SEQUENCE LISTING

<110> Florida Gulf Coast University
Isern, Sharon
Michael, Scott F.

<120> VACCINES AND METHODS FOR CREATING A VACCINE FOR INDUCING IMMUNITY TO ALL DENGUE VIRUS SEROTYPES

<130> 202455.00056

<150> US 61/550,982
<151> 2011-10-25

<160> 5

<170> PatentIn version 3.5

<210> 1
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<212> PRT
<213> Flavivirus yellow fever virus

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Ala His Cys Ile Gly Ile Thr Asp Arg Asp Phe Ile Glu Gly Val His
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Gly Gly Thr Trp Val Ser Ala Thr Leu Glu Gln Asp Lys Cys Val Thr
20 25 30

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

Ala Ile Asp Arg Pro Ala Glu Val Arg Lys Val Cys Tyr Asn Ala Val
50 55 60

Leu Thr His Val Lys Ile Asn Asp Lys Cys Pro Ser Thr Gly Glu Ala
65 70 75 80

His Leu Ala Glu Glu Asn Glu Gly Asp Asn Ala Cys Lys Arg Thr Tyr
85 90 95

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

Ile Val Ala Cys Ala Lys Phe Thr Cys Ala Lys Ser Met Ser Leu Phe
115 120 125

Glu Val Asp Gln Thr Lys Ile Gln Tyr Val Ile Arg Ala Gln Leu His
130 135 140

Val Gly Ala Lys Gln Glu Asn Trp Asn Thr Asp Ile Lys Thr Leu Lys
145 150 155 160

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Phe Asp Ala Leu Ser Gly Ser Gln Glu Val Glu Phe Ile Gly Tyr Gly
                165                 170                 175

Lys Ala Thr Leu Glu Cys Gln Val Gln Thr Ala Val Asp Phe Gly Asn
            180                 185                 190

Ser Tyr Ile Ala Glu Met Glu Thr Glu Ser Trp Ile Val Asp Arg Gln
        195                 200                 205

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

Trp Arg Glu Met His His Leu Val Glu Phe Glu Pro Pro His Ala Ala
225                 230                 235                 240

Thr Ile Arg Val Leu Ala Leu Gly Asn Gln Glu Gly Ser Leu Lys Thr
                245                 250                 255

Ala Leu Thr Gly Ala Met Arg Val Thr Lys Asp Thr Asn Asp Asn Asn
            260                 265                 270

Leu Tyr Lys Leu His Gly Gly His Val Ser Cys Arg Val Lys Leu Ser
        275                 280                 285

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

Phe Phe Val Lys Asn Pro Thr Asp Thr Gly His Gly Thr Val Val Met
305                 310                 315                 320

Gln Val Lys Val Ser Lys Gly Ala Pro Cys Arg Ile Pro Val Ile Val
                325                 330                 335

Ala Asp Asp Leu Thr Ala Ala Ile Asn Lys Gly Ile Leu Val Thr Val
            340                 345                 350

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

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

Leu Thr Tyr Gln Trp His Lys Glu Gly Ser Ser Ile Gly Lys Leu Phe
385                 390                 395                 400

Thr Gln Thr Met Lys Gly Val Glu Arg Leu Ala Val Met Gly Asp Thr
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405 410 415

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

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

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

Gly Val Ile Met Met Phe Leu Ser Leu Gly Val Gly Ala
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<210> 2
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<212> PRT
<213> Flavivirus dengue virus

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<222> (171)..(171)
<223> Xaa can be any naturally occurring amino acid

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Met Arg Cys Val Gly Ile Gly Ser Arg Asp Phe Val Glu Gly Leu Ser
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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

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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 Xaa 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
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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
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Ala Val Gly Leu Val Thr Leu Tyr Leu Gly Val Met Val Gln Ala
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Met Arg Cys Ile Gly Ile Ser Asn Arg Asp Phe Val Glu Gly Val Ser
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Gly Gly Ser Trp Val Asp Ile Val Leu Glu His Gly Ser Cys Val Thr
            20                  25                  30
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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 Glu 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 Glu Gly Lys
        115                 120                 125

Xaa 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 Xaa Lys Ala Trp Leu Val
        195                 200                 205

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
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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 Xaa 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 Ser Ile Gly Gln
385 390 395 400

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

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

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

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

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

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

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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

Xaa 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 Pro Ile Glu Gly Lys
        115                 120                 125

Val Val Gln Tyr 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 Pro Gln Ala Ser Thr Thr 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
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210 215 220

Glu 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 Asn 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 Glu Leu Lys Gly Met Ser Tyr Ala Met Cys Thr 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 Xaa 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 Asn Ala
370 375 380

Leu Lys Ile Asn Trp Tyr Lys Lys Gly Ser Ser Ile Gly Lys Met Phe
385 390 395 400

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

Ala Trp Asp Phe Gly Ser Val Gly Gly Val Leu Asn Ser Leu Gly Lys
420 425 430

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

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

Gly Leu Asn Ser Lys Asn Thr Ser Met Ser Phe Ser Cys Ile Ala Ile
465 470 475 480

Gly Ile Ile Thr Leu Tyr Leu Gly Ala Val Val Gln Ala
485 490

<210> 5
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<213> Flavivirus dengue virus

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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 Thr Lys Thr
35 40 45

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

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 Thr Ser 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

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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 Thr 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 Ala 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 Val Gly Arg Val Ile
            340                 345                 350

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

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

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

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

Glu Thr Ala Trp Asp Phe Gly Ser Val Gly Gly Leu Phe Thr Ser Leu
            420                 425                 430

Gly Lys Ala Val His Gln Val Phe Gly Ser Val Tyr Thr Thr Met Phe
        435                 440                 445
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Gly Gly Val Ser Trp Met Ile Arg Ile Leu Ile Gly Phe Leu Val Leu
    450                 455                 460

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

Ala Val Gly Gly Ile Thr Leu Phe Leu Gly Phe Thr Val Gln Ala
                485                 490                 495
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