

SEQ ID NO:3 (annotated)

plasmid DNA backbone

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-----
TCGCGCGTTTCGGTGATGACGGTGAAAACCTCTGACACATGCAGCTCCCGGAGACGGTCACAGCTTGTCTGTAGCGGAT < 80
      10      20      30      40      50      60      70
-----
GCCGGGAGCAGACAAGCCCGTCAGGGCGCGTCAGCGGGTGTGGCGGGTGTGGGGCTGGCTTAACATATGCGGCATCAGA < 160
      90      100      110      120      130      140      150
-----
                        NdeI
                        FauNDI
-----
GCAGATTGTACTGAGAGTGCACCATATGCGGTGTGAAATACCGCAGACATGCGTAAGGAGAAAAATACCGCATCAGGCGCC < 240
      170      180      190      200      210      220      230
-----
ATTTCGCCATTTCAGGCTGCGCAACTGTGGGAAGGGCGATCGGTGCGGGCTCTTCGCTATTACGCCAGCTGGCGAAAGGG < 320
      250      260      270      280      290      300      310
-----
GGATGTGCTGCAAGGCGATTAAAGTTGGGTAAACGCCAGGTTTTCAGTCACGACGTTGTAACACGACGGCCAGTGCCAA < 400
      330      340      350      360      370      380      390
-----
                        U3 of LTR
-----
GCTGACTCTAGAGGATCGATCCCCGGCCGCTCTAGCTTAAGTAACGCCATTTGCAAGGCATGGAAAAATACATAACTGA < 480
      410      420      430      440      450      460      470
-----
GAATAGAGAAGTTTCAGATCAAGGTCAAGAACAGATGGAACAGCTGAATATGGGCCAAACAGGATATCTGTGGTAAGCAGT < 560
      490      500      510      520      530      540      550
-----
TCCCTGCCCGCGCTCAGGGCCAAGAACAGATGGAACAGCTGAATATGGGCCAAACAGGATATCTGTGGTAAGCAGTTCCTG < 640
      570      580      590      600      610      620      630
-----
CCCCGBCCTCAGGGCCAAGAACAGATGGTCCCCAGATGCGGTCCAGCCCCTCAGCAGTTTCTAGAGAACCATCAGATGTTTC < 720
      650      660      670      680      690      700      710
-----
CAGGGTGCCCCAAGGACCTGAAATGACCCCTGTGCCTTATTTGAACTAACCAATCAGTTCGCTTCCTGCTTCGTTCGCGG < 800
      730      740      750      760      770      780      790
-----
                        R region of LTR
-----
GCTTCTGTCTCCCCGAGCTCAATAAAGAGCCCAACCCCTCACTCGGC GCGCCAGTCTCCGATTGACTGAGTCGCCCCG < 880
      810      820      830      840      850      860      870
-----
                        U5 of LTR
-----
GGTACCCGTGTATCCAATAAACCCCTCTGCAGTGCATCCGACTGTGGTCTCGCTGTTCCCTGGGAGGGTCTCCTCTGA < 960
      890      900      910      920      930      940      950
-----
                        Primer binding site
-----
GTGATTGACTACCCGTCAGCGGGGGTCTTTCATTGGGGGCTCGTCCGGGATCGGGAGACCCCTGCCAGGGACCACCGA < 1040
      970      980      990      1000      1010      1020      1030
-----
Psi packaging seq
-----
CCCACCACGGGGAGGTAAAGCTGGCCAGCAACTTATCTGTGTCTGTCCGATTGTCTAGTGTCTATGACTGATTTTATGCGC < 1120
      1050      1060      1070      1080      1090      1100      1110
-----
                        DsaI
                        BstDSI
                        BtgI
                        <TstI
-----
CTGCGTCGGTACTAGTTAGCTAACTAGCTCTGTATCTGGCGGACCGTGGTGGAACTGACGAGTTCGGAACACCCGGCCG < 1200
      1130      1140      1150      1160      1170      1180      1190
-----
                        PshAI
                        BstPAI
                        BoxI
-----
Psi tag
with built-in mutation and stop codon at coordinate 1487
CAACCCGGGGAGACGTCACAGGGACTTCGGGGCCGTTTTGTGGCCGACCTGAGTCCAAAAATCCCGATCGTTTGGG < 1280
      1210      1220      1230      1240      1250      1260      1270
-----
CTCTTGGTGCACCCCTTAGAGGAGGGATATGTGGTCTGGTAGGAGACGAGAACCTAAAACAGTTCCTCGCTCCGTC < 1360
      1290      1300      1310      1320      1330      1340      1350

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FIG. 1

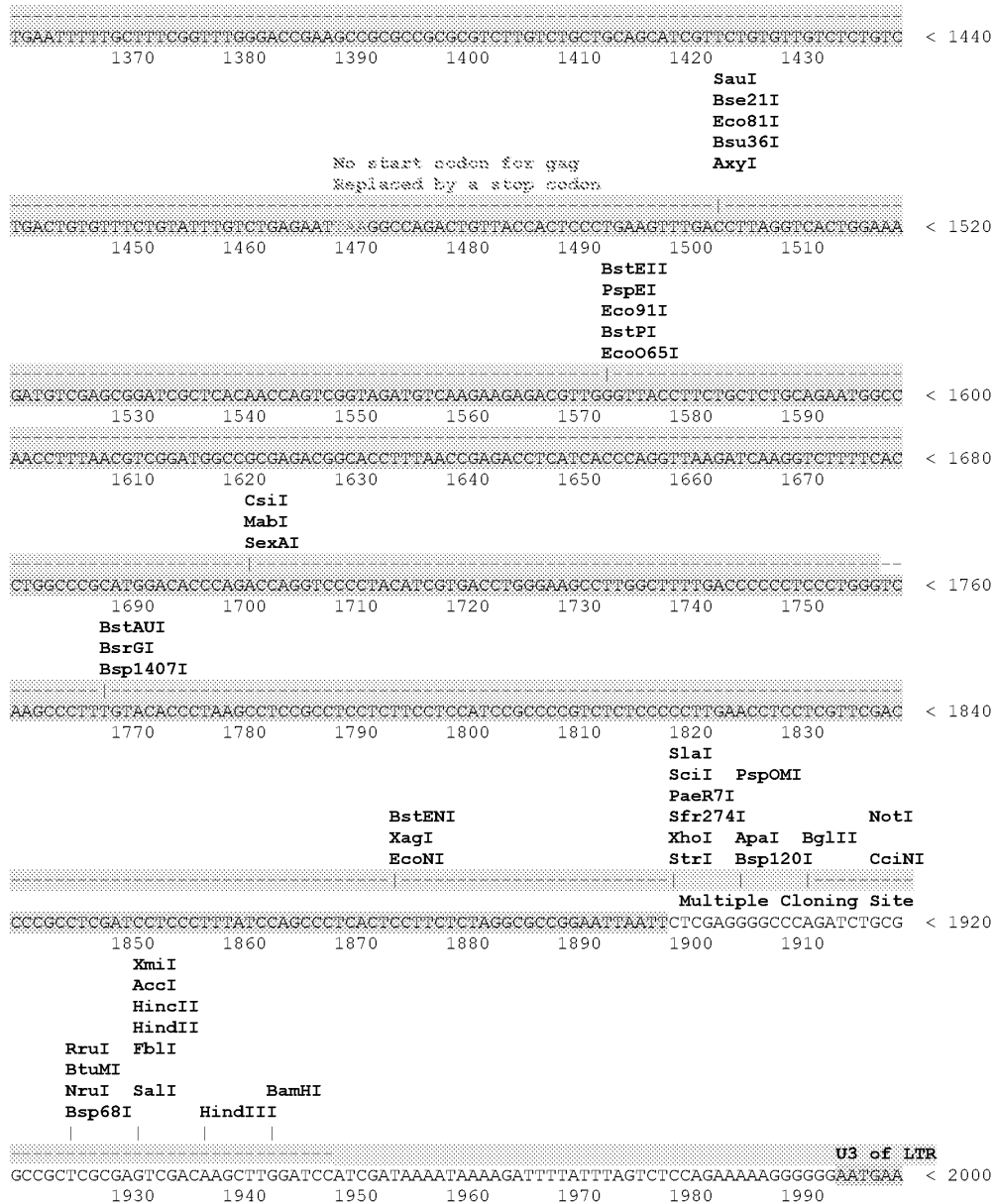


FIG. 1 (continued)

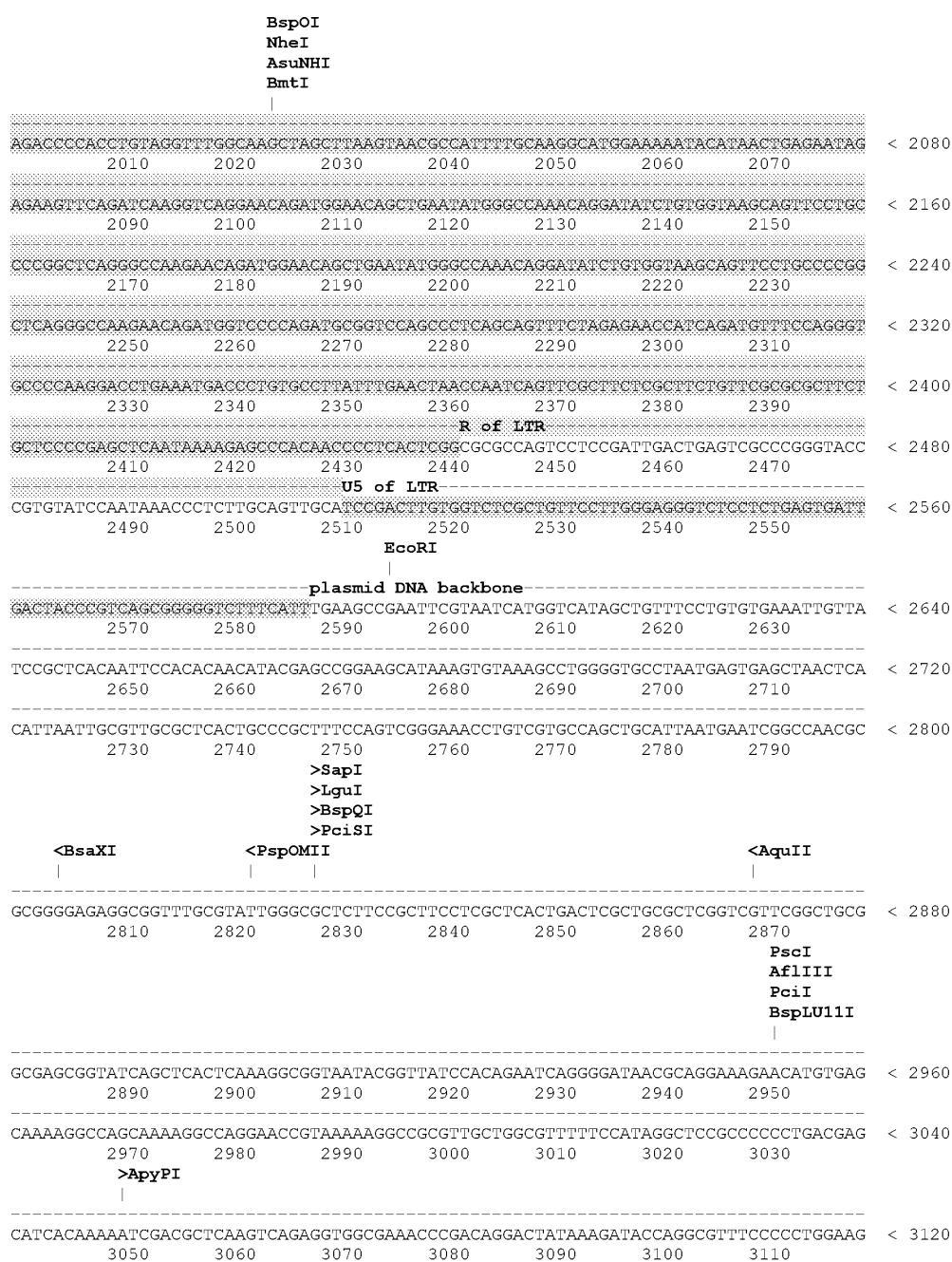


FIG. 1 (continued)

FIG. 1 (continued)

FIG. 1 (continued)

AssI
BmcAI
ZrmI
ScaI | **>BcgI** |

TGAGTACTCAACCAAGTCATTCTGAGAATAGTGTATGCGGCGACCGAGTTGCTCTTGCCCGGCGTCAATACGGGATAATA < 4400
4330 4340 4350 4360 4370 4380 4390

CCGCGCCACATAGCAGAACTTTAAAAGTGCTCATCATTTGGAAAACGTTCTTCGGGGCGAAAACCTCAAGGATCTTACCG < 4480
4410 4420 4430 4440 4450 4460 4470

CTGTTGAGATCCAGTTCGATGTAACCCACTCGTGCACCCAACGATCTTCAGCATCTTTTACTTTCCAGCGTTTCTGG < 4560
4490 4500 4510 4520 4530 4540 4550

GTGAGCAAAAACAGGAAGGCAAAATGCCGCAAAAAGGGAATAAGGGCGACACGGAAATGTTGAATACTCATACTCTTCC < 4640
4570 4580 4590 4600 4610 4620 4630
SspI
|

TTTTTCAATATATTGAAGCATTTATCAGGGTTATTGTCTCATGAGCGGATACATATTTGAATGTATTTAGAAAAATAAA < 4720
4650 4660 4670 4680 4690 4700 4710

CAAATAGGGGTTCCGCGCACATTTCCCGAAAAGTGCCACCTGACGCTTAAGAAACCATTTATCATGACATTAACCTA < 4800
4730 4740 4750 4760 4770 4780 4790

TAAAAATAGGCGTATCACGAGGCCCTTTCGTC < 4832
4810 4820 4830

FIG. 1 (continued)

pBA-9b vRNA genome (T replaced with U for RNA seq) (SEQ ID NO:12)

GCGCCAGUCCUCCGAUUGACUGAGUCGCCCCGGGUACCCGUGUAUCCAAUAAACCCUCUUGCAGUUGCA
UCCGACUUGUGGUCUCGCUUCCUUGGGAGGGUCUCCUCUGAGUGAUUGACUACCCGUCAGCGGGGG
UCUUUCAUUUUGGGGGCUCGUCGGGAUCGGGAGACCCUCGCCAGGGACCACCGACCACCACCGGGA
GGUAAGCUGGCCAGCAACUUAUCUGUGUCUGUCCGAUUGUCUAGUGUCUAUGACUGAUUUUAUGCGCC
UGCGUCGGUACUAGUUAGCUAACUAGCUCUGUAUCUGGCGGACCCGUGGUGGAACUGACGAGUUCGGA
ACACCCGGCCGCAACCCUGGGAGACGUCCAGGGACUUCGGGGGCCGUUUUGUGGCCCCGACCUGAGU
CCAAAAUCCCGAUCCGUUUUGGACUCUUUGGUGCACCCCCCUAGAGGAGGGGAUUGUGGUUUCUGGUA
GGAGACGAGAACCUA AAACAGUUCGCCUCCGUCUGAAUUUUGCUUUCGGUUUGGGACCGAAGCCG
CGCCGCGCUCUUGUCUGCUGCAGCAUCGUUCUGUGUUGUCUCUGUCUGACUGUUUUCUGUAUUUGU
CUGAGAAUUAAAGGCCAGACUGUUACCACUCCUGAAGUUUGACCUUAGGUCACUGGAAAGAUGUCGAG
CGGAUCGCUACAACCAAGUCGGUAGAUGUCAAGAAGAGACGUUGGGUUACCUUCUGCUCUGCAGAAUG
GCCAACCUUUAAACGUCGGAUGGCCGCGAGACGGCACCUUUAACCGAGACCUCACACCCAGGUUAAGA
UCAAGGUCUUUUCACCGGCCCGCAUGGACACCCAGACCAGGUCCCCUACAUCGUGACCUGGGAAGCC
UUGGCUUUUGACCCCCUCCUGGGUCAAGCCCUUUGUACACCUAAGCCUCCGCCUCCUCUCCUCC
AUCCGCCCCGUCUCUCCCCUUGAACCUCCUCGUUCGACCCGCCUCGAUCCUCCUUUAUCCAGCCC
UCACUCCUUCUCUAGGCGCCGGAUUAAUU CUCGAGGGGCCAGAUUCGCGGCCGUCGCGAGUCGAC
AAGCUUGGAUCCAUCGAUAAAAUAAAAGAUUUUAUUUAGUCUCCAGAAAAAGGGGGAAUGAAAGACC
CCACCUGUAGGUUUGGCAAGCUAGCUUAAGUAACGCCAUUUUGCAAGGCAUGGAAAAUACAUAACUG
AGAAUAGAGAAGUUCAGAUCAAGGUCAGGAACAGAUGGAACAGCUGAAUAUGGGCCAAACAGGAUAUC
UGUGGUAAGCAGUUCUGCCCCGGCUCAGGGCCAAGAACAGAUGGAACAGCUGAAUAUGGGCCAAACA
GGAUAUCUGUGGUAAGCAGUUCUGCCCCGGCUCAGGGCCAAGAACAGAUGGUCCCCAGAUCCGGUCC
AGCCUCACGAGUUUCUAGAGAACCAUCAGAUUUUCCAGGGUGCCCCAAGGACCUGAAAUGACCCUG
UGCCUUUUUGAACUAACCAUACAGUUCGCUUCUCGCUUCUGUUCGCGCGCUUCUGCUCCCCGAGCUC
AAUAAAAGAGCCACAACCCUCACUCGCGCGCCAGUCCUCCGAUUGACUGAGUCGCCCGGUACCC
GUGUAUCCAAUAAACCCUCUUGCAGUUGCA

FIG. 2

hCD19CAR1 (SEQ ID NO:13)

gcggccgcATGGCCCTCCCTGTCACCGCCCTGCTGCTTCCGCTGGCTCTTCTGCTCCACGCCGCTCGG
CCCGAAATTGTGATGACCCAGTCACCCGCCACTCTTAGCCTTTACCCGGTGAGCGCGCAACCCCTGTC
TTGCAGAGCCTCCCAAGACATCTCAAAATACCTTAATTGGTATCAACAGAAGCCCGGACAGGCTCCTC
GCCTTCTGATCTACCACACCAGCCGGCTCCATTCTGGAATCCCTGCCAGGTTACGCGGTAGCGGATCT
GGGACCGACTACACCTCACTATCAGCTCACTGCAGCCAGAGGACTTCGCTGTCTATTTCTGTCAGCA
AGGGAACACCCTGCCCTACACCTTTGGACAGGGCACCAAGCTCGAGATTAAAGGTGGAGGTGGCAGCG
GAGGAGGTGGGTCCGGCGGTGGAGGAAGCCAGGTCCAACCTCCAAGAAAGCGGACCGGGTCTTGTGAAG
CCATCAGAAACTCTTTCACTGACTTGTACTGTGAGCGGAGTGTCTCTCCCGATTACGGGGTGTCTTG
GATCAGACAGCCACCGGGAAGGGTCTGGAATGGATTGGAGTGATTGGGGCTCTGAGACTACTTACT
ACTCTTCATCCCTCAAGTCACGCGTCACCATCTCAAAGGACAACCTCTAAGAATCAGGTGTCACTGAAA
CTGTCTCTGTGACCGCAGCCGACACCGCCGTGTACTATTGCGCTAAGCATTACTATTATGGCGGGAG
CTACGCAATGGATTACTGGGGACAGGGTACTCTGGTCACCGTGTCCAGCACCCTACCCAGCACCAG
GGCCACCCACCCCGCTCCTACCATCGCTCCAGCCTCTGTCCCTGCGTCCGGAGGCATGTAGACCC
GCAGCTGGTGGGGCCGTGCATACCCGGGGTCTTGACTTCGCCTGCGATATCTACATTTGGGCCCCCTCT
GGCTGGTACTTGCGGGGTCTGCTGCTTTCCTCGTGATCACTCTTTACTGTAAGCGCGGTTCGGAAGA
AGCTGCTGTACATCTTTAAGCAACCCCTTCATGAGGCCGTGTGCAGACTACTCAAGAGGAGGACGGCTGT
TCATGCCGGTTCCAGAGGAGGAGGAAGCGGGCTGCGAACTGCGCGTGAAATTACGCCGAGCGCAGA
TGCTCCAGCCTACAAGCAGGGGAGAGGACGAGTCTACAACGAACCTCAATCTTGGTCGGAGAGAGGAGT
ACGACGTGCTGGACAAGCGGAGAGGACGGGACCCAGAAATGGGCGGGAAGCCGCGCAGAAAGAATCCC
CAAGAGGGCCTGTACAACGAGCTCCAAAAGGATAAGATGGCAGAAGCCTATAGCGAGATTGGTATGAA
AGGGGAACGAGAAGAGGCAAAGGCCACGACGACTGTACCAGGACTCAGCACCGCCACCAAGGACA
CCTATGACGCTCTTCACATGCAGGCCCTGCCGCTCGGTAGgtcgac

hCD19CAR2 (SEQ ID NO:14)

gcggccgcATGGCCCTCCCTGTCACCGCCCTGCTGCTTCCGCTGGCTCTTCTGCTCCACGCCGCTCGG
CCCGAAATTGTGATGACCCAGTCACCCGCCACTCTTAGCCTTTACCCGGTGAGCGCGCAACCCCTGTC
TTGCAGAGCCTCCCAAGACATCTCAAAATACCTTAATTGGTATCAACAGAAGCCCGGACAGGCTCCTC
GCCTTCTGATCTACCACACCAGCCGGCTCCATTCTGGAATCCCTGCCAGGTTACGCGGTAGCGGATCT
GGGACCGACTACACCTCACTATCAGCTCACTGCAGCCAGAGGACTTCGCTGTCTATTTCTGTCAGCA
AGGGAACACCCTGCCCTACACCTTTGGACAGGGCACCAAGCTCGAGATTAAAGGTGGAGGTGGCAGCG
GAGGAGGTGGGTCCGGCGGTGGAGGAAGCCAGGTCCAACCTCCAAGAAAGCGGACCGGGTCTTGTGAAG
CCATCAGAAACTCTTTCACTGACTTGTACTGTGAGCGGAGTGTCTCTCCCGATTACGGGGTGTCTTG
GATCAGACAGCCACCGGGAAGGGTCTGGAATGGATTGGAGTGATTGGGGCTCTGAGACTACTTACT
ACCAATCATCCCTCAAGTCACGCGTCACCATCTCAAAGGACAACCTCTAAGAATCAGGTGTCACTGAAA
CTGTCTCTGTGACCGCAGCCGACACCGCCGTGTACTATTGCGCTAAGCATTACTATTATGGCGGGAG
CTACGCAATGGATTACTGGGGACAGGGTACTCTGGTCACCGTGTCCAGCACCCTACCCAGCACCAG
GGCCACCCACCCCGCTCCTACCATCGCTCCAGCCTCTGTCCCTGCGTCCGGAGGCATGTAGACCC
GCAGCTGGTGGGGCCGTGCATACCCGGGGTCTTGACTTCGCCTGCGATATCTACATTTGGGCCCCCTCT
GGCTGGTACTTGCGGGGTCTGCTGCTTTCCTCGTGATCACTCTTTACTGTAAGCGCGGTTCGGAAGA
AGCTGCTGTACATCTTTAAGCAACCCCTTCATGAGGCCGTGTGCAGACTACTCAAGAGGAGGACGGCTGT
TCATGCCGGTTCCAGAGGAGGAGGAAGCGGGCTGCGAACTGCGCGTGAAATTACGCCGAGCGCAGA
TGCTCCAGCCTACAAGCAGGGGAGAGGACGAGTCTACAACGAACCTCAATCTTGGTCGGAGAGAGGAGT
ACGACGTGCTGGACAAGCGGAGAGGACGGGACCCAGAAATGGGCGGGAAGCCGCGCAGAAAGAATCCC
CAAGAGGGCCTGTACAACGAGCTCCAAAAGGATAAGATGGCAGAAGCCTATAGCGAGATTGGTATGAA
AGGGGAACGAGAAGAGGCAAAGGCCACGACGACTGTACCAGGACTCAGCACCGCCACCAAGGACA
CCTATGACGCTCTTCACATGCAGGCCCTGCCGCTCGGTAGgtcgac

FIG. 3

hCD19CAR4 (SEO ID NO:16)

ccgagcgcATGGCTCTGCCGCTGACCGCACTCCTCTGCCACTGGCTCTGCTGCTTCACGCCGCTCGC
CCACAAGTCCAGCTTCAAGAATCAGGGCCTGGTCTGGTGAAGCCATCTGAGACTCTGTCCCTCACTTG
CACCGTGAGCGGAGTGTCCTCCAGACTACGGAGTGAGCTGGATTAGACAGCCTCCCGGAAAGGGAC
TGGAGTGGATCGGAGTGATTTGGGTAGCGAAACCACTTACTATAACTCTTCCCTGAAGTCACGGGT
ACCATTTCAAAGGATAACTCAAAGAATCAAGTGAGCCTCAAGCTCTCATAGTCACCGCCGCTGACAC
CGCCGTGTATTACTGTGCCAAGCATTACTACTATGGAGGGTCTTACGCCATGGACTACTGGGGCCAGG
GAACTCTGGTCACTGTGTATCTGGTGGAGGAGGTAGCGGAGGAGGCGGGAGCGGTGGAGGTGGCTCC
GGAGGTGGCGGAAGCGAAATCGTGATGACCCAGAGCCCTGCAACCCCTGTCCCTTTCTCCCGGGGAACG
GGTACCCCTTTCTTGTTCGGGCATCAACAAGATATCTCAAAATCACTCAATTGGTATCAACAGAACCGCG
GACAGGCCCCTAGGCTTCTTATCTACACACTCTTCGCTGCATAGCGGGATTCCCGCAGCGTPTTAGC
GGGTCTGGAAGCGGGACCGACTACACTCTGACCATCTCATCTCTCCAGCCCAGGACTTCGCGCTCTA
CTTCTGCCAGCAGGGTAACACCCTGCCGTACACCTTCGGCCAGGGCACCAAGCTTGAGATCAAAACCA
CTACTCCCGCTCCAAGGCCACCCACCCCTGCCCCGACCATCGCTCTCAGCCGCTTTCCCTGCGTCCG
GAGGCATGTAGACCCGCAGCTGGTGGGGCCGTGCATACCCGGGGTCTTGACTTCGCTGCGATATCTA
CATTTGGGCCCCCTCTGGCTGGTACTTGCGGGGTCTGCTGCTTTCACTCGTGATCACTCTTTACTGTA
AGCGCGGTTCGGAAGAAGCTGCTGTACATCTTTAAGCAACCCCTTCATGAGGCCTGTGCAGACTACTCAA
GAGGAGGACGGCTGTTTCATGCCGGTTCAGAGGAGGAGGAAGGCGGCTGCGAACTGCGCGTGAAATT
CAGCCGACGCGAGATGCTCCAGCCTACAAGCAGGGGCAGAACCAAGCTCTACAACGAACCTCAATCTTG
GTCGGAGAGGAGGATACGACGTGCTGGACAAGCGGAGGAGGACGGGACCCAGAAATGGGCGGGGAAGCCG
CGCAGAAAGAATCCCCAAGAGGCTGTCACCAACGAGCTCCAAAAGGATAAGTGGCAGAGACCTATAG
CGGAGATTGGTATGAAAGGGGAACGCAGAAGAGGCAAAAGGCCACGACGGACTGTACCAGGGACTCAGCA
CCGCCACCAAGGACACCTATGACGCTCTTCACATGCAGGCCCTGCCGCTCGGTAGgtcgac

FIG. 3 (cont'd)

hCD19CAR5 (SEQ ID NO:17)

gcggccgcATGGCCTTACCAGTGACCGCCTTGCTCCTGCCGCTGGCCTTGCTGCTCCACGCCGCCAGG
CCGGACATCCAGATGACACAGACTACATCCTCCCTGTCTGCCTCTCTGGGAGACAGAGTCACCATCAG
TTGCAGGGCAAGTCAGGACATTAGTAAATATTTAAATTTGGTATCAGCAGAAACCAGATGGAACGTGTA
AACTCCTGATCTACCATACATCAAGATTACACTCAGGAGTCCCATCAAGGTTTCAGTGGCAGTGGGTCT
GGAACAGATTATTCTCTCACCATTAGCAACCTGGAGCAAGAAGATATTGCCACTTACTTTTGCCAAACA
GGGTAATACGCTTCCGTACACGTTCCGGAGGGGGGACCAAGCTGGAGATCACAGGTGGCGGTGGCTCGG
GCGGTGGTGGGTGGGTGGCGGCGGATCTGAGGTGAAACTGCAGGAGTCAGGACCTGGCCTGGTGGCG
CCCTCACAGAGCCTGTCCTGCATGCACTGTCTCAGGGGTCTCATTACCCGACTATGGTGTAAAGCTG
GATTCCGCCAGCCTCCACGAAAGGGTCTGGAGTGGCTGGGAGTAATATGGGGTAGTGAACCCACATACT
ATAATTACAGCTCTCAAATCCAGACTGACCATCATCAAGGACAACCTCCAAGAGCCAAGTTTTCTTAAAA
ATGAACAGTCTGCAAACTGATGACACAGCCATTTACTACTGTGCCAAACATTATTACTACGGTGGTAG
CTATGCTATGGACTACTGGGGCCAAGGAACCTCAGTCACCGTCTCCTCAACCACGACGCCAGCGCCGC
GACCACCAACACCGGCCCCACCATCGCGTCGCAGCCCCCTGTCCCTGCGCCCAGAGGCGTGCCGGCCA
GCGGCGGGGGGCGCAGTGACACAGAGGGGGCTGGACTTCGCCTGTGATATCTACATCTGGGCGCCCTT
GGCCGGGACTTGTGGGGTCTTCTCCTGTCACTGGTTATCACCCCTTACTGCAAACGGGGCAGAAAGA
AACTCCTGTATATATTCAAACAACCATTATGAGACCAGTACAACTACTCAAGAGGAAGATGGCTGT
AGCTGCCGATTTCCAGAAGAAGAAGAAGGAGGATGTGAAGTGAAGTTCAGCAGGAGCGCAGA
CGCCCCCGGTACAAGCAGGGCCAGAACCAGCTCTATAACGAGCTCAATCTAGGACGAAGAGAGGAGT
ACGATGTTTTGGACAAGAGACGTGGCCGGGACCCTGAGATGGGGGGAAGCCGAGAAGGAAGAACCCT
CAGGAAGGCCTGTACAATGAACTGCAGAAAGATAAGATGGCGGAGGCTACAGTGAGATTGGGATGAA
AGGCGAGCGCCGGAGGGGCAAGGGGCACGATGGCCTTTACCAGGGTCTCAGTACAGCCACCAAGGACA
CCTACGACGCCCTTCACATGCAGGCCCTGCCCCCTCGCTAGgtcgac

FIG. 3 (cont'd)**pBA9b-hCD19CAR1 (SEQ ID NO:18)**

TCGCGCGTTTTCGGTGATGACGGTGAAAACCTCTGACACATGCAGCTCCCGGAGACGGTCACAGCTTGT
CTGTAAGCGGATGCCGGGAGCAGACAAGCCCGTCAGGGCGCGTCAGCGGGTGTGGCGGGTGTCCGGG
CTGGCTTAACTATGCGGCATCAGAGCAGATTGTACTGAGAGTGCACCATATGCGGTGTGAAATACCGC
ACAGATGCGTAAGGAGAAAAATACCGCATCAGGCGCCATTGCGCCATTGAGGCTGCGCAACTGTTGGGAA
GGGCGATCGGTGCGGGCCTCTTCGCTATTACGCCAGCTGGCGAAAGGGGGATGTGCTGCAAGGCGATT
AAGTTGGGTAAACGCCAGGTTTTCCAGTCACGACGTTGTAAACGACGGCCAGTGCCAAAGCTGACTC
TAGAGGATCGATCCCCGGCGCTCTAGCTTAAAGTAACGCCATTTTGCAAGGCATGAAAAAATACATAA
CTGAGAATAGAGAAGTTTCAGATCAAGGTCAGGAACAGATGGAACAGCTGAATATGGGCCAAACAGGAT
ATCTGTGGTAAGCAGTTCTTGCCCCGGCTCAGGGCCAAGAACAGATGGAACAGCTGAATATGGGCCAA
ACAGGATATCTGTGGTAAGCAGTTCTTGCCCCGGCTCAGGGCCAAGAACAGATGGTCCCCAGATGCGG
TCCAGCCCTCAGCAGTTTCTAGAGAACCATCAGATGTTTCCAGGGTGCCCCAAGGACCTGAAATGACC
CTGTGCCCTTATTTGAACTAACCAATCAGTTCGCTTCTCGCTTCTGTTCGCGCGCTTCTGCTCCCCGAG
CTCAATAAAAGAGGCCACAACCCCTCACTCGGCGCGCCAGTCTCCTCCGATTGACTGAGTCGCCCCGGTA
CCCGTGTATCCAATAAACCCCTCTTGCAAGTTGCATCCGACTTGTGGTCTCGCTGTTCCTTGGGAGGGTC
TCCTCTGAGTGATTGACTACCCGTACGCGGGGGTCTTTCATTTGGGGGCTCGTCCGGGATCGGGAGAC
CCCTGCCCAGGGACACCGACCCACCACCGGGAGGTAAGCTGGCCAGCAACTTATCTGTGTCTGTCCG
ATTGTCTAGTGTCTATGACTGATTTTATGCGCCTGCGTGGTACTAGTTAGCTAAGTACTGCTGTATC
TGGCGGACCCGTGGTGAACTGACGAGTTCGGAACACCCGGCCGCAACCCTGGGAGACGTCCCAGGGA
CTTCGGGGGCGGTTTTTGTGGCCGACCTGAGTCCAAAAATCCCGATCGTTTTTGGACTCTTTGGTGCA
CCCCCTTAGAGGAGGGATATGTGGTTCTGGTAGGAGACGAGAACCCTAAAACAGTTCCTCGCTCCGTC
TGAATTTTTGCTTTTCGGTTTGGGACCGAAGCCGCGCGCGCTTGTCTGCTGCAGCATCGTTCTGT
GTTGTCTCTGTCTGACTGTGTTTCTGTATTGTCTGAGAATTAAGGCCAGACTGTTACCACTCCCTGA
AGTTTGACCTTAGGTCACTGGAAGATGTCGAGCGGATCGCTCACAACCAGTCGGTAGATGTCAAGAA

FIG. 4

GAGACGTTGGGTTACCTTCTGCTCTGCAGAATGGCCAACTTTAACGTCGGATGGCCGCGAGACGGCA
CCTTTAACCGAGACCTCATCACCCAGGTTAAGATCAAGGTCTTTTACCTGGCCCGCATGGACACCCA
GACCAGGTCCCCTACATCGTGACCTGGGAAGCCTTGGCTTTTGACCCCCCTCCCTGGGTCAAGCCCTT
TGTACACCCTAAGCCTCCGCCTCCTCTTCTCCATCCGCCCCGTCTCTCCCCCTTGAACCTCCTCGTT
CGACCCCGCCTCGATCCTCCCTTTATCCAGCCCTCACTCCTTCTCTAGGCGCCGGAATTAATTCTCGA
GGGGCCCAGATCTgcggccgcATGGCCCTCCCTGTCAACGCCCTGTGCTTCCGCTGGCTCTTCTGCT
CCACGCCGCTCGGCCCGAAATTGTGATGACCCAGTCACCCGCCACTCTTAGCCTTTACCCGGTGAGC
GCGCAACCTGTCTTGCAGAGCCTCCCAAGACATCTCAAAATACCTTAATTGGTATCAACAGAAGCCC
GGACAGGCTCCTCGCCTTCTGATCTACCACACCCGCGCTCCATTCTGGAATCCCTGCCAGGTTTCAG
CGGTAGCGGATCTGGGACCGACTACCCCTCACTATCAGCTCACTGCAGCCAGAGGACTTCGCTGTCT
ATTTCTGTGACGAAGGGAACACCCTGCCCTACACCTTTGGACAGGGCACCAAGCTCGAGATTAAAGGT
GGAGGTGGCAGCGGAGGAGGTGGGTCCGCGGTGGAGGAAGCCAGGTCCAACCTCCAAGAAAGCGGACC
GGGTCTTGTGAAGCCATCAGAACTCTTTCACTGACTTGTACTGTGAGCGGAGTGTCTCTCCCCGATT
ACGGGGTGTCTTGGATCAGACAGCCACCGGGGAAGGGTCTGGAATGGATTGGAGTGATTTGGGGCTCT
GAGACTACTTACTACTCTTCTATCCCTCAAGTCACGCGTCACCATCTCAAAGGACAACCTTAAGAATCA
GGTGTCACTGAAACTGTCTCTGTGACCGCAGCCGACACCGCCGTGTACTATTGCGCTAAGCATTA
ATTATGGCGGGAGCTACGCAATGGATTACTGGGGACAGGGTACTCTGGTCACCGTGTCCAGCACCCT
ACCCACGACCCGAGGCCACCCACCCCGGCTCCTACCATCGCCTCCAGCCTCTGTCCCTGCGTCCGGA
GGCATGTAGACCCGAGCTGGTGGGGCCGTGCATACCCGGGGTCTTGACTTCGCCTGCGATATCTACA
TTTGGGCCCTCTGGCTGGTACTTGCGGGGTCTGTCTTTCACTCGTGATCACTCTTTACTGTAAAG
CGCGGTGCGGAAGAAGCTGCTGTACATCTTTAAGCAACCCCTTCATGAGGCTGTGCAGACTACTCAAGA
GGAGGACGGCTGTTCTATGCGGGTCCAGAGGAGGAGGAAGGCGGCTGCGAACTGCGCGTGAAATTC
GCCGACGCGCAGATGCTCCAGCCTACAAGCAGGGGCAGAACAGCTCTACAACGAACTCAATCTTGGT
CGGAGAGAGGAGTACGACGTGCTGGACAAGCGGAGAGGACGGGACCCAGAAATGGGCGGGAAGCCGCG
CAGAAAGAATCCCCAAGAGGGCCTGTACAACGAGCTCCAAAAGGATAAGATGGCAGAAGCCTATAGCG
AGATTGGTATGAAAGGGGAACGCAGAAGAGGCCAAGGCCACGACGGACTGTACCAGGACTCAGCACC
GCCACCAAGGACACCTATGACGCTCTTCACATGCAGGCCCTGCCGCTCGGTAGTcgacAAGCTTGG
ATCCATCGATAAAATAAAGATTTTATTAGTCTCCAGAAAAGGGGGGAATGAAAGACCCACCTGT
AGGTTTGGCAAGCTAGCTTAAGTAACGCCATTTTGCAGGCATGGAAAAATACATAAAGTGAATAGA
GAAGTTCAGATCAAGGTCAGGAACAGATGGAACAGCTGAATATGGGCCAAACAGGATATCTGTGGTAA
GCAGTTCCTGCCCCGGCTCAGGGCCAAGAACAGATGGAACAGCTGAATATGGGCCAAACAGGATATCT
GTGGTAAGCAGTTCTTCCCCGGCTCAGGGCCAAGAACAGATGGTCCCCAGATGCGGTCCAGCCCTCA
GCAGTTTCTAGAGAACCATCAGATGTTTCCAGGGTGCCCCAAGGACCTGAAATGACCCTGTGCCCTAT
TTGAACTAACCAATCAGTTCGCTTCTCGCTTCTGTTGCGCGCTTCTGCTCCCCGAGCTCAATAAAAG
AGCCACAAACCCCTCACTCGGCGCGCCAGTCTCCTCGATTGACTGAGTCGCCCCGGTACCCGTGTATCC
AATAAACCTCTTGCAGTTGCATCCGACTTGTGGTCTCGCTGTTCCCTGGGAGGGTCTCCTCTGAGTG
ATTGACTACCCGTCAGCGGGGTCTTTCAATTTGAAGCCGAATTCGTAATCATGGTCATAGCTGTTTCC
TGTGTGAAATTTGTTATCCGCTCACAATTCCACACAACATACGAGCCGGAAGCATAAAGTGTAAGCCT
GGGGTGCCTAATGAGTGAGCTAACTCACATTAATTGCGTTGCGCTCACTGCCCGCTTTCCAGTCGGGA
AACCTGTCTGTCCAGCTGCATTAATGAATCGGCCAACGCGCGGGGAGAGGCGGTTTTCGTATTGGGCG
CTCTTCCGCTTCTCGCTCACTGACTCGCTGCGCTCGGTCGTTTCGGCTGCGGCGAGCGGTATCAGCTC
ACTCAAAGGCGGTAATACGGTTATCCACAGAATCAGGGGATAACGCAGGAAAGAACATGTGAGCAAAA
GGCCAGCAAAAGGCCAGGAACCGTAAAAAGCCGCGTTGCTGGCGTTTTTCCATAGGCTCCGCCCCC
TGACGAGCATCACAAAAATCGACGCTCAAGTCAGAGGTGGCGAAACCCGACAGGACTATAAAGATACC
AGGCGTTTCCCCCTGGAAGCTCCCTCGTGCCTCTCCTGTTCCGACCCTGCCGCTTACCGGATACCTG
TCCGCTTTCTCCCTTCGGGAAGCGTGGCGCTTTCTCAAAGCTCACGCTGTAGGTATCTCAGTTCGGT
GTAGGTGCTTTCGCTCCAAGCTGGGCTGTGTGCACGAACCCCCGTTTACGCCCAGCGCTGCGCCTTAT
CCGGTAACATATCGTCTTGTAGTCCAACCCGTAAGACACGACTTATCGCCACTGGCAGCAGCCACTGGT
AACAGGATTAGCAGAGCGAGGTATGTAGGCGGTGCTACAGAGTTCTTGAAGTGGTGGCCTAACTACGG
CTACACTAGAAGAACAGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTTACCTTCGGAAAAAGAGTTG
GTAGCTCTTGATCCGGCAAACAAACCCGCTGGTAGCGGTGGTTTTTTTTGTTTGAAGCAGCAGATT
ACGCGCAGAAAAAAGGATCTCAAGAAGATCCTTTGATCTTTTCTACGGGGTCTGACGCTCAGTGGAA
CGAAAACTCACGTTAAGGATTTTGGTCATGAGATTATCAAAAAGGATCTTACCTAGATCCTTTTAA

FIG. 4 (cont'd)

ATTAAAAATGAAAGTTTTAAATCAATCTAAAGTATATATGAGTAAACTTGGTCTGACAGTTACCAATGC
TTAATCAGTGAGGCACCTATCTCAGCGATCTGTCTATTTTCGTTTCATCCATAGTTGCCTGACTCCCCGT
CGTGTAGATAAATACGATACGGGAGGGCTTACCATCTGGCCCCAGTGCTGCAATGATACCGCGAGACC
CAGCTCACCGGCTCCAGATTTATCAGCAATAAACCAGCCAGCCGGAAGGGCCGAGCGCAGAAGTGGT
CCTGCAACTTTATCCGCCCTCCATCCAGTCTATTAATTGTTGCCGGGAAGCTAGAGTAAGTAGTTCGCC
AGTTAATAGTTTGCACAACGTTGTTGCCATTGCTACAGGCATCGTGGTGTACGCTCGTTCGTTTGGTA
TGGCTTCATTTCAGCTCCGGTTCCCAACGATCAAGGCGAGTTACATGATCCCCATGTTGTGCAAAAAA
GCGGTTAGCTCCTTCGGTCCTCCGATCGTTGTGAGAAGTAAGTTGGCCGAGTGTATCACTCATGGT
TATGGCAGCACTGCATAATTCTCTTACTGTGATGCCATCCGTAAGATGCTTTTCTGTGACTGGTGAGT
ACTCAACCAAGTCATTCTGAGAATAGTGTATGCGGCGACCGAGTTGCTCTTGCCCGGCGCTCAATACGG
GATAAATACCGCGCACATAGCAGAACTTTAAAGTGCTCATCATTTGAAAAACGTTCTTCGGGGCGAAA
ACTCTCAAGGATCTTACCCTGTTGAGATCCAGTTCCGATGTAACCCACTCGTGCACCCAACTGATCTT
CAGCATCTTTTACTTTTACCAGCGTTTCTGGGTGAGCAAAAAACAGGAAGGCAGAAATGCCGCAAAAAAG
GGAATAAGGGCGACACGGAAATGTTGAATACTCATACTCTTCTTTTCAATATTATTGAAGCATTTA
TCAGGGTTATTGTCTCATGAGCGGATACATATTTGAATGTATTTAGAAAAATAAACAAATAGGGGTTC
CGCGCACATTTCCCCGAAAAGTGCCACCTGACGTCTAAGAAACCATTATTATCATGACATTAACTAT
AAAAATAGGCGTATCACGAGGCCCTTTCGTC

pBA9b-hCD19CAR2 (SEQ ID NO:19)

TCGCGCGTTTCGGTGATGACGGTGAAAACCTCTGACACATGCAGCTCCCGGAGACGGTCACAGCTTGT
CTGTAAGCGGATGCCGGGAGCAGACAAGCCCGTCAGGGCGCGTCAGCGGGTGTGGCGGGTGTCCGGG
CTGGCTTAACTATGCGGCATCAGAGCAGATTGTACTGAGAGTGCACCATATGCGGTGTGAAATACCGC
ACAGATGCCGTAAGGAGAAAAATACCGCATCAGGCGCCATTTCGCCATTGAGCTGCGCAACTGTTGGGAA
GGGCGATCGGTGCGGGCTCTTCGCTATTACGCCAGCTGGCGAAAGGGGGATGTGCTGCAAGGCGATT
AAGTTGGGTAACGCCAGGGTTTTCCAGTCACGACGTTGTAAAACGACGGCCAGTGCCAAGCTGACTC
TAGAGGATCGATCCCCGGCGCTCTAGCTTAAGTAACGCCATTTTGCAAGGCATGAAAAATACATAA
CTGAGAATAGAGAAGTTCAGATCAAGGTGAGGAACAGATGGAACAGCTGAATATGGGCCAAACAGGAT
ATCTGTGGTAAGCAGTTCTGCCCCGGCTCAGGGCCAGAACAGATGGAACAGCTGAATATGGGCCAA
ACAGGATATCTGTGGTAAGCAGTTCTGCCCCGGCTCAGGGCCAGAACAGATGGTCCCCAGATGCGG
TCCAGCCCTCAGCAGTTTCTAGAGAACCATCAGATGTTTCCAGGGTGCCCCAAGGACCTGAAATGACC
CTGTGCCTTATTTGAACTAACCAATCAGTTCGCTTCTCGCTTCTGTTTCGCGCGCTTCTGCTCCCCGAG
CTCAATAAAGAGGCCACAAACCCCTCACTCGGCGCGCCAGTCTCCGATTGACTGAGTCGCCCGGGTA
CCCGTGTATCCAATAAACCCCTCTTGCACTGCACTCGACTTGTGGTCTCGCTGTTCTTGGGAGGGTC
CCTCTGAGTGATTGACTACCCGTGAGCGGGGCTCTTTCATTTGGGGGCTCGTCCGGGATCGGGAGAC
CCCTGCCCAGGGACCACCGACCCACCACCGGGAGGTAAGCTGGCCAGCAACTTATCTGTGTCTGTCCG
ATTGTCTAGTGTCTATGACTGATTTTATGCGCCTGCGTCGGTACTAGTTAGCTAACTAGCTCTGTATC
TGGCGGACCCGTGGTGAACTGACGAGTTCGGAACACCCGGCCGCAACCCCTGGGAGACGTCCCAGGGA
CTTCGGGGGCCGTTTTTGTGGCCCGACCTGAGTCCAAAAATCCCGATCGTTTTGGACTCTTTGGTGCA
CCCCCTTAGAGGAGGGATATGTGGTCTGGTAGGAGACGAGAACCTAAAACAGTTCGCGCTCCGTC
TGAATTTTGTCTTTCGGTTTGGGACCGAAGCCGCGCCGCGCTTGTCTGCTGACGATCGTTCTGT
GTTGTCTCTGTCTGACTGTGTTTCTGTATTTGTCTGAGAATTAAGGCCAGACTGTTACCACTCCCTGA
AGTTTGACCTTAGGTCACTGGAAGATGTGAGCGGATCGCTCACAAACAGTCGGTAGATGTCAAGAA
GAGACGTTGGGTTACCTTCTGCTCTGCAGAATGGCCAACCTTTAACGTCGGATGGCCGCGAGACGGCA
CCTTTAACCGAGACCTCATCACCCAGGTTAAGATCAAGGTCTTTTACCTGGCCCGCATGAGACCCCA
GACCAGGTCCCTTACATCGTGCAGTGGGAAGCCTTGGCTTTTGACCCCTCCCTGGGTGAGCCCTT
TGTAACCCCTAAGCCTCCGCTCCTCTTCCCTCCATCCGCCCCGTCTCTCCCCCTTGAACCTCCTCGTT
CGACCCCGCTCGATCCTCCCTTTATCCAGCCCTCACTCCTTCTTAGGCGCCGGAATTAATTTCTCGA
GGGGCCAGATCTGcgggcgcATGGCCCTCCCTGTACCGCCCTGTGCTTCCGCTGGCTCTTCTGCT
CCACGCCGCTCGGCCGAAATTGTGATGACCCAGTCACCCGCCACTCTTAGCCTTTACCCGGTGAGC
GCGCAACCCGTCTTGCAGAGCCTCCCAAGACATCTCAAAATACCTTAATTGGTATCAACAGAAGCCC
GGACAGGCTCCTCGCCTTCTGATCTACCACACAGCCGCTCCATTCTGGAATCCCTGCCAGGTTAG
CGGTAGCGGATCTGGGACCGACTACACCTCACTATCAGCTCACTGCAGCCAGAGGACTTCGCTGTCT
ATTTCTGTGACGAAGGGAACACCCCTGACCTTTGGACAGGGCACCAAGCTCGAGATTAAAGGT

FIG. 4 (cont'd)

GGAGGTGGCAGCGGAGGAGGTGGGTCCGGCGGTGGAGGAAGCCAGGTCCAACCTCCAAGAAAGCGGACC
GGGTCTTGTGAAGCCATCAGAACTCTTCACTGACTTGTACTGTGAGCGGAGTGTCTCTCCCGGATT
ACGGGGTGTCTTGGATCAGACAGCCACCGGGGAAGGGTCTGGAATGGATTGGAGTGATTTGGGGCTCT
GAGACTACTTACTACCAATCATCCCTCAAGTCACGCGTCACCATCTCAAAGGACAACCTCTAAGAATCA
GGTGTCACTGAAACTGTCTGTGACCGCAGCCGACACCGCGGTGTACTATTGCGCTAAGCATTACT
ATTATGGCGGAGCTACGCAATGGATTACTGGGGACAGGGTACTCTGGTCACCGGTGCCAGCACCCT
ACCCAGCAGCCGAGGCCACCCACCCCGGCTCCTACCATCGCCTCCCAGCCTCTGTCCCTGCGTCCGGA
GGCATGTAGACCCGAGCTGGTGGGGCCGTGCATACCCGGGGTCTTGACTTCGCCTGCGATATCTACA
TTTGGGCCCTCTGGCTGGTACTTGCGGGGTCTGTCTGCTTTCACTCGTGATCACTCTTTACTGTAAAG
CGCGGTTCGGAAGAAGCTGCTGTACATCTTTAAGCAACCCTTCATGAGGCCTGTGCAGACTACTCAAGA
GGAGGACGGCTGTTTCATGCCGGTCCAGAGGAGGAAGGCGGCTGCGAACTGCGCGTGAAATTCAG
GCCGACGGCAGATGCTCCAGCCTACAAGCAGGGGCAGAACCAGCTCTACAACGAACTCAATCTTGGT
CGGAGAGAGGAGTACGACGTGCTGGACAAGCGGAGAGGACGGGACCCAGAAATGGGCGGGAAGCCGCG
CAGAAAGAATCCCCAAGAGGGCCTGTACAACGAGCTCCAAAAGGATAAGATGGCAGAAGCCTATAGCG
AGATTGGTATGAAAGGGGAACGCAGAAGAGGCCAAAGGCCACGACGGACTGTACCAGGGACTCAGCACC
GCCACCAAGGACACCTATGACGCTCTTCACATGCAGGCCCTGCCGCTCGGTAGGtgcacAAGCTTGG
ATCCATCGATAAAATAAAAGATTTTATTAGTCTCCAGAAAAAGGGGGAATGAAAGACCCACCTGT
AGGTTTGGCAAGCTAGCTTAAAGTAACGCCATTTTGCAGGCATGGAATAATACATAACTGAGAATAGA
GAAGTTCAGATCAAGGTGAGGAACAGATGGAACAGCTGAATATGGGCCAAACAGGATATCTGTGGTAA
GCAGTTCCTGCCCGGCTCAGGGCCAAGAACAGATGGAACAGCTGAATATGGGCCAAACAGGATATCT
GTGGTAAGCAGTTCCTGCCCGGCTCAGGGCCAAGAACAGATGGTCCCAGATGCGGTCCAGCCCTCA
GCAGTTTCTAGAGAACCATCAGATGTTTCCAGGGTGCCCCAAGGACCTGAAATGACCCTGTGCCTTAT
TTGAACCTAACCAATCAGTTCGCTTCTCGCTTCTGTTCGCGCGCTTCTGCTCCCCGAGCTCAATAAAG
AGCCACAAACCCCTCACTCGGCGCGCCAGTCTCCGATTGACTGAGTCGCCCCGGGTACCCGTGTATCC
AATAAACCCCTCTTGAGTTGCATCCGACTTGTGGTCTCGCTGTTCCCTGGGAGGGTCTCCTCTGAGTG
ATTGACTACCCGTCAGCGGGGTCTTTTCAATTTGAAGCCGAATTCGTAATCATGGTCATAGCTGTTTCC
TGTGTGAAATGTTATCCGCTCACAATTCACACAACATACGAGCCGAAGCATAAAGTGTAAGCCT
GGGGTGCCTAATGAGTGAGCTAACTCACATTAATTGCGTTGCGCTCACTGCCCGCTTTCAGTCGCGGA
AACCTGTCTGTCAGCTGCATTAATGAATCGGCCAACGCGCGGGGAGAGGCGGTTTCGCTATTGGCGG
CTCTTCCGCTTCTCGCTCACTGACTCGCTGCGCTCGGTCGTTCCGGCTGCGGCGAGCGGTATCAGCTC
ACTCAAAGGCGGTAATACGGTTATCCACAGAATCAGGGGATAACGCAGGAAAGAATGTGAGCAAAA
GGCCAGCAAAAGGCCAGGAACCGTAAAAAGGCCGCGTTGCTGGCGTTTTTCCATAGGCTCCGCCCCC
TGACGAGCATCAGAAAAATCGACGCTCAAGTCAGAGGTGGCGAAACCCGACAGGACTATAAAGATACC
AGGCGTTTCCCCCTGGAAGCTCCCTCGTGCGCTCTCTGTTCCGACCCTGCCGCTTACCGGATACCTG
TCCGCTTTCTCCCTTCGGGAAGCGTGCGCTTTCTCAAAGCTCACGCTGTAGGTATCTCAGTTCGGT
GTAGGTGCTTCGCTCCAAGCTGGGCTGTGTGCACGAACCCCCCGTTACGCCCAGCCGCTGCGCCTTAT
CCGGTAACATATCGTCTTGAGTCCAACCCGGTAAGACACGACTTATCGCCACTGGCAGCAGCCACTGGT
AACAGGATTAGCAGAGCGAGGTATGTAGGCGGTGCTACAGAGTTCTTGAAGTGGTGGCCTAACTACGG
CTACACTAGAAGAACAGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTTACCTTCGAAAAAAGAGTTG
GTAGCTCTTGATCCGGCAAACAACACCGCTGGTAGCGGTGGTTTTTTTGTGTTGAAGCAGCAGATT
ACGCGCAGAAAAAAGGATCTCAAGAAGATCCTTTGATCTTTTCTACGGGGTCTGACGCTCAGTGGAA
CGAAACTCACGTTAAGGGATTTTGGTCATGAGATTATCAAAAAGGATCTTCACCTAGATCCTTTTAA
ATTAATAATGAAGTTTTAAATCAATCTAAAGTATATATGAGTAAACTTGGTCTGACAGTTACCAATGC
TTAATCAGTGAGGCACCTATCTCAGCGATCTGTCTATTTCCGTTTCATCCATAGTTGCCTGACTCCCGGT
CGTGTAGATAACTACGATACGGGAGGGCTTACCATCTGGCCCCAGTGCTGCAATGATACCGAGACC
CACGCTCACCGGCTCCAGATTTATCAGCAATAAACACGACGCGGAGGGCCGAGCGCAGAAGTGGT
CCTGCAACTTTATCCGCTCCATCCAGTCTATTAATTGTTGCCGGGAAGCTAGAGTAAGTAGTTCGCC
AGTTAATAGTTTGCGAACGTTGTTGCCATTGCTACAGGCATCGTGGTGTACGCTCGTCTTGGTA
TGGCTTCATTGAGCTCCGGTTCCTAACGATCAAGGCGAGTTACATGATCCCCATGTTGTGCAAAAAA
GCGGTTAGCTCCTTCGGTCTCCGATCGTTGTGAGAAAGTGGCCGAGTGTATCACTCATGGT
TATGGCAGCACTGCATAATCTCTTACTGTCATGCCATCCGTAAGATGCTTTTCTGTGACTGGTGAAT

FIG. 4 (cont'd)

ACTCAACCAAGTCATTCTGAGAATAGTGTATGCGGCGACCGAGTTGCTCTTGCCCGCGCTCAATACGG
GATAATACCGCGCCACATAGCAGAACTTTAAAAGTGCTCATCATTTGGAACGTTCTTCGGGGCGAAA
ACTCTCAAGGATCTTACCGCTGTTGAGATCCAGTTCCGATGTAACCCACTCGTGCACCCAACTGATCTT
CAGCATCTTTTACTTTACCAGCGTTTCTGGGTGAGCAAAAACAGGAAGGCAAAATGCCGCAAAAAAG
GGAATAAGGGCGACACGGAAATGTTGAATACTCATACTCTTCTTTTCAATATTATTGAAGCATTTA
TCAGGGTTATTGTCTCATGAGCGGATACATATTTGAATGTATTTAGAAAAATAAACAAATAGGGGTTC
CGCGCACATTTCCCCGAAAAGTGCCACCTGACGTCTAAGAAACCATTATTATCATGACATTAACCTAT
AAAAATAGGCGTATCACGAGGCCCTTTCGTC

pBA9b-hCD19CAR3 (SEQ ID NO:20)

TCGCGCGTTTCGGTGATGACGGTGAAAACCTCTGACACATGCAGCTCCCGGAGACGGTCACAGCTTGT
CTGTAAAGCGGATGCCGGGAGCAGACAAGCCCGTCAGGGCGCGTCAGCGGGTGTTGGCGGGTGTCGGGG
CTGGCTTAACTATGCGGCATCAGAGCAGATTGTACTGAGAGTGACCATATGCGGTGTGAAATACCGC
ACAGATGCGTAAGGAGAAAAATACCGCATCAGGCGCCATTCGCCATTCAGGCTGCGCAACTGTTGGGAA
GGGCGATCGGTGCGGGCTCTTCGCTATTACGCCAGCTGGCGAAAGGGGGATGTGCTGCAAGGCGATT
AAGTTGGGTAACGCCAGGGTTTTCCAGTCACGACGTTGTAAAACGACGGCCAGTGCCAAGCTGACTC
TAGAGGATCGATCCCCGGCGCTCTAGCTTAAGTAACGCCATTTTGAAGGCATGGAAAAATACATAA
CTGAGAATAGAGAAGTTCAGATCAAGGTCAGGAACAGATGGAACAGCTGAATATGGGCCAAACAGGAT
ATCTGTGGTAAGCAGTTCCTGCCCCGGCTCAGGGCCAAGAACAGATGGAACAGCTGAATATGGGCCAA
ACAGGATATCTGTGGTAAGCAGTTCCTGCCCCGGCTCAGGGCCAAGAACAGATGGTCCCCAGATGCGG
TCCAGCCCTCAGCAGTTTCTAGAGAACCATCAGATGTTTCCAGGGTGCCCCAAGGACCTGAAATGACC
CTGTGCCCTTATTTGAACATAACCAATCAGTTCGCTTCTCGCTTCTGTTTCGCGCGCTTCTGCTCCCCGAG
CTCAATAAAAAGAGCCCCACACCCCTCACTCGGCGCGCCAGTCCTCCGATTGACTGAGTCGCCCCGGTA
CCCGTGTATCCAATAAACCCCTCTTGCAAGTTCGATCCGACTTGTGGTCTCGCTGTTCTTGGGAGGGTC
TCCTCTGAGTGATTGACTACCCGTCAGCGGGGGTCTTTCATTTGGGGGCTCGTCCGGGATCGGGAGAC
CCCTGCCCAGGGACACCGACCCACCACCGGGAGGTAAGCTGGCCAGCAACTTATCTGTGTCTGTCCG
ATTGTCTAGTGTCTATGACTGATTTTATGCGCCTGCGTCGGTACTAGTTAGCTAACTAGCTCTGTATC
TGGCGGACCCGTGGTGGAAGTACGAGTTCGGAACACCCGGCCGCAACCCTGGGAGACGTCCCAGGGA
CTTCGGGGGCGCTTTTTTGTGGCCGACCTGAGTCCAAAAATCCCGATCGTTTTGGACTCTTTGGTGCA
CCCCCTTAGAGGAGGGATATGTGGTTCGGTAGGAGACGAGAACCCTAAAACAGTTCCTCGCCTCCGTC
TGAATTTTTGCTTTTCGGTTTGGGACCGAAGCCGCGCCGCGCTCTTGTCTGCTGCAGCATCGTTCTGT
GTTGTCTCTGCTGACTGTGTTTCTGTATTTGTCTGAGAATTAAGGCCAGACTGTTACCACTCCCTGA
AGTTTGACCTTAGGTCACTGGAAGATGTCGAGCGGATCGCTCACAACCAAGTCGGTAGATGTCAAGAA
GAGAGCTTGGGTACCTTCTGCTCTGCAGAATGGCCAACTTTAACGTCGGATGGCCGCGAGACGGCA
CCTTTAACCGAGACCTCATCACCCAGGTTAAGATCAAGGTCTTTTACCTGGCCCGCATGGACACCCA
GACCAGGTCCCTACATCGTGACCTGGGAAGCCTTGGCTTTTGACCCCCCTCCCTGGGTCAAGCCCTT
TGTACACCCTAAGCCTCCGCTCCTCTTCTCCATCCGCCCCGTCTCTCCCCCTTGAACCTCCTCGTT
CGACCCCGCCTCGATCCTCCCTTTATCCAGCCCTCACTCCTTCTTAGGCGCCGGAATTAATTCTCGA
GGGGCCAGATCTGcggcgcATGGCCCTCCCTGTACCGCCCTGCTGCTTCCGCTGGCTCTTCTGCT
CCACGCCGCTCGGCCCGAAATTGTGATGACCCAGTCACCGCCACTCTTAGCCTTTCACCCGGTGAGC
GCGCAACCCTGTCTTGAGAGCCTCCCAAGACATCTCAAAATACCTTAATTGGTATCAACAGAAGCCC
GGACAGGCTCCTCGCTTCTGATCTACCACACCAGCCGGCTCCATTCTGGAATCCCTGCCAGGTTGAG
CGGTAGCGGATCTGGGACCGACTACACCTCACTATCAGCTCACTGCAGCCAGAGGACTTCGCTGTCT
ATTTCTGTGACGAAGGGAACACCCCTGCCCTACACCTTTGGACAGGGCACCAGCTCGAGATTAAGGT
GGAGGTGGCAGCGGAGGAGGTGGGTCCGCGGTGGAGGAAGCGAGCGGTGGGAGCCAGGTTCAACT
CCAAGAAAGCGGACCGGGTCTTGTGAAGCCATCAGAACTCTTTCACTGACTTGTACTGTGAGCGGAG
TGTCTCTCCCGATTACGGGGTGTCTTGGATCAGACAGCCACCGGGGAAGGTCTGGAATGGATTGGA
GTGATTTGGGGCTCTGAGACTACTTACTACAACTCATCCCTCAAGTCACGCGTCACCATCTCAAGGA
CAACTCTAAGAATCAGGTGTCACTGAACTGTCTGTGACCGCAGCCGACACCGCGGTGACTATT
GCGCTAAGCATTACTATTATGGCGGGAGCTACGCAATGGATTACTGGGGACAGGGTACTCTGGTCACC
GTGTCCAGACCACTACCCAGCACCGAGGCCACCCACCCCGGCTCCTACCATCGCTCCCAGCTCT
GTCCCTGCGTCCGAGGCATGTAGACCCGAGCTGGTGGGGCGGTGCATACCCGGGGTCTTGACTTCG

FIG. 4 (cont'd)

SUBSTITUTE SHEET (RULE 26)

CCTGCGATATCTACATTTGGGCCCCCTCTGGCTGGTACTTGCGGGGTCTGCTGCTTTCACTCGTGATC
ACTCTTTACTGTAAGCGCGGTTCGGAAGAAGCTGCTGTACATCTTTAAGCAACCCTTCATGAGGCCTGT
GCAGACTACTCAAGAGGAGGACGGCTGTTTCATGCCGGTTCAGAGGAGGAGGAAGGCGGCTGCGAAC
TGCGCGTGAAATTCAGCCGCAGCGCAGATGCTCCAGCCTACAAGCAGGGGCAGAACAGCTCTACAAC
GAACTCAATCTTGGTCGGAGAGAGGAGTACGACGTGCTGGACAAGCGGAGAGGACGGGACCCAGAAAT
GGGCGGGAAGCCGCGCAGAAAAGAAATCCCCAAGAGGGCCTGTACAACGAGCTCCAAAAGGATAAGATGG
CAGAAGCCTATAGCGAGATTGGTATGAAAGGGGAACGCGAGAAGAGGCAAAGGCCACGACGACTGTAC
CAGGGACTCAGCACC GCCACCAAGGACACCTATGACGCTCTTCACATGCAGGCCCTGCCGCCTCGGTA
GgtcgacAAGCTTGGATCCATCGATAAAAATAAAGATTTTATTTAGTCTCCAGAAAAAGGGGGAATG
AAAGACCCACCTGTAGGTTTGGCAAGCTAGCTTAAGTAACGCCATTTTGAAGGCATGGAAAAATAC
ATAACTGAGAAATAGAGAAGTTTCAGATCAAGGTCAGGAACAGATGGAACAGCTGAATATGGGCCAAACA
GGATATCTGTGGTAAGCAGTTCTGCCCCGGCTCAGGGCCAAGAACAGATGGAACAGCTGAATATGGG
CCAAACAGGATATCTGTGGTAAGCAGTTCTGCCCCGGCTCAGGGCCAAGAACAGATGGTCCCCAGAT
GCGGTCCAGCCCTCAGCAGTTTCTAGAGAACCATCAGATGTTTCCAGGGTGCCCCAAGGACCTGAAAT
GACCCTGTGCCTTATTTGAACTAACCAATCAGTTCGCTTCTCGCTTCTGTTTCGCGCGCTTCTGCTCCC
CGAGCTCAATAAAGAGCCACAACCCCTCACTCGGCGCGCCAGTCTCCGATTGACTGAGTCGCCCG
GGTACCCGTGTATCCAATAAACCCCTCTTGCAAGTTGCATCCGACTTGTGGTCTCGCTGTTCTTGGGAG
GGTCTCCTCTGAGTGATTGACTACCCGTGACGCGGGGTCTTTTCATTTGAAGCCGAATTCGTAATCATG
GTCATAGCTGTTTCTGTGTGAAATTGTTATCCGCTCACAATTCACACAACATACGAGCCGGAAGCA
TAAAGTGTAAAGCCTGGGGTGCCCTAATGAGTGAGCTAACTCACATTAATTGCGTTGCGCTCACTGCCC
GCTTTCCAGTCGGGAAACCTGTCTGCCAGCTGCATTAATGAATCGGCCAACGCGCGGGGAGAGGCGG
TTTGCGTATTGGGCGCTCTCCGCTTCTCGCTCACTGACTCGCTGCGCTCGGTCTCGCTGCGGCTCGGC
GAGCGGTATCAGCTCACTCAAAGGCGGTAATACGTTATCCACAGAATCAGGGGATAACGCAGGAAAG
AACATGTGAGCAAAAGGCCAGCAAAAGGCCAGGAACCGTAAAAAGGCCGCTGCTGGCGTTTTTCCA
TAGGCTCCGCCCCCTGACGAGCATCACAAAAATCGACGCTCAAGTCAGAGGTGGCGAAACCCGACAG
GACTATAAAGATAACAGGCGTTTCCCCCTGGAAGCTCCCTCGTGCGCTCTCTGTTCCGACCCTGCCG
CTTACCGGATACCTGTCCGCTTTCTCCCTTCGGGAAGCGTGCGCTTTCTCAAAGCTCAGCGTGTAG
GTATCTCAGTTCCGTTGTAGTTCGTTCCGCTCCAAGCTGGGCTGTGTGCACGAACCCCCCGTTCAGCCCG
ACCGCTGCGCCTTATCCGGTAACTATCGTCTTGAGTCCAACCCGGTAAGACACGACTTATCGCCACTG
GCAGCAGCCACTGGTAACAGGATTAGCAGAGCGAGGTATGTAGGCGGTGTACAGAGTTCTTGAAGTG
GTGGCCTAACTACGGCTACACTAGAAGAACAGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTTACCT
TCGGAAAAAGAGTTGGTAGCTCTTGATCCGGCAAAACAAACCACCGCTGGTAGCGGTGGTTTTTTTGT
TGCAAGCAGCAGATTACGCGCAGAAAAAAGGATCTCAAGAAGATCCTTTGATCTTTTCTACGGGGCTC
TGACGCTCAGTGGAACGAAAACTCACGTTAAGGGATTTTGGTTCATGAGATTATCAAAAAGGATCTTCA
CCTAGATCCTTTTAAATTAATAATGAAGTTTTAAATCAATCTAAAGTATATATGAGTAAACTTGGTCT
GACAGTTACCAATGCTTAATCAGTGAGGCACCTATCTCAGCGATCTGTCTATTTTCGTTTCATCCATAGT
TGCCTGACTCCCCGTCGTGTAGATAACTACGATACGGGAGGGCTTACCATCTGGCCCCAGTGCTGCAA
TGATACCGCGAGACCCACGCTCACCGGCTCCAGATTTATCAGCAATAAACCAGCCAGCCGGAAGGGCC
GAGCGCAGAAAGTGGTCCTGCAACTTTATCCGCTCCATCCAGTCTATTAATTGTTGCCGGGAAGCTAG
AGTAAGTAGTTTCGCCAGTTAATAGTTTGCGCAACGTTGTTGCCATTGCTACAGGCATCGTGGTGTAC
GCTCGTCGTTTGGTATGGCTTCATTCAGTCCGGTTCCTAACGATCAAGGCGAGTTACATGATCCCCC
ATGTTGTGCAAAAAAGCGTTAGCTCCTTCGGTCTCCGATCGTTGTCAGAAGTAAGTTGGCCGAGT
GTTTACTACTCATGGTTATGGCAGCACTGCATAATTCTTACTGTCTATGCCATCCGTAAGATGCTTTT
CTGTATGCTGGTGAGTACTCAACCAAGTCATTCTGAGAATAGTGTATGCGGCGACCGAGTTGCTCTTGC
CCGGCGTCAATACGGGATAATAACCGCGCCACATAGCAGAACTTTAAAGTGCTCATCATTTGGAAAACG
TTCTTCGGGGCGAAAACTCTCAAGGATCTTACCGCTGTTGAGATCCAGTTCGATGTAACCCACTCGTG
CACCCAAGTATCTTACGATCTTTTACTTTACCAGCGTTTCTGGGTGAGCAAAAAACAGGAAGGCCAA
AATGCCGCAAAAAAGGGAATAAGGGCGACACGGAAATGTTGAATACTCATACTCTTCTTTTCAATA
TTATTGAAGCATTTATCAGGGTTATTGTCTCATGAGCGGATACATATTTGAATGTATTTAGAAAAATA
AACAAATAGGGGTTCCGCGCACATTTCCCCGAAAAGTGCCACCTGACGTCTAAGAAACCATTATTATC
ATGACATTAACCTATAAAAAATAGGCGTATCACGAGGCCCTTTTCGTC

FIG. 4 (cont'd)

SUBSTITUTE SHEET (RULE 26)

pBA9b-hCD19CAR4 (SEQ ID NO:21)

TCGCGCGTTTCGGTGATGACGGTGAAAACCTCTGACACATGCAGCTCCCGGAGACGGTCACAGCTTGT
CTGTAAGCGGATGCCGGGAGCAGACAAGCCCGTCAGGGCGCGTCAGCGGGTGTGGCGGGTGTCTGGGG
CTGGCTTAACTATGCGGCATCAGAGCAGATTGTACTGAGAGTGCACCATATGCGGTGTGAAATACCGC
ACAGATGCGTAAGGAGAAAATACCGCATCAGGCGCCATTGCGCCATTAGGCTGCGCAACTGTTGGGAA
GGGCGATCGGTGCGGGCCTCTTCGCTATTACGCCAGCTGGCGAAAGGGGGATGTGCTGCAAGGCGATT
AAGTTGGGTAAACGCCAGGGTTTTCCAGTCACGACGTTGTAAAACGACGGCCAGTGCCAAGCTGACTC
TAGAGGATCGATCCCCGGCGCTCTAGCTTAAGTAACGCCATTTTGCAAGGCATGAAAAATACATAA
CTGAGAATAGAGAAGTTTCAGATCAAGGTCAGGAACAGATGGAACAGCTGAATATGGGCCAAACAGGAT
ATCTGTGGTAAGCAGTTCTGCCCCGGCTCAGGGCCAAAGAACAGATGGAACAGCTGAATATGGGCCAA
ACAGGATATCTGTGGTAAGCAGTTCTGCCCCGGCTCAGGGCCAAAGAACAGATGGTCCCCAGATGCGG
TCCAGCCCTCAGCAGTTTCTAGAGAACCATCAGATGTTTCCAGGGTGCCCCAAGGACCTGAAATGACC
CTGTGCCTTATTTGAACTAACCAATCAGTTCGCTTCTCGCTTCTGTTTCGCGCGCTTCTGCTCCCCGAG
CTCAATAAAAGAGCCCCACAACCCCTCACTCGGCGCGCCAGTCTCCGATTGACTGAGTCGCCCCGGTA
CCCGTGTATCCAATAAACCCCTCTTGCACTTGCATCCGACTTGTGGTCTCGCTGTTCCCTGGGAGGGTC
TCCTCTGAGTGATTGACTACCCGTGAGCGGGGGTCTTTCATTTGGGGGCTCGTCCGGGATCGGGAGAC
CCCTGCCCAGGGACCACCGACCCACCACCGGGAGGTAAGCTGGCCAGCAACTTATCTGTGTCTGTCCG
ATTGTCTAGTGTCTATGACTGATTTTATGCGCCTGCGTCGGTACTAGTTAGCTAACTAGCTCTGTATC
TGGCGGACCCGTGGTGGAAGTACGAGTTTCGGAACACCCGGCCGCAACCCCTGGGAGACGTCCCAGGGA
CTTCGGGGGCGGTTTTTGTGGCCGACCTGAGTCCAAAAATCCCGATCGTTTTTGGACTCTTTGGTGCA
CCCCCTTAGAGGAGGGATATGTGGTTCTGGTAGGAGACGAGAACCATAAACAGTTCCCGCCTCCGTC
TGAATTTTTGCTTTTCGTTTGGGACCGAAGCCGCGCGCGCTTGTCTGCTGCAGCATCGTTCTGT
GTTGTCTCTGTCTGACTGTGTTTCTGTATTTGTCTGAGAATTAAGGCCAGACTGTTACCACTCCCTGA
AGTTTGACCTTAGGTACTGGAAGATGTGAGCGGATCGCTCACAACCAGTCGGTAGATGTCAAGAA
GAGACGTTGGGTTACCTTCTGCTCTGCAGAATGGCCAACCTTTAACGTCGGATGGCCGCGAGACGGCA
CCTTTAACCGAGACCTCATACCCAGGTTAAGATCAAGGTCTTTTACCTGGCCCGCATGGACACCCA
GACCAGGTCCCTACATCGTGACCTGGGAAGCCTTGGCTTTTGACCCCCCTCCCTGGGTCAAGCCCTT
TGTAACCCCTAAGCCTCCGCTCCTCTTCTCCATCCGCCCCGTCTCTCCCCCTTGAACCTCCTCGTT
CGACCCCGCTCGATCCTCCCTTTATCCAGCCCTCACTCCTTCTCTAGGCGCCGGAATTAATTCCTGA
GGGGCCAGATCTGcgggcgcATGGCTCTGCCCCGTGACCGCACTCCTCCTGCCACTGGCTCTGTGCT
TCACGCGGCTCGCCACAGTCCAGCTTCAAGAATCAGGGCCTGGTCTGGTGAAGCCATCTGAGACTC
TGTCCTCACTTGCACCGTGAGCGGAGTGTCCCTCCAGACTACGGAGTGAGCTGGATTAGACAGCCT
CCCGGAAAGGGACTGGAGTGGATCGGAGTGATTTGGGGTAGCGAAACCACTTACTATACTCTTCCCT
GAAGTCACGGGTCAACATTTCAAAGGATAAATCAAAGAATCAAGTGAGCCTCAAGCTCTCATCAGTCA
CCGCCGCTGACACCGCGGTGTATTACTGTGCCAAGCATTACTACTATGGAGGGTCTACGCCATGGAC
TACTGGGGCCAGGGAATCTGGTCACTGTGTCTGTCATCTGGTGGAGGAGGTAGCGGAGGAGGCGGGAGCGG
TGGAGGTGGCTCCGAGGTGGCGGAAGCGAAATCGTGATGACCCAGAGCCCTGCAACCCCTGTCCCTTT
CTCCCGGGGAACGGGTACCCCTTTCTTGTGCGGCATCACAAGATATCTCAAAATACCTCAATTGGTAT
CAACAGAAGCCGGGACAGGCCCTAGGCTTCTTATCTACCACACCTCTCGCTGCATAGCGGGATTCC
CGCACGCTTTAGCGGCTCTGGAAGCGGGACCGACTACACTCTGACCATCTCATCTCTCCAGCCCGAGG
ACTTCGCCGTCTACTTCTGCCAGCAGGTAACACCCCTGCCGTACACCTTCGGCCAGGGCACCAAGCTT
GAGATCAAAACCACTACTCCCGCTCCAAGGCCACCCACCCCTGCCCCGACCATCGCTCTCAGCCGCT
TTCCTGCGTCCGGAGGCATGTAGACCCGACGCTGGTGGGGCCGTGCATACCCGGGGTCTTGACTTCG
CCTGCGATATCTACATTTGGGCCCTCTGGCTGGTACTTGCGGGGTCTGCTGCTTCACTCGTGATC
ACTCTTTACTGTAAAGCGCGGTGGAAGAAGCTGCTGTACATCTTTAAGCAACCCCTCATGAGGCCTGT
GCAGACTACTCAAGAGGAGGACGGCTGTTTCATGCCGGTTCAGAGAGGAGGAGGAAGGCGGCTGCGAAC
TGCGCGTGAAATTCAGCCGACGCGCAGATGCTCCAGCCTACAAGCAGGGGCAGAACAGCTCTACAAC
GAACTCAATCTTGGTCGGAGAGAGGAGTACGACGTGCTGGACAAGCGGAGAGGACGGGACCCAGAAAT
GGGCGGGAAGCCGCGCAGAAAGAATCCCCAAGAGGGCTGTACAACGAGCTCCAAAGGATAAGATGG
CAGAAGCCTATAGCGAGATTGGTATGAAAGGGGAACGCAGAAGAGGCAAGGCCACGACGACTGTAC

FIG. 4 (cont'd)

CAGGGACTCAGCACCGCCACCAAGGACACCTATGACGCTCTTCACATGCAGGCCCTGCCGCTCGGTA
GgtcgacAAGCTTGGATCCATCGATAAAATAAAAGATTTTATTTAGTCTCCAGAAAAAGGGGGAATG
AAAGACCCACCTGTAGGTTTGGCAAGCTAGCTTAAGTAACGCCATTTTGCAAGGCATGGAAAAATAC
ATAACTGAGAATAGAGAAGTTCAGATCAAGGTCAGGAACAGATGGAACAGCTGAATATGGGCCAAACA
GGATATCTGTGGTAAGCAGTTCCTGCCCCGGCTCAGGGCCAAGAACAGATGGAACAGCTGAATATGGG
CCAAACAGGATATCTGTGGTAAGCAGTTCCTGCCCCGGCTCAGGGCCAAGAACAGATGGTCCCCAGAT
GCGGTCCAGCCCTCAGCAGTTTCTAGAGAACCATCAGATGTTTCCAGGGTGCCCCAAGGACCTGAAAT
GACCCTGTGCCTTATTTGAACTAACCAATCAGTTCGCTTCTCGCTTCTGTTTCGCGCGCTTCTGCTCCC
CGAGCTCAATAAAAGAGCCCAACCCCTCACTCGGCGCGCCAGTCCCTCCGATTGACTGAGTCGCCCG
GGTCTCCTCTGAGTGATTGACTACCCGTCAGCGGGGGTCTTTTCATTTGAAGCCGAATTCGTAATCATG
GTCATAGCTGTTTCTGTGAAATTGTTATCCGCTCACAATTCACACAACATACGAGCCGGAAGCA
TAAAGTGTAAGCCTGGGGTGCTAATGAGTGAGCTAACTCACATTAATTGCGTTGCGCTCACTGCCC
GCTTTCAGTCGGGAAACCTGTGTCGCCAGCTGCATTAATGAATCGGCCAACGCGCGGGGAGAGGCGG
TTTGCGTATTGGGCGCTTCTCCGCTTCTCGCTCACTGACTCGCTGCGCTCGGTGCTTCGGCTGCGGC
GAGCGGTATCAGCTCACTCAAAGGCGGTAATACGGTTATCCACAGAATCAGGGGATAACGCAGGAAAG
AACATGTGAGCAAAAGGCCAGCAAAAGGCCAGGAACCGTAAAAAGGCCGCTTGCTGGCGTTTTTCCA
TAGGCTCCGCCCCCTGACGAGCATCAGAAAAATCGACGCTCAAGTCAGAGGTGGCGAAACCCGACAG
GACTATAAAGATACCAGGCGTTTCCCCCTGGAAGCTCCCTCGTGCGCTCTCCTGTTCCGACCCTGCCG
CTTACCGGATACCTGTCCGCTTCTCCCTTCGGGAAGCGTGGCGCTTCTCAAAGCTCAGCGTGTAG
GTATCTCAGTTCGGTGATAGTTCGTTTCGCTCCAAGCTGGGCTGTGTGCACGAACCCCGTTACGCCCG
ACCGCTGCGCCTTATCCGGTAACATATCGTCTTGAGTCCAACCCGTTAAGACACGACTTATCGCCACTG
GCAGCAGCCACTGGTAACAGGATTAGCAGAGCGAGGTATGTAGGCGGTGCTACAGAGTTCTTGAAGTG
GTGGCCTAACTACGGCTACACTAGAAGAACAGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTTACCT
TCGGAAAAAGAGTTGGTAGCTCTTGATCCGGCAAAACAAACCACCGCTGGTAGCGGTGGTTTTTTTTGT
TGCAAGCAGCAGATTACGCGCAGAAAAAAGGATCTCAAGAAGATCCTTTGATCTTTCTACGGGGTC
TGACGCTCAGTGGAACGAAACTCACGTTAAGGGATTTTGGTCATGAGATTATCAAAAAGGATCTTCA
CCTAGATCCTTTTAAATTAAAAATGAAGTTTTTAAATCAATCTAAAGTATATATGAGTAAACTTGGTCT
GACAGTTACCAATGCTTAATCAGTGAGGCACCTATCTCAGCGATCTGTCTATTTTCGTTTCATCCATAGT
TGCCTGACTCCCCGTCGTGTAGATAACTACGATACGGGAGGGCTTACCATCTGGCCCCAGTGCTGCAA
TGATACCGCGAGACCCACGCTCACC GGCTCCAGATTTATCAGCAATAAACCAGCCAGCCGGAAGGGCC
GAGCGCAGAAAGTGGTCTGCACTTTATCCGCTCCATCCAGTCTATTAATTGTTGCCGGGAAGCTAG
AGTAAGTAGTTTCGCCAGTTAATAGTTTTGCGCAACGTTGTTGCCATTGCTACAGGCATCGTGGTGTAC
GCTCGTCGTTTGGTATGGCTTCATTCAGCTCCGGTTCCCAACGATCAAGGCGAGTTACATGATCCCCC
ATGTTGTGCAAAAAAGCGGTTAGTCTCCTTCGGTCTCCGATCGTTGTCAGAAGTAAGTTGGCCGAGT
GTTATCACTCATGGTTATGGCAGCACTGCATAATTCTCTTACTGTGTCATGCCATCCGTAAGATGCTTTT
CTGTGACTGGTGAGTACTCAACCAAGTCATTCTGAGAATAGTGTATGCGGCGACCGAGTTGCTCTTGC
CCGGCGTCAATACGGGATAATACCGCGCCACATAGCAGAACTTTAAAAGTGCTCATATTGAAAAACG
TTCTTCGGGCGCAAACTCTCAAGGATCTTACCGCTGTTGAGATCCAGTTCGATGTAACCCACTCGTG
CACCAACTGATCTTCAGCATCTTTTACTTTACCAGCGTTTCTGGGTGAGCAAAAAACAGGAAGGCAA
AATGCCGCAAAAAAGGGAATAAGGGCGACCGGAAATGTTGAATACTCATACTCTTCCTTTTTCAATA
TTATTGAAGCATTTATCAGGGTTATTGTCTCATGAGCGGATACATATTTGAATGTATTTAGAAAAATA
AACAAATAGGGGTTCCGCGCACATTTCCCGGAAAGTGCCACCTGACGTCTAAGAAACCATTTATATC
ATGACATTAACCTATAAAAAATAGGCGTATCACGAGGCCCTTTCGTC

pBA9b-hCD19CAR5 (SEQ ID NO:22)

TCGCGCGTTTCGGTGATGACGGTGAAAACCTCTGACACATGCAGCTCCCGGAGACGGTCACAGCTTGT
CTGTAAGCGGATGCCGGGAGCAGACAAGCCCGTCAGGGCGCGTCAGCGGGTGTGGCGGGTGTCCGGG
CTGGCTTAACTATGCGGCATCAGAGCAGATTGTACTGAGAGTGACCATATGCGGTGTGAAATACCGC
ACAGATGCCGAAGGAGAAAATACCGCATCAGGCGCCATTGCCATTGAGGCTGCGCAACTGTTGGGAA

FIG. 4 (cont'd)

SUBSTITUTE SHEET (RULE 26)

GGGCGATCGGTGCGGGCCTCTTCGCTATTACGCCAGCTGGCGAAAGGGGGATGTGCTGCAAGGCGATT
AAGTTGGGTAACGCCAGGGTTTTCCAGTCACGACGTTGTAAAACGACGGCCAGTGCCAAGCTGACTC
TAGAGGATCGATCCCCGGCGCTCTAGCTTAAGTAACGCCATTTTGCAAGGCATGGAAAAATACATAA
CTGAGAATAGAGAAGTTCAGATCAAGGTCAGGAACAGATGGAACAGCTGAATATGGGCCAAACAGGAT
ATCTGTGGTAAGCAGTTCCTGCCCCGGCTCAGGGCCAAGAACAGATGGAACAGCTGAATATGGGCCAA
ACAGGATATCTGTGGTAAGCAGTTCCTGCCCCGGCTCAGGGCCAAGAACAGATGGTCCCCAGATGCGG
TCCAGCCCTCAGCAGTTTCTAGAGAACCATCAGATGTTTCCAGGGTGCCCCAAGGACCTGAAATGACC
CTGTGCCTTATTTGAACTAACCAATCAGTTCGCTTCTCGCTTCTGTTTCGCGCGCTTCTGCTCCCCGAG
CTCAATAAAAAGAGCCCAACCCCTCACTCGGCGCGCCAGTCCCTCCGATTGACTGAGTCGCCCCGGTA
CCCGTGTATCCAATAAACCCCTCTTGCACTTGCATCCGACTTGTGGTCTCGCTGTTCCCTTGGGAGGGTC
TCCTCTGAGTGATTGACTACCCGTGACGCGGGGCTCTTTCATTTGGGGGCTCGTCCGGGATCGGGAGAC
CCCTGCCCAGGGACCACCGACCCACCACCGGGAGGTAAGCTGGCCAGCAACTATCTGTGTCTGTCCG
ATTGTCTAGTGTCTATGACTGATTTTATGCGCCTGCGTCGGTACTAGTTAGCTAACTAGCTCTGTATC
TGGCGGACCCGTGGTGGAACTGACGAGTTCGGAACACCCGGCCGCAACCCTGGGAGACGTCCCAGGGA
CTTCGGGGGCGGTTTTTGTGGCCGACCTGAGTCCAAAAATCCCGATCGTTTTGGACTCTTTGGTGCA
CCCCCTTAGAGGAGGGATATGTGGTCTGGTAGGAGACGAGAACCATAAACAGTTCCTCGCCTCCGTC
TGAATTTTTGCTTTTCGGTTTGGGACCGAAGCCGCGCCGCGCTTGTCTGCTGCAGCATCGTTCTGT
GTTGTCTCTGTCTGACTGTGTTTCTGTATTTGTCTGAGAATTAAGGCCAGACTGTTACCACTCCCTGA
AGTTTGACCTTAGGTCAGTGGAAGATGTGAGCGGATCGCTCACAAACAGTCGGTAGATGTCAAGAA
GAGACGTTGGGTTACCTTCTGCTCTGCAGAATGGCCAACCTTTAACGTCGGATGGCCGCGAGACGGCA
CCTTTAACCGAGACCTCATCACCAGGTTAAGATCAAGGTCTTTTACCTGGCCCGATGGACACCCA
GACCAGGTCCCTACATCTGACCTGGGAAGCCTTGGCTTTTGACCCCCCTCCCTGGGTCAAGCCCTT
TGTACACCCTAAGCCTCCGCTCCTCTTCCATCCGCCCCGTCTCTCCCCCTTGAACCTCCTCGTT
CGACCCCGCTCGATCCTCCCTTTATCCAGCCCTCACTCCTTCTCTAGGCGCCGGAATTAATTCTCGA
GGGGCCAGATCTgcgggcgcATGGCCTTACCAGTGACCGCCTTGCTCCTGCGCTGGCCTTGCTGCT
CCACGCCGCCAGGCCGACATCCAGATGACACAGACTACATCCTCCCTGTCTGCCTCTCTGGGAGACA
GAGTCACCATCAGTTGCAGGGCAAGTCAGGACATTAGTAAATATTTAAATTGGTATCAGCAGAAACCA
GATGGAACGTATAAATCCTGATCTACCATACATCAAGATTACACTCAGGAGTCCCATCAAGGTTAG
TGGCAGTGGGTCTGGAACAGATTATCTCTCACCATTAGCAACCTGGAGCAAGAAGATATTGCCACTT
ACTTTTGCCAAACAGGTAATACGCTTCCGTACAGTTCGGAGGGGGGACCAAGCTGGAGATCACAGGT
GGCGGTGGCTCGGGCGGTGGTGGGTGGCGGGGATCTGAGGTGAAACTGCAGGAGTCAGGACC
TGGCTGTGGTGGCGCCCTCACAGAGCCTGTCCGTACATGCATGCTCAGGGGTCTCATTACCCGACT
ATGGTGTAAGCTGGATTTCGCCAGCCTCCAGAAAGGCTCTGGAGTGGCTGGGAGTAATATGGGGTAGT
GAAACCACATACTATAATTAGCTCTCAAATCCAGACTGACCATCATCAAGGACAACCTCCAAGAGCCA
AGTTTTCTTAAAAATGAACAGTCTGCAAACTGATGACACAGCCATTTACTACTGTGCCAAACATTATT
ACTACGGTGGTAGCTATGCTATGGACTACTGGGGCCAAGGAACCTCAGTCACCGTCTCCTCAACCACG
ACGCCAGCGCCGCGACCAACACCGGCGCCACCATCGCGTCGCAGCCCCGTGTCCTGCGCCCGA
GGCGTGCCGCGCCAGCGCGGGGGGCGCAGTGCACACGAGGGGGCTGGACTTCGCCTGTGATATCTACA
TCTGGGCGCCCTTGGCCGGGACTTGTGGGTCTTCTCCTGTCACTGGTTATCACCTTTACTGCAAA
CGGGGCAGAAAGAACTCCTGTATATATTCAAACAACCATTTATGAGACCAGTACAACTACTCAAGA
GGAAGATGGCTGTAGCTGCCGATTTCCAGAAGAAGAAGGAGGATGTGAAGTGAAGTGAAGTTCA
GCAGGAGCGCAGACGCCCCGCTACAAGCAGGGCCAGAACCAGCTCTATAACGAGCTCAATCTAGGA
CGAAGAGAGGACTACGATGTTTGGACAAGAGAGTGGCCGGGACCCTGAGATGGGGGGGAAAGCCGAG
AAGGAAGAACCCTCAGGAAGGCCTGTACAATGAACATGCAGAAAGATAAGATGGCGGAGGCCATACAGTG
AGATTGGGATGAAAGGCGAGCGCCGGAGGGCAAGGGGCACGATGGCCTTTACCAGGCTCTCAGTACA
GCCACCAAGGACACCTACGACGCCCTTACATGCAGGCCCTGCCCCCTCGCTAGgtcgacAAGCTTGG
ATCCATCGATAAAATAAAAGATTTTATTTAGTCTCCAGAAAAAGGGGGGAATGAAAGACCCACCTGT
AGGTTTGGCAAGCTAGCTTAAGTAACGCCATTTTGCAAGGCATGGAAAAATACATAACTGAGAATAGA
GAAGTTCAGATCAAGGTCAGGAACAGATGGAACAGCTGAATATGGGCCAAACAGGATATCTGTGGTAA
GCAGTTCCTGCCCCGGCTCAGGGCCAAGAACAGATGGAACAGCTGAATATGGGCCAAACAGGATATCT
GTGGTAAGCAGTTCCTGCCCCGGCTCAGGGCCAAGAACAGATGGTCCCCAGATGCGGTCCAGCCCTCA
GCAGTTTCTAGAGAACCATCAGATGTTTCCAGGGTGCCCCAAGGACCTGAAATGACCCTGTGCCTTAT

FIG. 4 (cont'd)

TTGAACTAACCAATCAGTTCGCTTCTCGCTTCTGTTTCGCGCGCTTCTGCTCCCCGAGCTCAATAAAAG
AGCCCACAACCCCTCACTCGGCGCGCCAGTCTCTCGATTGACTGAGTCGCCCCGGGTACCCGTGTATCC
AATAAACCCCTCTTGAGTTGCATCCGACTTGTGGTCTCGCTGTTCCCTGGGAGGGTCTCCTCTGAGTG
ATTGACTACCCGTGAGCGGGGTCTTTTCAATTTGAAGCCGAATTCGTAATCATGGTCATAGCTGTTTCC
TGTGTGAAATTGTTATCCGCTCACAAATPCCACACAACATACGAGCCGGAAGCATAAAGTGTAAGCCT
GGGGTGCCTAATGAGTGAGCTAACTCACATTAATTGCGTTGCGCTCACTGCCCCGCTTTCAGTCGGGA
AACCTGTCGTGCCAGCTGCATTAATGAATCGGCCAACGCGCGGGGAGAGGCGGTTTTCGTATTGGGCG
CTCTTCCGCTTCCCTCGCTCACTGACTCGCTGCGCTCGGTTCGTTTCGGCTGCGGCGAGCGGTATCAGCTC
ACTCAAAGGCGGTAATACGGTTATCCACAGAATCAGGGGATAACGCAGGAAAGAACATGTGAGCAAAA
GGCCAGCAAAAGGCCAGGAACCGTAAAAAGGCCGCGTTGCTGGCGTTTTTCCATAGGCTCCGCCCCC
TGACGAGCATCAAAAAATCGACGCTCAAGTCAGAGGTGGCGAAACCCGACAGGACTATAAAGATACC
AGGCGTTTTCCCCCTGGAAGCTCCCTCGTGCCTCTCCTGTTCCGACCCCTGCCGCTTACCGGATACCTG
TCCGCCTTTCTCCCTTCGGAAGCGTGGCGCTTTCTCAAAGCTCACGCTGTAGGTATCTCAGTTCGGT
GTAGGTGCTTCGCTCCAAGCTGGGCTGTGTGCACGAACCCCCGTTTACGCCCAGCGCTGCGCCTTAT
CCGGTAACATATCGTCTTGAGTCCAACCCGGTAAGACACGACTTATCGCCACTGGCAGCAGCCACTGGT
AACAGGATTAGCAGAGCGAGGTATGTAGGCGGTGCTACAGAGTTCCTGAAGTGGTGGCCTAACTACGG
CTACACTAGAAGAACAGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTTACCTTCGGAAGAGAGTTG
GTAGCTCTTGATCCGGCAAAACAAACCCGCTGGTAGCGGTGGTTTTTTTGTGTTGCAAGCAGCAGATT
ACGCGCAGAAAAAAGGATCTCAAGAAGATCCTTTGATCTTTTCTACGGGGTCTGACGCTCAGTGGA
CGAAAACTCACGTTAAGGATTTTGGTCATGAGATTATCAAAAAGGATCTTACCTAGATCCTTTTAA
ATTAAAAATGAAGTTTTTAAATCAATCTAAAGTATATATGAGTAACTTGGTCTGACAGTTACCAATGC
TTAATCAGTGAGGCACCTATCTCAGCGATCTGTCTATTTTCGTTTCATCCATAGTTGCCTGACTCCCCGT
CGTGTAGATAACTACGATACGGGAGGGCTTACCATCTGGCCCCAGTGTGCAATGATACCGCGAGACC
CACGCTCACCGGCTCCAGATTTATCAGCAATAAACCCAGCCAGCCGGAAGGGCCGAGCGCAGAAGTGGT
CCTGCAACTTTATCCGCTCCATCCAGTCTATTAATTGTTGCCGGAAGCTAGAGTAAGTAGTTCGCC
AGTTAATAGTTTGCACAACGTTGTTGCCATTGCTACAGGCATCGTGGTGTACGCTCGTTCGTTGGTA
TGGCTTCATTGAGTCCGTTCCCAACGATCAAGGCGAGTTACATGATCCCCCATGTTGTGCAAAAAA
GCGGTTAGCTCCTTCGGTCCCTCCGATCGTTGTGAGAAAGTAAAGTTGGCCGAGTGTATCACTCATGGT
TATGGCAGCACTGCATAATTCTCTTACTGTGTCATGCCATCCGTAAGATGCTTTTCTGTGACTGGTGA
ACTCAACCAAGTCATTCTGAGAATAGTGTATGCGGCGACCGAGTTGCTCTTGCCCGCGTCAATACGG
GATAATACCGCGCCACATAGCAGAACTTTAAAAGTGCTCATCATTGGAAAACGTTCTTCGGGGCGAAA
ACTCTCAAGGATCTTACCGCTGTTGAGATCCAGTTTCGATGTAACCCACTCGTGCACCCAAGTATCTT
CAGCATCTTTTACTTTTACCAGCGTTTCTGGGTGAGCAAAAACAGGAAGGCAAAATGCCGCAAAAAAG
GGAATAAGGGCGACACGGAATGTTGAATACTCATACTCTTCTTTTCAATATTATTGAAGCATTTA
TCAGGGTTATTGTCTCATGAGCGGATACATATTTGAATGTATTTAGAAAAATAAACAAATAGGGGTTC
CGCGCACATTTCCCCGAAAAGTGCCACCTGACGTCTAAGAAACCATTATTATCATGACATTAACCTAT
AAAAATAGGCGTATCACGAGGCCCTTTTCGTGATGGCCCTGCCTGTGACAGCCCTGCTGCTGCCTCTGG
CTCTGCTGCTGCATGCCGCTAGACCC

FIG. 4 (cont'd)

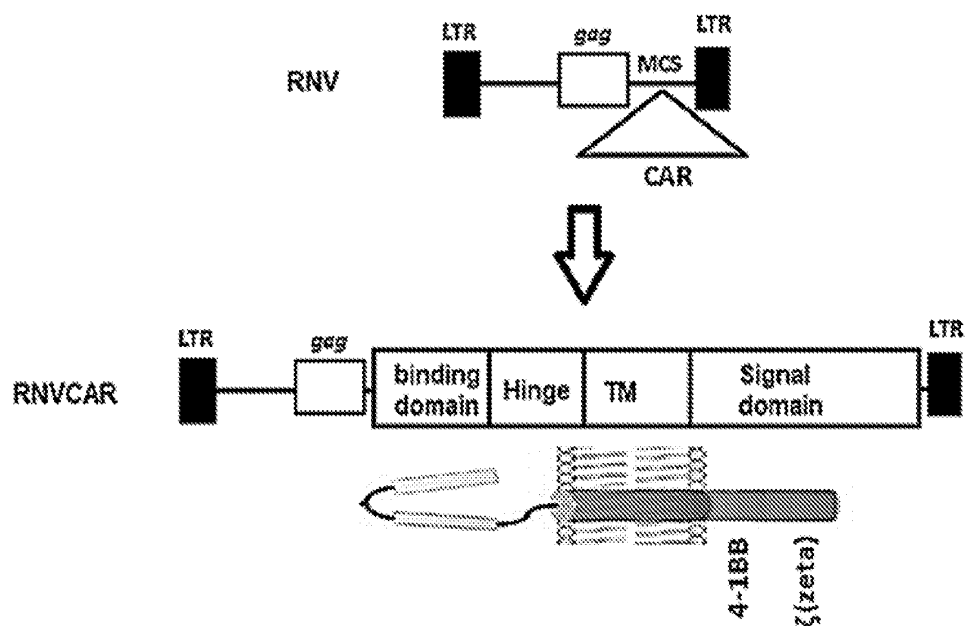


FIG. 5A

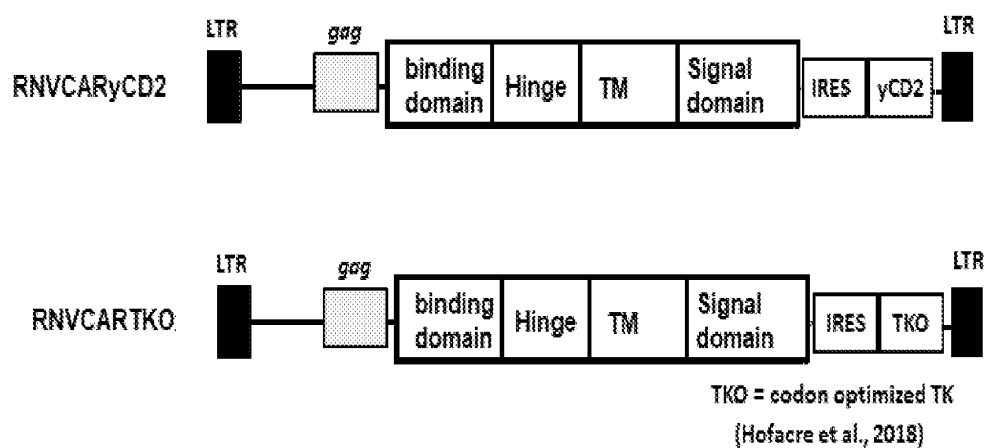


FIG. 5B

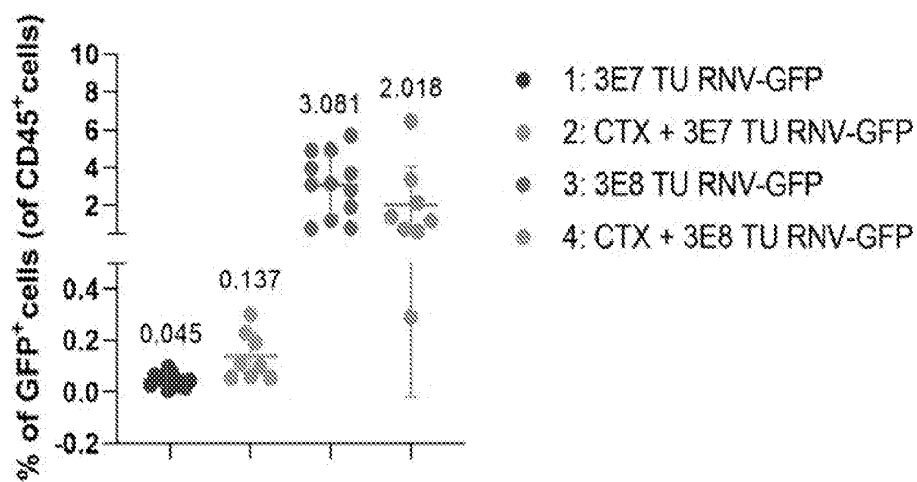


FIG. 6

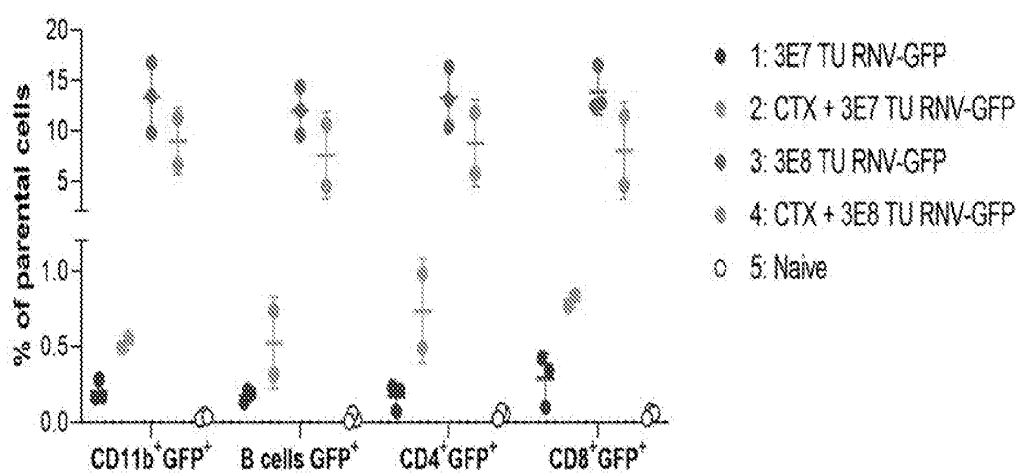


FIG. 7

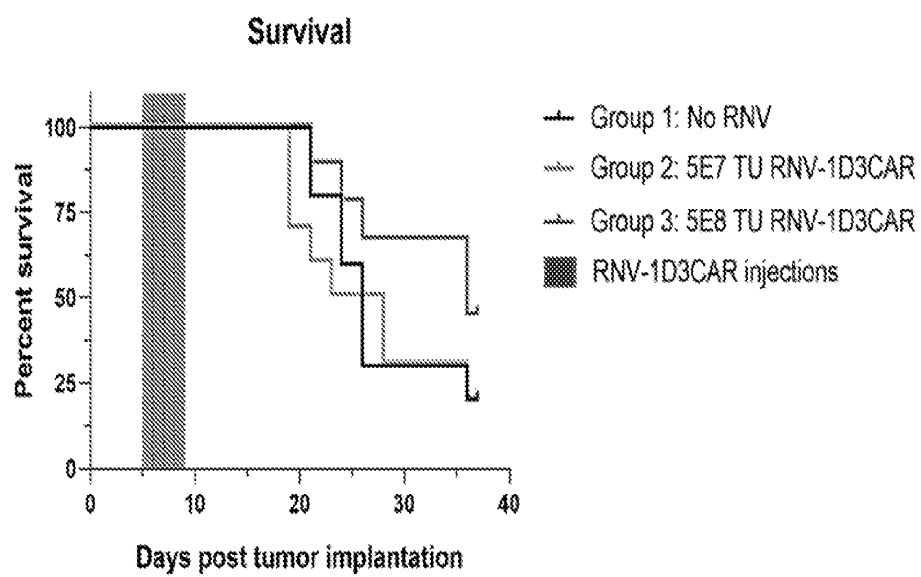


FIG. 8