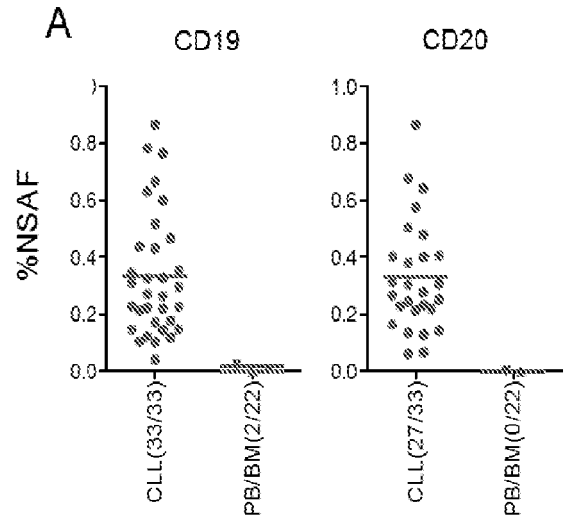

A
CD19
CD20
%NSAF
0.0
0.2
0.4
0.6
0.8
1.0
CLL(33/33)
PB/BM(2/22)
CLL(27/33)
PB/BM(0/22)

FIG. 1A

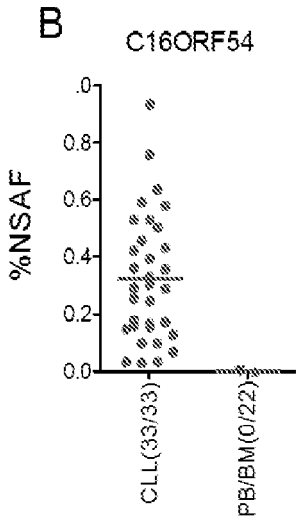

B
C16ORF54
%NSAF
0.0
0.2
0.4
0.6
0.8
CLL(33/33)
PB/BM(0/22)

FIG. 1B

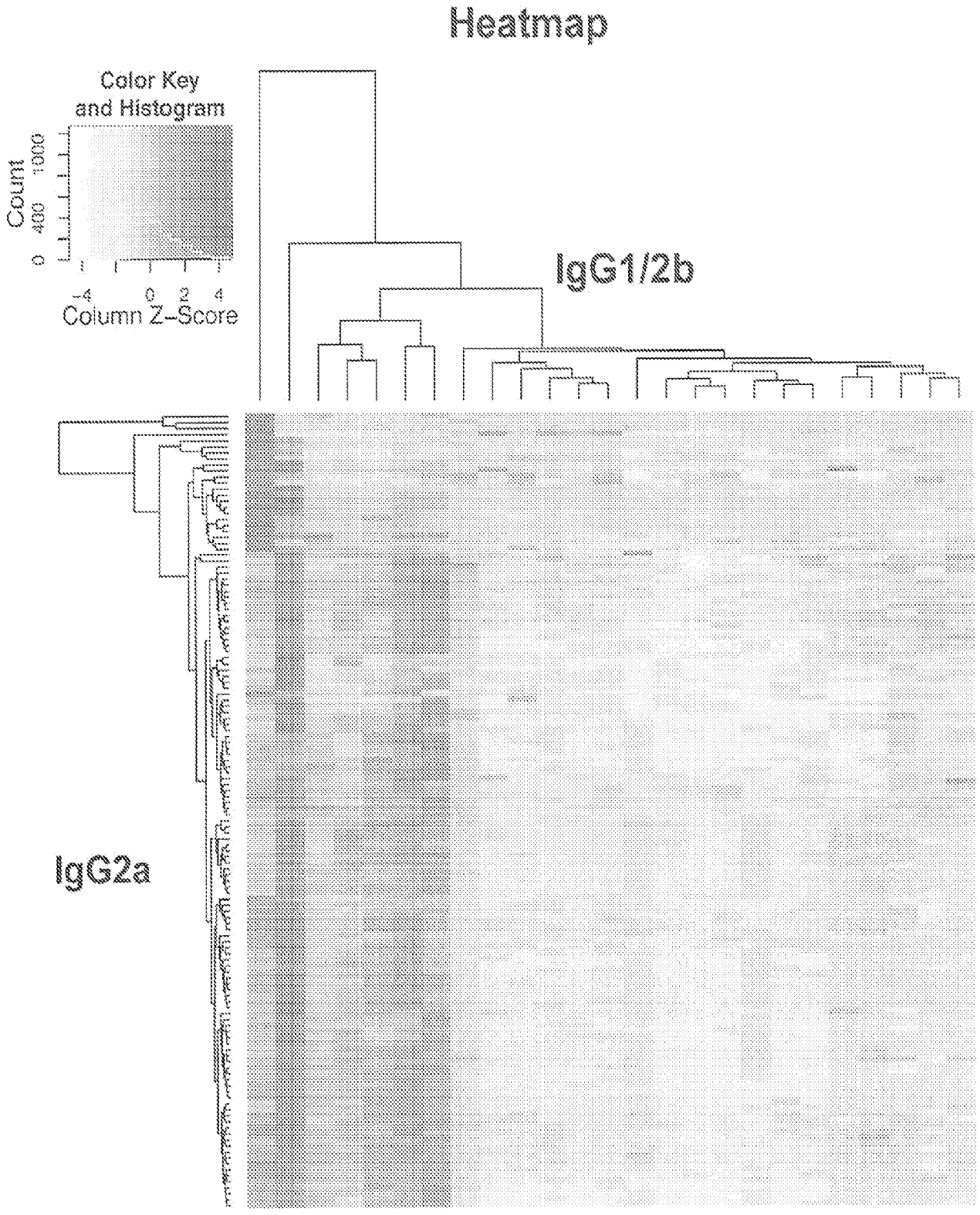

Heatmap
Color Key
and Histogram
Count
0
400
1000
-4
0
2
4
Column Z-Score
IgG1/2b
IgG2a

FIG. 2A

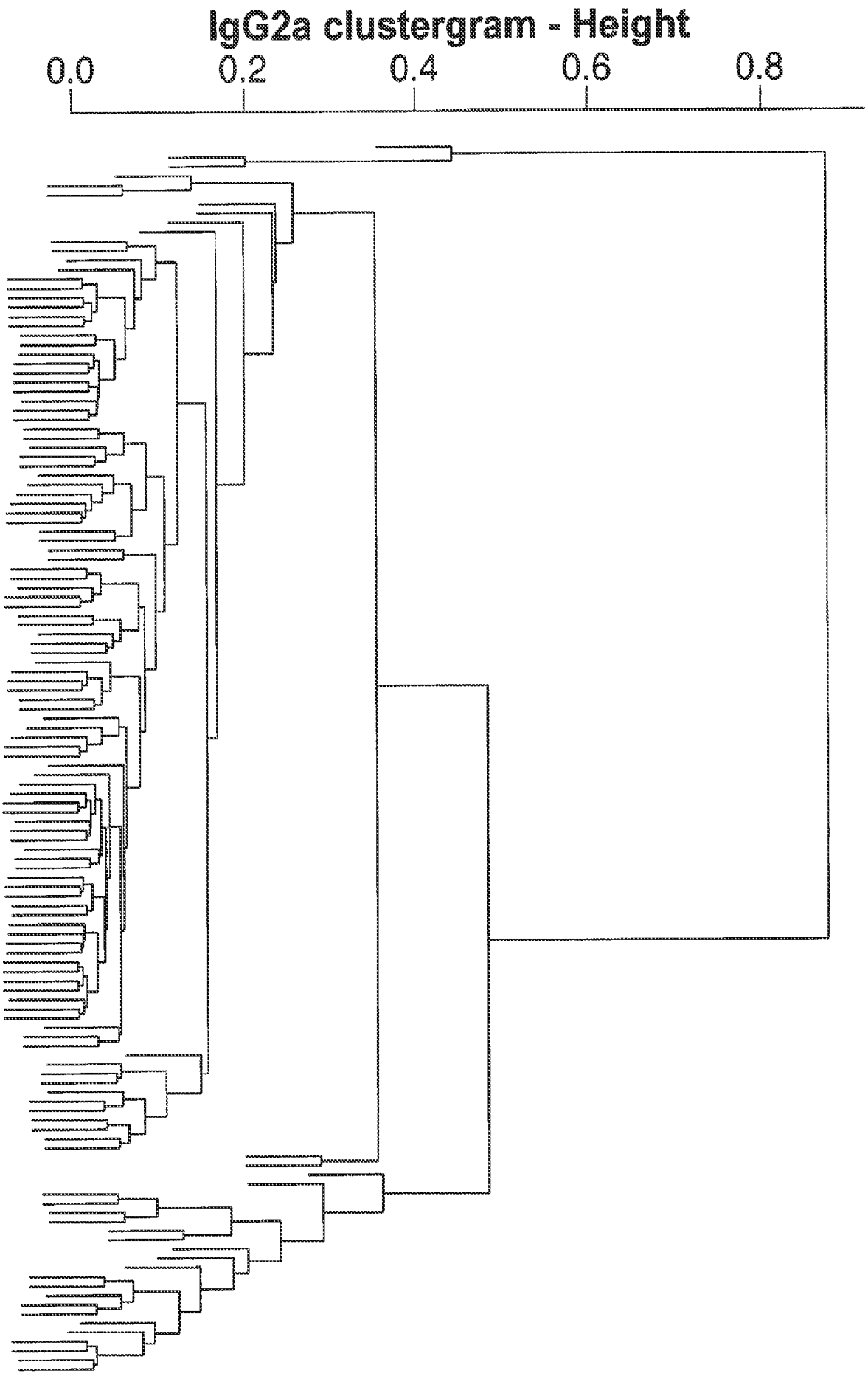



FIG. 2B

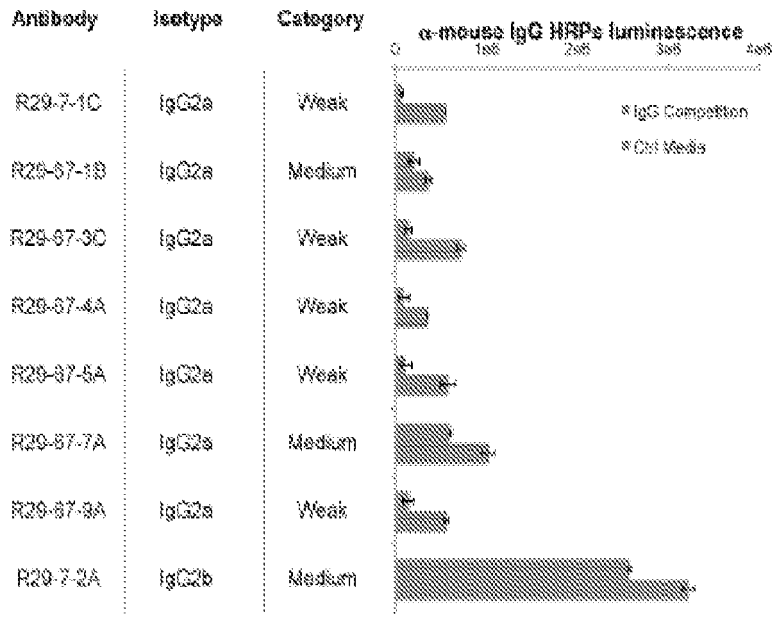

Antibody
Isotype
Category
α-mouse IgG HRPs luminescence
0
1e6
2e6
3e6
4e6
R29-7-1C
IgG2a
Weak
R29-67-1B
IgG2a
Medium
R29-67-3C
IgG2a
Weak
R29-67-4A
IgG2a
Weak
R29-67-5A
IgG2a
Weak
R29-67-7A
IgG2a
Medium
R29-67-8A
IgG2a
Weak
R29-7-2A
IgG2b
Medium
IgG Competition
Ctrl Media

Fig. 3

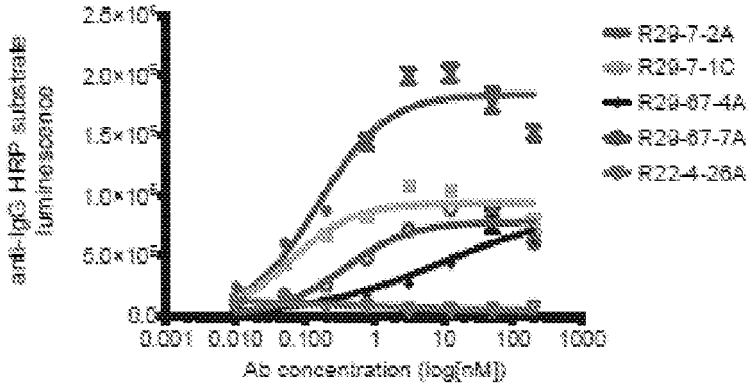

anti-IgG HRP substrate luminescence
2.5×10⁶
2.0×10⁶
1.5×10⁶
1.0×10⁶
5.0×10⁵
0.0
0.001
0.010
0.100
1
10
100
1000
Ab concentration (log[nM])
R28-7-2A
R28-7-1C
R28-67-4A
R28-67-7A
R22-4-26A

Fig. 4

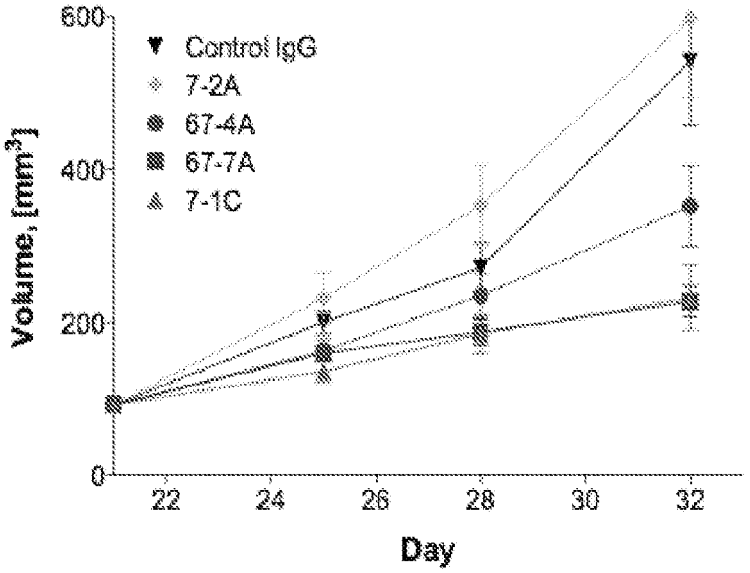

Volume, [mm³]
600
400
200
0
22
24
26
28
30
32
Day
Control IgG
7-2A
67-4A
67-7A
7-1C

Fig. 5

```
R29 VH

R29-8-9B      MNYGFSLIFLVLVLKGVQC
R29-8-93B
R29-8-51B
R29-8-30A
R29-8-120B    MNFGFSLIFLVLVLKGVQC
R29-8-18B
R29-8-28C     MNFGFSLIFLVLVLKGVQS
R29-8-19B     MNFGFSLIFLVLVSKGVQC
R29-8-50C     MNFGFSLIFLVLVSKGVQC
R29-8-12A     MNFGFSLIFLVLVSKGVQC
R29-8-36C     MNFGFSLIFLVLVSKGVQC
R29-8-58C     MNFGFSLIFLVLVSKGVQC
R29-8-75B     MDSRLNLVFLVLILKGVQC
R29-8-57B     MRVLILLWLFTAFPGILS
R29-8-136C    MRVLILLWLFTAFPGILS
R29-7-1C      MRVLILLWLFTAFPGILS
R29-67-7A     MRVLILLWLFTAFPGILS
R29-67-4A                    S
R29-7A-53A    MAVLGLLLCLVTFPSCVLS
R29-7A-54C    MAVLGLLLCLVTFPSCVLS
R29-7A-38C
R29-7A-49A
R29-7A-13A
R29-7-2A      MLLGLKWVFFVVFYQGVPC
```

Fig. 6A

```
Kabat     1        10        22        31---35     40        50--abc--------60---65
AbM       1        10        22     26---------35  40        50--abc--------58     65
Chothia   1        10        22     26--------32   40           abc-55          65
Contact   1        10        22        30-------35 40     47--------abc-----58     65
IMGT      1                  23     27--------38  41           56--------65       74
8-9B      EVKLVESGGGVVKPGGSLKLSCAAS GFTFSS-YAMS WFRQTSEMSLEWVA SIT---GGGGTYYPDSVKG
8-93B     EVKLVESGGGVVKPGGSLKLSCTAS GFTFSS-YAMS WFRQTSEMRLEWVA SIT---GGGGTYYPDSVKG
8-51B     EVKLVESGGDMVKPGGSLKLSCAAS GFTFSS-YAMS WFRQTSEMRLEWVA SIT---GGGGTYYPDSVKG
8-30A     EVKLVESGGGLVKPGGSLKLSCAAS GFTFSN-YAMS WFRQTPEKRLEWVA SIT---GGGSTYYPDSVKG
8-120B    KVNLVESGGGLVKAGGSLKLSCAAS GFTFSI-YAMS WFRQTPEKRLEWVA SIT---GGGTNFYPDSVRG
8-18B     EVKLVESGGGLVKPGGSLKLSCAAS GFTFST-YAVS WFRQTPERRLEWVA SIT---SGGSTYYPDSVKG
8-28C     EVKLVESGGGVVKPGGSLTLSCAAS GFTFSN-YAVS WFRQTPEKRLEWVA SIT---SGGRTYYPDSMKG
8-19B     EVKLVESGGGLVKPGGSLKFSCAAS GFTFSS-YAVS WVRQTPEKRLEWVA SIT---SGGRTYYPDSVKG
8-50C     EVKLVESGGGLVKPGGSLKFSCAAS GFTFSS-YAVS WVRQTPEKRLEWVA SIT---SGGRTYYPDSVKG
8-12A     EVKLVESGGGLVKPGGSLKFSCAAS GFTFSS-YAVS WVRQTPEKRLEWVA SIT---SGGRTYYPDSVKG
8-36C     EVKLVESGGGLVKPGGSLKFSCAAS GFTFSS-YAVS WVRQTPEKRLEWVA SIT---SGGRSYYPDSVKG
8-58C     EVKLVESGGGLVKPGGSLKFSCAAS GFTFSS-YAVS WVRQTPEKRLEWVA SIT---SGGRSYYPDSVKG

8-75B     DVQLVESGGGLVQPGGSRKLSCAAS GFTFSR-FGMH WVRQAPEKGLEWVA YIS--SGSSTIYYADTVKG

8-57B     DVQLQESGPGLVKPSQSLSLTCTVT GYSITSDYAWN WIRQFPGNKLEWMG YIN---YSGSTRYNPSLKS
8-136C    DVQLQESGPGLVKPSQSLSLTCTVT GYSITSDYAWN WIRQFPGNKLEWMG YIN---YSGSSRYNPSLKS
7-1C      DVQLQESGPGLVKPSQSLSLTCTVT GYSITSDYAWN WIRQFPGNKLEWMG YIS---YSGSIRYNPSLKS
67-7A     DVQLQESGPGLVKPSQSLSLTCTVT GYSITSDYAWN WIRQFPGNKLEWMG YIN---YSGRTRYNPSLNS
67-4A     DVQLQESGPGLVKPSQSLSLTCTVT GYSITSVYAWN WIRQFPGNKLEWMG YIS---YSGITTYNPSLKS

7A-53A    QVQLKESGPGLVAPSQSLSITCTVS GFSLTD-YAIS WIRQPPGKGLEWLG VIW---GGGRTYSNSALKS
7A-54C    QVQLKESGPGLVAPSQSLSITCTVS GFSLTD-YAIS WIRQPPGKGLEWLG VIW---GGGRTYSNSALKS
7A-38C    QVQLKESGPGLVAPSQSLSITCTVS GFSLTD-YAIS WIRQPPGKGLEWLG VIW---GGGRTYSNSALKS
7A-49A    QVQLKESGPGLVAPSQSLSITCTVS GFSLTD-YGVS WIRQPPGKGLEWLG VIW---GGGGTYYNSALKS
7A-13A    QVQLKESGPGLVAPSQSLSITCTVS GFSLTD-YAIS WIRQPPGKGLEWLG VIW---GGGRTYSNSALKS

7-2A      EVQLVESGGGLIQPKGSLKLSCVAS GFSFNT-HAMN WVRQAPGKGLEWVA RIRSKSNNYARYYADSVKD
```

Fig. 6B

```
Kabat      70          80  abc       90      95--100---102       110
AbM        70          80  abc       90      95--100---102       110
Chothia    70          80  abc       90       96-100--101        110
Contact    70          80  abc       90  93-------100--101       110
IMGT   75                 89          105-----------------117
8-9B       RFTISRDTVRNILYLQMRSLRSGDTAIYYCAR GWDEN-----DY WGQGTTLTVSS
8-93B      RFTISRDTVRNILYLQMRSLRSGDTAIYYCAR GWDEN-----DY WGQGTPLTVSS
8-51B      RFTISRDTVRNILYLQMRSLRSGDTAIYYCAR GWDEN-----DY WGQGTTLTVSS
8-30A      RFTISRDNARNILYLQMRSLRSEDTAMYYCAR GWDEN-----DY WGQGTTLTVSS
8-120B     RFTISRDNVRNILYLQMSSLRSEDTAMYYCAR GWDEN-----DY WGQGTTLTVSS
8-18B      RFTISRDNARNTLYLQMISLRSGDTAMYYCAR GWDEN-----DY WGQGTTLTVSS
8-28C      RFTISRDNARNILYLQMSSLRSEDTAIYYCGR GWDEN-----DY WGQGTTLTVSS
8-19B      RFTISRDNARSMLYLHMSSLRSEDTAMYYCTR GWDEN-----DL WGQGTTLTVSS
8-50C      RFTISRDNARSMLYLHMSSLRSEDTAMYYCTR GWDEN-----DL WGQGTTLTVSS
8-12A      RFTISRDNARSMLYLHMSSLRSEDTAMYYCTR GWDEN-----DL WGQGTTLTVSS
8-36C      RFTISRDNARSMLYLHMSSLRSEDTAMYYCTR GWDEN-----DL WGQGTTLTVSS
8-58C      RFTISRDNARSMLYLHMSSLRSEDTAMYYCTR GWDEN-----DL WGQGTTLTVSS

8-75B      RFTISRDNPKNTLFLQMTSLRSEDTAMYYCAR VDYDVAL---AY WGQGTLVTVSA

8-57B      RISITRDTSKNHFFLQLNSVTPEDTATYHCAR ERYDGVYYGMDY WGQGTSVTVSS
8-136C     RISITRDTSKNHFFLQLNSVTPEDTATYHCAR ERYDGVYYGMDY WGQGTSVTVSS
7-1C       RISITRDTSKNQFFLQLNSVTTEDTATYYCAR EKYDNYYYAMDY WGQGTSVTVSS
67-7A      RISLTRDTSTNQFFLQLNSVTTEDTATYYCAR ENYDYEFYAMDY WGQGTSVTVSS
67-4A      RISITRDTSKNQFFLQLNSVTTEDTATYYCAT TGTR          WGQGTTLTVSS

7A-53A     RLSISKDNSRSQIFLKMNSLQTDDTAMYYCAK HEEVSRF---AY WGQGTLVTVSV
7A-54C     RLSISKDNSRSQIFLKMNSLQTDDTAMYYCAK HEEVSRF---AY WGQGTLVTVSV
7A-38C     RLSISKDNSRSQIFLKMNSLQTDDTAMYYCAK HEEVSRF---AH WGQGTLVTVSA
7A-49A     RLSINKDNSKSQIFLKMNSLQTDDTAIYYCAK HEEVSRF---AY WGQGTLVTVSA
7A-13A     RLSISKDNSRSQIFLKMNSLHTEDTAVYYCAK HEEVSRF---AY WGQGTLVTVSA

7-2A       RFTISRDDSQSILYLQMNNLKTEDTAMYYCVK QGDGGF---AY WGQGTLVTVSA
```

Fig. 6C

```
R29 VL

R29-8-9B     MKLPVRLLVLMFWIPASRS
R29-8-120B   MKLPVRLLVLMFWIPASSS
R29-8-28C    MKLPVRLLVLMFWIPASCS
R29-8-19B    MKLPVRLLVLMFWIPASRS
R29-8-50C    MKLPVRLLVLMFWIPASSS
R29-8-12A    MKLPVRLLVLMFWIPASRS
R29-8-36C    MKLPVRLLVLMFWIPASSS
R29-8-58C    MKLPVRLLVLMFWIPASSS
R29-7A-53A   MKLPVRLLVLMFWIPASIS
R29-7A-54C   MKLPVRLLVLMFWIPASIS
R29-8-75B    MKLPVRLLVLMFWIPASSS

R29-8-57B    MDSQAQVLMSLLLLWVSGTCG
R29-8-136C   MDSQAQVLMSLLLLWVSGTCG
R29-7-1C     MDSQAQVLMLLLLLWVSGTCG
R29-67-7A    MESQAQVLMLLLLLWVSGTCG

R29-7-2A     MDSQAQVLMLLLLLWVSGTCG
```

Fig. 6D

```
Kabat     1          10        20        24-27abcd-------34        40              50-----56
AbM       1          10        20        24-----30abcd---34        40              50-----56
Chothia   1          10        20          26--30abcd-32           40              50--
Contact   1          10        20             30abcd---------36    40      46----------55
IMGT      1                    23    27----------28   41                      56-65  69
                                                                               |  |
8-9B      DVVMTQIPLSLPVSLGDQASISC RSSQSLVFSNGNTYLH WYFQKPGQSPKLLIY KVSNRFS
8-120B    DVVMTQTPLSLPVSLGDQASISC RSSQSLVYSNGNTYLH WYLQKFGQSPKLLIY KVSNRFS
8-28C     DVVMTQTPLSLPVSLGDQASISC RSSQSLVYSNGNTYLH WYLQKPGQSPKLLIY KVSNRFS
8-19B     DVVMTQTPLSLPVSLGDQASISC RSSQSLVYSNGNTYLH WYLQKFGQSPQLLIY KVSNRFS
8-50C     DVVMTQTPLSLPVSLGDQASISC RSSQSLVYSNGNTYLH WYLQRPGQSPQLLIY KVSNRFS
8-12A     DVVMTQTPLSLPVSLGDQASISC RSSQSLVYSNGNTYLH WYLQKPGQSPQLLIY KVSNRFS
8-36C     DVVMTQTPLSLFVSLGDQASISC RSSQSLLYSNGNTYLH WYLQRPGQSPQLLIY KVSNRFS
8-58C     DVVMTQTPLSLFVSLGDQASISC RSSQSLLYSNGNTYLH WYLQRPGQSPQLLIY KVSNRFS
7A-53A    DVVLTQTPLSLPVSLGDQASISC RSSQSLVYSNGNSYLH WYLQKPGQSPKLLIY KVSNRFS
7A-54C    DVVLTQTPLSLPVSLGDQASISC RSSQSLVYSNGNSYLH WYLQKPGQSPKLLIY KVSNRFS
8-75B     GVLMTQTPLSLPVSLGDQASISC RSSQSIVHRNGNTYLE WYLQKPGQSPKLLIY KVSNRFS

8-57B     DIVMSQSPSSLAVSVGEKVTMSC KSSQSLLYSSNQKNYLA WYQQKPGQSPKLLIY WASTRES
8-136C    DIVMSQSPSSLAVSVGEKVTMSC KSSQSLLYSSNQKNYLA WYQQKPGQSPKLLIY WASTRES
7-1C      DIVMSQSPSSLAVSVGEKVTLSC KSSQNLLYSTNQKNYLA WYQQKPGQSPKLLIY WASTRES
67-7A     DIVMSQSPSSLAVSVGEKVTMSC KSSQNLLYSSNQKNYLA WYQQKPGQSPKLLIY WASTRES

7-2A      DIVMSQSPSSLAVSVGEKVTMSC KSSQSLLYSSNQKNYLA WYQQRPGQSPKLLIY WASARES
```

Fig. 6E

```
Kabat      60        70        80        89------97
AbM        60        70        80        89------97
Chothia    60        70        80          91---96
Contact    60        70        80        89------96
IMGT    70                  89                  103-----117
8-9B       GVPDRFSGSGSGTDFILRISRVEAEDLGVYFC SQSTHVPWT FGGGTKLEIK
8-120B     GVPDRFSGSGSGTDFTLKISRVEAEDLGVYFC SQSTHVPWT FGGGTKLEIK
8-28C      GVPDRFSGSGSGTDFTLKINRVEAEDLGVYFC SQTTHVPWT FGGGTKLEIK
8-19B      GVPDRFSGSGSGTDFTLKISRVEAEDLGVYFC SQTTHVPWT FGGGTKLEIK
8-50C      GVPDRFSGSGSGTDFTLKISRVEAEDLGVYFC SQTTHVPWT FGGGTKLEIK
8-12A      GVPDRFSGSGSGTDFTLKISRVEAEDLGVYFC SQTTHVPWT FGGGTKLEIK
8-36C      GVPDRFSGSGSGTDFTLKISRVEAEDLGVYFC SQTTHVPWT FGGGTKLEIK
8-58C      GVPDRFSGSGSGTDFTLKISRVEAEDLGVYFC SQTTHVPWT FGGGTKLEIK
7A-53A     GVPDRFSGSGSGTDFTLKITRVEAEDLGVYFC SQSTHIPLT FGAGTKLELK
7A-54C     GVPDRFSGSGSGTDFTLKITRVEAEDLGVYFC SQSTHIPLT FGAGTKLELK
8-75B      GVPDRFSGSGSGTDFTLKISRVEAEDLGVYYC   FQGSQWT FGGGTKLEIK

8-57B      GVPDRFTGSGSGTDFTLTISSVKTEDLAVYYC QQYYSY-RT FGGGTKLEIK
8-136C     GVPDRFTGSGSGTDFTLTISSVKTEDLAVYYC QQYYSY-RT FGGGTKLEIK
7-1C       GVPDRFTGSGSGTDFTLTISSVKAEDLAVYYC QQYYSY-RT FGGGTKLEIK
67-7A      GVPDRFTGSGSGTDFTLTISSVKAEDLAVYYC QQYYIY-RT FGGGTKLEIK

7-2A       GVPDRFTGSGSGTDFTLTISSVKAEDLAVYYC QQYYSYPPT FGAGTKVELK
```

Fig. 6F