SEQUENCE LISTING

<110> The Trustees of the University of Pennsylvania
June, Carl H
Porter, David L
Kalos, Michael
Levine, Bruce L

<120> USE OF CHIMERIC ANTIGEN RECEPTOR-MODIFIED T CELLS TO TREAT CANCER

<130> 46483-6001-00-WO.601218

<150> 61/421,470
<151> 2010-12-09

<150> 61/502,649
<151> 2010-06-29

<160> 27

<170> PatentIn version 3.5

<210> 1
<211> 9174
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 1
gcgcgctcac tggccgtcgt tttacaacgt cgtgactggg aaaaccctgg cgttacccaa 60

cttaatcgcc ttgcagcaca tccccctttc gccagctggc gtaatagcga agaggcccgc 120

accgatcgcc cttcccaaca gttgcgcagc ctgaatggcg aatgggacgc gccctgtagc 180

ggcgcattaa gcgcggcggg tgtggtggtt acgcgcagcg tgaccgctac acttgccagc 240

gccctagcgc ccgctccttt cgctttcttc ccttcctttc tcgccacgtt cgccggcttt 300

ccccgtcaag ctctaaatcg ggggctccct ttagggttcc gatttagtgc tttacggcac 360

ctcgacccca aaaaacttga ttagggtgat ggttcacgta gtgggccatc gccctgatag 420

acggtttttc gccctttgac gttggagtcc acgttcttta atagtggact cttgttccaa 480

actggaacaa cactcaaccc tatctcggtc tattcttttg atttataagg gattttgccg 540

atttcggcct attggttaaa aaatgagctg atttaacaaa aatttaacgc gaattttaac 600

aaaatattaa cgcttacaat ttaggtggca cttttcgggg aaatgtgcgc ggaacccctа 660

tttgtttatt tttctaaata cattcaaata tgtatccgct catgagacaa taaccctgat 720

aaatgcttca ataatattga aaaaggaaga gtatgagtat tcaacatttc cgtgtcgccc 780

ttattccctt ttttgcggca ttttgccttc ctgtttttgc tcacccagaa acgctggtga 840

aagtaaaaga tgctgaagat cagttgggtg cacgagtggg ttacatcgaa ctggatctca 900

acagcggtaa gatccttgag agttttcgcc ccgaagaacg ttttccaatg atgagcactt 960

ttaaagttct gctatgtggc gcggtattat cccgtattga cgccgggcaa gagcaactcg 1020

gtcgccgcat acactattct cagaatgact tggttgagta ctcaccagtc acagaaaagc 1080

atcttacgga tggcatgaca gtaagagaat tatgcagtgc tgccataacc atgagtgata 1140

acactgcggc caacttactt ctgacaacga tcggaggacc gaaggagcta accgcttttt 1200

tgcacaacat gggggatcat gtaactcgcc ttgatcgttg ggaaccggag ctgaatgaag 1260

ccataccaaa cgacgagcgt gacaccacga tgcctgtagc aatggcaaca acgttgcgca 1320

aactattaac tggcgaacta cttactctag cttcccggca acaattaata gactggatgg 1380

aggcggataa agttgcagga ccacttctgc gctcggccct tccggctggc tggtttattg 1440

ctgataaatc tggagccggt gagcgtgggt ctcgcggtat cattgcagca ctggggccag 1500

atggtaagcc ctcccgtatc gtagttatct acacgacggg gagtcaggca actatggatg 1560

aacgaaatag acagatcgct gagataggtg cctcactgat taagcattgg taactgtcag 1620

accaagttta ctcatatata ctttagattg atttaaaact tcatttttaa tttaaaagga 1680

tctaggtgaa gatccttttt gataatctca tgaccaaaat cccttaacgt gagttttcgt 1740

tccactgagc gtcagacccc gtagaaaaga tcaaaggatc ttcttgagat cctttttttc 1800

tgcgcgtaat ctgctgcttg caaacaaaaa aaccaccgct accagcggtg gtttgtttgc 1860

cggatcaaga gctaccaact ctttttccga aggtaactgg cttcagcaga gcgcagatac 1920

caaatactgt tcttctagtg tagccgtagt taggccacca cttcaagaac tctgtagcac 1980

cgcctacata cctcgctctg ctaatcctgt taccagtggc tgctgccagt ggcgataagt 2040

cgtgtcttac cgggttggac tcaagacgat agttaccgga taaggcgcag cggtcgggct 2100

gaacgggggg ttcgtgcaca gcccagct tggagcgaac gacctacacc gaactgagat 2160

acctacagcg tgagctatga gaaagcgcca cgcttcccga agggagaaag gcggacaggt 2220

atccggtaag cggcagggtc ggaacaggag agcgcacgag ggagcttcca gggggaaacg 2280

cctggtatct ttatagtcct gtcgggtttc gccacctctg acttgagcgt cgatttttgt 2340

gatgctcgtc agggggggcgg agcctatgga aaaacgccag caacgcggcc tttttacggt 2400

tcctggcctt ttgctggcct tttgctcaca tgttctttcc tgcgttatcc cctgattctg 2460

tggataaccg tattaccgcc tttgagtgag ctgataccgc tcgccgcagc cgaacgaccg 2520

agcgcagcga gtcagtgagc gaggaagcgg aagagcgccc aatacgcaaa ccgcctctcc 2580

ccgcgcgttg gccgattcat taatgcagct ggcacgacag gtttcccgac tggaaagcgg 2640

gcagtgagcg caacgcaatt aatgtgagtt agctcactca ttaggcaccc caggctttac 2700

actttatgct tccggctcgt atgttgtgtg gaattgtgag cggataacaa tttcacacag 2760

gaaacagcta tgaccatgat tacgccaagc gcgcaattaa ccctcactaa agggaacaaa 2820

agctggagct gcaagcttaa tgtagtctta tgcaatactc ttgtagtctt gcaacatggt 2880

aacgatgagt tagcaacatg ccttacaagg agagaaaaag caccgtgcat gccgattggt 2940

ggaagtaagg tggtacgatc gtgccttatt aggaaggcaa cagacgggtc tgacatggat 3000

tggacgaacc actgaattgc cgcattgcag agatattgta tttaagtgcc tagctcgata 3060

cataaacggg tctctctggt tagaccagat ctgagcctgg gagctctctg gctaactagg 3120

gaacccactg cttaagcctc aataaagctt gccttgagtg cttcaagtag tgtgtgcccg 3180

tctgttgtgt gactctggta actagagatc cctcagaccc ttttagtcag tgtggaaaat 3240

ctctagcagt ggcgcccgaa cagggacttg aaagcgaaag ggaaaccaga ggagctctct 3300

cgacgcagga ctcggcttgc tgaagcgcgc acggcaagag gcgaggggcg gcgactggtg 3360

agtacgccaa aaattttgac tagcggaggc tagaaggaga gagatgggtg cgagagcgtc 3420

agtattaagc gggggagaat tagatcgcga tgggaaaaaa ttcggttaag gccaggggga 3480

aagaaaaaat ataaattaaa acatatagta tgggcaagca gggagctaga acgattcgca 3540

gttaatcctg gcctgttaga aacatcagaa ggctgtagac aaatactggg acagctacaa 3600

ccatcccttc agacaggatc agaagaactt agatcattat ataatacagt agcaaccctc 3660

tattgtgtgc atcaaaggat agagataaaa gacaccaagg aagctttaga caagatagag 3720

gaagagcaaa acaaaagtaa gaccaccgca cagcaagcgg ccgctgatct tcagacctgg 3780

aggaggagat atgagggaca attggagaag tgaattatat aaatataaag tagtaaaaat 3840

tgaaccatta ggagtagcac ccaccaaggc aaagagaaga gtggtgcaga gagaaaaaag 3900

agcagtggga ataggagctt tgttccttgg gttcttggga gcagcaggaa gcactatggg 3960

cgcagcgtca atgacgctga cggtacaggc cagacaatta ttgtctggta tagtgcagca 4020

gcagaacaat ttgctgaggg ctattgaggc gcaacagcat ctgttgcaac tcacagtctg 4080

gggcatcaag cagctccagg caagaatcct ggctgtggaa agatacctaa aggatcaaca 4140

gctcctgggg atttggggtt gctctggaaa actcatttgc accactgctg tgccttggaa 4200

tgctagttgg agtaataaat ctctggaaca gatttggaat cacacgacct ggatggagtg 4260

ggacagagaa attaacaatt acacaagctt aatacactcc ttaattgaag aatcgcaaaa 4320

ccagcaagaa aagaatgaac aagaattatt ggaattagat aaatgggcaa gtttgtggaa 4380

ttggtttaac ataacaaatt ggctgtggta tataaaatta ttcataatga tagtaggagg 4440

cttggtaggt ttaagaatag tttttgctgt actttctata gtgaatagag ttaggcaggg 4500

atattcacca ttatcgtttc agacccacct cccaaccccg aggggacccg acaggcccga 4560

aggaatagaa gaagaaggtg gagagagaga cagagacaga tccattcgat tagtgaacgg 4620

atctcgacgg tatcgattag actgtagccc aggaatatgg cagctagatt gtacacattt 4680

agaaggaaaa gttatcttgg tagcagttca tgtagccagt ggatatatag aagcagaagt 4740

aattccagca gagacagggc aagaaacagc atacttcctc ttaaaattag caggaagatg 4800

gccagtaaaa acagtacata cagacaatgg cagcaatttc accagtacta cagttaaggc 4860

cgcctgttgg tgggcgggga tcaagcagga atttggcatt ccctacaatc cccaaagtca 4920

aggagtaata gaatctatga ataaagaatt aaagaaaatt ataggacagg taagagatca 4980

ggctgaacat cttaagacag cagtacaaat ggcagtattc atccacaatt ttaaaagaaa 5040

agggggggatt ggggggtaca gtgcagggga aagaatagta gacataatag caacagacat 5100

acaaactaaa gaattacaaa aacaaattac aaaaattcaa aattttcggg tttattacag 5160

ggacagcaga gatccagttt ggctgcattg atcacgtgag gctccggtgc ccgtcagtgg 5220

gcagagcgca catcgcccac agtccccgag aagttggggg gaggggtcgg caattgaacc 5280

ggtgcctaga gaaggtggcg cggggtaaac tgggaaagtg atgtcgtgta ctggctccgc 5340

ctttttcccg agggtggggg agaaccgtat ataagtgcag tagtcgccgt gaacgttctt 5400

tttcgcaacg ggtttgccgc cagaacacag gtaagtgccg tgtgtggttc ccgcgggcct 5460

ggcctctttа cgggttatgg ccccttgcgtg ccttgaatta cttccacctg gctgcagtac 5520

gtgattcttg atcccgagct tcgggttgga agtgggtggg agagttcgag gccttgcgct 5580

taaggagccc cttcgcctcg tgcttgagtt gaggcctggc ctgggcgctg gggccgccgc 5640

gtgcgaatct ggtggcacct tcgcgcctgt ctcgctgctt tcgataagtc tctagccatt 5700

taaaattttt gatgacctgc tgcgacgctt ttttttctggc aagatagtct tgtaaatgcg 5760

ggccaagatc tgcacactgg tatttcggtt tttggggccg cgggcggcga cggggcccgt 5820

gcgtcccagc gcacatgttc ggcgaggcgg ggcctgcgag cgcggccacc gagaatcgga 5880

cggggtagt ctcaagctgg ccggcctgct ctggtgcctg gcctcgcgcc gccgtgtatc 5940

gccccgccct gggcggcaag gctggcccgg tcggcaccag ttgcgtgagc ggaaagatgg 6000

ccgcttcccg gccctgctgc agggagctca aaatggagga cgcggcgctc gggagagcgg 6060

gcgggtgagt cacccacaca aaggaaaagg gcctttccgt cctcagccgt cgcttcatgt 6120

gactccactg agtaccgggc gccgtccagg cacctcgatt agttctcgag cttttggagt 6180

acgtcgtctt taggttgggg ggaggggttt tatgcgatgg agtttcccca cactgagtgg 6240

gtggagactg aagttaggcc agcttggcac ttgatgtaat tctccttgga atttgccctt 6300

tttgagtttg gatcttggtt cattctcaag cctcagacag tggttcaaag tttttttctt 6360

ccatttcagg tgtcgtgatc tagaggatcc atggccttac cagtgaccgc cttgctcctg 6420

ccgctggcct tgctgctcca cgccgccagg ccggacatcc agatgacaca gactacatcc 6480

tccctgtctg cctctctggg agacagagtc accatcagtt gcagggcaag tcaggacatt 6540

agtaaatatt taaattggta tcagcagaaa ccagatggaa ctgttaaact cctgatctac 6600

catacatcaa gattacactc aggagtccca tcaaggttca gtggcagtgg gtctggaaca 6660

gattattctc tcaccattag caacctggag caagaagata ttgccactta cttttgccaa 6720

cagggtaata cgcttccgta cacgttcgga gggggggacca agctggagat cacaggtggc 6780

ggtggctcgg gcggtggtgg gtcgggtggc ggcggatctg aggtgaaact gcaggagtca 6840

ggacctggcc tggtggcgcc ctcacagagc ctgtccgtca catgcactgt ctcaggggtc 6900

tcattacccg actatggtgt aagctggatt cgccagcctc cacgaaaggg tctggagtgg 6960

ctgggagtaa tatggggtag tgaaaccaca tactataatt cagctctcaa atccagactg 7020

accatcatca aggacaactc caagagccaa gttttcttaa aaatgaacag tctgcaaact 7080

gatgacacag ccatttacta ctgtgccaaa cattattact acggtggtag ctatgctatg 7140

gactactggg gccaaggaac ctcagtcacc gtctcctcaa ccacgacgcc agcgccgcga 7200

ccaccaacac cggcgcccac catcgcgtcg cagccccctgt ccctgcgccc agaggcgtgc 7260

cggccagcgg cgggggggcgc agtgcacacg agggggctgg acttcgcctg tgatatctac 7320

atctgggcgc ccttggccgg gacttgtggg gtccttctcc tgtcactggt tatcaccctt 7380

tactgcaaac ggggcagaaa gaaactcctg tatatattca aacaaccatt tatgagacca 7440

gtacaaacta ctcaagagga agatggctgt agctgccgat ttccagaaga agaagaagga 7500

ggatgtgaac tgagagtgaa gttcagcagg agcgcagacg cccccgcgta caagcagggc 7560

cagaaccagc tctataacga gctcaatcta ggacgaagag aggagtacga tgttttggac 7620

aagagacgtg gccgggaccc tgagatgggg ggaaagccga gaaggaagaa ccctcaggaa 7680

ggcctgtaca atgaactgca gaaagataag atggcggagg cctacagtga gattgggatg 7740

aaaggcgagc gccggagggg caaggggcac gatggccttt accagggtct cagtacagcc 7800

accaaggaca cctacgacgc ccttcacatg caggccctgc cccctcgcta agtcgacaat 7860

caacctctgg attacaaaat ttgtgaaaga ttgactggta ttcttaacta tgttgctcct 7920

tttacgctat gtggatacgc tgctttaatg cctttgtatc atgctattgc ttcccgtatg 7980

gctttcattt tctcctcctt gtataaatcc tggttgctgt ctctttatga ggagttgtgg 8040

cccgttgtca ggcaacgtgg cgtggtgtgc actgtgtttg ctgacgcaac ccccactggt 8100

tggggcattg ccaccacctg tcagctcctt tccgggactt tcgctttccc cctccctatt 8160

gccacggcgg aactcatcgc cgcctgcctt gcccgctgct ggacaggggc tcggctgttg 8220

ggcactgaca attccgtggt gttgtcgggg aagctgacgt cctttccatg gctgctcgcc 8280

tgtgttgcca cctggattct gcgcgggacg tccttctgct acgtcccttc ggccctcaat 8340

ccagcggacc ttccttcccg cggcctgctg ccggctctgc ggcctcttcc gcgtcttcgc 8400

cttcgccctc agacgagtcg gatctcccct tgggccgcct ccccgcctgg aattcgagct 8460

cggtaccttt aagaccaatg acttacaagg cagctgtaga tcttagccac tttttaaaag 8520

aaaaggggggg actggaaggg ctaattcact cccaacgaag acaagatctg ctttttgctt 8580

gtactgggtc tctctggtta gaccagatct gagcctggga gctctctggc taactaggga 8640

acccactgct taagcctcaa taaagcttgc cttgagtgct tcaagtagtg tgtgcccgtc 8700

tgttgtgtga ctctggtaac tagagatccc tcagaccctt ttagtcagtg tggaaaatct 8760

ctagcagtag tagttcatgt catcttatta ttcagtattt ataacttgca aagaaatgaa 8820

tatcagagag tgagaggaac ttgtttattg cagcttataa tggttacaaa taaagcaata 8880

gcatcacaaa tttcacaaat aaagcatttt tttcactgca ttctagttgt ggtttgtcca 8940

aactcatcaa tgtatcttat catgtctggc tctagctatc ccgcccctaa ctccgcccat 9000

cccgccccta actccgccca gttccgccca ttctccgccc catggctgac taatttttt 9060

tatttatgca gaggccgagg ccgcctcggc ctctgagcta ttccagaagt agtgaggagg 9120

ctttttgga ggcctaggga cgtacccaat tcgccctata gtgagtcgta ttac 9174

<210> 2
<211> 228
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 2
atgtagtctt atgcaatact cttgtagtct tgcaacatgg taacgatgag ttagcaacat 60

gccttacaag gagagaaaaa gcaccgtgca tgccgattgg tggaagtaag gtggtacgat 120

cgtgccttat taggaaggca acagacgggt ctgacatgga ttggacgaac cactgaattg 180

ccgcattgca gagatattgt atttaagtgc ctagctcgat acataaac 228

<210> 3
<211> 98
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 3
gggtctctct ggttagacca gatctgagcc tgggagctct ctggctaact agggaaccca 60

ctgcttaagc ctcaataaag cttgccttga gtgcttca 98

<210> 4
<211> 85
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 4
agtagtgtgt gcccgtctgt tgtgtgactc tggtaactag agatccctca gacccttttа 60

gtcagtgtgg aaaatctcta gcagt 85

<210> 5
<211> 1377
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 5
cgaacaggga cttgaaagcg aaagggaaac cagaggagct ctctcgacgc aggactcggc 60

ttgctgaagc gcgcacggca agaggcgagg ggcggcgact ggtgagtacg ccaaaaattt 120

tgactagcgg aggctagaag gagagagatg ggtgcgagag cgtcagtatt aagcgggggа 180

gaattagatc gcgatgggaa aaaattcggt taaggccagg gggaaagaaa aaatataaat 240

taaaacatat agtatgggca agcagggagc tagaacgatt cgcagttaat cctggcctgt 300

tagaaacatc agaaggctgt agacaaatac tgggacagct acaaccatcc cttcagacag 360

gatcagaaga acttagatca ttatataata cagtagcaac cctctattgt gtgcatcaaa 420

ggatagagat aaaagacacc aaggaagctt tagacaagat agaggaagag caaaacaaaa 480

gtaagaccac cgcacagcaa gcggccgctg atcttcagac ctggaggagg agatatgagg 540

gacaattgga gaagtgaatt atataaatat aaagtagtaa aaattgaacc attaggagta 600

gcacccacca aggcaaagag aagagtggtg cagagagaaa aaagagcagt gggaatagga 660

gctttgttcc ttgggttctt gggagcagca ggaagcacta tgggcgcagc gtcaatgacg 720

ctgacggtac aggccagaca attattgtct ggtatagtgc agcagcagaa caatttgctg 780

agggctattg aggcgcaaca gcatctgttg caactcacag tctggggcat caagcagctc 840

caggcaagaa tcctggctgt ggaaagatac ctaaaggatc aacagctcct ggggatttgg 900

ggttgctctg gaaaactcat ttgcaccact gctgtgcctt ggaatgctag ttggagtaat 960

aaatctctgg aacagatttg gaatcacacg acctggatgg agtgggacag agaaattaac 1020

aattacacaa gcttaataca ctccttaatt gaagaatcgc aaaaccagca agaaaagaat 1080

gaacaagaat tattggaatt agataaatgg gcaagtttgt ggaattggtt taacataaca 1140

aattggctgt ggtatataaa attattcata atgatagtag gaggcttggt aggtttaaga 1200

atagtttttg ctgtactttc tatagtgaat agagttaggc agggatattc accattatcg 1260

tttcagaccc acctcccaac cccgagggga cccgacaggc ccgaaggaat agaagaagaa 1320

ggtggagaga gagacagaga cagatccatt cgattagtga acggatctcg acggtat 1377

<210> 6
<211> 547
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 6
tagactgtag cccaggaata tggcagctag attgtacaca tttagaagga aaagttatct 60

tggtagcagt tcatgtagcc agtggatata tagaagcaga agtaattcca gcagagacag 120

ggcaagaaac agcatacttc ctcttaaaat tagcaggaag atggccagta aaaacagtac 180

atacagacaa tggcagcaat ttcaccagta ctacagttaa ggccgcctgt tggtgggcgg 240

ggatcaagca ggaatttggc attccctaca atccccaaag tcaaggagta atagaatcta 300

tgaataaaga attaaagaaa attataggac aggtaagaga tcaggctgaa catcttaaga 360

cagcagtaca aatggcagta ttcatccaca attttaaaag aaaaggggg attgggggt 420

acagtgcagg ggaaagaata gtagacataa tagcaacaga catacaaact aaagaattac 480

aaaaacaaat tacaaaaatt caaaattttc gggtttatta cagggacagc agagatccag 540

tttggct 547

<210> 7
<211> 1178
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 7
gctccggtgc ccgtcagtgg gcagagcgca catcgcccac agtccccgag aagttggggg 60

gaggggtcgg caattgaacc ggtgcctaga gaaggtggcg cggggtaaac tgggaaagtg 120

atgtcgtgta ctggctccgc ctttttcccg agggtggggg agaaccgtat ataagtgcag 180

tagtcgccgt gaacgttctt tttcgcaacg ggtttgccgc cagaacacag gtaagtgccg 240

tgtgtggttc ccgcgggcct ggcctctttа cgggttatgg cccttgcgtg ccttgaatta 300

cttccacctg gctgcagtac gtgattcttg atcccgagct tcgggttgga agtgggtggg 360

agagttcgag gccttgcgct taaggagccc cttcgcctcg tgcttgagtt gaggcctggc 420

ctgggcgctg gggccgccgc gtgcgaatct ggtggcacct tcgcgcctgt ctcgctgctt 480

tcgataagtc tctagccatt taaaattttt gatgacctgc tgcgacgctt tttttctggc 540

aagatagtct tgtaaatgcg ggccaagatc tgcacactgg tatttcggtt tttggggccg 600

cgggcggcga cggggcccgt gcgtcccagc gcacatgttc ggcgaggcgg ggcctgcgag 660

cgcggccacc gagaatcgga cgggggtagt ctcaagctgg ccggcctgct ctggtgcctg 720

gcctcgcgcc gccgtgtatc gccccgccct gggcggcaag gctggcccgg tcggcaccag 780

ttgcgtgagc ggaaagatgg ccgcttcccg gccctgctgc agggagctca aaatggagga 840

cgcggcgctc gggagagcgg gcgggtgagt cacccacaca aaggaaaagg gcctttccgt 900

cctcagccgt cgcttcatgt gactccactg agtaccgggc gccgtccagg cacctcgatt 960

agttctcgag cttttggagt acgtcgtctt taggttgggg ggagggtttt tatgcgatgg 1020

agtttccccа cactgagtgg gtggagactg aagttaggcc agcttggcac ttgatgtaat 1080

tctccttgga atttgccctt tttgagtttg gatcttggtt cattctcaag cctcagacag 1140

tggttcaaag ttttttttct ccatttcagg tgtcgtga 1178

<210> 8
<211> 1459
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 8
atggccttac cagtgaccgc cttgctcctg ccgctggcct tgctgctcca cgccgccagg 60

ccggacatcc agatgacaca gactacatcc tccctgtctg cctctctggg agacagagtc 120

accatcagtt gcagggcaag tcaggacatt agtaaatatt taaattggta tcagcagaaa 180

ccagatggaa ctgttaaact cctgatctac catacatcaa gattacactc aggagtccca 240

tcaaggttca gtggcagtgg gtctggaaca gattattctc tcaccattag caacctggag 300

caagaagata ttgccactta cttttgccaa cagggtaata cgcttccgta cacgttcgga 360

ggggggacca agctggagat cacaggtggc ggtggctcgg gcggtggtgg gtcgggtggc 420

ggcggatctg aggtgaaact gcaggagtca ggacctggcc tggtggcgcc ctcacagagc 480

ctgtccgtca catgcactgt ctcaggggtc tcattacccg actatggtgt aagctggatt 540

cgccagcctc cacgaaaggg tctggagtgg ctgggagtaa tatggggtag tgaaaccaca 600

tactataatt cagctctcaa atccagactg accatcatca aggacaactc caagagccaa 660

gttttcttaa aaatgaacag tctgcaaact gatgacacag ccatttacta ctgtgccaaa 720

cattattact acggtggtag ctatgctatg gactactggg gccaaggaac ctcagtcacc 780

gtctcctcaa ccacgacgcc agcgccgcga ccaccaacac cggcgcccac catcgcgtcg 840

cagccctgt ccctgcgccc agaggcgtgc cggccagcgg cgggggcgc agtgcacacg 900

aggggctgg acttcgcctg tgatatctac atctgggcgc ccttggccgg gacttgtggg 960

gtccttctcc tgtcactggt tatcaccctt tactgcaaac ggggcagaaa gaaactcctg 1020

tatatattca aacaaccatt tatgagacca gtacaaacta ctcaagagga agatggctgt 1080

agctgccgat ttccagaaga agaagaagga ggatgtgaac tgagagtgaa gttcagcagg 1140

agcgcagacg cccccgcgta caagcagggc cagaaccagc tctataacga gctcaatcta 1200

ggacgaagag aggagtacga tgttttggac aagagacgtg gccgggaccc tgagatgggg 1260

ggaaagccga gaaggaagaa ccctcaggaa ggcctgtaca atgaactgca gaaagataag 1320

atggcggagg cctacagtga gattgggatg aaaggcgagc gccggagggg caaggggcac 1380

gatggccttt accagggtct cagtacagcc accaaggaca cctacgacgc ccttcacatg 1440

caggccctgc ccctcgct 1459

<210> 9
<211> 591
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 9
atcaacctct ggattacaaa atttgtgaaa gattgactgg tattcttaac tatgttgctc 60

cttttacgct atgtggatac gctgctttaa tgcctttgta tcatgctatt gcttcccgta 120

tggctttcat tttctcctcc ttgtataaat cctggttgct gtctctttat gaggagttgt 180

ggcccgttgt caggcaacgt ggcgtggtgt gcactgtgtt tgctgacgca acccccactg 240

gttggggcat tgccaccacc tgtcagctcc tttccgggac tttcgctttc cccctcccta 300

ttgccacggc ggaactcatc gccgcctgcc ttgcccgctg ctggacaggg gctcggctgt 360

tgggcactga caattccgtg gtgttgtcgg ggaagctgac gtcctttcca tggctgctcg 420

cctgtgttgc cacctggatt ctgcgcggga cgtccttctg ctacgtccct tcggccctca 480

atccagcgga ccttccttcc cgcggcctgc tgccggctct gcggcctctt ccgcgtcttc 540

gccttcgccc tcagacgagt cggatctccc tttgggccgc ctccccgcct g 591

<210> 10
<211> 98
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthezied

<400> 10
gggtctctct ggttagacca gatctgagcc tgggagctct ctggctaact agggaaccca 60

ctgcttaagc ctcaataaag cttgccttga gtgcttca 98

<210> 11
<211> 84
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 11
agtagtgtgt gcccgtctgt tgtgtgactc tggtaactag agatccctca gacccttta 60

gtcagtgtgg aaaatctcta gcag 84

<210> 12
<211> 486
<212> PRT
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 12

Met Ala Leu Pro Val Thr Ala Leu Leu Leu Pro Leu Ala Leu Leu Leu
1 5 10 15

His Ala Ala Arg Pro Asp Ile Gln Met Thr Gln Thr Thr Ser Ser Leu
20 25 30

Ser Ala Ser Leu Gly Asp Arg Val Thr Ile Ser Cys Arg Ala Ser Gln
35 40 45

Asp Ile Ser Lys Tyr Leu Asn Trp Tyr Gln Gln Lys Pro Asp Gly Thr
50 55 60

Val Lys Leu Leu Ile Tyr His Thr Ser Arg Leu His Ser Gly Val Pro
65 70 75 80

Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Tyr Ser Leu Thr Ile
85 90 95

Ser Asn Leu Glu Gln Glu Asp Ile Ala Thr Tyr Phe Cys Gln Gln Gly
100 105 110

Asn Thr Leu Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Thr
115 120 125

```
Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Glu
    130                 135                 140

Val Lys Leu Gln Glu Ser Gly Pro Gly Leu Val Ala Pro Ser Gln Ser
145                 150                 155                 160

Leu Ser Val Thr Cys Thr Val Ser Gly Val Ser Leu Pro Asp Tyr Gly
                165                 170                 175

Val Ser Trp Ile Arg Gln Pro Pro Arg Lys Gly Leu Glu Trp Leu Gly
            180                 185                 190

Val Ile Trp Gly Ser Glu Thr Thr Tyr Tyr Asn Ser Ala Leu Lys Ser
        195                 200                 205

Arg Leu Thr Ile Ile Lys Asp Asn Ser Lys Ser Gln Val Phe Leu Lys
    210                 215                 220

Met Asn Ser Leu Gln Thr Asp Asp Thr Ala Ile Tyr Tyr Cys Ala Lys
225                 230                 235                 240

His Tyr Tyr Tyr Gly Gly Ser Tyr Ala Met Asp Tyr Trp Gly Gln Gly
                245                 250                 255

Thr Ser Val Thr Val Ser Ser Thr Thr Thr Pro Ala Pro Arg Pro Pro
            260                 265                 270

Thr Pro Ala Pro Thr Ile Ala Ser Gln Pro Leu Ser Leu Arg Pro Glu
        275                 280                 285

Ala Cys Arg Pro Ala Ala Gly Gly Ala Val His Thr Arg Gly Leu Asp
    290                 295                 300

Phe Ala Cys Asp Ile Tyr Ile Trp Ala Pro Leu Ala Gly Thr Cys Gly
305                 310                 315                 320

Val Leu Leu Leu Ser Leu Val Ile Thr Leu Tyr Cys Lys Arg Gly Arg
                325                 330                 335

Lys Lys Leu Leu Tyr Ile Phe Lys Gln Pro Phe Met Arg Pro Val Gln
            340                 345                 350

Thr Thr Gln Glu Glu Asp Gly Cys Ser Cys Arg Phe Pro Glu Glu Glu
        355                 360                 365

Glu Gly Gly Cys Glu Leu Arg Val Lys Phe Ser Arg Ser Ala Asp Ala
    370                 375                 380

Pro Ala Tyr Lys Gln Gly Gln Asn Gln Leu Tyr Asn Glu Leu Asn Leu
385                 390                 395                 400

Gly Arg Arg Glu Glu Tyr Asp Val Leu Asp Lys Arg Arg Gly Arg Asp
                405                 410                 415

Pro Glu Met Gly Gly Lys Pro Arg Arg Lys Asn Pro Gln Glu Gly Leu
            420                 425                 430

Tyr Asn Glu Leu Gln Lys Asp Lys Met Ala Glu Ala Tyr Ser Glu Ile
        435                 440                 445
```

Gly Met Lys Gly Glu Arg Arg Arg Gly Lys Gly His Asp Gly Leu Tyr
450 455 460

Gln Gly Leu Ser Thr Ala Thr Lys Asp Thr Tyr Asp Ala Leu His Met
465 470 475 480

Gln Ala Leu Pro Pro Arg
485

<210> 13
<211> 63
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 13
atggccttac cagtgaccgc cttgctcctg ccgctggcct tgctgctcca cgccgccagg 60

ccg 63

<210> 14
<211> 726
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 14
gacatccaga tgacacagac tacatcctcc ctgtctgcct ctctgggaga cagagtcacc 60

atcagttgca gggcaagtca ggacattagt aaatatttaa attggtatca gcagaaacca 120

gatggaactg ttaaactcct gatctaccat acatcaagat tacactcagg agtcccatca 180

aggttcagtg gcagtgggtc tggaacagat tattctctca ccattagcaa cctggagcaa 240

gaagatattg ccacttactt ttgccaacag ggtaatacgc ttccgtacac gttcggaggg 300

gggaccaagc tggagatcac aggtggcggt ggctcgggcg gtggtgggtc gggtggcggc 360

ggatctgagg tgaaactgca ggagtcagga cctggcctgg tggcgccctc acagagcctg 420

tccgtcacat gcactgtctc aggggtctca ttacccgact atggtgtaag ctggattcgc 480

cagcctccac gaaagggtct ggagtggctg ggagtaatat ggggtagtga aaccacatac 540

tataattcag ctctcaaatc cagactgacc atcatcaagg acaactccaa gagccaagtt 600

ttcttaaaaa tgaacagtct gcaaactgat gacacagcca tttactactg tgccaaacat 660

tattactacg gtggtagcta tgctatggac tactggggcc aaggaacctc agtcaccgtc 720

tcctca 726

<210> 15
<211> 135

<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 15
accacgacgc cagcgccgcg accaccaaca ccggcgccca ccatcgcgtc gcagcccctg 60

tcccctgcgcc cagaggcgtg ccggccagcg gcgggggggcg cagtgcacac gagggggctg 120

gacttcgcct gtgat 135

<210> 16
<211> 72
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 16
atctacatct gggcgccctt ggccgggact tgtggggtcc ttctcctgtc actggttatc 60

acccttttact gc 72

<210> 17
<211> 126
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 17
aaacggggca gaaagaaact cctgtatata ttcaaacaac catttatgag accagtacaa 60

actactcaag aggaagatgg ctgtagctgc cgatttccag aagaagaaga aggaggatgt 120

gaactg 126

<210> 18
<211> 336
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 18
agagtgaagt tcagcaggag cgcagacgcc cccgcgtaca agcagggcca gaaccagctc 60

tataacgagc tcaatctagg acgaagagag gagtacgatg ttttggacaa gagacgtggc 120

cgggaccctg agatgggggg aaagccgaga aggaagaacc ctcaggaagg cctgtacaat 180

gaactgcaga aagataagat ggcggaggcc tacagtgaga ttgggatgaa aggcgagcgc 240

cggaggggca aggggcacga tggcctttac cagggtctca gtacagccac caaggacacc 300

tacgacgccc ttcacatgca ggccctgccc cctcgc 336

<210> 19
<211> 21
<212> PRT
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 19

Met Ala Leu Pro Val Thr Ala Leu Leu Leu Pro Leu Ala Leu Leu Leu
1 5 10 15

His Ala Ala Arg Pro
20

<210> 20
<211> 242
<212> PRT
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 20

Asp Ile Gln Met Thr Gln Thr Thr Ser Ser Leu Ser Ala Ser Leu Gly
1 5 10 15

Asp Arg Val Thr Ile Ser Cys Arg Ala Ser Gln Asp Ile Ser Lys Tyr
20 25 30

Leu Asn Trp Tyr Gln Gln Lys Pro Asp Gly Thr Val Lys Leu Leu Ile
35 40 45

Tyr His Thr Ser Arg Leu His Ser Gly Val Pro Ser Arg Phe Ser Gly
50 55 60

Ser Gly Ser Gly Thr Asp Tyr Ser Leu Thr Ile Ser Asn Leu Glu Gln
65 70 75 80

Glu Asp Ile Ala Thr Tyr Phe Cys Gln Gln Gly Asn Thr Leu Pro Tyr
85 90 95

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

Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Glu Val Lys Leu Gln Glu
115 120 125

Ser Gly Pro Gly Leu Val Ala Pro Ser Gln Ser Leu Ser Val Thr Cys
130 135 140

Thr Val Ser Gly Val Ser Leu Pro Asp Tyr Gly Val Ser Trp Ile Arg
145 150 155 160

```
Gln Pro Pro Arg Lys Gly Leu Glu Trp Leu Gly Val Ile Trp Gly Ser
                165                 170                 175

Glu Thr Thr Tyr Tyr Asn Ser Ala Leu Lys Ser Arg Leu Thr Ile Ile
            180                 185                 190

Lys Asp Asn Ser Lys Ser Gln Val Phe Leu Lys Met Asn Ser Leu Gln
        195                 200                 205

Thr Asp Asp Thr Ala Ile Tyr Tyr Cys Ala Lys His Tyr Tyr Tyr Gly
    210                 215                 220

Gly Ser Tyr Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser Val Thr Val
225                 230                 235                 240

Ser Ser
```

<210> 21
<211> 47
<212> PRT
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 21

```
Thr Thr Thr Pro Ala Pro Arg Pro Pro Thr Pro Ala Pro Thr Ile Ala
1               5                   10                  15

Ser Gln Pro Leu Ser Leu Arg Pro Glu Ala Cys Arg Pro Ala Ala Gly
            20                  25                  30

Gly Ala Val His Thr Arg Gly Leu Asp Phe Ala Cys Asp Ile Tyr
        35                  40                  45
```

<210> 22
<211> 22
<212> PRT
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 22

```
Ile Trp Ala Pro Leu Ala Gly Thr Cys Gly Val Leu Leu Leu Ser Leu
1               5                   10                  15

Val Ile Thr Leu Tyr Cys
            20
```

<210> 23
<211> 42
<212> PRT
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 23

Lys Arg Gly Arg Lys Lys Leu Leu Tyr Ile Phe Lys Gln Pro Phe Met
1 5 10 15

Arg Pro Val Gln Thr Thr Gln Glu Glu Asp Gly Cys Ser Cys Arg Phe
20 25 30

Pro Glu Glu Glu Glu Gly Gly Cys Glu Leu
35 40

<210> 24
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 24

Arg Val Lys Phe Ser Arg Ser Ala Asp Ala Pro Ala Tyr Lys Gln Gly
1 5 10 15

Gln Asn Gln Leu Tyr Asn Glu Leu Asn Leu Gly Arg Arg Glu Glu Tyr
20 25 30

Asp Val Leu Asp Lys Arg Arg Gly Arg Asp Pro Glu Met Gly Gly Lys
35 40 45

Pro Arg Arg Lys Asn Pro Gln Glu Gly Leu Tyr Asn Glu Leu Gln Lys
50 55 60

Asp Lys Met Ala Glu Ala Tyr Ser Glu Ile Gly Met Lys Gly Glu Arg
65 70 75 80

Arg Arg Gly Lys Gly His Asp Gly Leu Tyr Gln Gly Leu Ser Thr Ala
85 90 95

Thr Lys Asp Thr Tyr Asp Ala Leu His Met Gln Ala Leu Pro Pro Arg
100 105 110

<210> 25
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 25
gaaagctgac tgcccctatt tg 22

<210> 26
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 26
gagaggaagt gctgggaaca at 22

<210> 27
<211> 15
<212> DNA
<213> Artificial Sequence

<220>
<223> Chemically Synthesized

<400> 27
ctccccagtc tcttt 15