Optimized Nucleic Acid Sequence Encoding IgG Heavy Chain

GGATCCGCCACCATGGAAACCGACACTCTGCTGCTGTGGGTGCTGCTGCTGTGGGTGCCCGGCTCAACAGGCGACGGC
GCTCAGGTCCAGCTGGTCCAGTCTGGAGCTGTGATCAAGACCCCTGGCAGCTCCGTCAAAATTTCTTGCAGAGCAAGTG
GCTACAACTTCCGGGACTATAGCATCCACTGGGTGCGGCTGATTCCTGATAAGGGATTTGAGTGGATCGGCTGGATCAA
GCCACTGTGGGGCGCTGTGTCCTACGGCAAGGGGCGGCGTCTCCATGACACGGACAGCTGTCTCAGGACCC
AGACCGATCCCGATTGGGGGGTGGCCTACATGGAGTTCAGTGGACTGACTCCCGCAGACACCGCCGAATATTTTTGCGTG
CGGAGAGGCTCCTGCGACTACTGTGGGGATTTCCCATGGCAGTATTGGTGGTCAGGGAACTGTGGTCACCGTCTCTAGTG
CATCAACCAAGGGCCCCAGCGTGTTTCCTCTGGCCCCCATCAAGCAAAAGTACATCAGGAGGAACTGCAGCTCTGGGAT
GTCTGGTGAAGGATTACTTCCCCGAGCCTGTGACCGTCAGCTGGAACTCCGGAGCACTGACCTCCGGAGTGCACACATT
TCCCGCTGTCCTGCAGTCCTCTGGGCTGTACTCTCTGAGTTCAGTGGTCACAGTGCCTAGCTCCTCTCTGGGCACCCAGA
CATATATCTGCAACGTCAATCATAAGCCAAGTAATACTAAAGTGGACAAGAAAGTCGAACCCAAATCATGTTACCCCT
ATGACGTGCCTGATTATGCTTGATAACTCGAG (SEQ ID NO:6)

FIG. 1

Optimized Nucleic Acid Sequence Encoding IgG Light Chain

GGATCCGCCACCATGGAGACTGATACACTGCTGCTGTGGGTGCTGCTGTGGGTGCCTGGCTCAACCGGCGACGGG
GCTCAGGTCCAGATTGTGCTGACCCAGAGCCCTGGCATCCTGTCACTGAGCCCAGGAGAGACCGCAACACTGTTCTGCA
AGGCCTCCCAGGGCGGGAACGCTATGACATGGTACCAGAAACGGGAGAGGACAGGTGCCCCGACTGCTGATCTATGACA
CTTCAAGGCGAGCAAGCCGAGTGCCTGATTTGTCGGCAGCGGCTCTGGGACAGACTTCTCTTTCTGACTATTAATAA
GCTGGACAGAGAGGATTTCGCTGTGTACTATTGCCAGCAGTTTGAATTCTTTGGACTGGGCAGCGAGCTGGAAGTGCAC
AGGACCGTCGCCGCTCCAAGTGTTCATTTTTCCCCCTAGCGATGAGCAGCTGAAATCCGGGACAGCCTCTGTTGTGTCT
GTCTGCTGAACAATTTCTACCCCCGCGAAGCAAAGGTGCAGTGGAAAGTCGACAACGCCCTGCAGAGTGGCAATTCAC
AGGAGAGCGTGACCGAACAGGACTCCAAGGATTCTACATATAGTCTGAGCTCCACTCTGACCCTGTCTAAAGCTGATTA
CGAGAAGCACAAAGTGTATGCATGCGAAGTCACTCATCAGGGCCTGTCTAGTCCTGTGACCAAGAGCTTTAACCGAGG
GGAGTGTTACCCATATGACGTCCCCGATTACGCCTGATAACTCGAG (SEQ ID NO:7)

FIG. 2

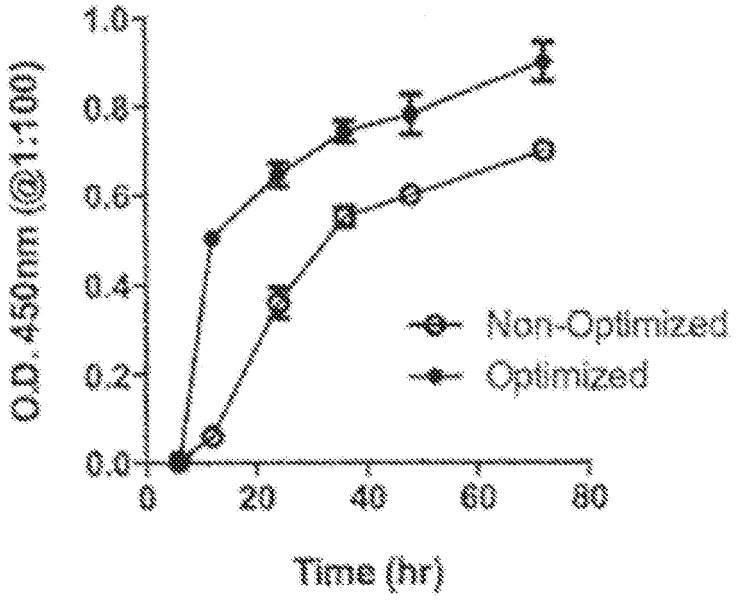

O.D. 450nm (@1:100)
1.0
0.8
0.6
0.4
0.2
0.0
0
20
40
60
80
Time (hr)
Non-Optimized
Optimized

FIG. 3

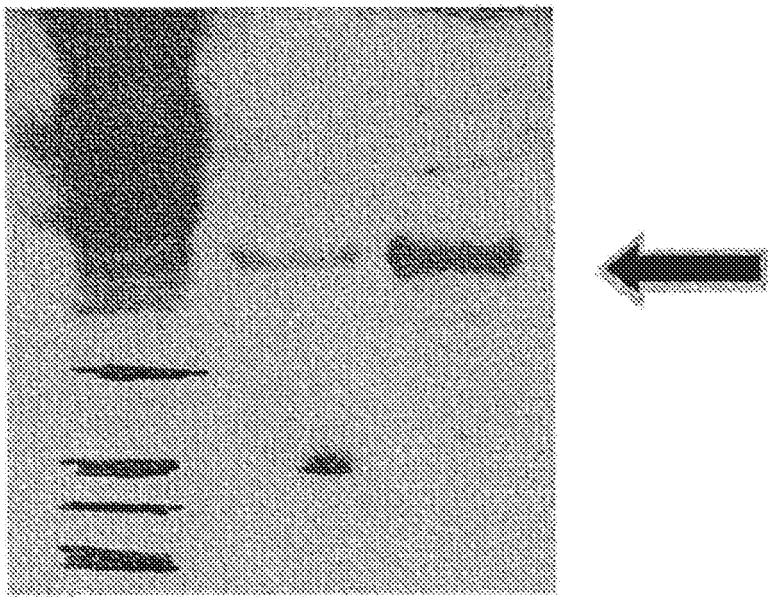


FIG. 4

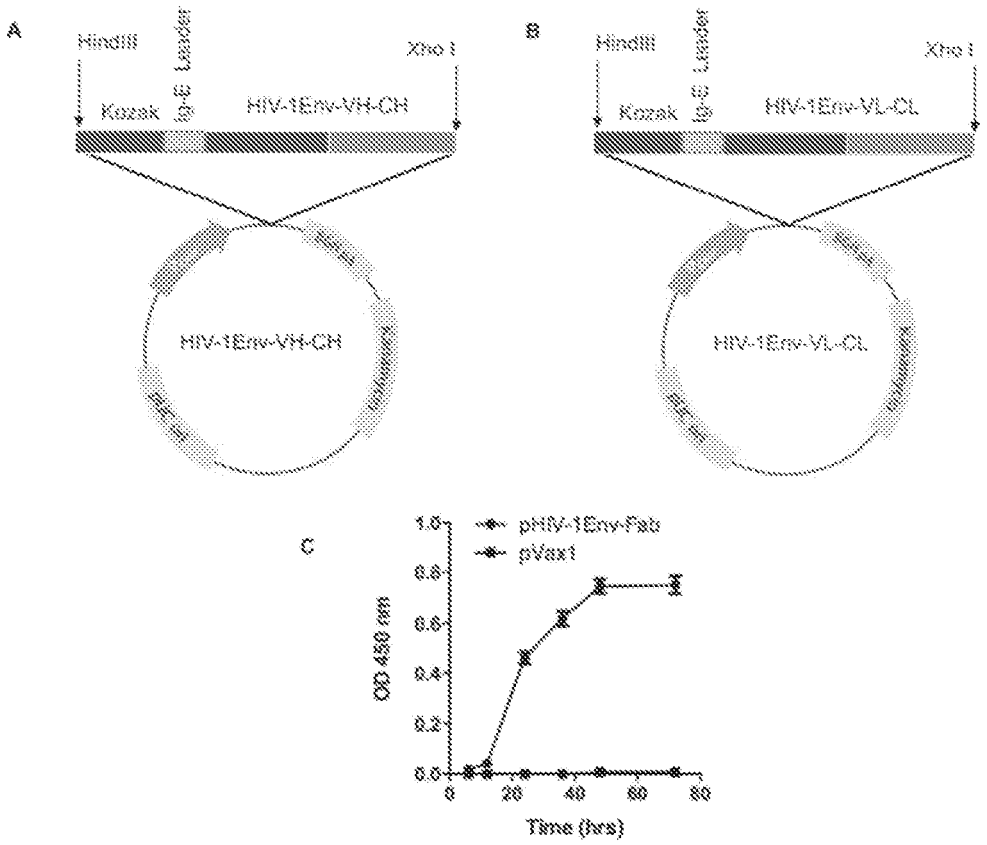

A
HindIII
Leader
Kozak
HIV-1Env-VH-CH
Xho I
HIV-1Env-VH-CH
B
HindIII
Leader
Kozak
HIV-1Env-VL-CL
Xho I
HIV-1Env-VL-CL
C
pHIV-1Env-Fab
pVax1
OD 450 nm
1.0
0.8
0.6
0.4
0.2
0.0
0
20
40
60
80
Time (hrs)

FIG. 5

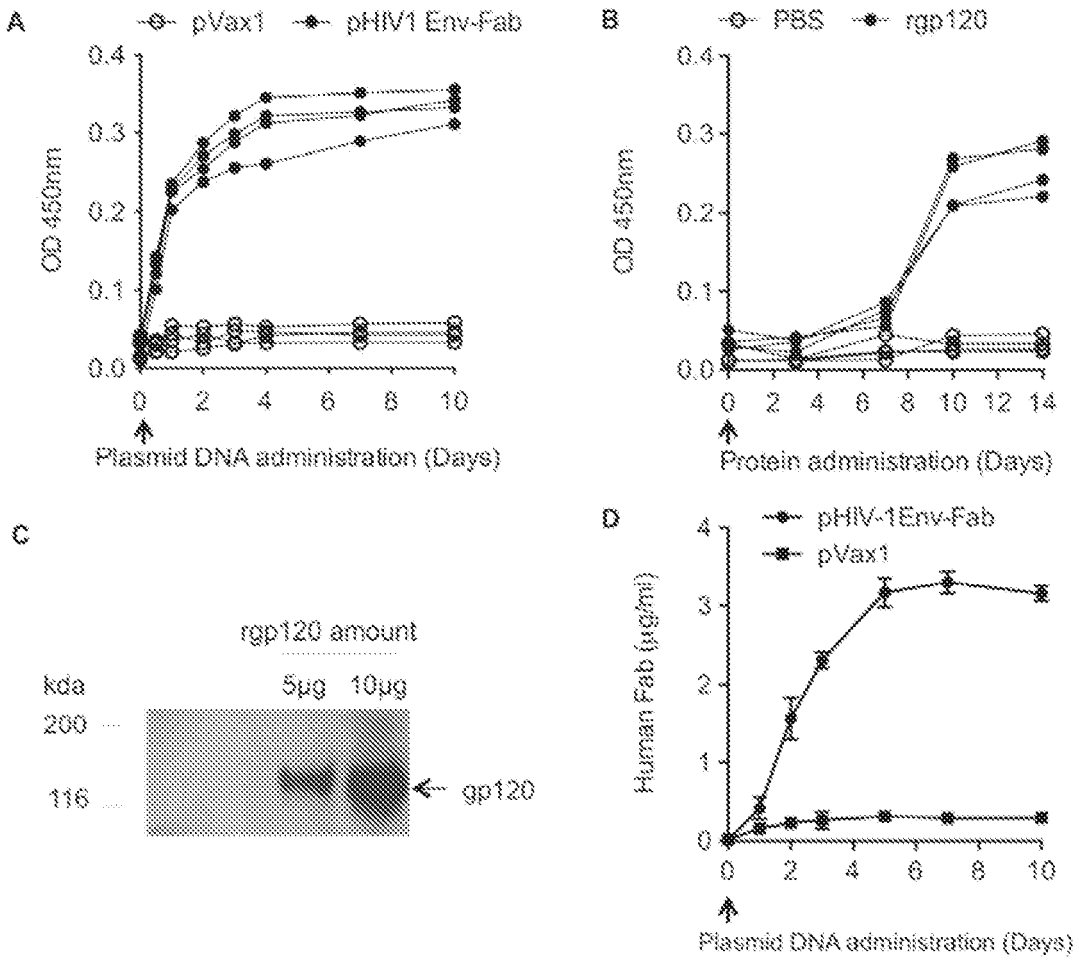

A
pVax1
pHIV1 Env-Fab
OD 450nm
0.4
0.3
0.2
0.1
0.0
0 2 4 6 8 10
Plasmid DNA administration (Days)
B
PBS
rgp120
OD 450nm
0.4
0.3
0.2
0.1
0.0
0 2 4 6 8 10 12 14
Protein administration (Days)
C
rgp120 amount
kda
5μg 10μg
200
116
gp120
D
pHIV-1Env-Fab
pVax1
Human Fab (μg/ml)
4
3
2
1
0
0 2 4 6 8 10
Plasmid DNA administration (Days)

FIG. 6

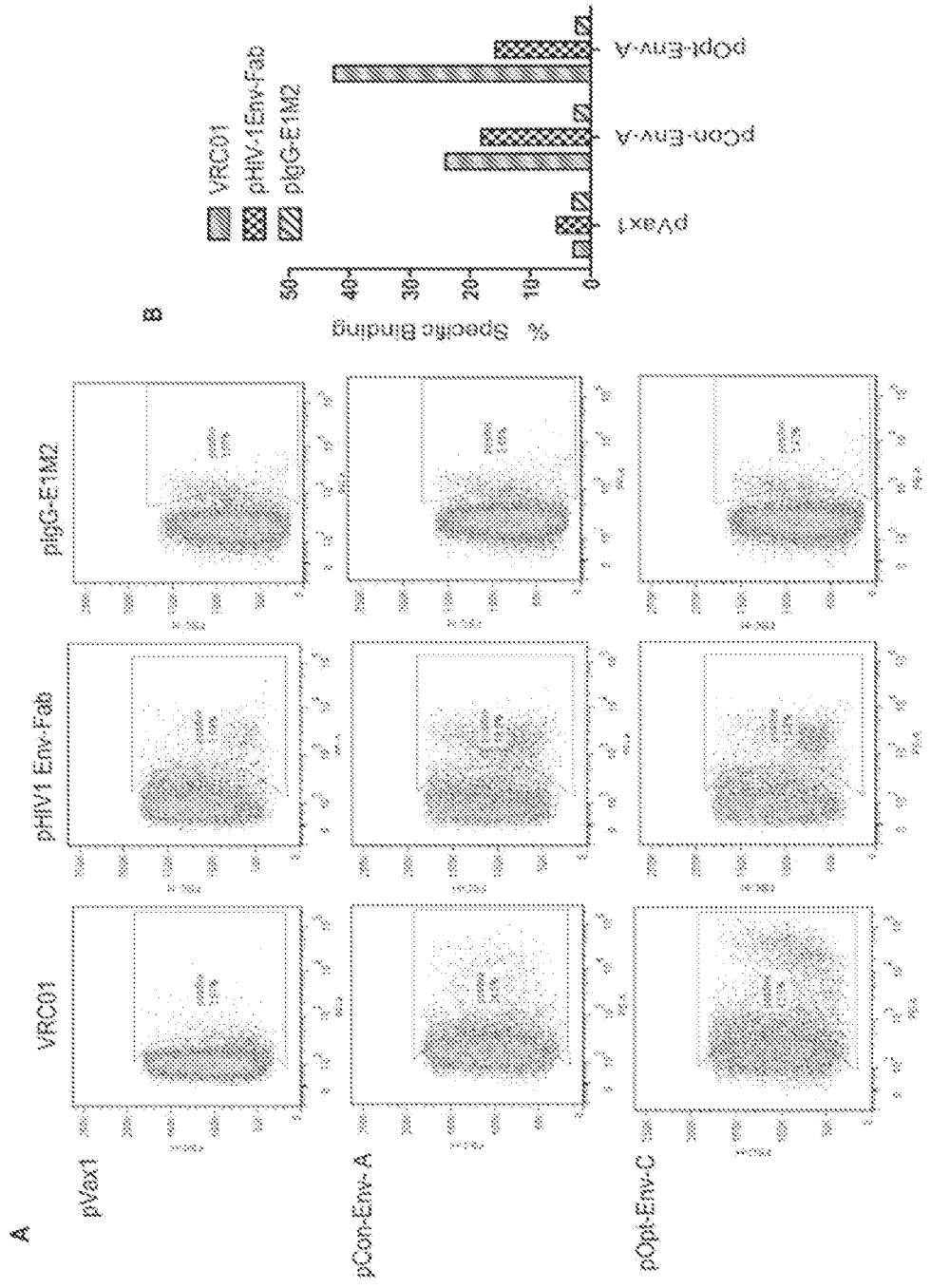

A
VRC01
pHIV1 Env-Fab
pIgG-E1M2
pVax1
pCon-Env-A
pOpt-Env-C
B
% Specific Binding
VRC01
pHIV-1Env-Fab
pIgG-E1M2
pVax1
pCon-Env-A
pOpt-Env-A

FIG. 7

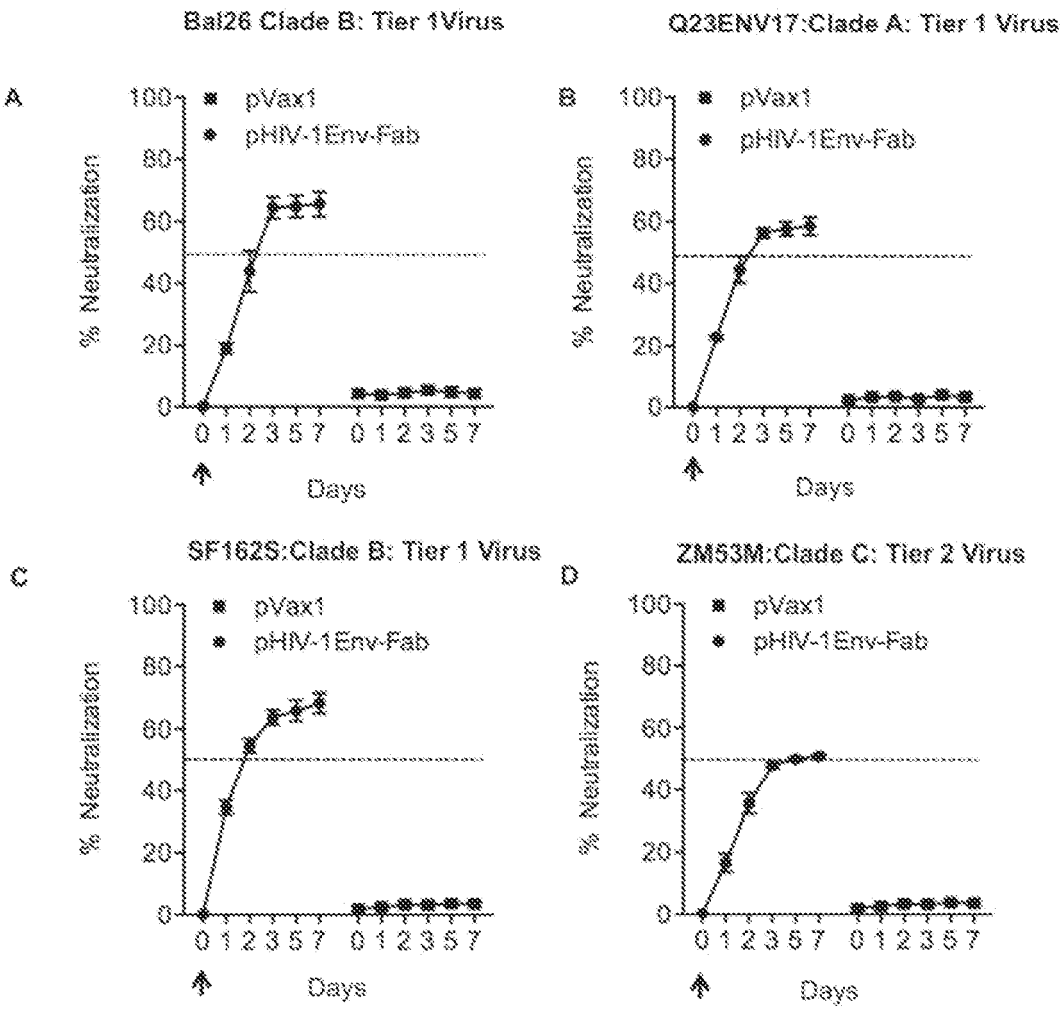

A
Bal26 Clade B: Tier 1Virus
B
Q23ENV17:Clade A: Tier 1 Virus
C
SF162S:Clade B: Tier 1 Virus
D
ZM53M:Clade C: Tier 2 Virus
pVax1
pHIV-1Env-Fab
% Neutralization
Days
0 1 2 3 5 7 0 1 2 3 5 7

FIG. 8

Nucleic Acid Sequence Encoding the Heavy Chain (VH-CH1) of HIV-1 Env Fab

AAGCTTGCCGCCACC**ATG**GAGACTGATACACTGCTGCTGTGGGTGCTGCTGCTGTGG
GTGCCAGGGTCAACCGGAGATGGGGCTCAGGTCCAGCTGGTCCAGAGCGGCGGACA
GATGAAGAAACCCGGCGAGAGCATGAGGATCTCCTGCAGAGCATCTGGATACGAGT
TCATCGACTGTACCCTGAACTGGATTAGGCTGGCTCCTGGAAAGAGACCAGAGTGG
ATGGGGTGGCTGAAACCACGAGGGGGAGCAGTGAATTACGCCCGGCCCCTGCAGGG
ACGAGTGACCATGACCAGGGACGTGTACAGCGATACCGCCTTCCTGGAGCTGCGGT
CCCTGACAGTGGACGATACTGCTGTCTACTTCTGCACACGCGGAAAGAACTGTGACT
ATAATTGGGATTTTGAACACTGGGGCCGGGGAACACCCGTGATCGTCAGCTCCCCCA
GTACTAAGGGACCTTCAGTGTTTCCACTGGCCCCCTCTAGTAAATCCACCTCTGGAG
GGACAGCCGCTCTGGGATGCCTGGTGAAAGATTATTTCCCCGAACCTGTGACCGTCA
GTTGGAACTCAGGGGCTCTGACTTCTGGCGTGCACACCTTTCCTGCAGTCCTGCAGT
CAAGCGGGCTGTACAGTCTGTCCTCTGTGGTCACTGTGCCTAGTTCAAGCCTGGGCA
CTCAGACCTATATTTGTAACGTGAATCATAAGCCATCCAATACAAAAGTGGACAAA
AAAGCCGAACCCAAATCCTGTTACCCTTATGATGTGCCCGACTACGCC**TGA**CTCGAG
(SEQ ID NO:3)

FIG. 9

Light Chain (VL-CL) of HIV-1 Env Fab

AAGCTTGCCGCCACC**ATG**GAAACCGATACACTGCTGCTGTGGGTGCTGCTGCTGTGG
GTGCCAGGAAGTACCGGGGATGGGGCTCAGGTCCAGATTGTGCTGACTCAGTCCCCT
GGGACCCTGTCTCTGAGTCCAGGCGAGACAGCTATCATTTCATGCCGAACTAGCCAG
TACGGCAGCCTGGCTTGGTATCAGCAGCGACCAGGACAGGCACCACGACTGGTCAT
CTACTCAGGCAGCACAAGGGCCGCTGGCATCCCCGACAGGTTCTCCGGCAGCAGGT
GGGGGCCTGATTACAACCTGACTATCTCTAATCTGGAGAGTGGGGACTTTGGCGTGT
ACTATTGCCAGCAGTATGAGTTCTTCGGCCAGGGAACTAAGGTGCAGGTGGACATC
AAAAGAACCGTGGCAGCCCCATCCGTCTTCATTTTTCCCCCTTCTGATGAGCAGCTG
AAGTCAGGCACCGCCAGCGTGGTCTGTCTGCTGAACAATTTCTACCCCCGGGAAGCC
AAGGTGCAGTGGAAAGTGGACAACGCTCTGCAGAGTGGAAATTCACAGGAGAGCGT
GACCGAACAGGACTCCAAGGATTCTACATATAGTCTGAGCAGCACCCTGACCCTGA
GTAAAGCAGATTACGAGAAGCACAAAGTGTATGCCTGTGAAGTCACACATCAGGGC
CTGAGGAGCCCCGTGACTAAAAGTTTCAACCGAGGAGAGTGCTACCCTTATGATGTG
CCCGACTACGCC**TAA**CTCGAG (SEQ ID NO:4)

FIG. 10

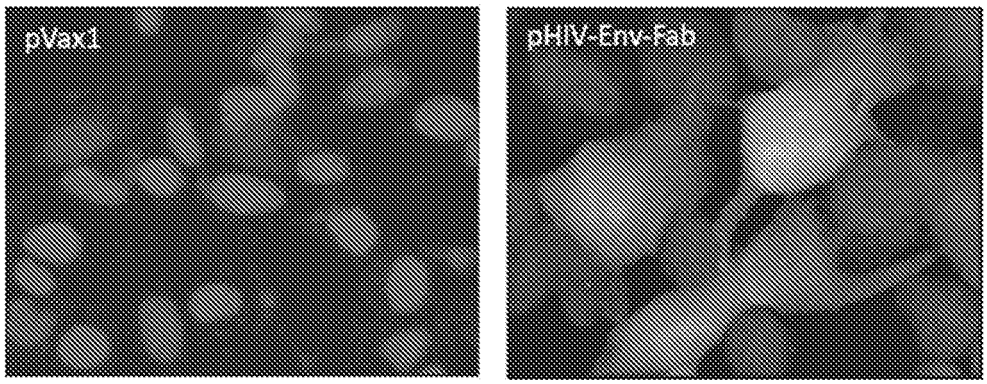

pVax1
pHIV-Env-Fab

FIG. 11

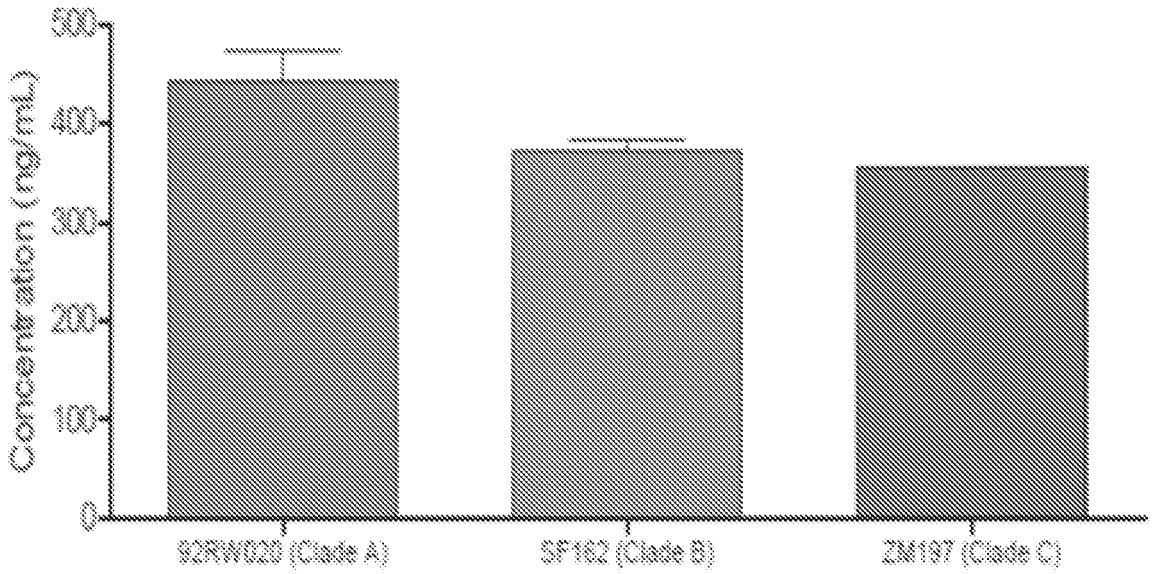

Concentration (ng/mL)
500
400
300
200
100
0
92RW020 (Clade A)
SF162 (Clade B)
ZM197 (Clade C)

FIG. 12

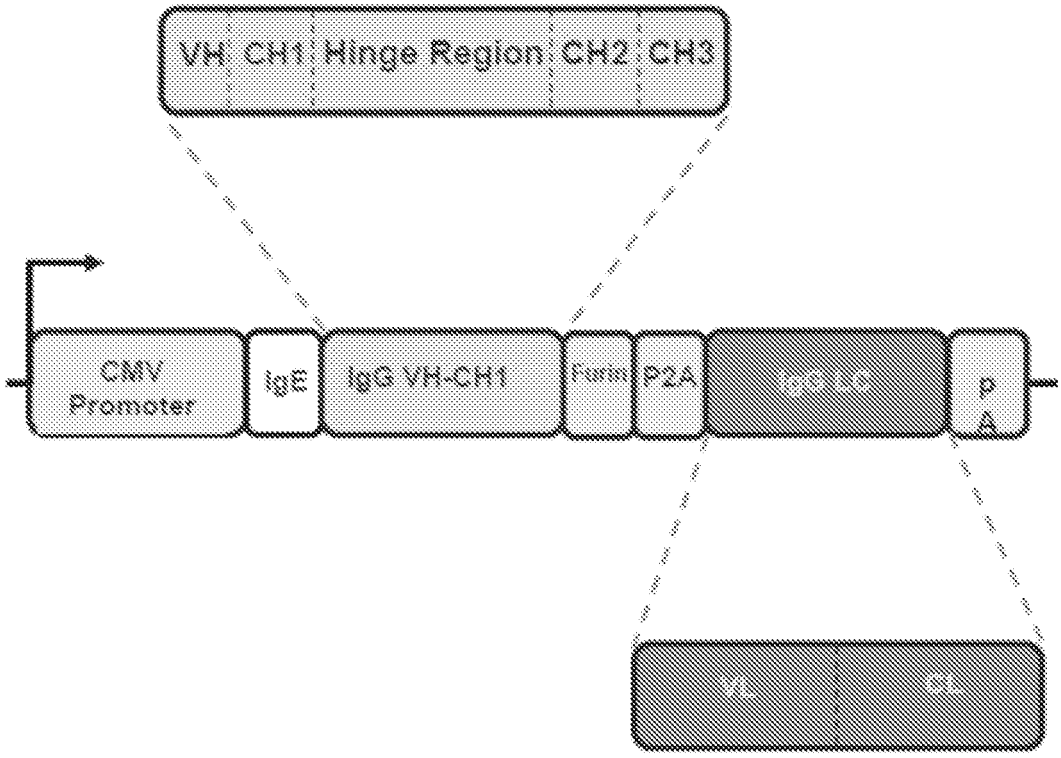

VH
CH1
Hinge Region
CH2
CH3
CMV Promoter
IgE
IgG VH-CH1
Furin
P2A
IgG LC
p A
VL
CL

FIG. 13

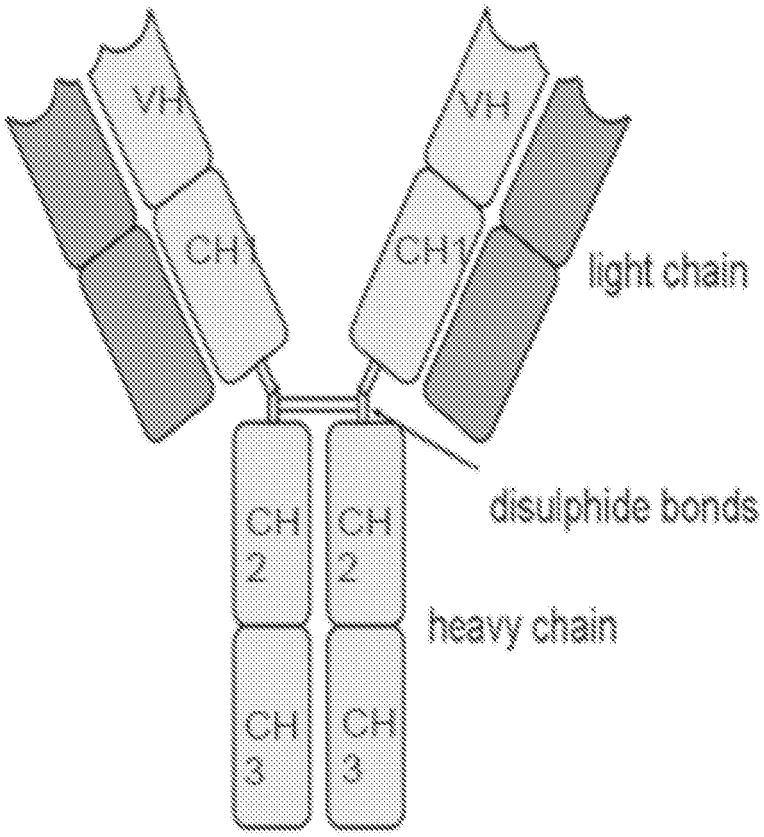

VH
VH
CH1
CH1
light chain
disulphide bonds
CH 2
CH 2
heavy chain
CH 3
CH 3

FIG. 14

VRC01 IgG

MDWTWILFLVAAATRVHSQVQLVQSGGQMKKPGESMRISCRASGYEFIDCTLNWIRLA
PGKRPEWMGWLKPRGGAVNYARPLQGRVTMTRDVYSDTAFLELRSLTVDDTAVYFCT
RGKNCDYNWDFEHWGRGTPVIVSSPSTKGPSVFPLAPSSKSTSGGTAALGCLVKDYFPE
PVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTKVD
KKAEPKSCEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVS
HEDPEVKFNWYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKV
SNKALPAPIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWES
NGQPENNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSL
SLSPGKRGRKRRSGSGATNFSLLKQAGDVEENPGPMDWTWILFLVAAATRVHSEIVLTQ
SPGTLSLSPGETAIISCRTSQYGSLAWYQQRPGQAPRLVIYSGSTRAAGIPDRFSGSRWGP
DYNLTISNLESGDFGVYYCQQYEFFGQGTKVQVDIKRTVAAPSVFIFPPSDEQLKSGTAS
VVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKDSTYSLSSTLTLSKADYEKH
KVYACEVTHQGLRSPVTKSFNRGEC (SEQ ID NO:5)

FIG. 15



FIG. 16A

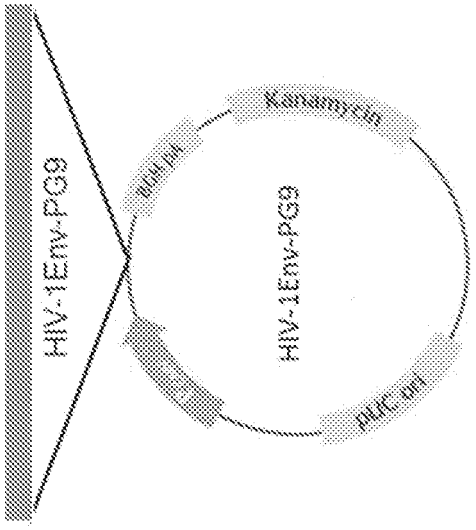


FIG. 16B

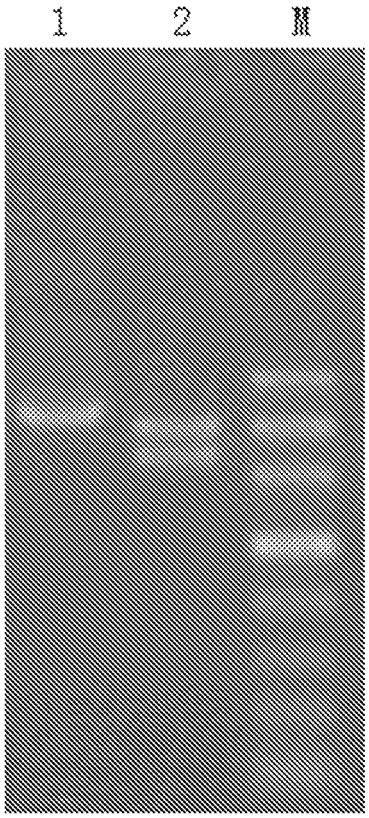


FIG. 16C



FIG. 17A

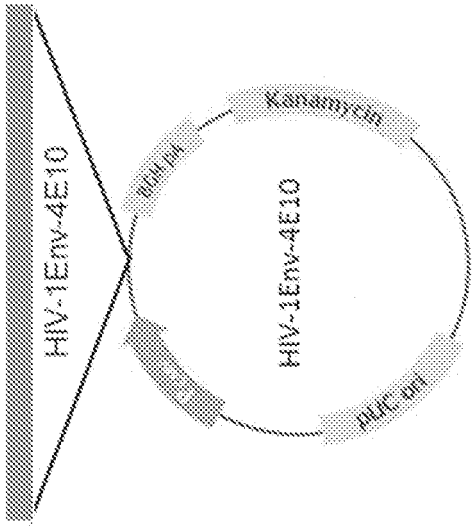


FIG. 17B

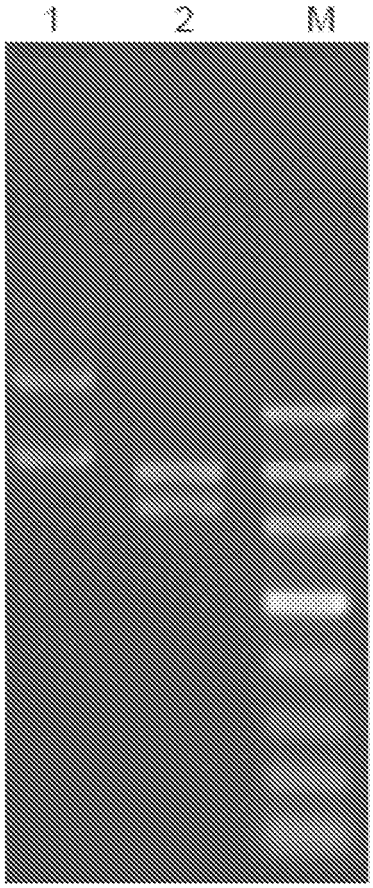


FIG. 17C

Amino Acid Sequence of HIV-1 Env-PG9 Ig (before protease cleavage)
MDWTWRILFLVAAATGTHAEFGLSWVFLVAFLRGVQCQRLVESGGGVVQPGSSLRLSC
AASGFDFSRQGMHWVRQAPGQGLEWVAFIKYDGSEKYHADSVWGRLSISRDNSKDTL
YLQMNSLRVEDTATYFCVREAGGPDYRNGYNYYDFYDGYYNYHYMDVWGKGTTVT
VSSASTKGPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVL
QSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTKVDKRVEPKSCDKTHTCPPCPAPEL
LGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPRE
EQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPREPQVYTLP
PSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSKLTV
DKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGKRGRKRRSGSGATNFSLLKQAGD
VEENPGPMAWTPLFLFLLTCCPGGSNSQSALTQPASVSGSPGQSITISCNGTSNDVGGYE
SVSWYQQHPGKAPKVVIYDVSKRPSGVSNRFSGSKSGNTASLTISGLQAEDEGDYYCKS
LTSTRRRVFGTGTKLTVLGQPKAAPSVTLFPPSSEELQANKATLVCLISDFYPGAVTVAW
KADSSPVKAGVETTTPSKQSNNKYAASSYLSLTPEQWKSHKSYSCQVTHEGSTVEKTV
APTECS (SEQ ID NO:2)

FIG. 18

Amino Acid Sequence of HIV-1 Env-4E10 Ig (before protease cleavage)
MDWTWRILFLVAAATGTHAQVQLVQSGAEVKRPGSSVTVSCKASGGSFSTYALSWVR
QAPGRGLEWMGGVIPLLTITNYAPRFQGRITITADRSTSTAYLELNSLRPEDTAVYYCAR
EGTTGWGWLGKPIGAFAHWGQGTLVTVSSASTKGPSVFPLAPSSKSTSGGTAALGCLV
KDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKP
SNTKVDKKVEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDV
SHEDPEVKFNWYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCK
VSNKALPAPIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWE
SNGQPENNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKS
LSLSPGKRGRKRRSGSGATNFSLLKQAGDVEENPGPMVLQTQVFISLLLWISGAYGEIVL
TQSPGTQSLSPGERATLSCRASQSVGNNKLAWYQQRPGQAPRLLIYGASSRPSGVADRF
SGSGSGTDFTLTISRLEPEDFAVYYCQQYGQSLSTFGQGTKVEKRTVAAPSVFIFPPSDEQ
LKSGTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKDSTYSLSSTLTLSK
ADYEKHKVYACEVTHQGLSSPVTKSFNRGE (SEQ ID NO:1)

FIG. 19

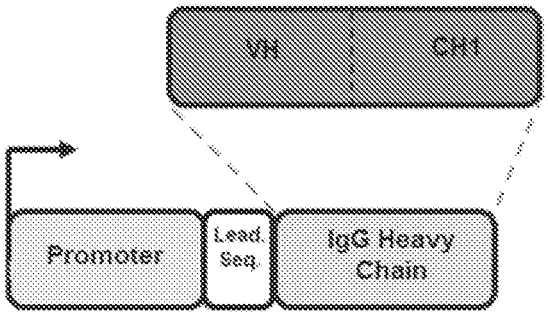


FIG. 20A

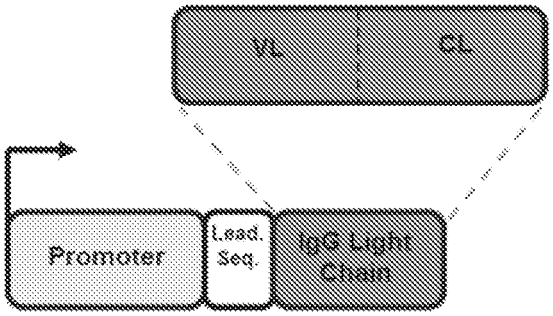


FIG. 20B

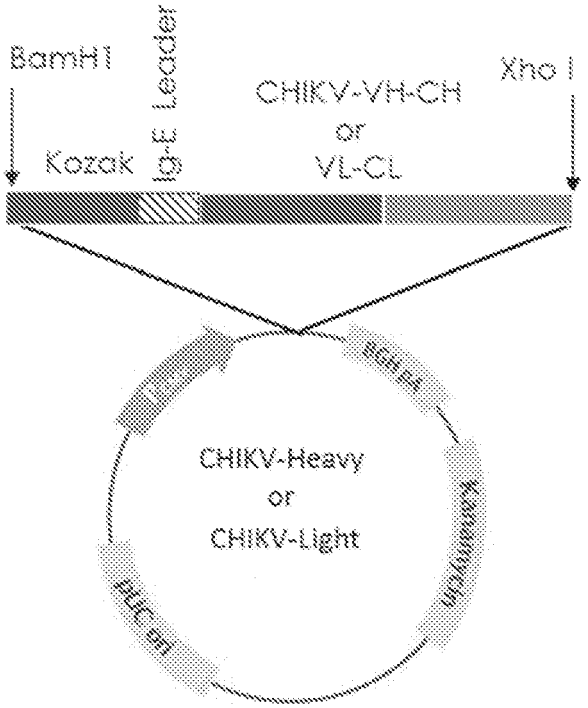

BamH1
Ig-κ Leader
Kozak
CHIKV-VH-CH
or
VL-CL
Xho I
CHIKV-Heavy
or
CHIKV-Light
pUC ori
Kanamycin
Ampr
hCMV

FIG. 21

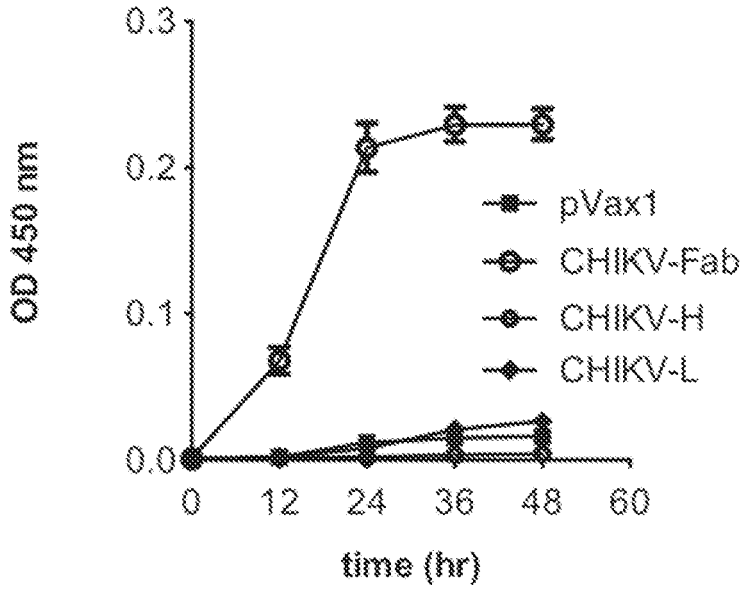

OD 450 nm
0.3
0.2
0.1
0.0
0
12
24
36
48
60
time (hr)
pVax1
CHIKV-Fab
CHIKV-H
CHIKV-L

FIG. 22

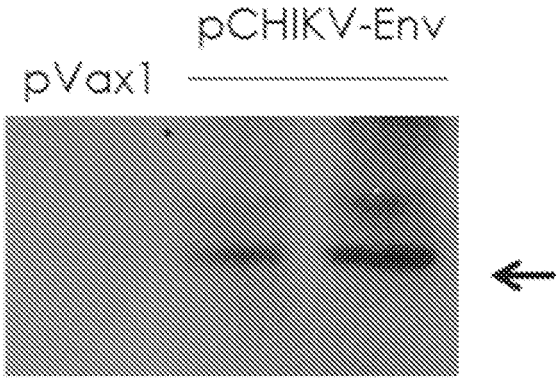


FIG. 23

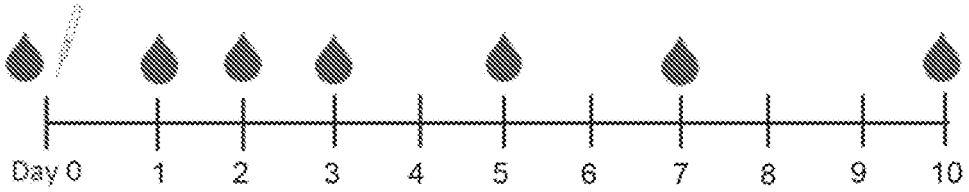


FIG. 24

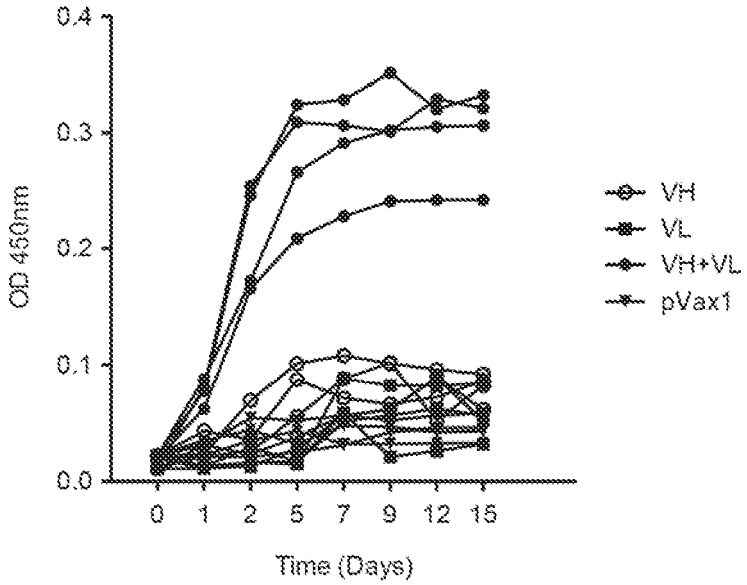


FIG. 25

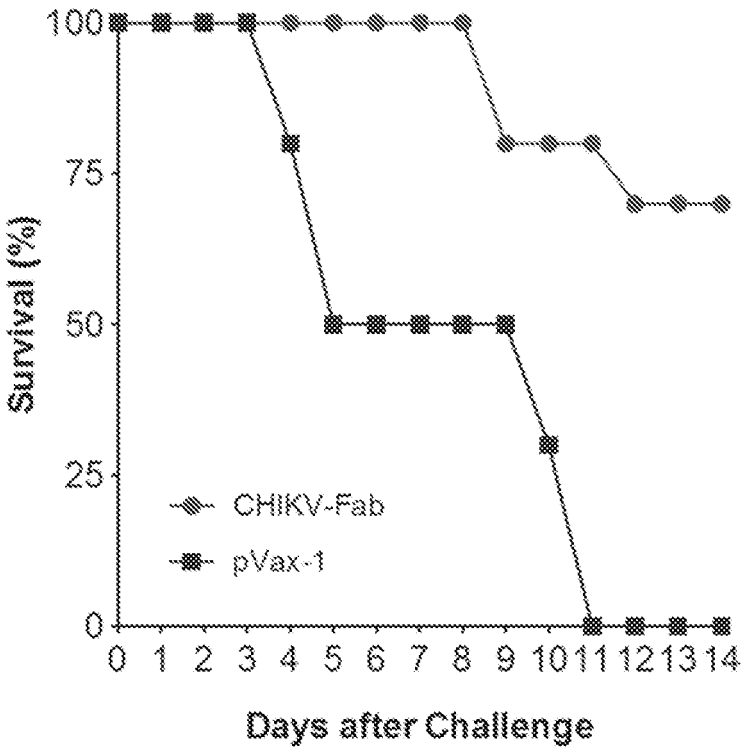

100
75
50
25
0
Survival (%)
CHIKV-Fab
pVax-1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
Days after Challenge

FIG. 26

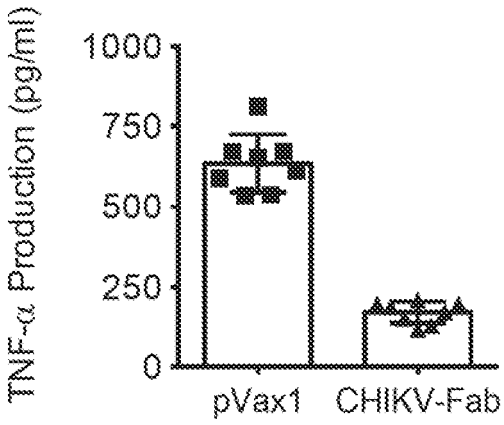

TNF-α Production (pg/ml)
1000
750
500
250
0
pVax1
CHIKV-Fab

FIG. 27

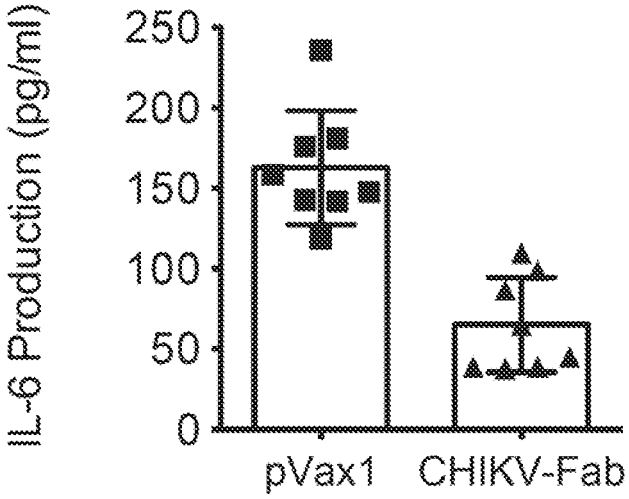


FIG. 28

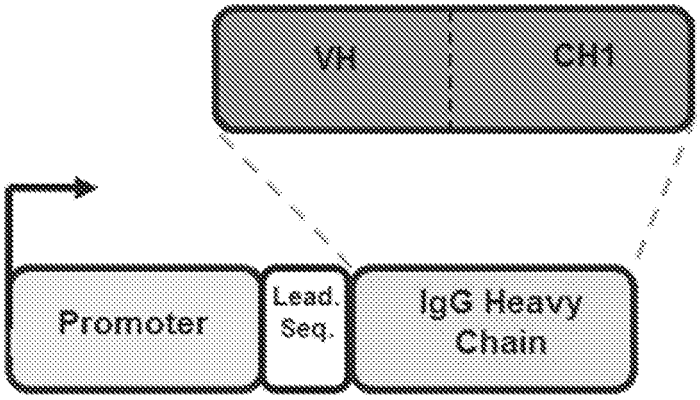

VH
CH1
Promoter
Lead. Seq.
IgG Heavy Chain

FIG. 29

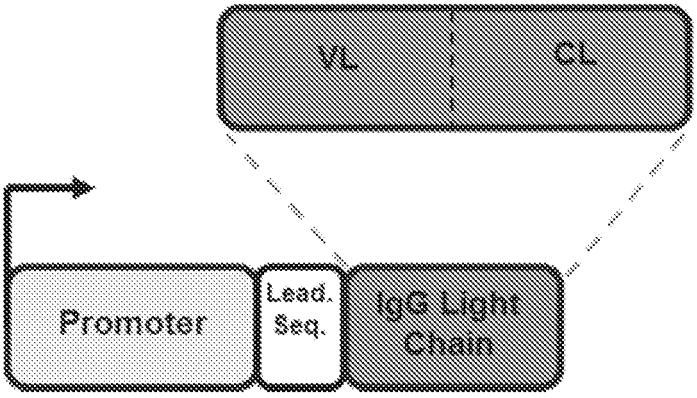

VL
CL
Promoter
Lead. Seq.
IgG Light Chain

FIG. 30

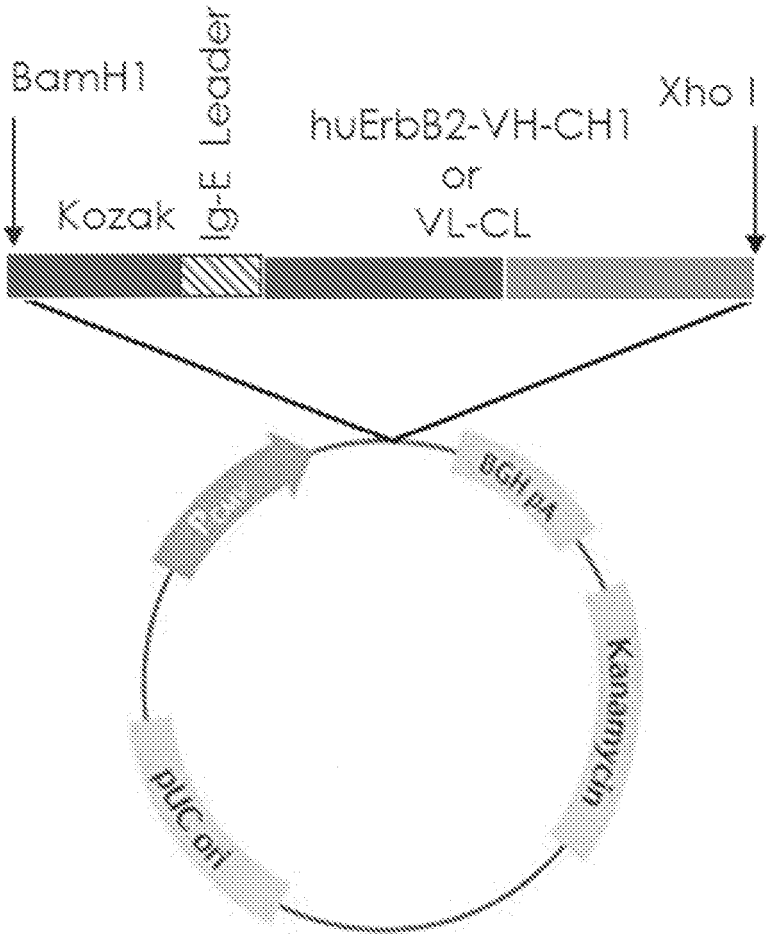

BamH1
Leader
Xho I
huErbB2-VH-CH1
or
VL-CL
Kozak
pUC ori
Kanamycin

FIG. 31

Nucleic Acid Sequence Encoding the VH-CH1 of anti-Her-2 Fab

GGATCCGCCACCATGGACTGGACATGGATTCTGTTTCTGGTCGCCGCCGCTACAAGAGTGCATTCCGAAGTGCAGCTGG
TCGAGAGTGGAGGGGGACTGGTGCAGCCCGGCGGATCTCTGCGACTGAGTTGCGCCGCTTCAGGCTTCACCTTTACAGA
CTACACCATGGATTGGGTGAGACAGGCACCTGGCAAGGGACTGGAGTGGGTGGCTGATGTCAACCCAAATAGTGGGGG
CTCAATCTACAACCAGAGGTTCAAGGGCAGGTTCACCCTGAGCGTGGACAGGTCCAAAAACACTCTGTATCTGCAGAT
GAATTCTCTGCGGGCTGAAGATACCGCAGTCTACTATTGCGCCCGCAATCTGGGCCCAAGCTTCTACTTTGACTATTGG
GGGCAGGGCACACTGGTGACTGTCAGCTCCGCTTCTACAAAGGGACCAAGCGTGTTCCCACTGGCACCCTCTAGTAAAT
CCACCTCTGGAGGGACAGCAGCCCTGGGCTGTCTGGTGAAAGACTATTTCCCCGAGCCTGTGACTGTCAGCTGGAACTC
CGGAGCACTGACTAGCGGAGTGCACACCTTTCCAGCCGTCCTGCAGTCAAGCGGCCTGTACTCCCTGTCCTCTGTGGTC
ACAGTGCCTAGTTCAAGCCTGGGAACTCAGACCTATATTTGTAATGTGAACCATAAACCAAGCAATACAAAGGTGGAC
AAGAAGGTGGAACCAAAATCCTGCTGATAACTCGAG (SEQ ID NO:40)

FIG. 32

Amino Acid Sequence of the VH-CH1 of anti-Her-2 Fab

MDWTWILFLVAAATRVHSEVQLVESGGGLVQPGGSLRLSCAASGFTFTDYTMDWVRQAPGKGLEWVADVNPNSGGSIYN
QRFKGRFTLSVDRSKNTLYLQMNSLRAEDTAVYYCARNLGPSFYFDYWGQGTLVTVSSASTKGPSVFPLAPSSKSTSGGTA
ALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTKVDKKVEPKSC
(SEQ ID NO:41)

FIG. 33

Nucleic Acid Sequence Encoding the VL-CL of anti-Her-2 Fab

GGATCCGCCACCATGGATTGGACTTGGATTCTGTTCCTGGTCGCCGCCGCTACCCGCGTGCATTCCGATATTCAGATGA
CTCAGAGCCCCTCCTCACTGTCAGCCAGCGTGGGCGACCGAGTCACCATCACATGCAAAGCTTCTCAGGATGTGAGTAT
TGGGGTCGCATGGTACCAGCAGAAGCCAGGCAAAGCACCCAAGCTGCTGATCTATTCCGCCTCTTACAGGTATACAGG
AGTGCCCAGCAGATTCAGTGGCTCAGGAAGCGGGACTGACTTTACTCTGACCATCAGCTCCCTGCAGCCTGAGGATTTC
GCTACCTACTATTGCCAGCAGTACTATATCTACCCATATACCTTTGGCCAGGGAACAAAAGTGGAGATCAAGCGGACCG
TGGCCGCTCCCTCCGTCTTCATTTTTCCCCCTTCTGACGAACAGCTGAAGAGCGGAACAGCAAGCGTGGTCTGTCTGCT
GAACAATTTCTACCCTCGCGAGGCCAAAGTGCAGTGGAAGGTCGATAACGCTCTGCAGTCCGGGAATTCTCAGGAGAG
TGTGACTGAACAGGACTCAAAAGATAGCACCTATTCCCTGTCTAGTACACTGACTCTGAGCAAGGCAGACTACGAAAA
GCACAAAGTGTATGCCTGTGAGGTCACCCACCAGGGGCTGTCAAGTCCCGTCACCAAGTCCTTCAATAGAGGCGAATG
CTGATAACTCGAG (SEQ ID NO:42)

FIG. 34

Amino Acid Sequence of the VL-CL of anti-Her-2 Fab

MDWTWILFLVAAATRVHSDIQMTQSPSSLSASVGDRVTITCKASQDVSIGVAWYQQKPGKAPKLLIYSASYRYTGVPSRFSG
SGSGTDFTLTISSLQPEDFATYYCQQYYIYPYTFGQGTKVEIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQW
KVDNALQSGNSQESVTEQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC (SEQ ID NO:43)

FIG. 35

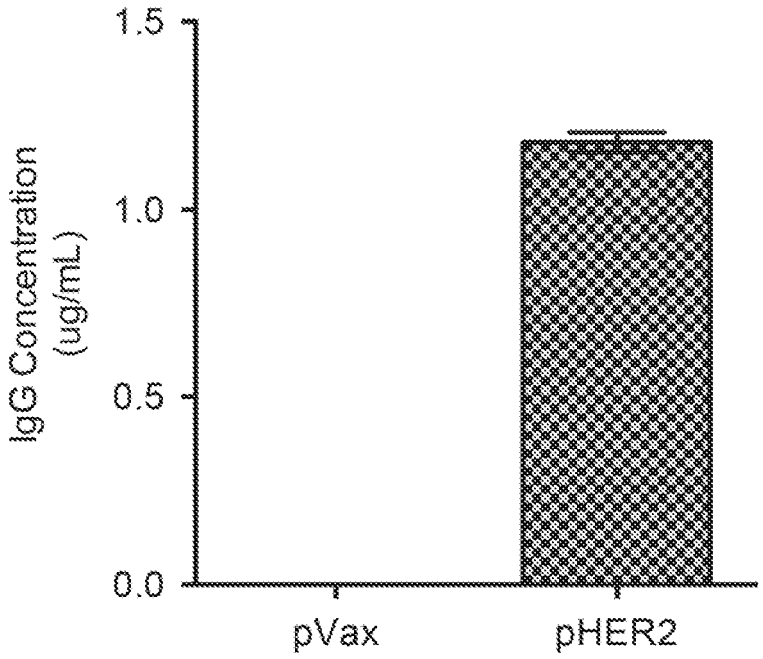


FIG. 36

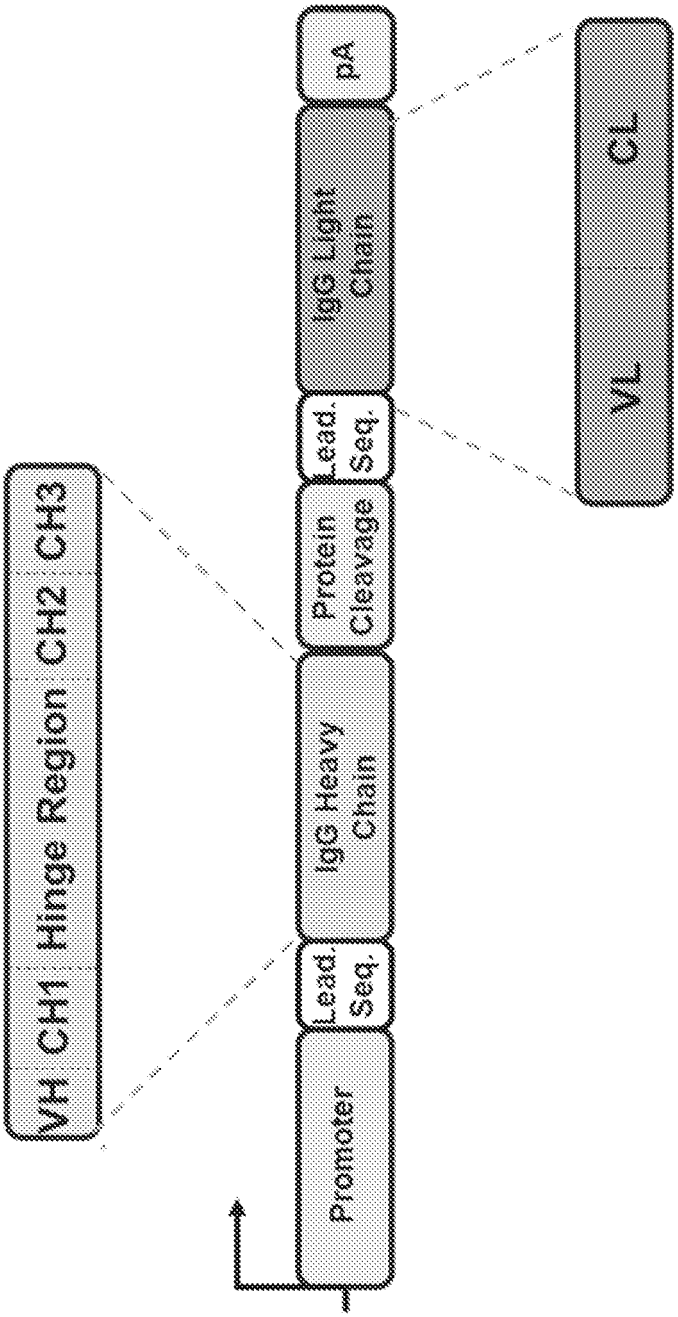

Promoter
Lead. Seq.
IgG Heavy Chain
Protein Cleavage
Lead. Seq.
IgG Light Chain
pA
VH CH1 Hinge Region CH2 CH3
VL
CL

FIG. 37

Nucleic Acid Sequence Encoding anti-DENV Human IgG

GGATCCGCCACCA**TG**GACTGGACTTGGAGGATTCTGTTTCTGGTCGCCGCCGCTACTGGGACTCACGCTCAGGCACATC
TGGTCGAATCTGGAGGAGGAGTGGTCCAGCCTGGCCGATCCCTGCGACTGTCTTGCGCAGCTAGCGCCTTCAACTTCAG
CACAAACGCAATGCACTGGGTGCGACAGGCACCAGGCAAGGGACTGGAGTGGGTCGCTGTGATCTCATACGACGGAA
GCCATAAGTACTATGCAGATTCTGTGAAAGGCCGGTTCACCATTTCCAGGGACAATTCTAAGAACACCCTGTATCTGCA
GATGAATAGCCTGCGCGCAGCCGATACCGCAGTGTACTATTGCGCAACTGTCGGCGTGCTGACCTGGCCAGTGAACGC
CGAATACTTTCACCATTGGGGACAGGGCAGTCTGGTCTCAGTGAGCTCCGCAAGTACTAAGGGACCATCAGTGTTCCCA
CTGGCACCCTCTAGTAAATCTACTAGTGGCGGGACCGCTGCACTGGGATGTCTGGTGAAGGACTATTTCCCCGAGCCTG
TCACCGTGAGCTGGAATTCCGGAGCCCTGACAAGCGGCGTCCACACTTTTCCCGCTGTGCTGCAGTCAAGCGGACTGTA
CTCCCTGTCCTCTGTGGTCACTGTGCCTAGTTCAAGCCTGGGCACTCAGACCTATATCTGCAATGTGAACCACAAGCCCT
CTAACACCAAAGTCGACAAGAAAGTGGAACCTAAGAGCTGTGATAAAACACATACTTGCCCACCTTGTCCAGCACCAG
AGCTGCTGGGAGGACCAAGCGTGTTCCTGTTTCCACCCAAGCCTAAAGACACACTGATGATTAGCCGGACACCTGAAG
TCACTTGCGTGGTCGTGGACGTGTCCCACGAGGACCCCGAAGTCAAGTTTAATTGGTACGTGGATGGCGTCGAGGTGCA
TAACGCCAAGACCAAACCCCGGGAGGAACAGTACAATAGCACATATAGAGTCGTGTCCGTCCTGACTGTGCTGCATCA
GGATTGGCTGAATGGGAAGGAGTATAAGTGCAAAGTGTCTAACAAGGCTCTGCCTGCACCAATCGAGAAAACCATTAG
CAAGGCTAAAGGCCAGCCTAGGGAACCACAGGTGTACACACTGCCTCCAAGTCGCGACGAGCTGACCAAGAATCAGGT
CTCCCTGACATGTCTGGTGAAAGGCTTCTATCCATCAGATATCGCCGTGGAGTGGGAAAGCAACGGGCAGCCCGAAAA
CAATTACAAGACCACACCCCCTGTGCTGGACTCTGATGGCAGTTTCTTTCTGTATTCTAAGCTGACCGTGGACAAAAGT
AGATGGCAGCAGGGGAATGTCTTTTCATGTAGCGTGATGCACGAGGCCCTGCACAACCATTACACACAGAAGTCCCTG
TCTCTGAGTCCCGGAAAGAGGGGCCGCAAACGGAGATCAGGGAGCGGAGCTACTAATTTCAGCCTGCTGAAACAGGCA
GGGGATGTGGAGGAAAACCCCGGACCTATGGCTTGGACCCCACTGTTCCTGTTTCTGCTGACATGCTGTCCCGGGGGCA
GCAATTCTCAGAGTGTCCTGACACAGCCACCATCAGTGAGCGGAGCACCAGGACAGAGGGTGACCATCTCCTGCACAG
GCAGCAGCAGCAACATTGGCGCCGGGTACGACGTGCATTGGTATCAGCAGCTGCCCGGCACCGCTCCTAAGCTGCTGA
TCTGTGGCAACAATAACCGCCCATCTGGGGTGCCCGATCGATTCTCCGGCTCTAAAAGTGGGACTTCAGCCAGCCTGGC
TATTACCGGCCTGCAGGCCGAGGACGAAGCTGATTACTATTGCCAGAGCTACGACTCAAGCCTGACCGGAGTCGTGTTC
GGAGGAGGAACCAAGCTGACAGTCCTGGGACAGCCTAAAGCCGCTCCAAGCGTGACACTGTTTCCTCCATCCTCTGAG
GAACTGCAGGCAAACAAGGCCACCCTGGTGTGCCTGATTTCCGACTTCTACCCCGGGGCAGTCACTGTGGCTTGGAAG
GCAGATAGTTCACCTGTCAAAGCCGGAGTGGAGACTACCACACCATCAAAGCAGAGCAATAACAAATACGCAGCCAG
CTCCTATCTGTCCCTGACCCCTGAGCAGTGGAAGTCTCACAAATCCTATTCTTGCCAGGTCACTCACGAAGGAAGCACT
GTGGAGAAAACTGTCGCACCAACCGAATGTAGT**TGATAA**CTCGAG (SEQ ID NO:44)

FIG. 38

Amino Acid Sequence of anti-DENV Human IgG (before protease cleavage to separate heavy and light chain polypeptides)

MDWTWRILFLVAAATGTHAQAHLVESGGGVVQPGRSLRLSCAASAFNFSTNAMHWVRQAPGKGLEWVAVISYDGSHKYY
ADSVKGRFTISRDNSKNTLYLQMNSLRAADTAVYYCATVGVLTWPVNAEYFHHWGQGSLVSVSSASTKGPSVFPLAPSSKS
TSGGTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTKVDKKVE
PKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPREEQYNS
TYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVE
WESNGQPENNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGKRGRKRRSGSGATNF
SLLKQAGDVEENPGPMAWTPLFLLTCCPGGSNSQSVLTQPPSVSGAPGQRVTISCTGSSSNIGAGYDVHWYQQLPGTAPK
LLICGNNNRPSGVPDRFSGSKSGTSASLAITGLQAEDEADYYCQSYDSSLTGVVFGGGTKLTVLGQPKAAPSVTLFPPSSEEL
QANKATLVCLISDFYPGAVTVAWKADSSPVKAGVETTTPSKQSNNKYAASSYLSLTPEQWKSHKSYSCQVTHEGSTVEKTV
APTECS (SEQ ID NO:45)

FIG. 39

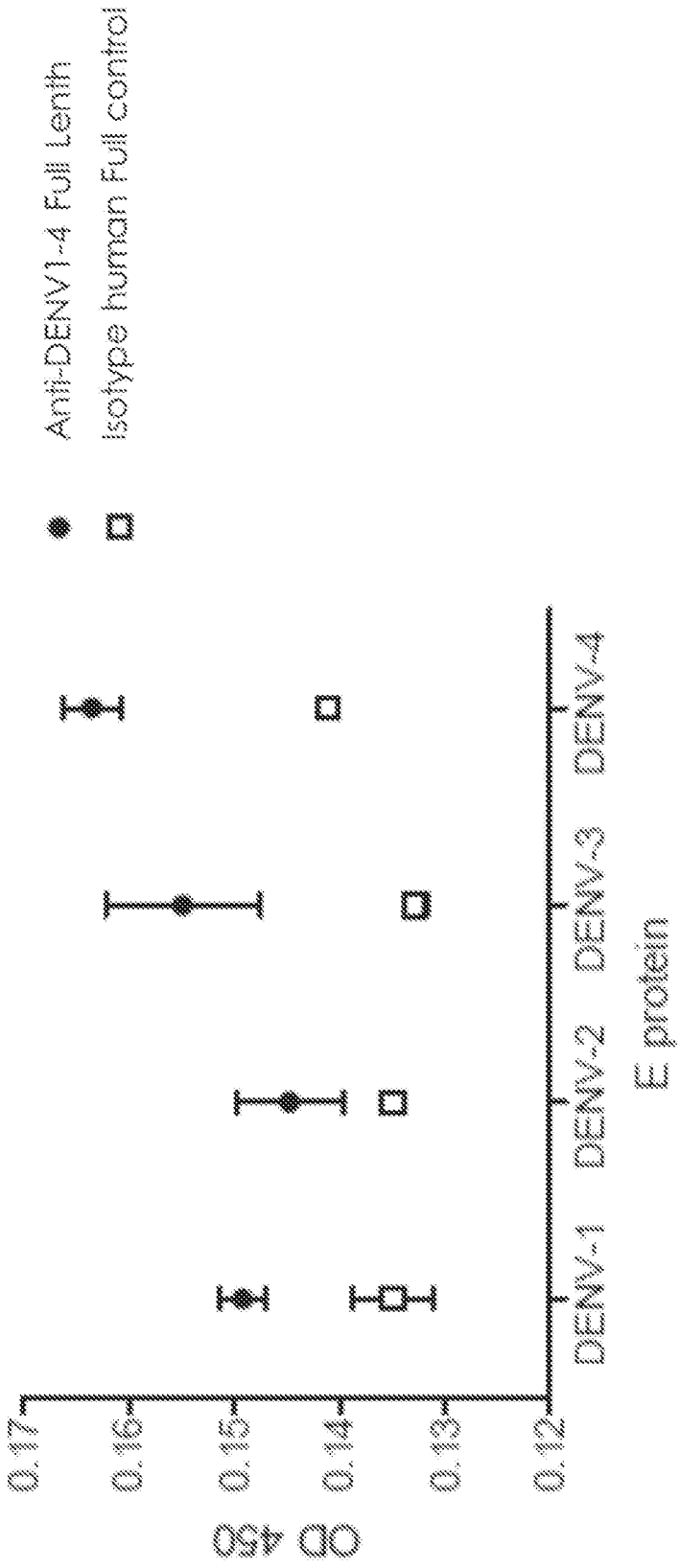

Anti-DENV1-4 Full Lenth
Isotype human Full control
OD 450
0.17
0.16
0.15
0.14
0.13
0.12
DENV-1
DENV-2
DENV-3
DENV-4
E protein

FIG. 40

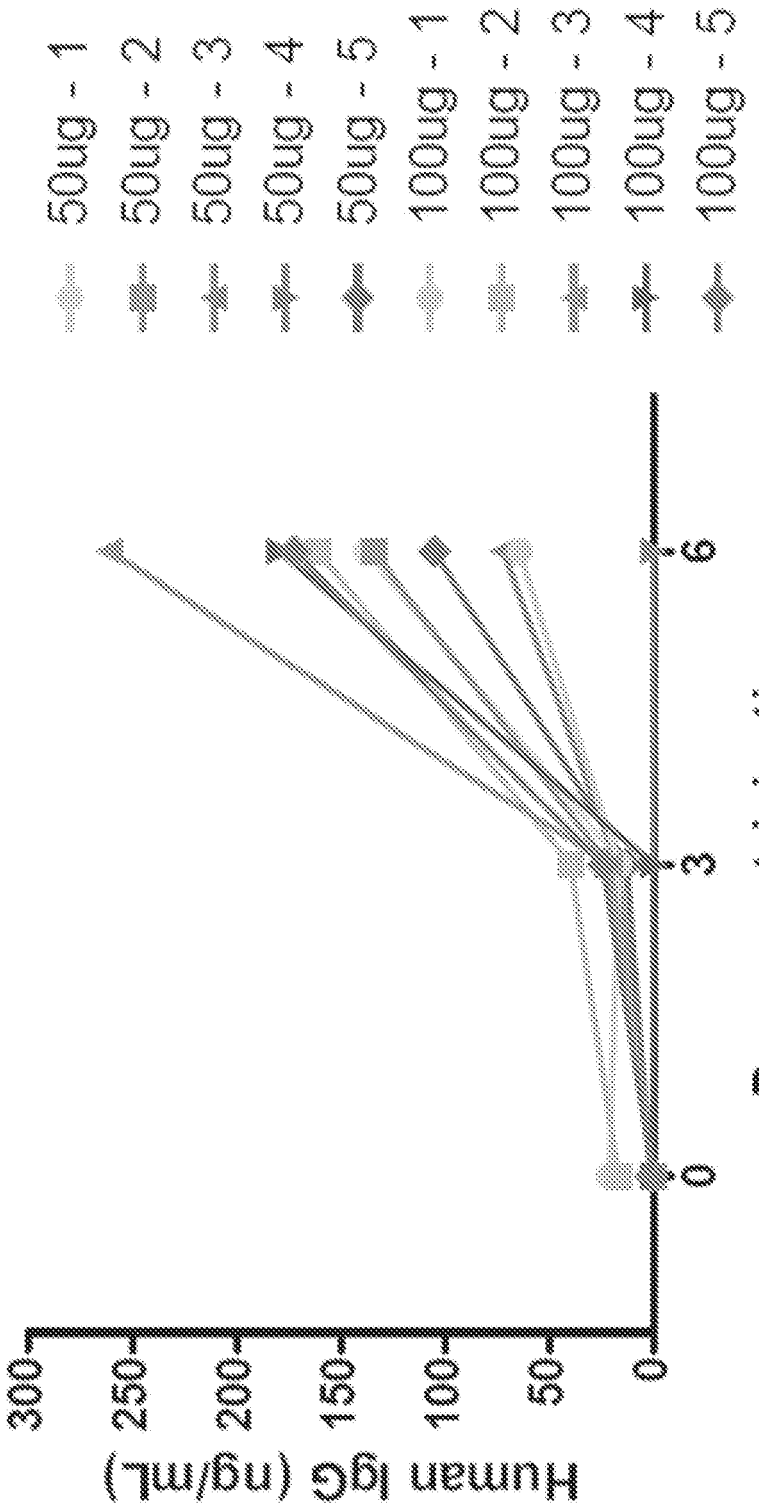

Human IgG (ng/mL)
300
250
200
150
100
50
0
0
3
6
Days post-injection
50ug - 1
50ug - 2
50ug - 3
50ug - 4
50ug - 5
100ug - 1
100ug - 2
100ug - 3
100ug - 4
100ug - 5

FIG. 41

IgG Heavy Chain

METDTLLLWVLLLWVPGSTGDGAQVQLVQSGAVIKTPGSSVKISCRASGYNFRDYSIHWVRLIPDKGFEWIGWIKPLWGAV
SYARQLQGRVSMTRQLSQDPDDPDWGVAYMEFSGLTPADTAEYFCVRRGSCDYCGDFPWQYWCQGTVVVVSSASTKGPS
VFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPS
NTKVDKKVEPKSCYPYDVPDYA (SEQ ID NO:46)

FIG. 42

IgG Light Chain

METDTLLLWVLLLWVPGSTGDGAQVQIVLTQSPGILSLSPGETATLFCKASQGGNAMTWYQKRRGQVPRLLIYDTSRRASG
VPDRFVGSGSGTDFFLTINKLDREDFAVYYCQQFEFFGLGSELEVHRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREA
KVQWKVDNALQSGNSQESVTEQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGECYPYDVPDYA
(SEQ ID NO:47)

FIG. 43

Amino Acid Sequence of the Heavy Chain (VH-CH1) of HIV-1 Env Fab

METDTLLLWVLLLWVPGSTGDGAQVQLVQSGGQMKKPGESMRISCRASGYEFIDCTLNWIRLAPGKRPEWMGWLKPRGG
AVNYARPLQGRVTMTRDVYSDTAFLELRSLTVDDTAVYFCTRGKNCDYNWDFEHWGRGTPVIVSSPSTKGPSVFPLAPSSK
STSGGTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTKVDKKA
EPKSCYPYDVPDYA (SEQ ID NO:48)

FIG. 44

Amino Acid Sequence of the Light Chain (VL-CL) of HIV-1 Env Fab

METDTLLLWVLLLWVPGSTGDGAQVQIVLTQSPGTLSLSPGETAIISCRTSQYGSLAWYQQRPGQAPRLVIYSGSTRAAGIPD
RFSGSRWGPDYNLTISNLESGDFGVYYCQQYEFFGQGTKVQVDIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAK
VQWKVDNALQSGNSQESVTEQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLRSPVTKSFNRGECYPYDVPDYA
(SEQ ID NO:49)

FIG. 45

Nucleic Acid Sequence Encoding HIV-1 PG9 Fab

GGATCCGCCACCA**TG**GCAAGACCCCTGTGCACCCTGCTGCTGCTGATGGCAACCCTGGCCGGAGCCCTGGCACAGAGC
GCCCTGACCCAGCCCGCAAGCGTCTCCGGCTCACCAGGCCAGAGCATCACTATTAGTTGCAACGGGACTAGCAACGAC
GTGGGAGGCTATGAGAGTGTCAGCTGGTACCAGCAGCATCCCGGAAAAGCACCAAAAGTGGTCATCTACGATGTCAGT
AAAAGGCCAAGTGGGGTCTCAAATAGGTTCTCAGGGAGTAAATCTGGGAATACAGCATCTCTGACCATCTCCGGACTG
GGCGCAGAAGATGAAGGCGACTACTATTGCAAAAGCCTGACCTCAACCAGACGGCGAGTCTTTGGGACAGGCACCAA
GCTGACAGTCCTGACAGTCGCTGCCCCCTCCGTCTTCATTTTTCCACCTTCAGATGAGCAGCTGAAATCTGGCACTGCAT
CTGTGGTCTGCCTGCTGAACAACTTCTATCCACGAGAGGCCAAGGTGCAGTGGAAAGTGGATAACGCACTGCAGTCCG
GCAATAGTCAGGAAAGCGTGACTGAGCAGGATTCCAAGGACAGTACCTATAGCCTGTCCAGTACACTGACCCTGTCCA
AGGCTGACTACGAAAAACATAAGGTGTATGCATGTGAAGTGACTCACCAGGGACTGAGGTCACCAGTCACTAAGTCTT
TTAACAGGGGAGAGTGCGGCGGGGGAGGATCTGGAGGCGGCGGCTCTGGAGGGGGAGGCTCAGGGGGCGGAGGAAG
CGGCGGAGGAGGGTCCGGAGGAGGAGGCAGTCAGAGACTGGTCGAAAGCGGGGGAGGAGTGGTGCAGCCTGGGTCCT
CACTGAGACTGTCATGCGCTGCCAGTGGCTTTGATTTTTCACGACAGGGAATGCATTGGGTCAGGCAGGCACCCGGACA
GGGCCTGGAATGGGTCGCCTTCATTAAGTACGACGGAAGCGAGAAGTACCATGCCGACTCAGTGTGGGGAAGGCTGAG
CATCTCAAGGGACAACTCAAAGGACACCCTGTACCTGCAGATGAATAGCCTGAGAGTGGAAGATACCGCTACTTATTT
CTGCGTGCGAGAGGCCGGAGGGCCAGATTACCGGAACGGGTACAATTACTATGATTTCTACGACGGCTACTACAATTA
CCATTATATGGATGTCTGGGGCAAAGGAACTACAGTCACCGTGAGCTCCGCAAGTACTAAGGGACCTTCCGTGTTTCCT
CTGGCTCCCAGTTCCAAAAGTACATCCGGAGGAACAGCCGCTCTGGGATGTCTGGTCAAGGACTATTTTCCCGAGCCCG
TGACTGTCTCCTGGAACAGCGGGGCTCTGACAAGCGGGGTGCACACCTTTCCTGCCGTGCTGCAGTCCAGTGGGCTGTA
CAGTCTGTCTAGTGTCGTCACTGTGCCAAGCTCAAGTCTGGGGACCCAGACATACATTTGTAATGTGAACCATAAACCC
TCAAACACCAAAGTGGACAAGAAAGTGGAACCTAAAAGC**TGATAA**CTCGAG (SEQ ID NO:50)

FIG. 46

Amino Acid Sequence of HIV-1 PG9 Fab

MARPLCTLLLLMATLAGALAQSALTQPASVSGSPGQSITISCNGTSNDVGGYESVSWYQQHPGKAPKVVIYDVSKRPSGVSN
RFSGSKSGNTASLTISGLGAEDEGDYYCKSLTSTRRRVFGTGTKLTVLTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREA
KVQWKVDNALQSGNSQESVTEQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLRSPVTKSFNRGECGGGSGGGGS
GGGGSGGGGSGGGGSGGGGSQRLVESGGGVVQPGSSLRLSCAASGFDFSRQGMHWVRQAPGQGLEWVAFIKYDGSEKYH
ADSVWGRLSISRDNSKDTLYLQMNSLRVEDTATYFCVREAGGPDYRNGYNYYDFYDGYYNYHYMDVWGKGTTVTVSSAS
TKGPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNV
NHKPSNTKVDKKVEPKS (SEQ ID NO:51)

FIG. 47

Nucleic Acid Sequence Encoding HIV-1 4E10 Fab

GGATCCGCCACCA**TG**GCAAGACCTCTGTGCACTCTGCTGCTGCTGATGGCTACTCTGGCCGGGGCTCTGGCTGAGATTG
TCCTGACCCAGTCCCCTGGCACTCAGTCACTGTCCCCCGGCGAGCGCGCAACTCTGTCCTGCAGAGCAAGCCAGTCCGT
CGGGAACAACAAGCTGGCATGGTACCAGCAGCGCCCAGGACAGGCACCCAGGCTGCTGATCTACGGAGCAAGCTCCC
GGCCTAGCGGAGTCGCTGATAGATTCTCCGGAAGCGGCTCCGGGACCGATTTCACTCTGACCATCTCCAGGCTGGAACC
TGAGGATTTTGCCGTGTATTACTGTCAGCAGTACGGGCAGAGCCTGTCAACTTTCGGCCAGGGAACTAAAGTCGAAAA
GAGAACCGTGGCCGCACCAAGCGTCTTTATTTTTCCCCCTAGCGATGAACAGCTGAAATCCGGGACTGCTTCCGTGGTC
TGCCTGCTGAATAACTTCTATCCAAGAGAGGCAAAGGTGCAGTGGAAAGTGGACAACGCCCTGCAGAGCGGAAACTCA
CAGGAATCTGTGACAGAGCAGGACTCCAAGGATAGCACATACAGTCTGTCCTCAACTCTGACCCTGTCCAAAGCTGAC
TATGAGAAGCATAAAGTCTACGCATGTGAGGTGACCCACCAGGGACTGAGGTCCCCCGTCACTAAGTCCTTCAATAGA
GGCGAGTGCGGGGGCGGGGGCAGTGGCGGAGGGGGAAGTGGGGGCGGAGGGAGTGGCGGCGGCGGGAGTGGCGGCG
GCGGCTCAGGGGGCGGCGGCTCCCAGGTCCAGCTGGTCCAGAGCGGAGCCGAGGTCAAGAGACCAGGCTCTTCAGTCA
CCGTGAGCTGCAAAGCCAGCGGAGGCTCCTTTAGCACTTACGCCCTGTCATGGGTGCGGCAGGCCCCAGGCCGAGGCC
TGGAGTGGATGGGCGGCGTGATCCCCCTGCTGACCATTACTAACTATGCCCCTAGATTTGGAGGCCGGATCACCATCAC
AGCTGACAGATCCACATCCACAGCTTACCTGGAGCTGAACAGTCTGAGGCCCGAGGACACTGCAGTCTACTACTGTGC
ACCGAGAAGGCACCACTGGATGGGGGTGGCTGGGGAAGCCCATCGGGGCTTTTGCACATTGGGGCGGAGGGACACTGGT
GACTGTGAGCTCTGCCAGCACTAAAGGGCCCAGTGTCTTCCCTCTGGCCCCAAGTTCCAAGAGTACATCAGGGGGCACC
GCCGCACTGGGGTGTCTGGTGAAGGATTACTTCCCAGAGCCCGTGACAGTCAGTTGGAACAGCGGCGCTCTGACCAGT
GGGGTGCACACTTTCCCAGCCGTGCTGCAGAGTTCAGGGCTGTACTCCCTGTCCTCAGTGGTGACTGTGCCCTCAAGCA
GTCTGGGGACTCAGACTTACATTTGTAATGTGAACCATAAACCCTCAAATACTAAAGTGGACAAAAAAGTGGAACCAA
AGAGC**TGATAA**CTCGAG (SEQ ID NO:52)

FIG. 48

Amino Acid Sequence of HIV-1 4E10 Fab

MARPLCTLLLLMATLAGALAEIVLTQSPGTQSLSPGERATLSCRASQSVGNNKLAWYQQRPGQAPRLLIYGASSRPSGVADR
FSGSGSGTDFTLTISRLEPEDFAVYYCQQYGQSLSTFGQGTKVEKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKV
QWKVDNALQSGNSQESVTEQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLRSPVTKSFNRGECGGGSGGGSGG
GGSGGGGSGGGGSGGGSQVQLVQSGAEVKRPGSSVTVSCKASGGSFSTYALSWVRQAPGRGLEWMGGVIPLLTITNYAP
RFQGRITITADRSTSTAYLELNSLRPEDTAVYYCARFGTTGWGWLGKPIGAFAHWGQGTLVTVSSASTKGPSVFPLAPSSKST
SGGTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTKVDKKVEP
KS (SEQ ID NO:53)

FIG. 49

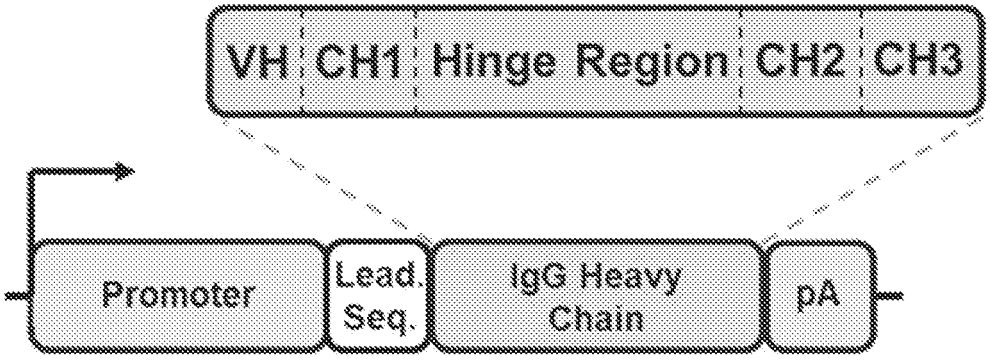

VH
CH1
Hinge Region
CH2
CH3
Promoter
Lead. Seq.
IgG Heavy Chain
pA

FIG. 50

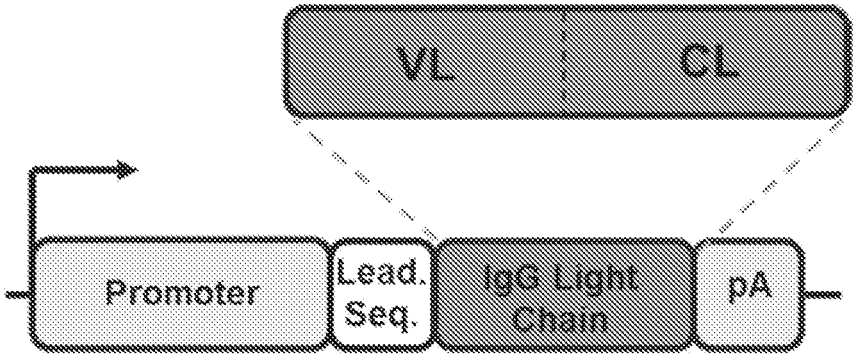

VL
CL
Promoter
Lead. Seq.
IgG Light Chain
pA

FIG. 51

Nucleic Acid Sequence Encoding the HIV-1 VRC01 IgG1 Heavy Chain (VH/CH1/Hinge/CH2/CH3)

GGATCCGCCACCATGGATTGGACATGGATTCTGTTCCTGGTCGCCGCCGCAACTAGAGTGCATTCACAGGTGCAGCTGG
TGCAGTCAGGCGGGCAGATGAAGAAACCCGGCGAGAGTATGCGAATCTCATGCCGGGCTAGCGGGTACGAATTCATCG
ACTGTACCCTGAACTGGATTAGACTGGCACCTGGGAAGAGGCCAGAGTGGATGGGATGGCTGAAACCTAGAGGCGGG
GCAGTGAATTACGCCAGACCACTGCAGGGCAGGGTCACTATGACCCGCGACGTGTATTCTGATACCGCATTCCTGGAG
CTGCGAAGTCTGACAGTCGACGATACTGCCGTGTACTTCTGCACACGGGGCAAGAACTGTGACTATAATTGGGATTTTG
AACACTGGGGCAGGGGGACACCTGTCATTGTGAGCTCCCCAAGTACTAAGGGACCCTCAGTGTTTCCCCTGGCCCCTTC
TAGTAAAAGTACCTCAGGAGGCACAGCCGCTCTGGGATGCCTGGTGAAGGATTACTTCCCTGAGCCAGTCACCGTGAG
TTGGAACTCAGGCGCCCTGACAAGCGGGGTCCATACTTTTCCAGCTGTGCTGCAGTCAAGCGGGCTGTACTCCCTGTCC
TCTGTGGTCACAGTGCCCAGTTCAAGCCTGGGAACACAGACTTATATCTGTAACGTCAATCACAAGCCTAGCAATACTA
AAGTGGACAAGAAAGCCGAGCCTAAGAGCTGCGAACCAAAGTCCTGTGATAAAACCCATACATGCCCTCCCTGTCCAG
CTCCTGAACTGCTGGGCGGCCCATCCGTGTTCCTGTTTCCACCCAAGCCCAAAGACACCCTGATGATTAGCAGGACTCC
TGAGGTCACCTGCGTGGTCGTGGACGTGTCCCACGAGGACCCCGAAGTCAAGTTTAACTGGTACGTGGATGGCGTCGA
AGTGCATAATGCCAAGACAAAACCCCGGGAGGAACAGTACAACTCTACCTATAGAGTCGTGAGTGTCCTGACAGTGCT
GCACCAGGACTGGCTGAACGGGAAGGAGTATAAGTGCAAAGTGTCTAATAAGGCCCTGCCAGCTCCCATCGAGAAAAC
AATTTCCAAGGCAAAAGGCCAGCCAAGGGAACCCCAGGTGTACACTCTGCCTCCATCCCGCGACGAGCTGACTAAGAA
CCAGGTCTCTCTGACCTGTCTGGTGAAAGGATTCTATCCAAGCGATATCGCCGTGGAGTGGGAATCCAATGGCCAGCCC
GAGAACAATTACAAGACCACACCCCCTGTGCTGGACAGCGATGGCTCCTTCTTTCTGTATTCAAAGCTGACCGTGGATA
AAAGCCGCTGGCAGCAGGGGAACGTCTTTAGCTGCTCCGTGATGCACGAAGCTCTGCACAATCATTACACCCAGAAGT
CTCTGAGTCTGTCACCTGGCAAG**TGATAA**CTCGAG (SEQ ID NO:54)

FIG. 52

Amino Acid Sequence of the HIV-1 VRC01 IgG1 Heavy Chain (VH/CH1/CH2/CH3)

MDWTWILFLVAAATRVHSQVQLVQSGGQMKKPGESMRISCRASGYEFIDCTLNWIRLAPGKRPEWMGWLKPRGGAVNYA
RPLQGRVTMTRDVYSDTAFLELRSLTVDDTAVYFCTRGKNCDYNWDFEHWGRGTPVIVSSPSTKGPSVFPLAPSSKSTSGGT
AALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTKVDKKAEPKSCE
PKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPREEQYNS
TYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVE
WESNGQPENNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK (SEQ ID NO:55)

FIG. 53

Nucleic Acid Sequence Encoding the HIV-1 VRC01 IgG Light Chain (VL/CL)

GGATCCGCCACCATGGATTGGACTTGGATTCTGTTCCTGGTGGCAGCCGCTACCAGAGTCCATTCCGAAATTGTGCTGA
CCCAGTCTCCCGGAACACTGTCTCTGAGTCCTGGCGAGACAGCCATCATTTCCTGTAGGACTTCTCAGTACGGGAGTCT
GGCATGGTATCAGCAGCGACCAGGACAGGCTCCTCGACTGGTCATCTACTCAGGAAGCACTCGGGCAGCCGGCATTCC
CGACCGATTCTCCGGGTCTCGGTGGGGACCTGATTACAACCTGACCATCTCAAATCTGGAAAGCGGAGACTTTGGCGTG
TACTATTGCCAGCAGTATGAGTTCTTTGGGCAGGGAACCAAGGTCCAGGTGGACATCAAACGCACAGTCGCTGCACCA
AGCGTGTTCATCTTTCCACCCTCAGATGAACAGCTGAAGTCCGGCACCGCCTCTGTGGTGTGCCTGCTGAACAATTTCTA
CCCCCGGGAGGCAAAGGTCCAGTGGAAAGTGGACAACGCCCTGCAGTCTGGCAATAGTCAGGAGTCAGTGACTGAAC
AGGACAGCAAGGATTCCACCTATTCTCTGTCCTCTACTCTGACCCTGAGCAAAGCTGATTACGAGAAGCACAAAGTGTA
TGCATGTGAGGTCACCCACCAGGGACTGCGGTCACCCGTCACCAAGAGCTTCAATCGCGGAGAGTGT**TGATAA**CTCGA
G (SEQ ID NO:56)

FIG. 54

Amino Acid Sequence of the HIV-1 VRC01 IgG Light Chain (VL/CL)

MDWTWILFLVAAATRVHSEIVLTQSPGTLSLSPGETAIISCRTSQYGSLAWYQQRPGQAPRLVIYSGSTRAAGIPDRFSGSRW
GPDYNLTISNLESGDFGVYYCQQYEFFGQGTKVQVDIKRTVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPREAKVQWKVD
NALQSGNSQESVTEQDSKDSTYSLSSTLTLSKADYEKHKVYACEVTHQGLRSPVTKSFNRGEC (SEQ ID NO:57)

FIG. 55

Nucleic Acid Sequence Encoding the Heavy Chain (VH-CH1) of the CHIKV-Env-Fab

GGATCCGCCACCATGGATTGGACATGGAGGATTCTGTTTCTGGTCGCCGCCGCTACTGGAACTCACGCTCAGGTGCAGC
TGGTGCAGTCAGGGTCCGAACTGAAGAAACCAGGGGCATCTGTGAAGGTCAGTTGCAAAGCCTCAGGCTACACCCTGA
CACGGTATGCCATGACTTGGGTGCGCCAGGCTCCTGGACAGGGACTGGAGTGGATGGGCTGGATCAACACTTACACCG
GAAATCCAACTTATGTGCAGGGGTTCACCGGCCGATTCGTGTTTTCTCTGGACACTTCCGTCTCTACCGCCTTTCTGCAC
ATTACAAGTCTGAAGGCAGAGGACACTGCCGTGTACTTCTGCGCTAGGGAAGGCGGAGCAAGAGGCTTTGATTATTGG
GGCCAGGGAACCCTGGTGACAGTCAGCTCCGCCAGCACAAAGGGACCCTCCGTGTTCCCACTGGCTCCCTCTAGTAAA
AGTACATCAGGGGGCACTGCCGCTCTGGGATGTCTGGTCAAAGATTACTTCCCCGAACCTGTGACCGTCAGCTGGAACT
CCGGAGCTCTGACCAGCGGGGTGCATACATTTCCCGCAGTCCTGCAGTCAAGCGGACTGTACTCCCTGTCCTCTGTGGT
CACAGTGCCTAGTTCAAGCCTGGGGACACAGACTTATATCTGTAATGTGAACCATAAGCCAAGCAACACCAAAGTGGA
CAAAAAAGTGGAACCTAAGAGCTGCTGATAACTCGAG (SEQ ID NO:58)

FIG. 56

Amino Acid Sequence of the Heavy Chain (VH-CH1) of the CHIKV-Env-Fab

MDWTWRILFLVAAATGTHAQVQLVQSGSELKKPGASVKVSCKASGYTLTRYAMTWVRQAPGQGLEWMGWINTYTGNPT
YVQGFTGRFVFSLDTSVSTAFLHITSLKAEDTAVYFCAREGGARGFDYWGQGTLVTVSSASTKGPSVFPLAPSSKSTSGGTA
ALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTKVDKKVEPKSC
(SEQ ID NO:59)

FIG. 57

Nucleic Acid Sequence Encoding the Light Chain (VL-CL) of the CHIKV-Env-Fab

GGATCCGCCACCATGGCATGGACCCCACTGTTCCTGTTCCTGCTGACTTGTTGTCCTGGCGGGAGCAATTCACAGAGCG
TCCTGACCCAGCCCCCTTCTGTGTCCGGAGCACCAGGACAGCGAGTCACAATCTCTTGCACTGGAAGCTCCTCTAACAT
TGGGGCCAGCCACGACGTGCATTGGTACCAGCAGCTGCCAGGGACCGCTCCCACACTGCTGATCTATGTGAACTCTAAT
AGGCCTAGTGGCGTCCCAGATAGATTTTCAGGGAGCAAGTCCGGCACCTCTGCTAGTCTGGCAATTACAGGACTGCAG
GCTGAGGACGAAGCAGATTACTATTGCCAGAGTTACGACTCAAACCTGTCAGGCAGCGGCAGTGTTCGGAGGAGGAACT
AAGCTGACCGTCCTGGGACAGCCCAAAGCCGCTCCTTCTGTGACCCTGTTTCCCCCTAGTTCAGAGGAACTGCAGGCCA
ACAAGGCTACTCTGGTGTGTCTGATCTCCGACTTCTACCCTGGAGCAGTGACCGTCGCATGGAAGGCCGATAGCTCCCC
AGTGAAAGCTGGGGTCGAGACCACAACTCCCAGCAAGCAGTCCAACAACAAGTACGCAGCCTCTAGTTATCTGTCACT
GACACCTGAACAGTGGAAGAGCCACAAATCCTATTCTTGCCAAGTGACTCATGAGGGCAGTACCGTGGAAAAGACAGT
CGCCCCAACTGAGTGTTCCTGATAACTCGAG (SEQ ID NO:60)

FIG. 58

Amino Acid Sequence of the Light Chain (VL-CL) of the CHIKV-Env-Fab

MAWTPLFLFLLTCCPGGSNSQSVLTQPPSVSGAPGQRVTISCTGSSSNIGASHDVHWYQQLPGTAPTLLIYVNSNRPSGVPDR
FSGSKSGTSASLAITGLQAEDEADYYCQSYDSNLSGSAVFGGGTKLTVLGQPKAAPSVTLFPPSSEELQANKATLVCLISDFY
PGAVTVAWKADSSPVKAGVETTTPSKQSNNKYAASSYLSLTPEQWKSHKSYSCQVTHEGSTVEKTVAPTECS (SEQ ID
NO:61)

FIG. 59

Nucleic Acid Sequence Encoding HIV-1 Env-4E10 Ig

GGATCCGCCACCATGGATTGGACATGGAGGATTCTGTTTCTGGTCGCCGCCGCTACAGGAACTCACGCCCAGGTGCAG
CTGGTGCAGTCAGGAGCCGAAGTGAAGCGACCAGGCAGCTCCGTCACTGTGTCCTGCAAAGCATCTGGCGGATCATTC
AGCACCTACGCCCTGAGCTGGGTGAGACAGGCTCCTGGACGAGGACTGGAATGGATGGGAGGCGTCATCCCACTGCTG
ACAATTACTAACTACGCCCCCCGATTTCAGGGCAGGATCACCATTACAGCAGACCGCTCCACTTCTACCGCCTATCTGG
AGCTGAATAGCCTGAGACCAGAAGATACCGCAGTGTACTATTGCGCCCGGGAGGGAACCACAGGATGGGGATGGCTG
GGAAAGCCCATCGGGGCTTTCGCACACTGGGGCCAGGGAACCCTGGTCACAGTGTCTAGTGCCAGCACAAAGGGCCCC
TCCGTGTTTCCCCTGGCTCCTTCAAGCAAAAGTACTTCAGGAGGGACCGCCGCTCTGGGATGTCTGGTGAAGGACTACT
TCCCTGAGCCAGTCACCGTGTCCTGGAACTCTGGCGCTCTGACCTCCGGAGTGCATACATTTCCCGCAGTCCTGCAGTC
CTCTGGGCTGTACTCTCTGAGTTCAGTGGTCACTGTGCCTAGCTCCTCTCTGGGCACACAGACTTATATCTGCAACGTGA
ATCACAAGCCCTCCAATACCAAAGTCGACAAGAAAGTGGAACCTAAGTCTTGTGATAAAACCCATACATGCCCACCTT
GTCCAGCACCTGAGCTGCTGGGCGGACCTTCCGTGTTCCTGTTTCCACCCAAGCCAAAAGACACACTGATGATTAGCCG
GACACCTGAAGTGACTTGTGTGGTCGTGGACGTCAGCCACGAGGACCCCGAAGTGAAGTTCAACTGGTACGTGGATGG
CGTCGAGGTGCATAATGCCAAGACCAAACCCAGGGAGGAACAGTACAACTCTACTTATAGGGTCGTGAGTGTCCTGAC
CGTGCTGCACCAGGACTGGCTGAACGGGAAGGAGTATAAGTGCAAAGTGTCCAATAAGGCCCTGCCAGCTCCCATCGA
GAAAACAATTTCTAAGGCTAAAGGCCAGCCACGCGAACCCCAGGTGTACACTCTGCCTCCCAGCAGGGACGAGCTGAC
CAAGAACCAGGTGAGTCTGACATGTCTGGTCAAAGGCTTCTATCCAAGCGATATCGCCGTGGAGTGGGAATCCAATGG
ACAGCCCGAAAACAATTACAAGACTACCCCCCCTGTGCTGGACAGTGATGGATCATTCTTTCTGTATTCCAAGCTGACC
GTGGACAAATCTCGCTGGCAGCAGGGGAACGTCTTTAGCTGCTCCGTGATGCACGAGGCCCTGCACAATCATTACACA
CAGAAGTCTCTGAGTCTGTCACCAGGCAAGCGGGGACGCAAAAGGAGAAGCGGGTCCGGCGCTACTAACTTCAGCCTG
CTGAAACAGGCAGGGGATGTGGAGGAAAATCCTGGCCCAATGGTCCTGCAGACCCAGGTGTTTATCTCACTGCTGCTGT
GGATTAGCGGGGCTTATGGCGAAATCGTGCTGACTCAGAGCCCCGGAACCCAGTCTCTGAGTCCTGGGGAGCGCGCTA
CACTGAGCTGTCGAGCATCACAGAGCGTGGGGAACAATAAGCTGGCATGGTACCAGCAGAGGCCTGGCCAGGCTCCAA
GACTGCTGATCTATGGCGCAAGTTCACGGCCTAGCGGAGTGGCAGACCGCTTCTCCGGATCTGGGAGTGGCACCGATTT
TACTCTGACCATTAGCAGGCTGGAGCCAGAAGACTTCGCTGTGTACTATTGCCAGCAGTACGGCCAGTCACTGAGCACA
TTTGGACAGGGGACTAAGGTCGAAAAAAGAACCGTGGCAGCCCCAAGTGTCTTCATTTTTCCACCCTCAGACGAGCAG
CTGAAGAGTGGAACAGCCTCAGTCGTGTGTCTGCTGAACAATTTCTACCCCAGGGAGGCCAAGGTCCAGTGGAAAGTG
GATAACGCTCTGCAGAGCGGCAATTCCCAGGAGTCTGTGACAGAACAGGACAGTAAGGATTCAACTTATAGCCTGAGC
TCCACACTGACTCTGTCCAAAGCAGATTACGAGAAGCACAAAGTGTATGCCTGCGAAGTCACCCATCAGGGACTGTCT
AGTCCTGTGACAAAGTCTTTTAACAGAGGGGAGTGATAACTCGAG (SEQ ID NO:62)

FIG. 60

Nucleic Acid Sequence Encoding HIV-1 Env-PG9 Ig

GGATCCGCCACCATGGACTGGACTTGGAGGATTCTGTTTCTGGTCGCCGCCGCAACTGGAACTCACGCTGAATTTGGAC
TGTCATGGGTCTTTCTGGTGGCCTTTCTGCGAGGGGTCCAGTGCCAGAGGCTGGTGGAGTCCGGAGGAGGAGTGGTCCA
GCCAGGCAGCTCCCTGCGACTGAGTTGTGCCGCTTCAGGGTTCGACTTTTCTAGACAGGGCATGCACTGGGTGCGGCAG
GCACCAGGACAGGGACTGGAGTGGGTGGCTTTCATCAAGTACGACGGAAGTGAAAAATATCATGCCGATTCAGTGTGG
GGGCGGCTGTCAATTAGCCGCGACAACTCCAAGGATACCCTGTACCTGCAGATGAATTCTCTGAGGGTCGAGGACACA
GCTACTTATTTCTGCGTGAGGGAAGCAGGCGGACCTGATTACAGAAACGGGTATAATTACTATGACTTTTACGATGGCT
ACTATAACTACCACTATATGGACGTGTGGGGCAAGGGAACCACAGTCACAGTGTCTAGTGCATCAACTAAAGGCCCAA
GCGTGTTTCCCCTGGCCCCTTCAAGCAAGTCCACTTCTGGAGGAACCGCAGCACTGGGATGTCTGGTGAAGGATTACTT
CCCTGAGCCAGTCACCGTGAGTTGGAACTCAGGCGCCCTGACTAGCGGAGTCCATACCTTTCCTGCTGTGCTGCAGTCC
TCTGGGCTGTACAGCCTGAGTTCAGTGGTCACAGTGCCAAGCTCCTCTCTGGGCACCCAGACATATATCTGCAACGTGA
ATCACAAGCCTAGCAATACTAAGGTCGACAAAAGAGTGGAACCAAAGAGCTGTGATAAAACTCATACCTGCCCACCTT
GTCCAGCACCTGAGCTGCTGGGAGGGCCTTCCGTGTTCCTGTTTCCACCCAAGCCAAAAGACACCCTGATGATTAGCCG
GACACCAGAAGTCACTTGCGTGGTCGTGGACGTGAGCCACGAGGACCCCGAAGTCAAGTTTAACTGGTACGTGGATGG
CGTCGAGGTGCATAATGCTAAGACAAAACCACGGGAGGAACAGTACAACTCCACATATCGCGTCGTGTCTGTCCTGAC
TGTGCTGCACCAGGACTGGCTGAACGGCAAGGAGTATAAGTGCAAAGTGTCCAATAAGGCACTGCCAGCCCCCATCGA
GAAAACCATTTCTAAGGCCAAAGGCCAGCCACGAGAACCCCAGGTGTACACACTGCCTCCAAGTAGGGACGAGCTGAC
TAAGAACCAGGTCTCTCTGACCTGTCTGGTGAAAGGCTTCTATCCCTCTGATATCGCTGTGGAGTGGGAAAGTAATGGA
CAGCCTGAAAACAATTACAAGACTACCCCCCCTGTGCTGGACAGCGATGGCAGCTTCTTCCTGTATAGCAAGCTGACCG
TGGACAAATCCAGATGGCAGCAGGGGAACGTCTTTAGTTGCTCAGTGATGCACGAGGCACTGCACAATCATTACACCC
AGAAAAGCCTGTCCCTGTCTCCTGGCAAGAGGGGAAGAAAAAGGAGAAGTGGGTCAGGCGCAACAAACTTCAGCCTG
CTGAAGCAGGCCGGAGATGTGGAGGAAAATCCTGGGCCAATGGCTTGGACCCCCCTGTTCCTGTTTCTGCTGACATGCT
GTCCTGGCGGAAGCAACTCCCAGTCTGCACTGACACAGCCAGCAAGTGTGTCAGGGAGCCCAGGACAGAGCATCACCA
TTTCCTGTAACGGCACAAGCAATGACGTCGGGGGCTACGAGTCCGTGTCTTGGTATCAGCAGCATCCTGGAAAGGCCCC
AAAAGTCGTGATCTACGATGTCAGCAAACGCCCCTCTGGGGTGAGTAACCGATTCAGTGGATCAAAGAGCGGGAATAC
CGCTTCTCTGACAATTAGTGGCCTGCAGGCAGAGGACGAAGGAGATTACTATTGCAAATCACTGACAAGCACTCGGCG
CCGAGTCTTCGGAACCGGGACAAAGCTGACTGTGCTGGGCCAGCCCAAAGCTGCACCTAGCGTGACCCTGTTTCCACCC
AGTTCAGAGGAACTGCAGGCTAATAAGGCAACACTGGTGTGTCTGATCTCCGACTTCTACCCTGGCGCTGTCACTGTGG
CCTGGAAGGCTGATAGCTCCCCAGTCAAAGCAGGAGTGGAAACAACTACCCCCTCCAAGCAGTCTAACAACAAGTACG
CCGCTTCTAGTTATCTGTCACTGACTCCCGAGCAGTGGAAGAGCCACAAATCCTATTCTTGCCAGGTGACCCATGAGGG
CTCCACTGTCGAAAAGACCGTGGCCCCTACAGAGTGTTCTTGATAACTCGAG (SEQ ID NO:63)

FIG. 61

Nucleic Acid Sequence Encoding VRC01 IgG

GGATCCGCCACCA**TG**GATTGGACATGGATTCTGTTCCTGGTCGCCGCCGCAACTAGAGTGCATTCACAGGTGCAGCTGG
TGCAGTCAGGCGGGCAGATGAAGAAACCCGGCGAGAGTATGCGAATCTCATGCCGGGCTAGCGGGTACGAATTCATCG
ACTGTACCCTGAACTGGATTAGACTGGCACCTGGGAAGAGGCCAGAGTGGATGGGATGGCTGAAACCTAGAGGCGGG
GCAGTGAATTACGCCAGACCACTGCAGGGCAGGGTCACTATGACCCGCGACGTGTATTCTGATACCGCATTCCTGGAG
CTGCGAAGTCTGACAGTCGACGATACTGCCGTGTACTTCTGCACACGGGGCAAGAACTGTGACTATAATTGGGATTTTG
AACACTGGGGCAGGGGGACACCTGTCATTGTGAGCTCCCCAAGTACTAAGGGACCCTCAGTGTTTCCCCTGGCCCCTTC
TAGTAAAAGTACCTCAGGAGGCACAGCCGCTCTGGGATGCCTGGTGAAGGATTACTTCCCTGAGCCAGTCACCGTGAG
TTGGAACTCAGGCGCCCTGACAAGCGGGGTCCATACTTTTCCAGCTGTGCTGCAGTCAAGCGGGCTGTACTCCCTGTCC
TCTGTGGTCACAGTGCCCAGTTCAAGCCTGGGAACACAGACTTATATCTGTAACGTCAATCACAAGCCTAGCAATACTA
AAGTGGACAAGAAAGCCGAGCCTAAGAGCTGCGAACCAAAGTCCTGTGATAAAACCCATACATGCCCTCCCTGTCCAG
CTCCTGAACTGCTGGGCGGCCCATCCGTGTTCCTGTTTCCACCCAAGCCCAAAGACACCCTGATGATTAGCAGGACTCC
TGAGGTCACCTGCGTGGTCGTGGACGTGTCCCACGAGGACCCCGAAGTCAAGTTTAACTGGTACGTGGATGGCGTCGA
AGTGCATAATGCCAAGACAAAACCCCGGGAGGAACAGTACAACTCTACCTATAGAGTCGTGAGTGTCCTGACAGTGCT
GCACCAGGACTGGCTGAACGGGAAGGAGTATAAGTGCAAAGTGTCTAATAAGGCCCTGCCAGCTCCCATCGAGAAAAC
AATTTCCAAGGCAAAAGGCCAGCCAAGGGAACCCCAGGTGTACACTCTGCCTCCATCCCGCGACGAGCTGACTAAGAA
CCAGGTCTCTCTGACCTGTCTGGTGAAAGGATTCTATCCAAGCGATATCGCCGTGGAGTGGGAATCCAATGGCCAGCCC
GAGAACAATTACAAGACCACACCCCCTGTGCTGGACAGCGATGGCTCCTTCTTTCTGTATTCAAAGCTGACCGTGGATA
AAAGCCGCTGGCAGCAGGGGAACGTCTTTAGCTGCTCCGTGATGCACGAAGCTCTGCACAATCATTACACCCAGAAGT
CTCTGAGTCTGTCACCTGGCAAGAGGGGACGAAAACGGAGAAGCGGCAGCGGAGCTACAAACTTCAGCCTGCTGAAA
CAGGCAGGCGACGTGGAGGAAAATCCTGGGCCAATGGATTGGACTTGGATTCTGTTCCTGGTGGCAGCCGCTACCAGA
GTCCATTCCGAAATTGTGCTGACCCAGTCTCCCGGAACACTGTCTCTGAGTCCTGGCGAGACAGCCATCATTTCCTGTA
GGACTTCTCAGTACGGGAGTCTGGCATGGTATCAGCAGCGACCAGGACAGGCTCCTCGACTGGTCATCTACTCAGGAA
GCACTCGGGCAGCCGGCATTCCCGACCGATTCTCCGGGTCTCGGTGGGGACCTGATTACAACCTGACCATCTCAAATCT
GGAAAGCGGAGACTTTGGCGTGTACTATTGCCAGCAGTATGAGTTCTTTGGGCAGGGAACCAAGGTCCAGGTGGACAT
CAAACGCACAGTCGCTGCACCAAGCGTGTTCATCTTTCCACCCTCAGATGAACAGCTGAAGTCCGGCACCGCCTCTGTG
GTGTGCCTGCTGAACAATTTCTACCCCCGGGAGGCAAAGGTCCAGTGGAAAGTGGACAACGCCCTGCAGTCTGGCAAT
AGTCAGGAGTCAGTGACTGAACAGGACAGCAAGGATTCCACCTATTCTCTGTCCTCTACTCTGACCCTGAGCAAAGCTG
ATTACGAGAAGCACAAAGTGTATGCATGTGAGGTCACCCACCAGGGACTGCGGTCACCCGTCACCAAGAGCTTCAATC
GCGGAGAGTGT**TGATAA**CTCGAG (SEQ ID NO:64)

FIG. 62

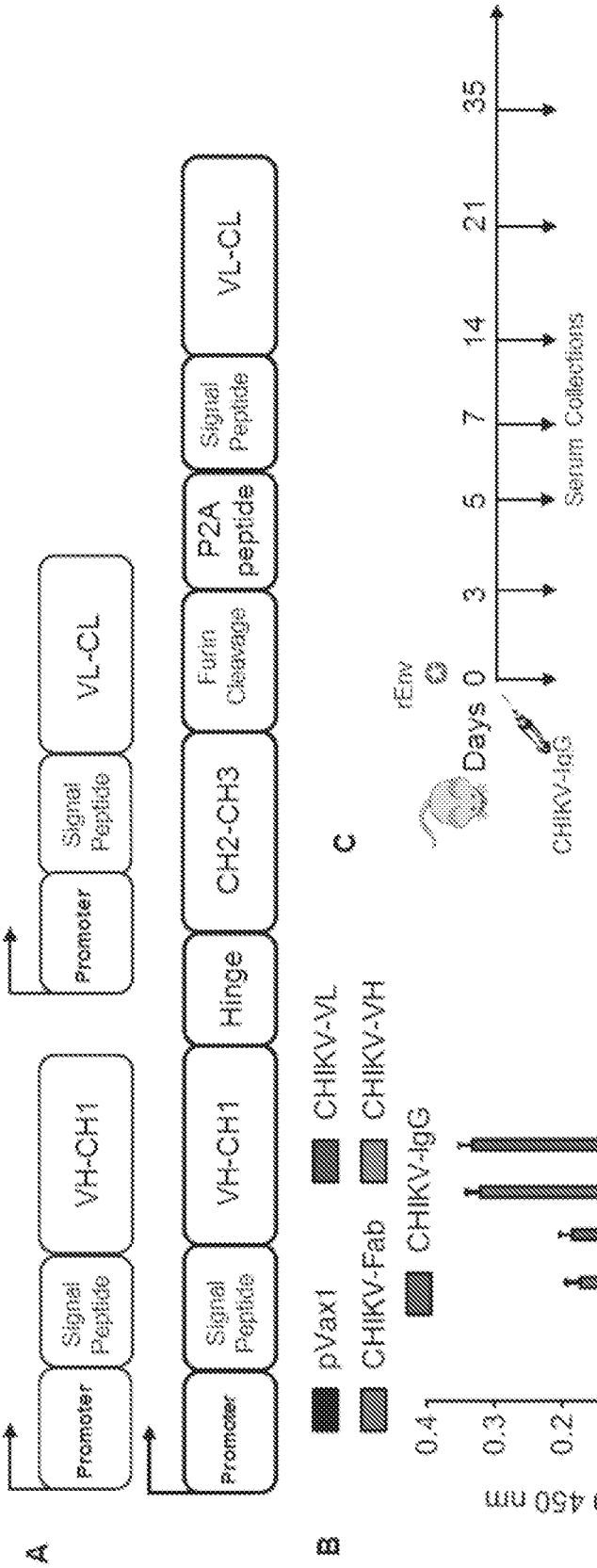

A
Promoter
Signal Peptide
VH-CH1
Promoter
Signal Peptide
VL-CL
Promoter
Signal Peptide
VH-CH1
Hinge
CH2-CH3
Furin Cleavage
P2A peptide
Signal Peptide
VL-CL
B
pVax1
CHIKV-Fab
CHIKV-IgG
CHIKV-VL
CHIKV-VH
OD 450 nm
0.0
0.1
0.2
0.3
0.4
0
24
48
Post Transfection (hrs)
C
rEnv
Days 0 3 5 7 14 21 35
CHIKV-IgG
Serum Collections

FIG. 63

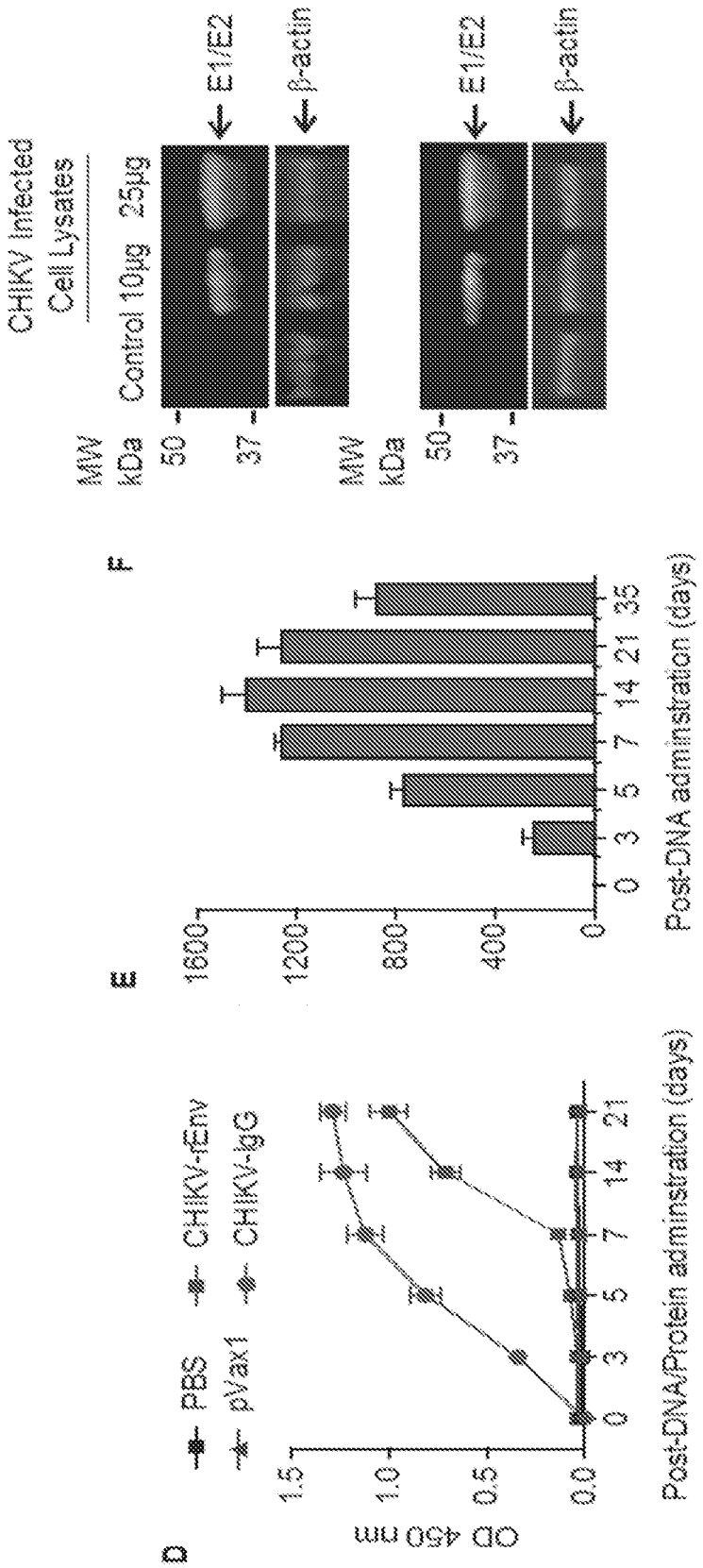

CHIKV Infected Cell Lysates
Control 10μg 25μg
MW kDa
50
37
E1/E2
β-actin
F
E
1600
1200
800
400
0
0 3 5 7 14 21 35
Post-DNA administration (days)
D
PBS
pVax1
CHIKV-rEnv
CHIKV-IgG
OD 450 nm
1.5
1.0
0.5
0.0
0 3 5 7 14 21
Post-DNA/Protein administration (days)

FIG. 63 (con't)

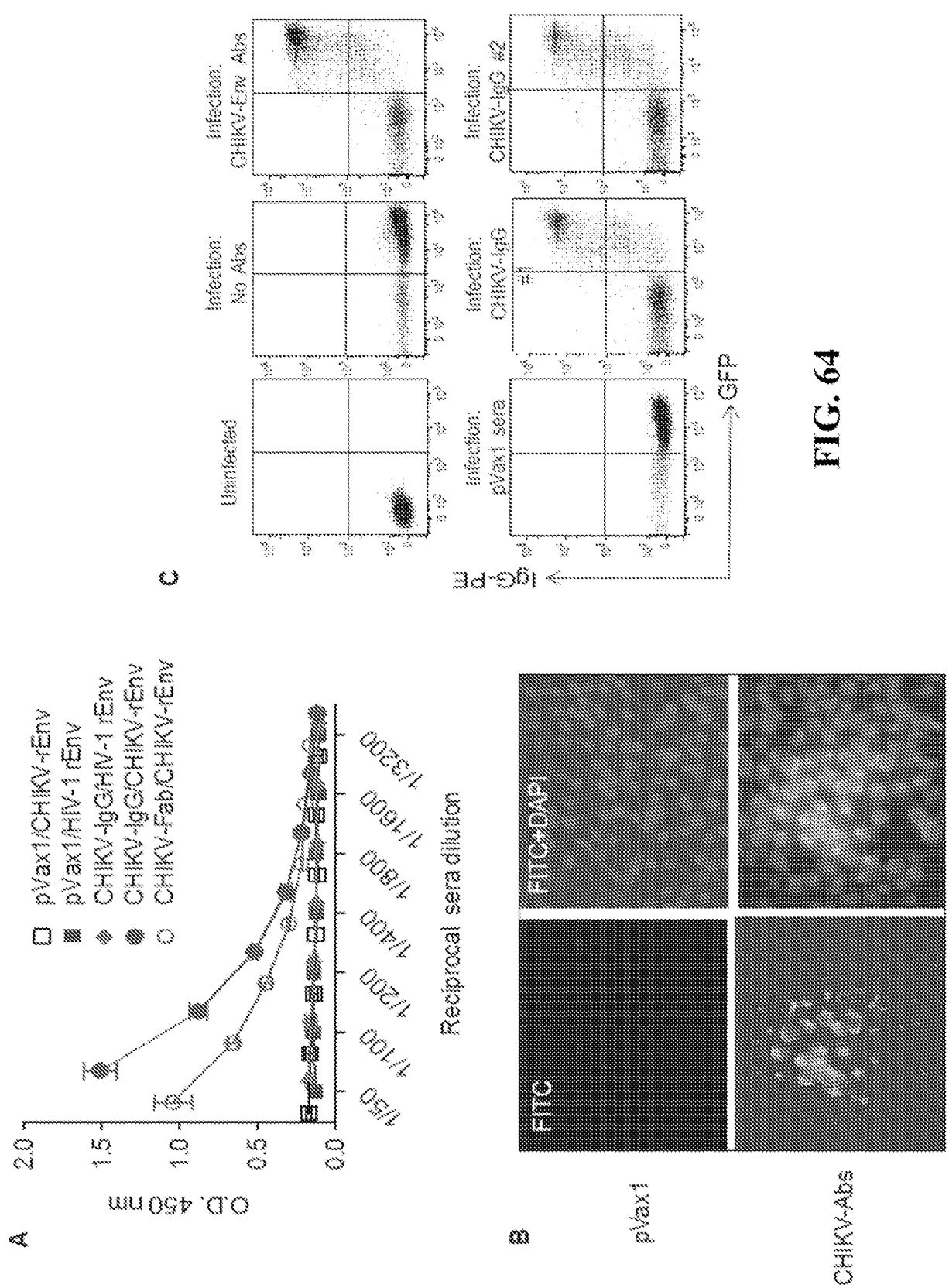

A
pVax1/CHIKV-rEnv
pVax1/HIV-1 rEnv
CHIKV-IgG/HIV-1 rEnv
CHIKV-IgG/CHIKV-rEnv
CHIKV-Fab/CHIKV-rEnv
O.D. 450 nm
2.0
1.5
1.0
0.5
0.0
1/50
1/100
1/200
1/400
1/800
1/1600
1/3200
Reciprocal sera dilution
B
pVax1
CHIKV-Abs
FITC
FITC/DAPI
C
Uninfected
Infection: No Abs
Infection: CHIKV-Env Abs
Infection: pVax1 sera
Infection: CHIKV-IgG #1
Infection: CHIKV-IgG #2
IgG-PE
GFP

FIG. 64

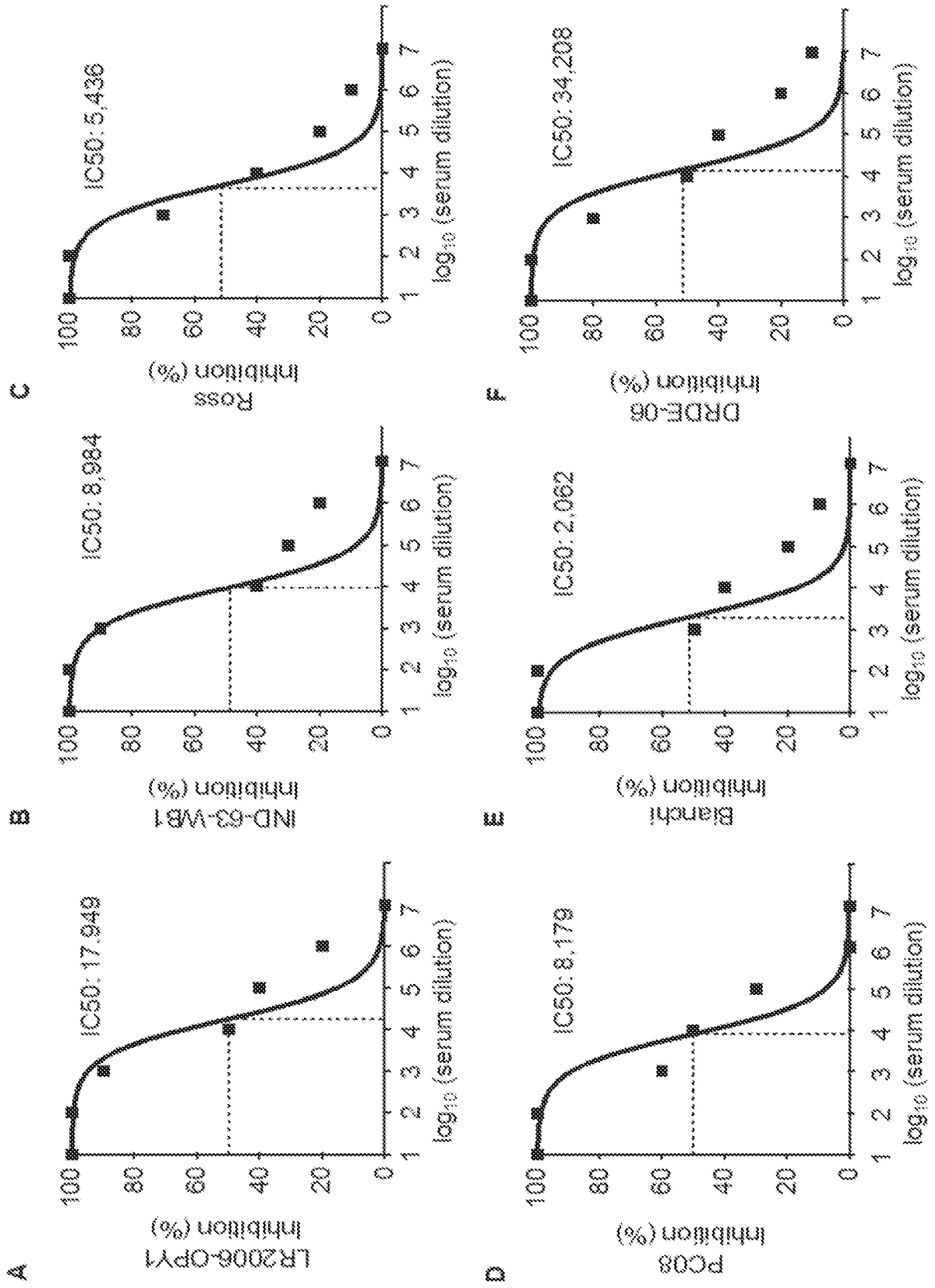

A
LR2006-OPY1
Inhibition (%)
IC50: 17,949
log10 (serum dilution)
B
IND-63-WB1
Inhibition (%)
IC50: 8,984
log10 (serum dilution)
C
Ross
Inhibition (%)
IC50: 5,436
log10 (serum dilution)
D
PC08
Inhibition (%)
IC50: 8,179
log10 (serum dilution)
E
Bianchi
Inhibition (%)
IC50: 2,062
log10 (serum dilution)
F
DRDE-06
Inhibition (%)
IC50: 34,208
log10 (serum dilution)

FIG. 65

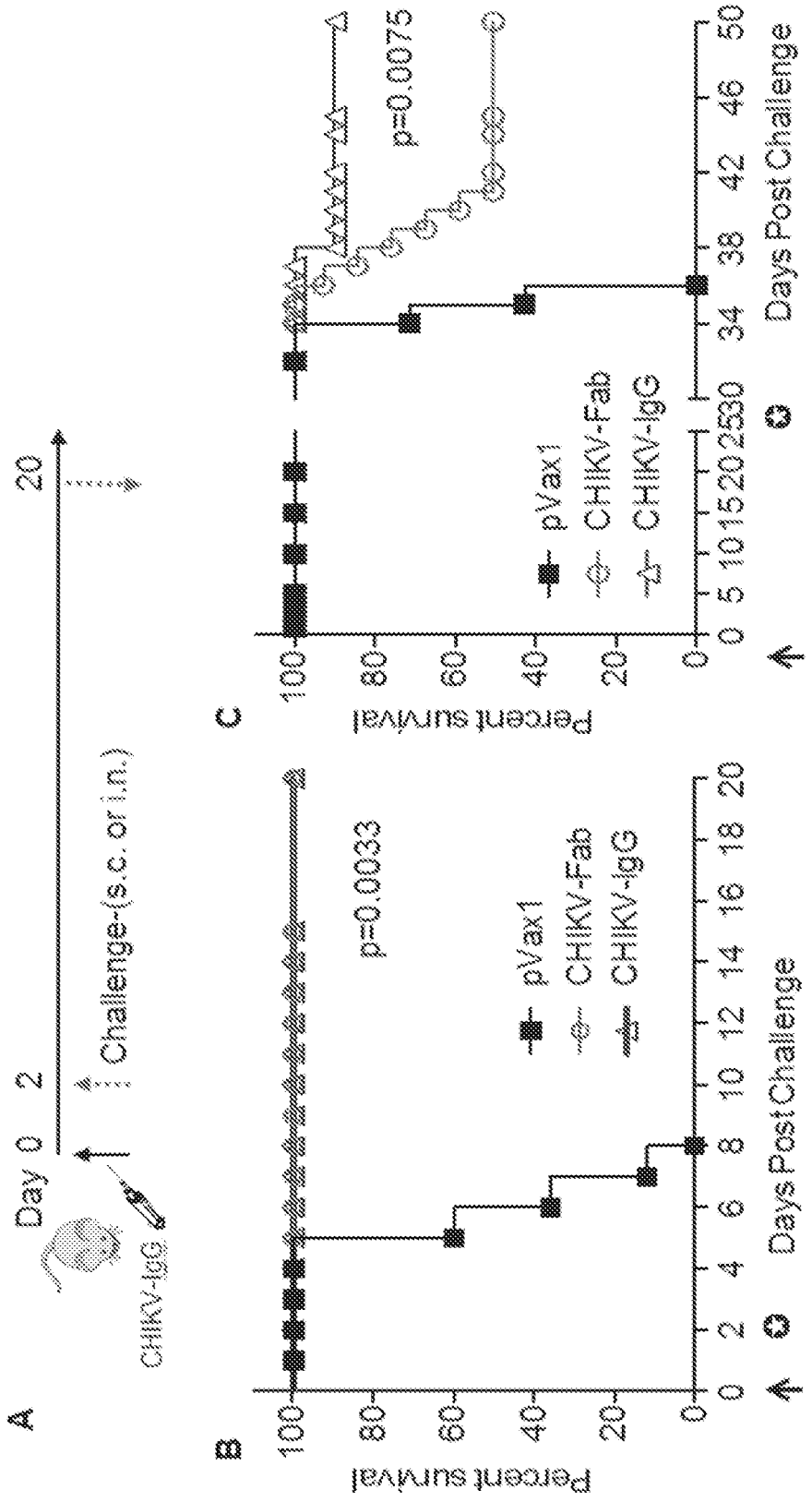

A
Day 0
2
20
Challenge-(s.c. or i.n.)
CHIKV-IgG
B
Percent survival
100
80
60
40
20
0
p=0.0033
pVax1
CHIKV-Fab
CHIKV-IgG
0 2 4 6 8 10 12 14 16 18 20
Days Post Challenge
C
Percent survival
100
80
60
40
20
0
p=0.0075
pVax1
CHIKV-Fab
CHIKV-IgG
0 5 10 15 20 25 30 34 38 42 46 50
Days Post Challenge

FIG. 66

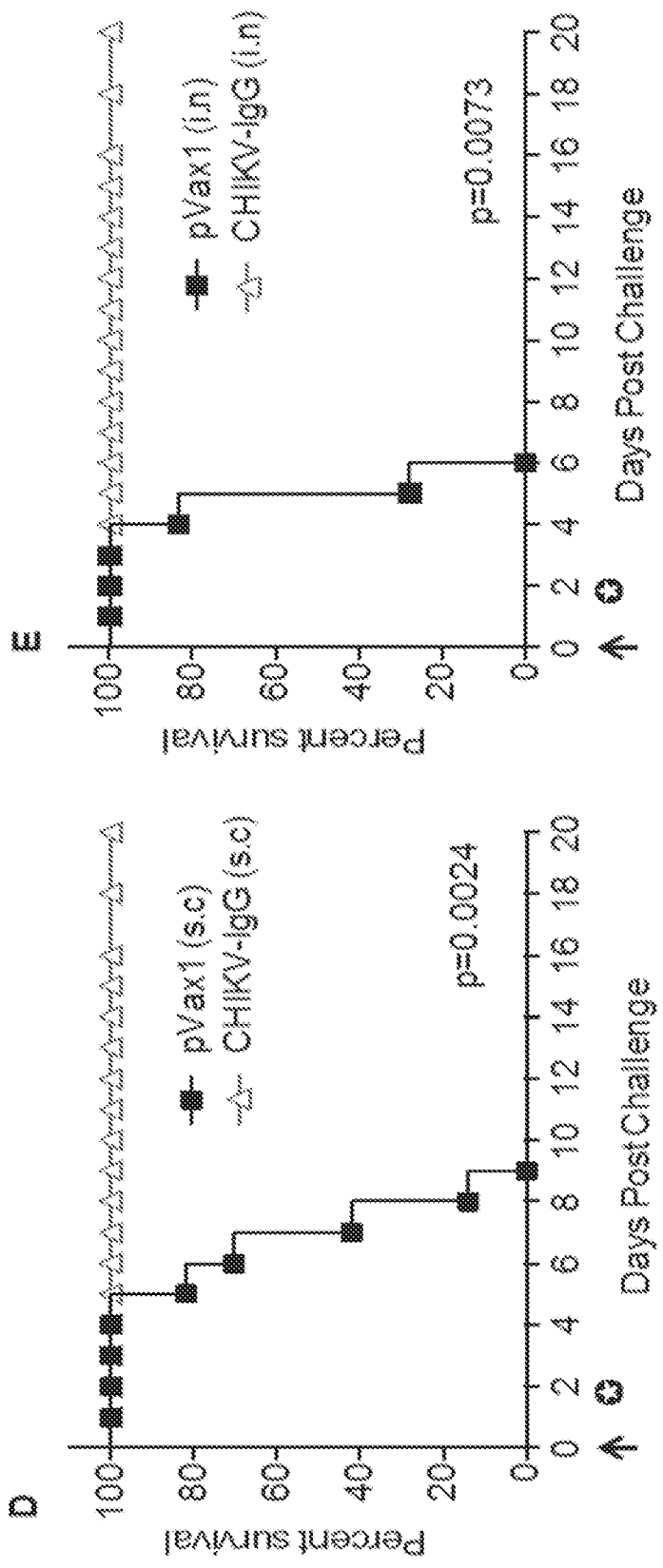

D
E
Percent survival
Days Post Challenge
pVax1 (s.c)
CHIKV-IgG (s.c)
pVax1 (i.n)
CHIKV-IgG (i.n)
p=0.0024
p=0.0073
0
20
40
60
80
100
0 2 4 6 8 10 12 14 16 18 20

FIG. 66 (con't)

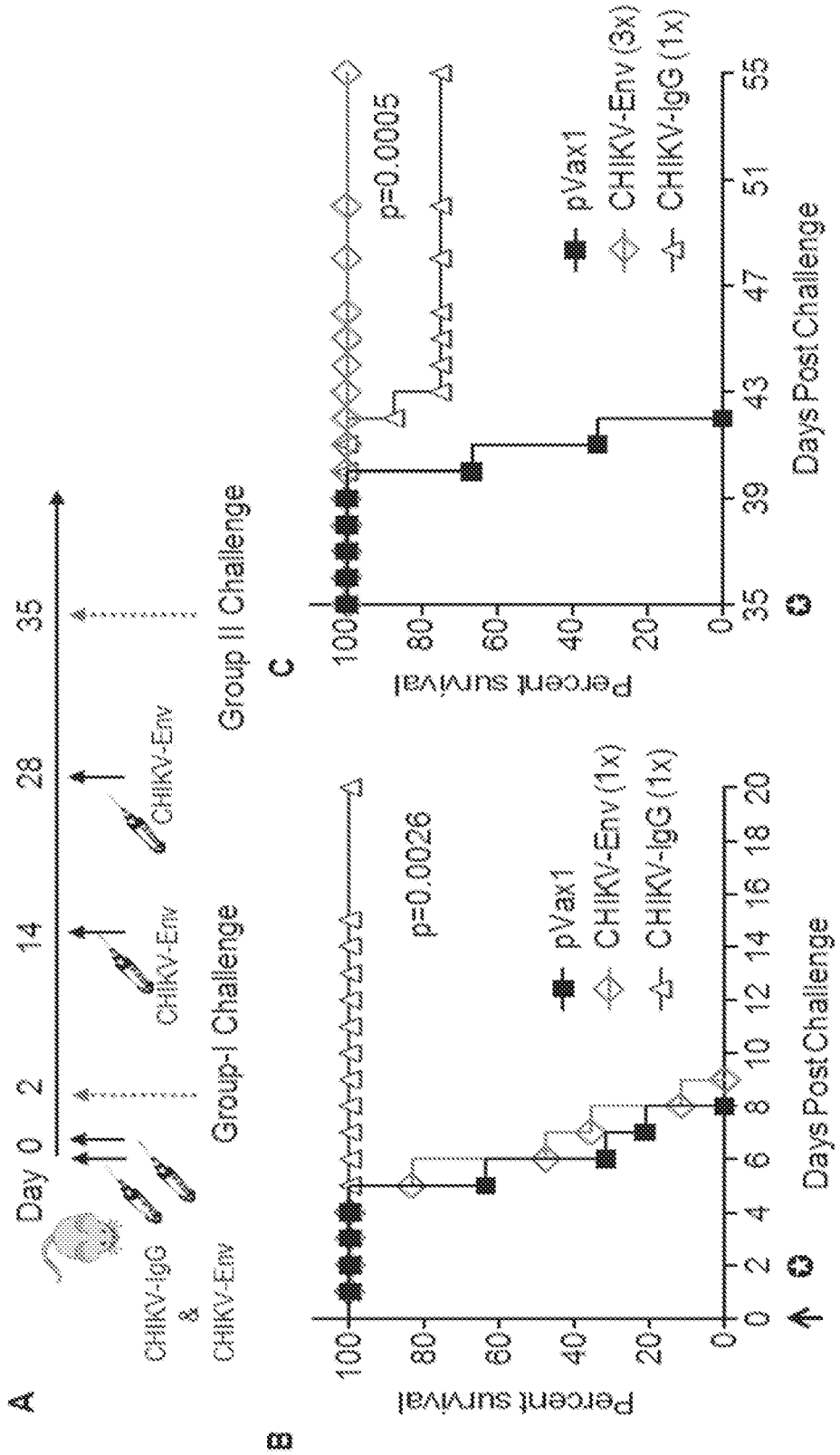

A
Day 0
2
14
28
35
CHIKV-IgG & CHIKV-Env
CHIKV-Env
CHIKV-Env
Group-I Challenge
Group II Challenge
B
Percent survival
100
80
60
40
20
0
p=0.0026
pVax1
CHIKV-Env (1x)
CHIKV-IgG (1x)
0 2 4 6 8 10 12 14 16 18 20
Days Post Challenge
C
Percent survival
100
80
60
40
20
0
p=0.0005
pVax1
CHIKV-Env (3x)
CHIKV-IgG (1x)
35 39 43 47 51 55
Days Post Challenge

FIG. 67

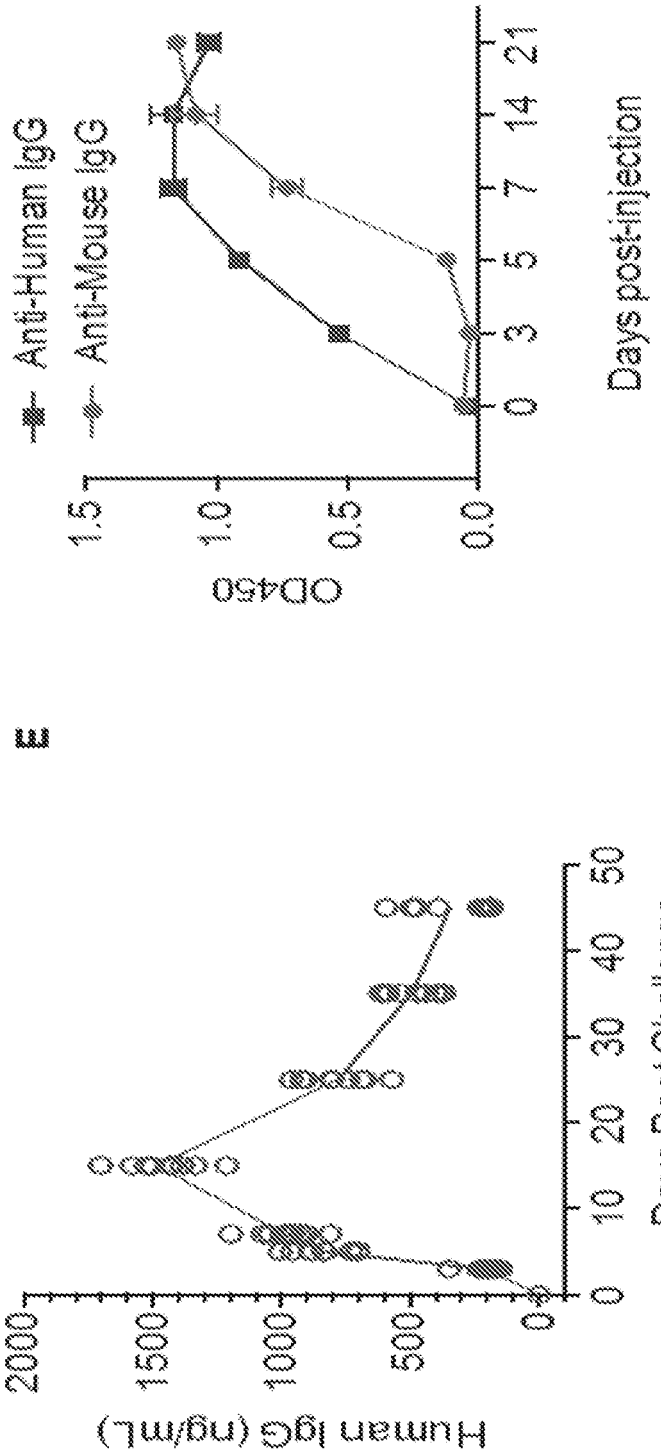

D
Human IgG (ng/mL)
2000
1500
1000
500
0
0
10
20
30
40
50
Days Post Challenge
E
OD450
1.5
1.0
0.5
0.0
Anti-Human IgG
Anti-Mouse IgG
0
3
5
7
14
21
Days post-injection

FIG. 67 (con't)

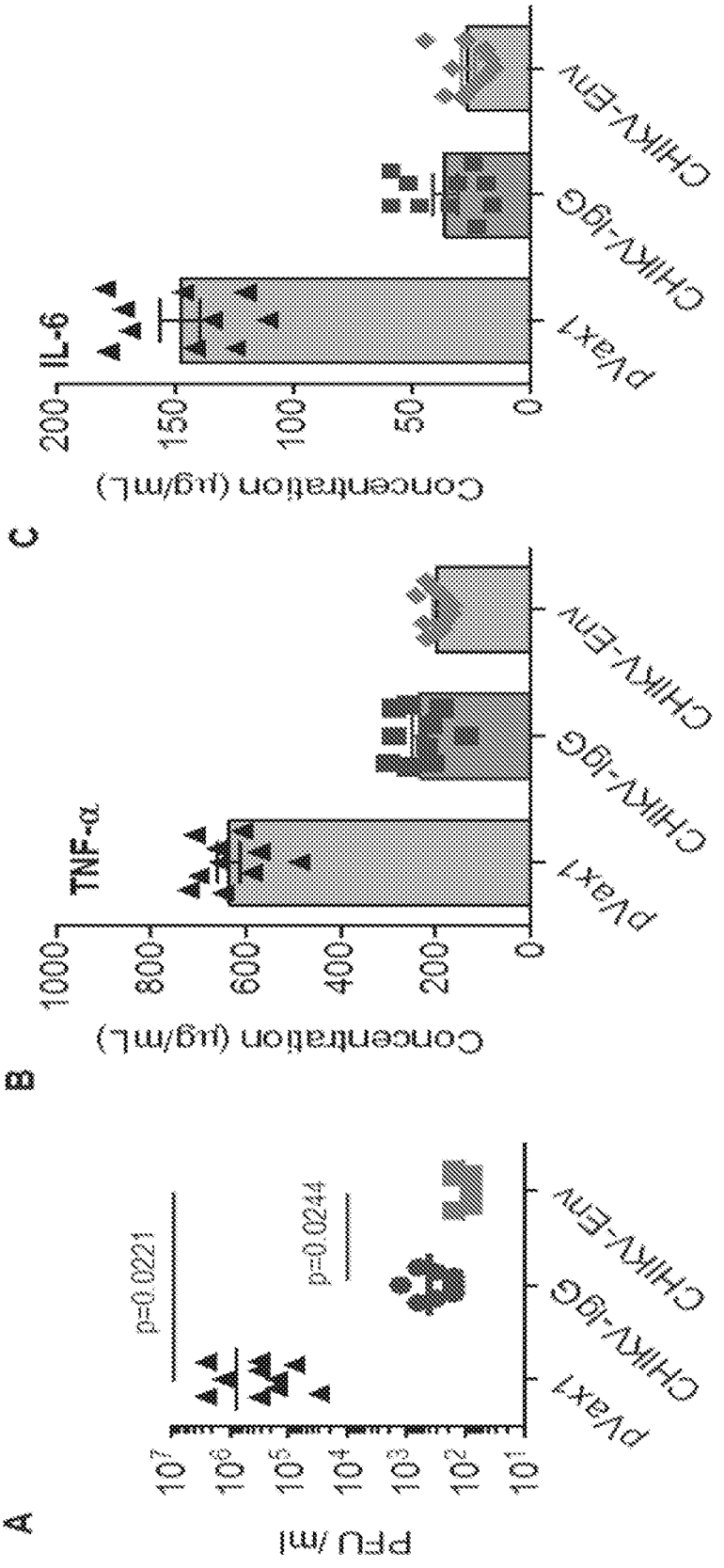

A
PFU /ml
p=0.0221
p=0.0244
pVax1
CHIKV-IgG
CHIKV-ENV
B
TNF-α
Concentration (μg/mL)
C
IL-6
Concentration (μg/mL)

FIG. 68

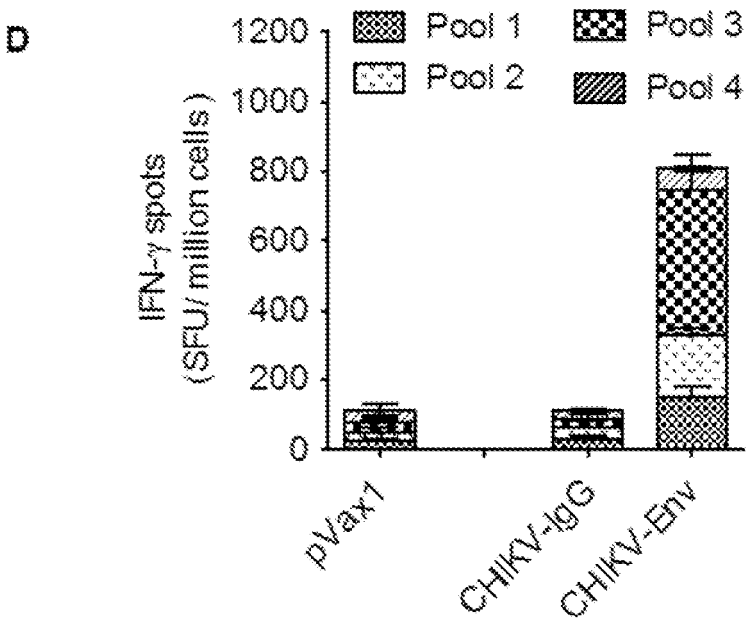

D
IFN-γ spots
(SFU/ million cells)
1200
1000
800
600
400
200
0
Pool 1
Pool 2
Pool 3
Pool 4
pVax1
CHIKV-IgG
CHIKV-Env

FIG. 68 (con't)

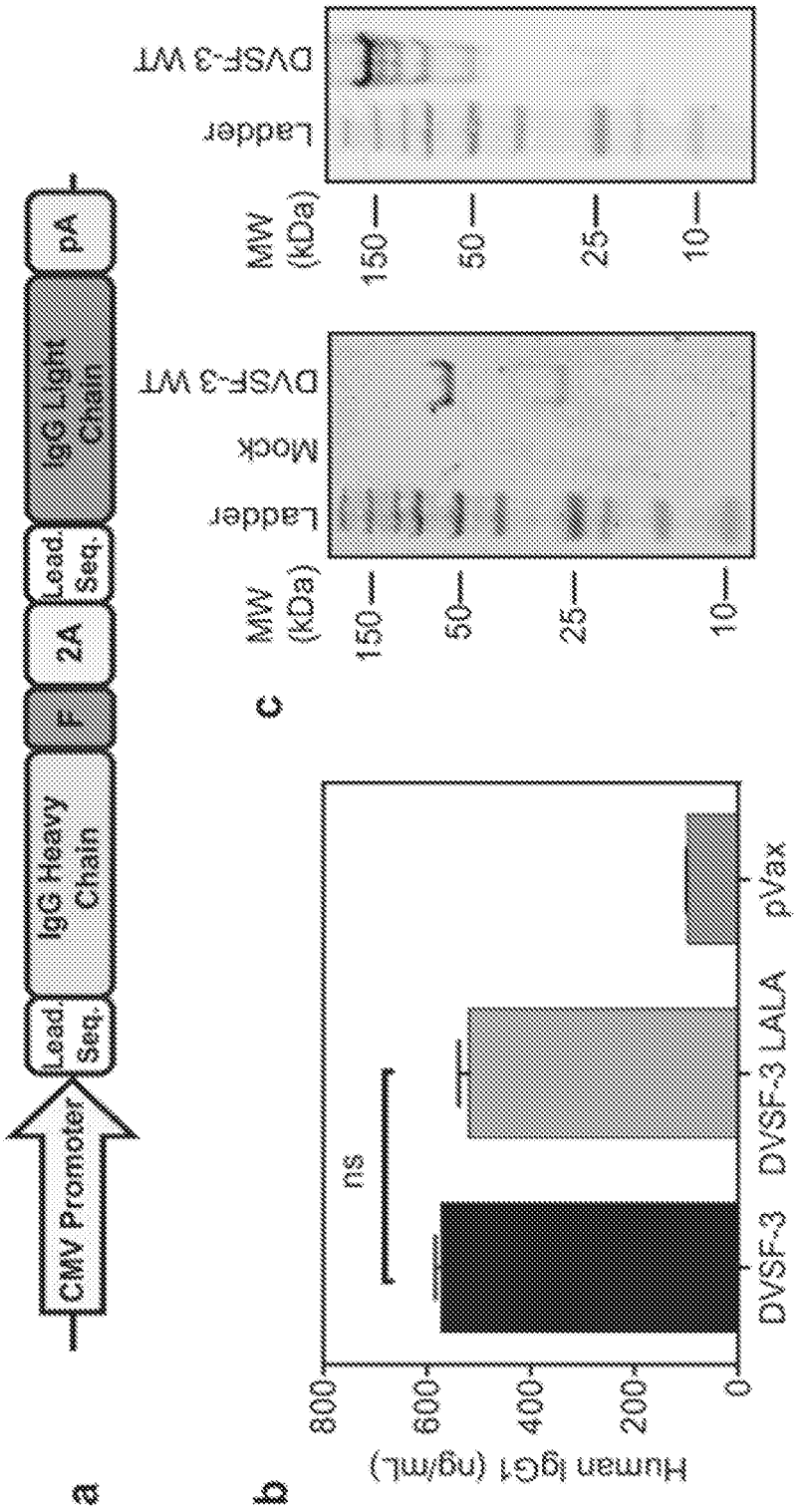

a
CMV Promoter
Lead. Seq.
IgG Heavy Chain
F
2A
Lead. Seq.
IgG Light Chain
pA
b
Human IgG1 (ng/mL)
800
600
400
200
0
ns
DVSF-3
DVSF-3 LALA
pVax
c
MW (kDa)
150
50
25
10
Ladder
Mock
DVSF-3 WT
Ladder
DVSF-3 WT

FIG. 69

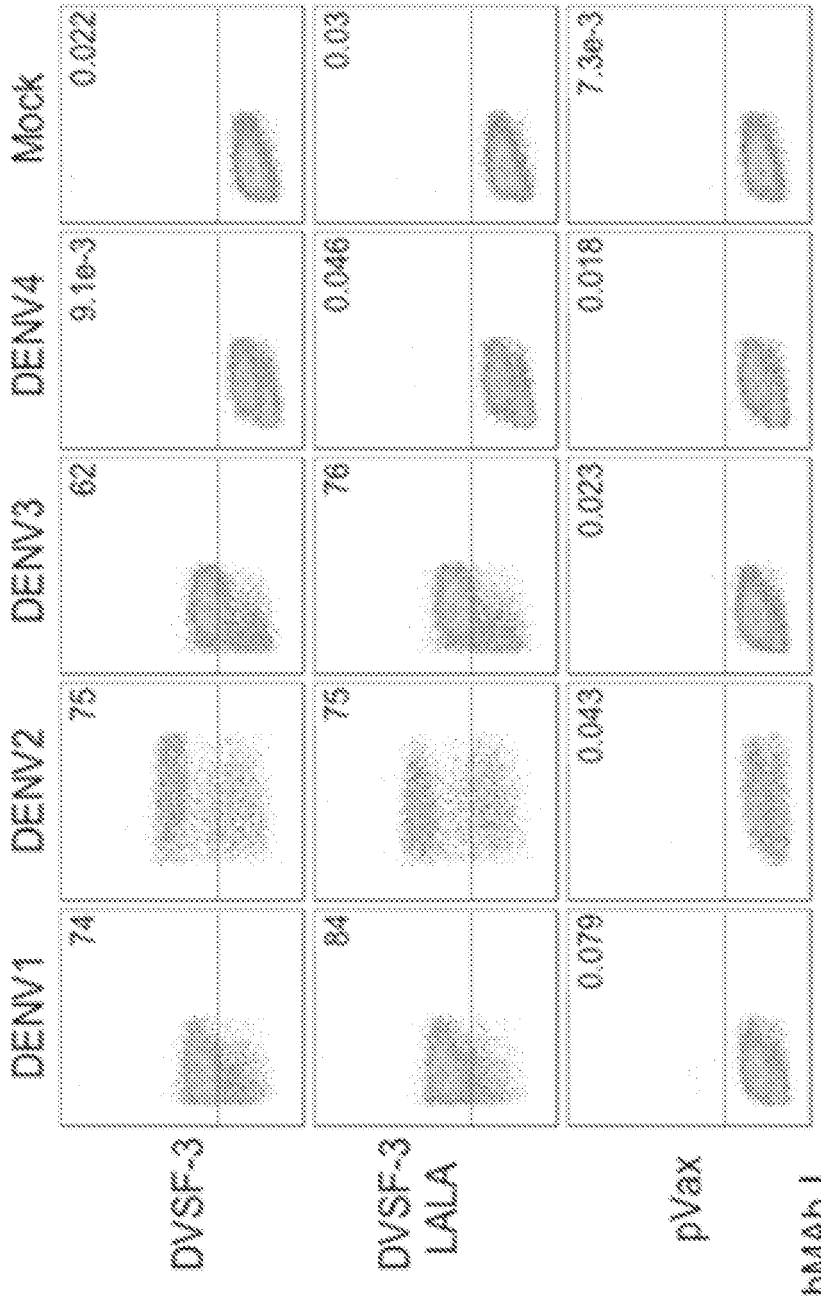

d
DENV1
DENV2
DENV3
DENV4
Mock
DVSF-3
DVSF-3 LALA
pVax
hMAb
FSC
74
75
62
9.1e-3
0.022
84
75
76
0.046
0.03
0.079
0.043
0.023
0.018
7.3e-3

FIG. 69 (con't)

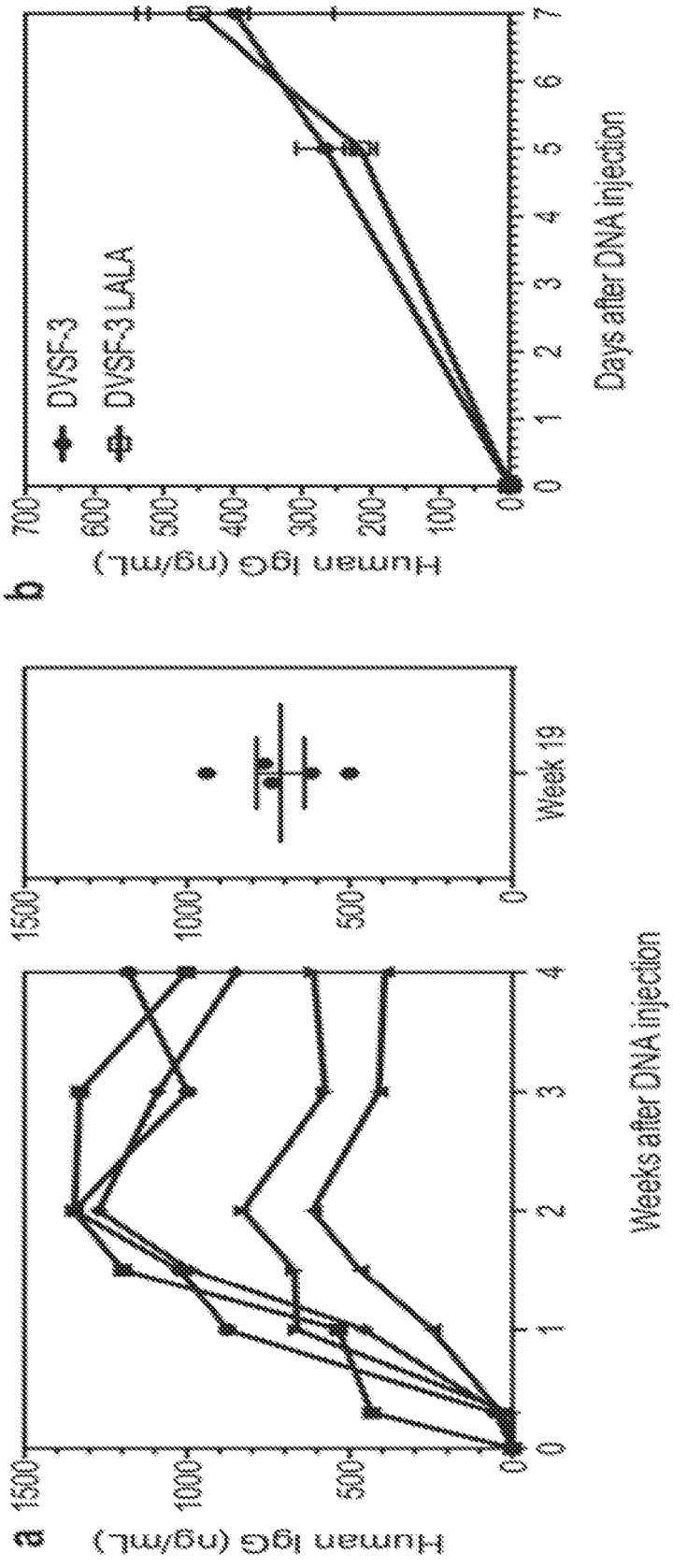

a
Human IgG (ng/mL)
1500
1000
500
0
0 1 2 3 4
Weeks after DNA injection
Week 19
b
Human IgG (ng/mL)
700
600
500
400
300
200
100
0
DVSF-3
DVSF-3 LALA
0 1 2 3 4 5 6 7
Days after DNA injection

FIG. 70

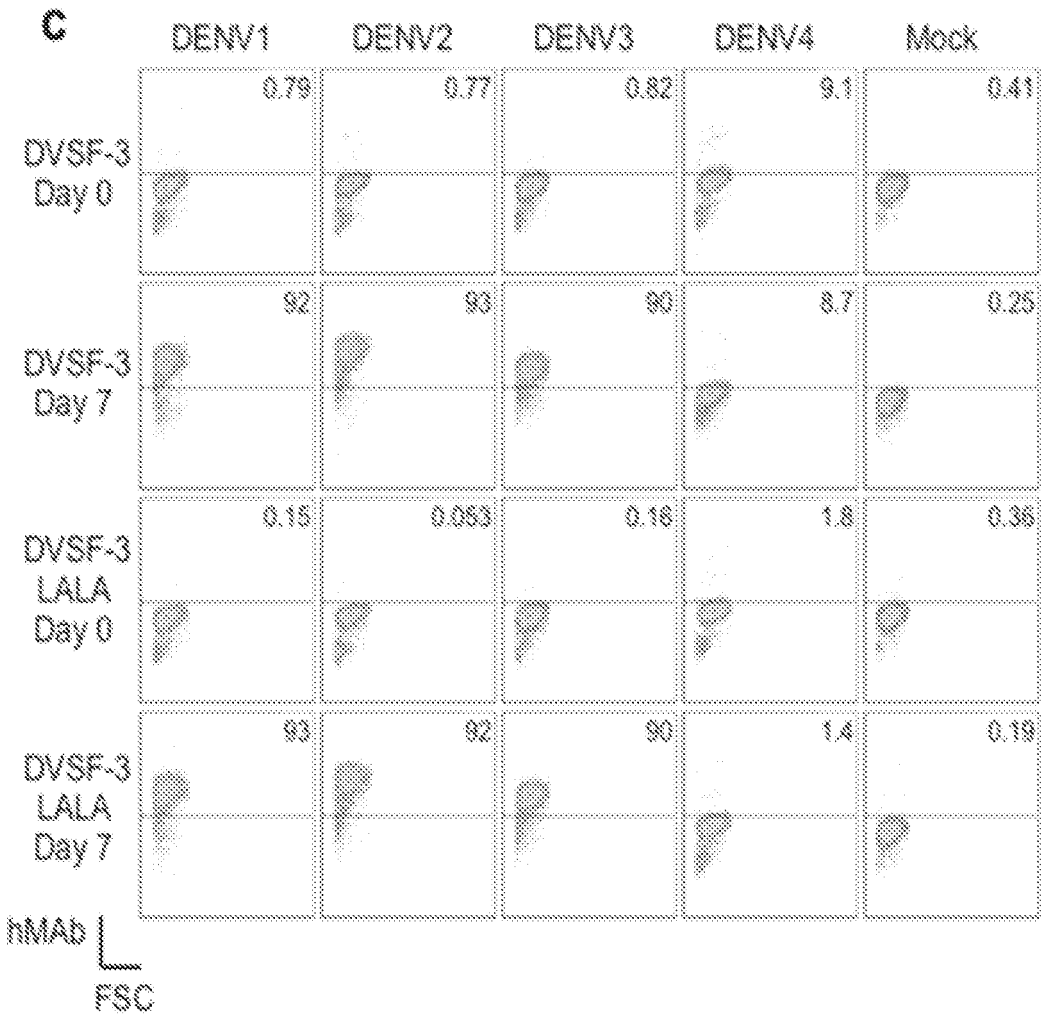

C
DENV1
DENV2
DENV3
DENV4
Mock
DVSF-3 Day 0
DVSF-3 Day 7
DVSF-3 LALA Day 0
DVSF-3 LALA Day 7
0.79
0.77
0.82
9.1
0.41
92
93
90
8.7
0.25
0.15
0.053
0.16
1.8
0.36
93
92
90
1.4
0.19
hMAb
FSC

FIG. 70 (con't)

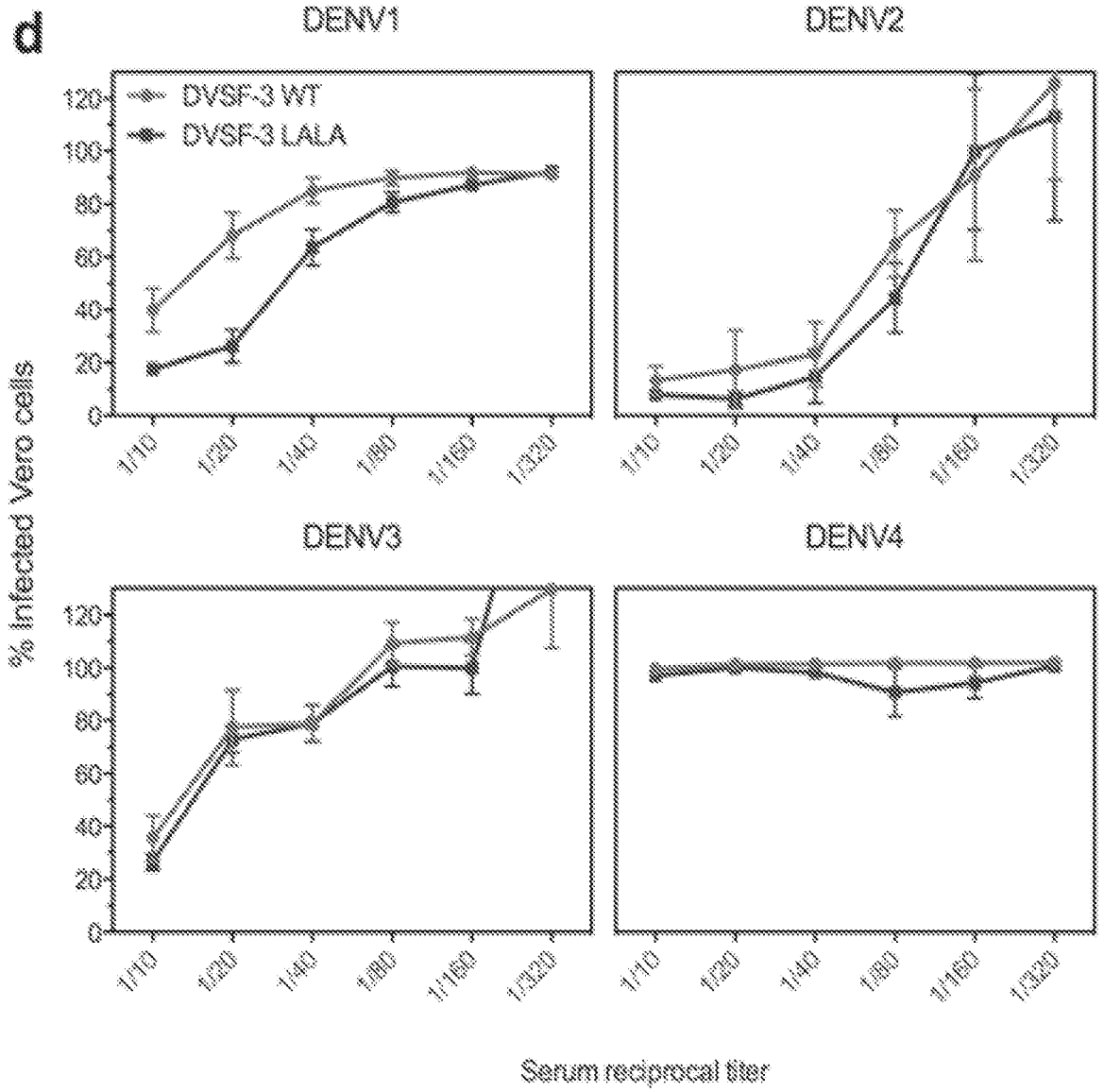

d
DENV1
DENV2
DENV3
DENV4
DVSF-3 WT
DVSF-3 LALA
% Infected Vero cells
Serum reciprocal titer
0
20
40
60
80
100
120
1/10
1/20
1/40
1/80
1/160
1/320

FIG. 70 (con't)

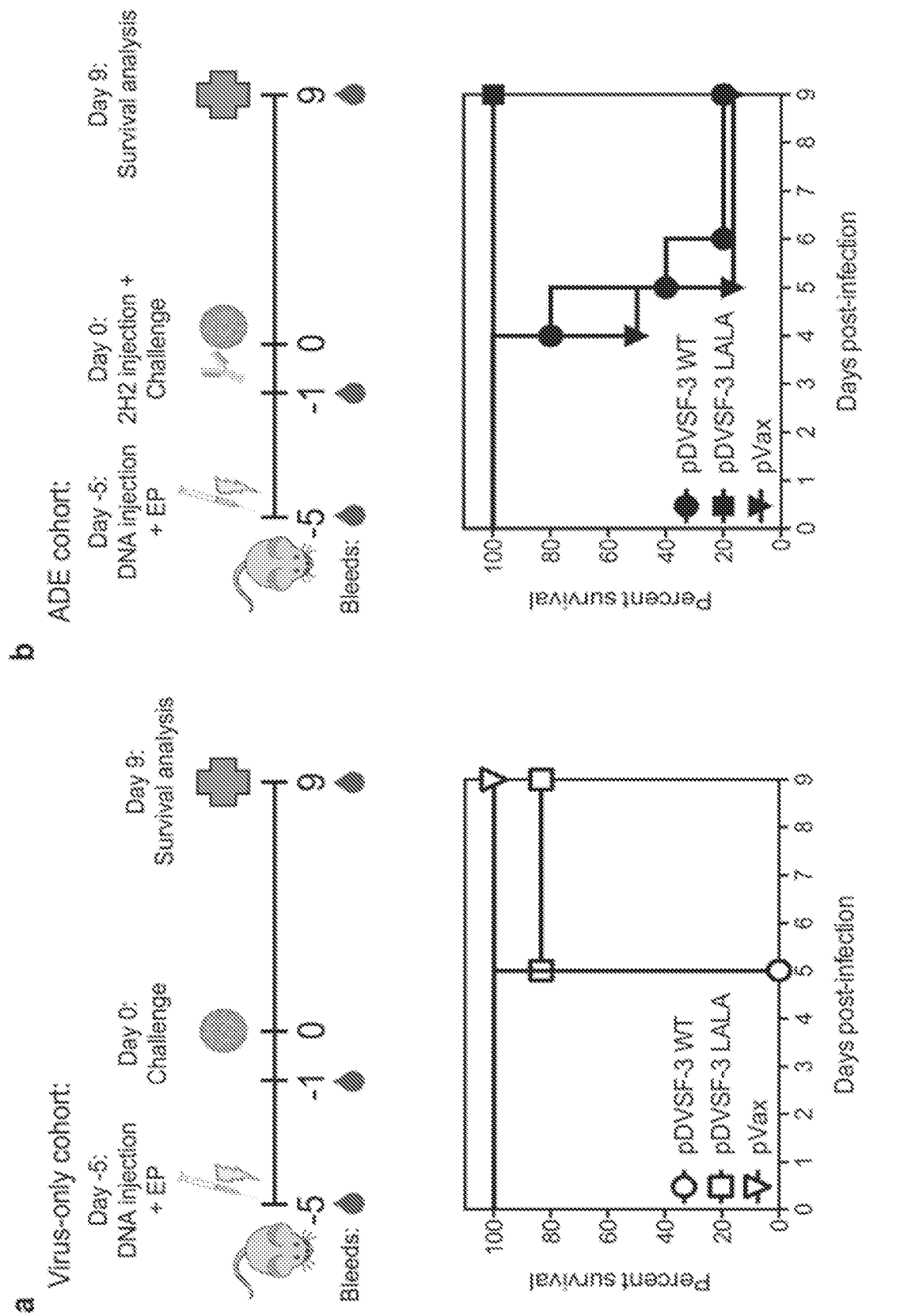

a
Virus-only cohort:
Day -5:
DNA injection
+ EP
Day 0:
Challenge
Day 9:
Survival analysis
-5
-1
0
9
Bleeds:
b
ADE cohort:
Day -5:
DNA injection
+ EP
Day 0:
2H2 injection +
Challenge
Day 9:
Survival analysis
-5
-1
0
9
Bleeds:
Percent survival
Days post-infection
pDVSF-3 WT
pDVSF-3 LALA
pVax
0
20
40
60
80
100
0 1 2 3 4 5 6 7 8 9

FIG. 71

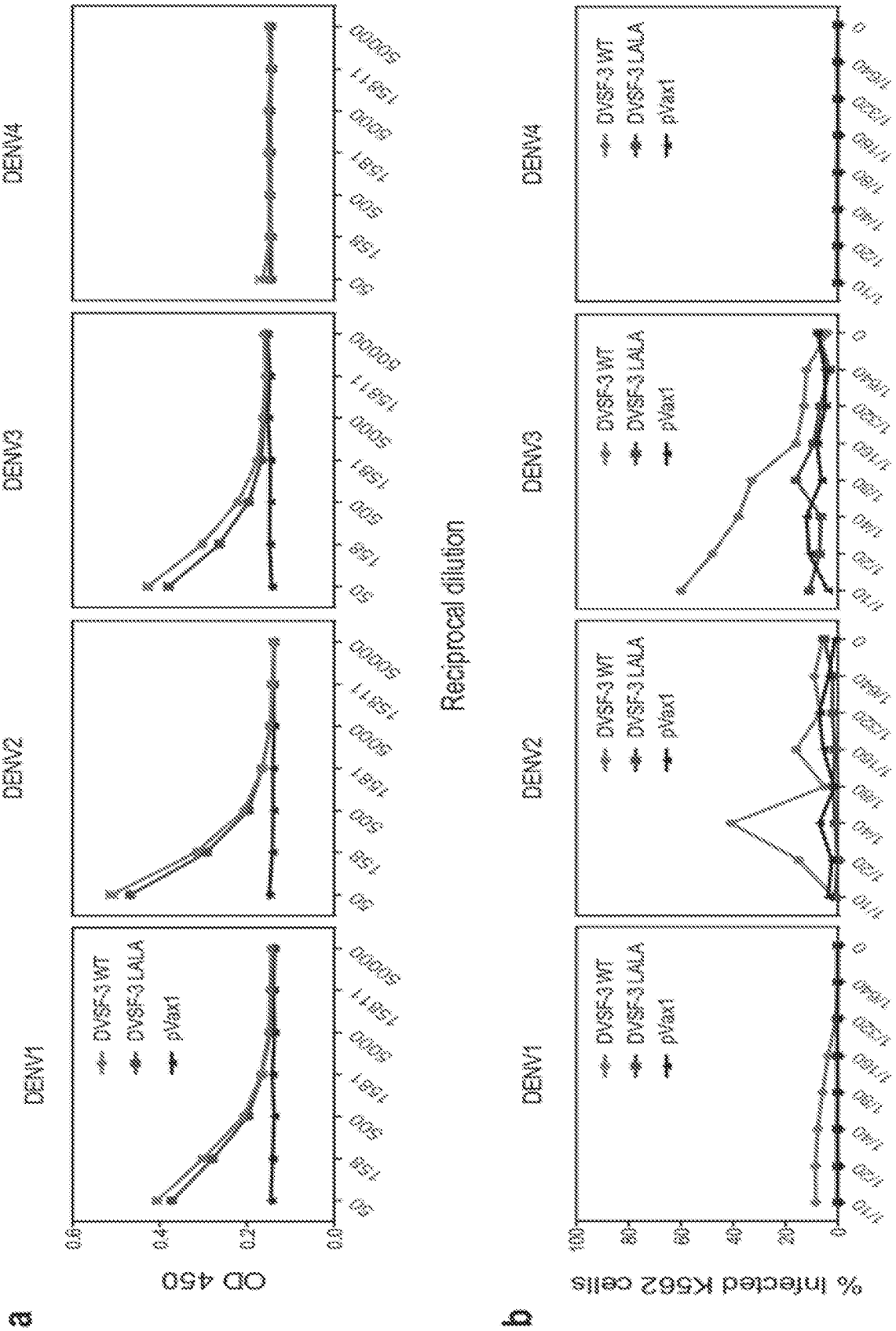

a
DENV1
DENV2
DENV3
DENV4
DVSF-3 WT
DVSF-3 LALA
pVax1
OD 450
Reciprocal dilution
b
% infected K562 cells
Supernatant dilution

FIG. 72

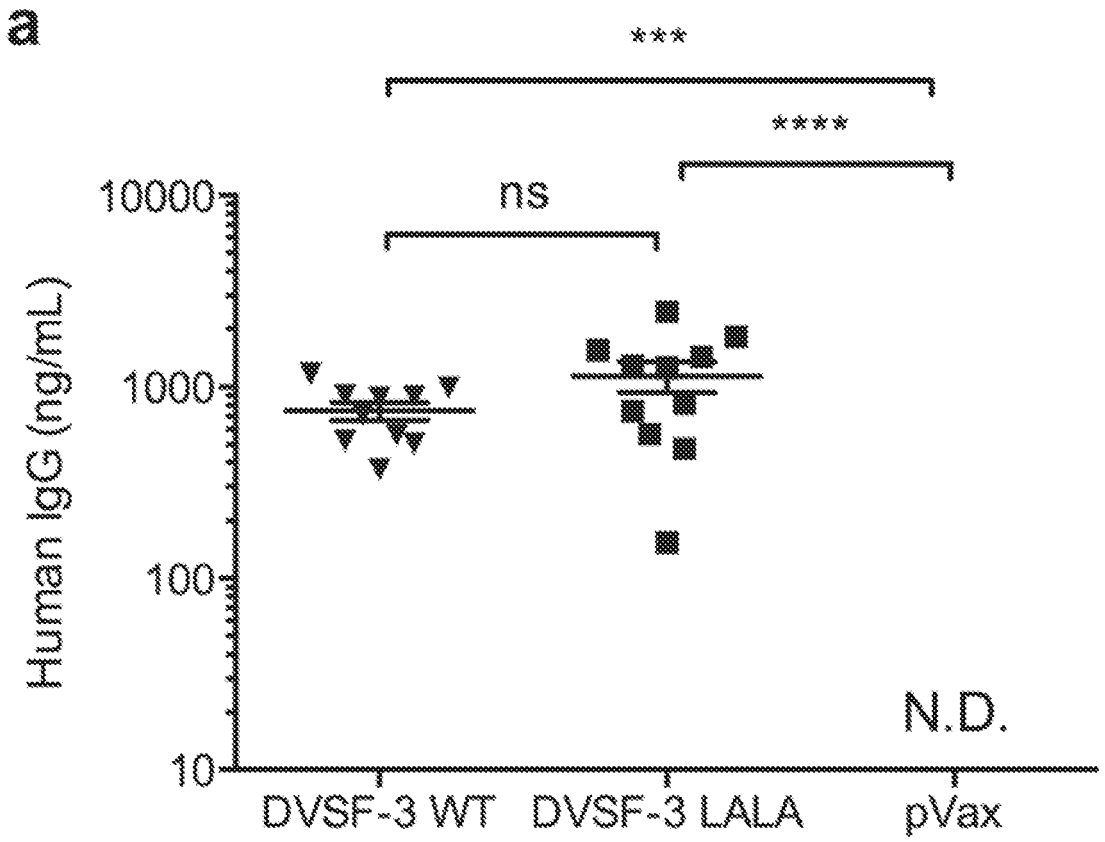

a
***
****
ns
10000
1000
100
10
Human IgG (ng/mL)
N.D.
DVSF-3 WT
DVSF-3 LALA
pVax

FIG. 73

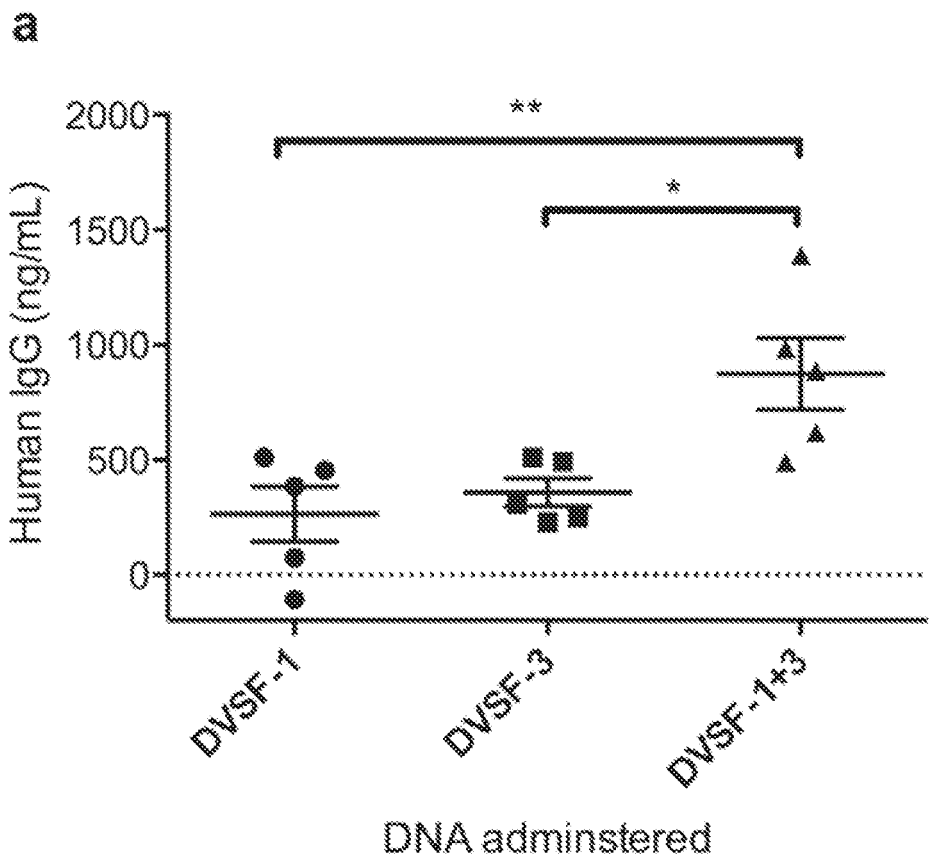

a
2000
1500
1000
500
0
Human IgG (ng/mL)
**
*
DVSF-1
DVSF-3
DVSF-1+3
DNA adminstered

FIG. 74

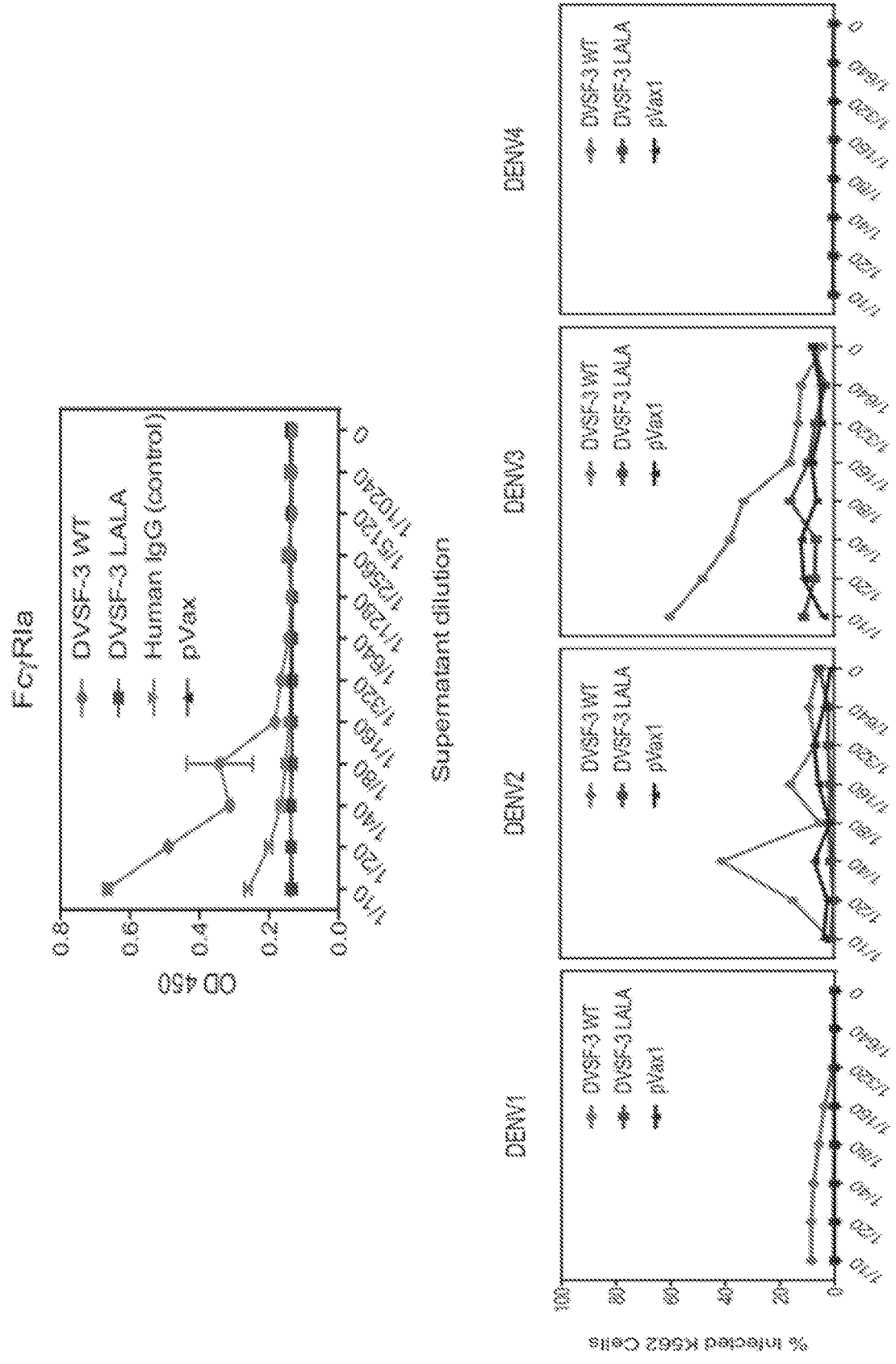

FcγRIa
DVSF-3 WT
DVSF-3 LALA
Human IgG (control)
pVax
OD 450
0.8
0.6
0.4
0.2
0.0
0
1/20
1/40
1/80
1/160
1/320
1/640
1/1280
1/2560
1/5120
1/10240
Supernatant dilution
DENV1
DENV2
DENV3
DENV4
% infected K562 cells
100
80
60
40
20
0
1/1
1/10
1/20
1/40
1/80
1/160
1/320
1/640
1/1280
1/2560
Supernatant dilution

FIG. 75