyr Thr Gly Thr Asp Gly Pro Cys
                325                 330                 335

Lys Val Pro Ile Ser Ser Val Ala Ser Leu Asn Asp Leu Thr Pro Val
            340                 345                 350

Gly Arg Leu Val Thr Val Asn Pro Phe Val Ser Val Ala Thr Ala Asn
        355                 360                 365

Ala Lys Val Leu Ile Glu Leu Glu Pro Pro Phe Gly Asp Ser Tyr Ile
    370                 375                 380

Val Val Gly Arg Gly Glu Gln Gln Ile Asn His His Trp His Lys Ser
385                 390                 395                 400

Gly Ser
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