FIG. 1A

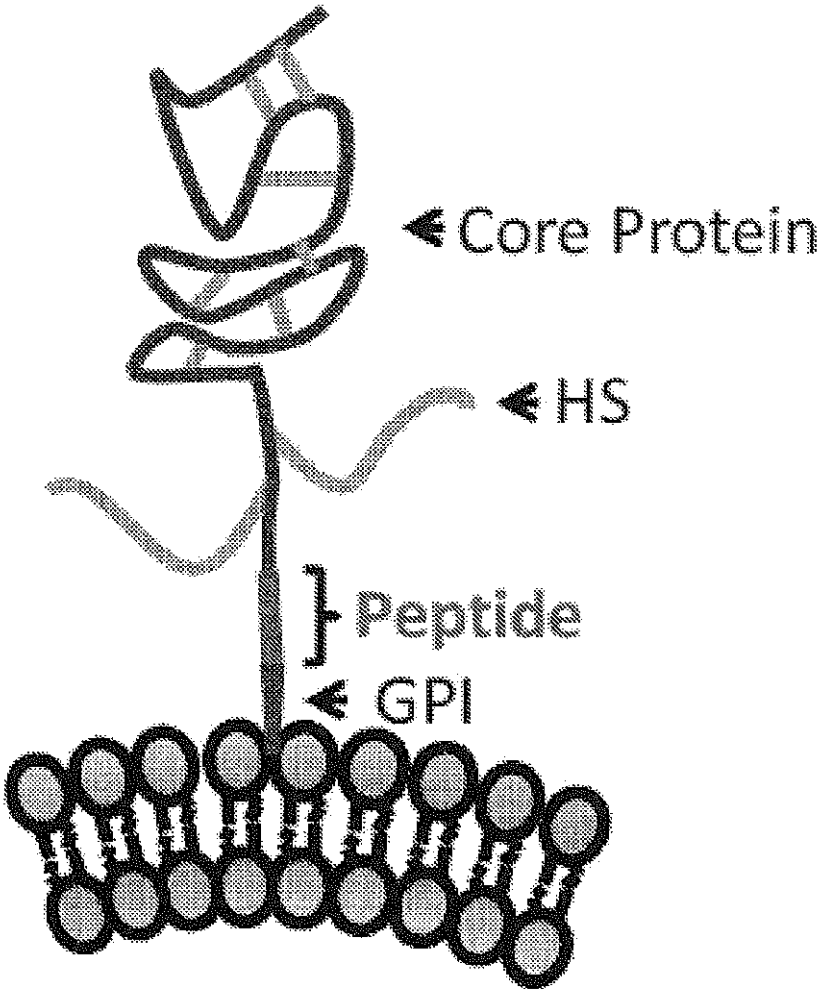
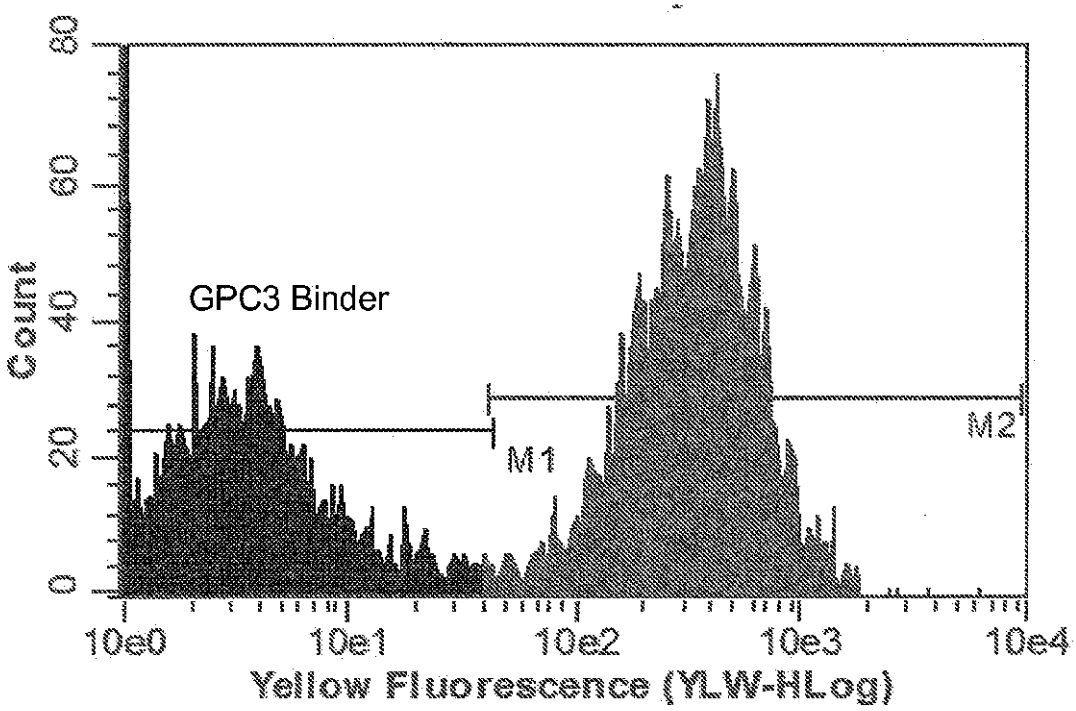
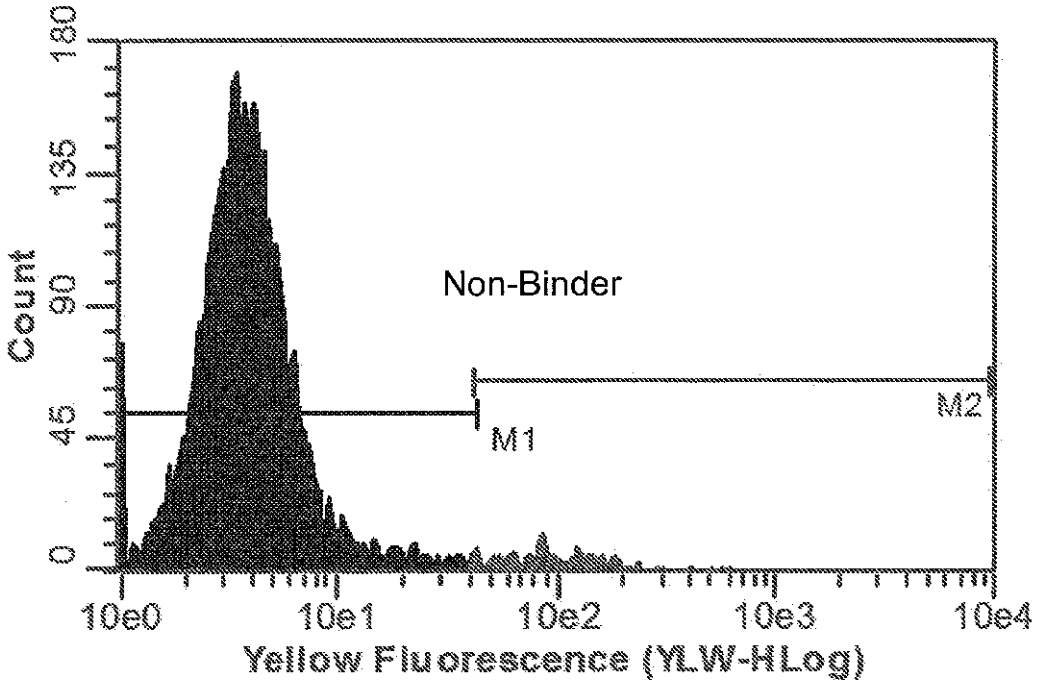


FIG. 1B


GPC3 Binder
Count
0
20
40
60
80
M1
M2
10e0
10e1
10e2
10e3
10e4
Yellow Fluorescence (YLW-HLog)


Non-Binder
Count
0
45
90
135
180
M1
M2
10e0
10e1
10e2
10e3
10e4
Yellow Fluorescence (YLW-HLog)

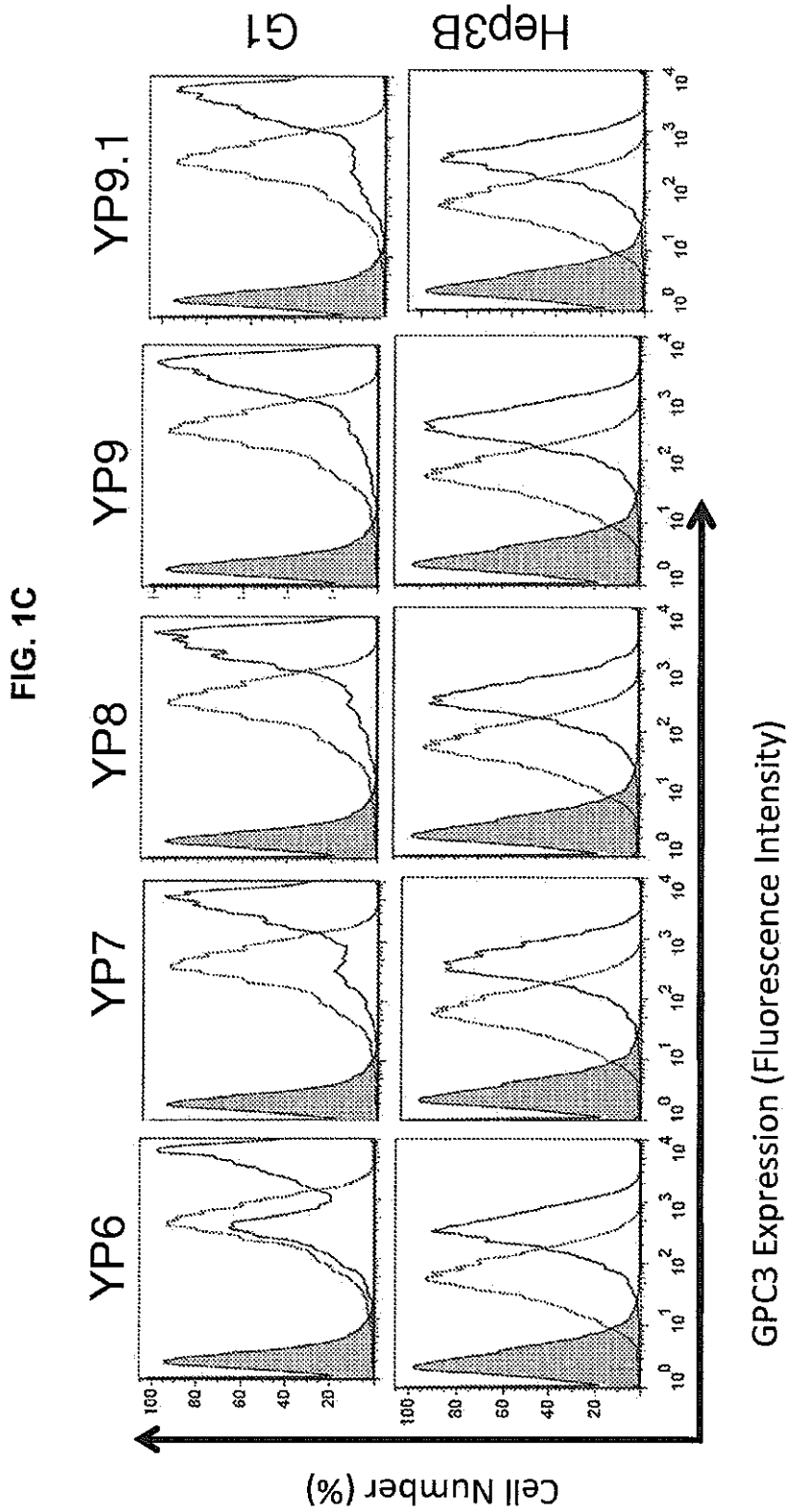

YP6
YP7
YP8
YP9
YP9.1
G1
Hep3B
Cell Number (%)
GPC3 Expression (Fluorescence Intensity)

FIG. 1C

FIG. 1D

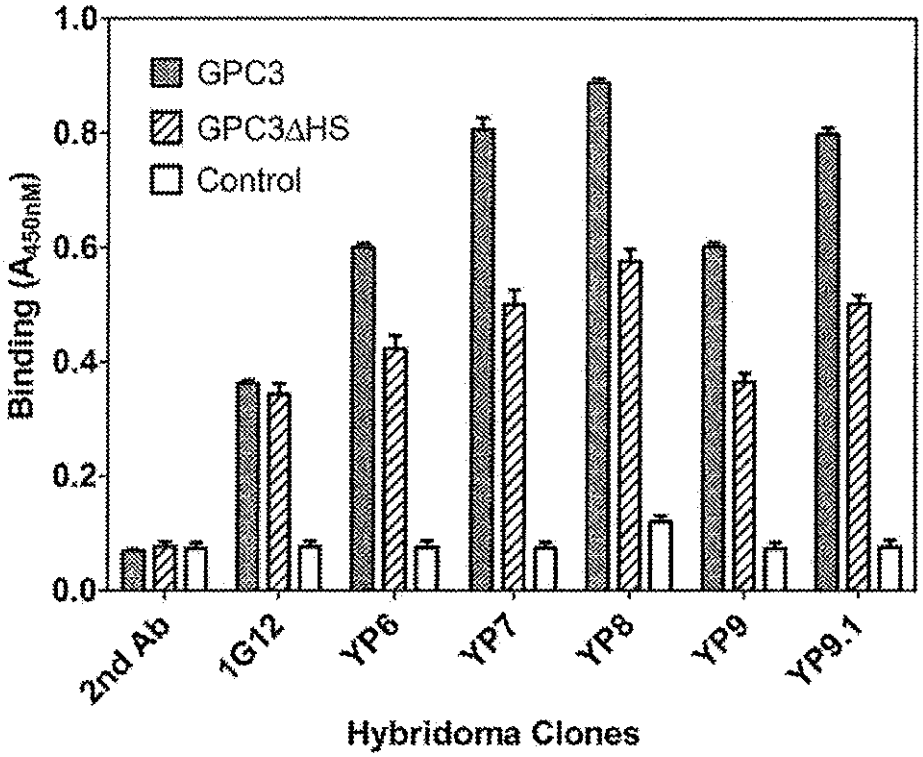

1.0
0.8
0.6
0.4
0.2
0.0
GPC3
GPC3ΔHS
Control
Binding (A_{450nM})
2nd Ab
1G12
YP6
YP7
YP8
YP9
YP9.1
Hybridoma Clones

FIG. 1E

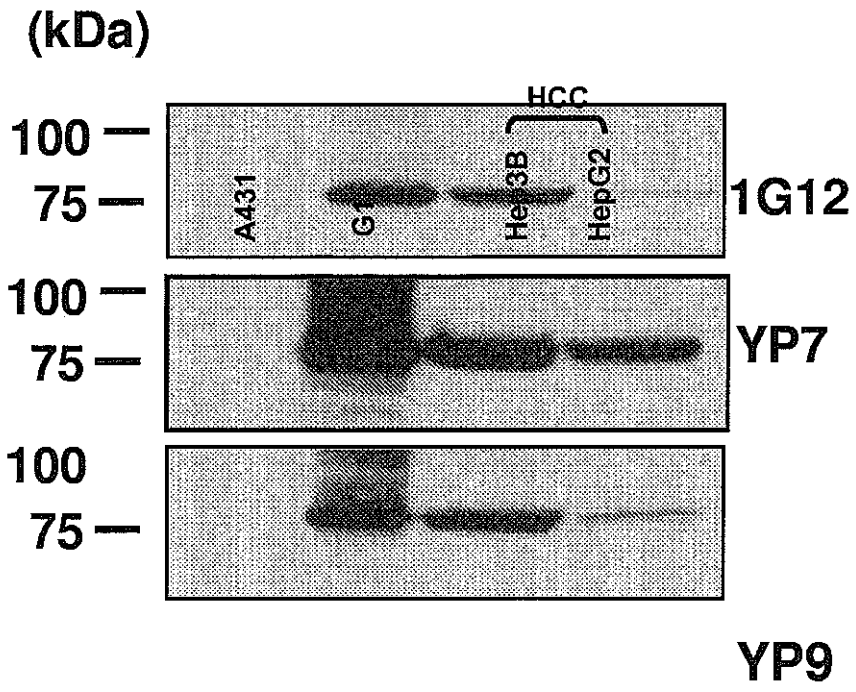

(kDa)
100
75
HCC
A431
G
Hep3B
HepG2
1G12
100
75
YP7
100
75
YP9

FIG. 2A

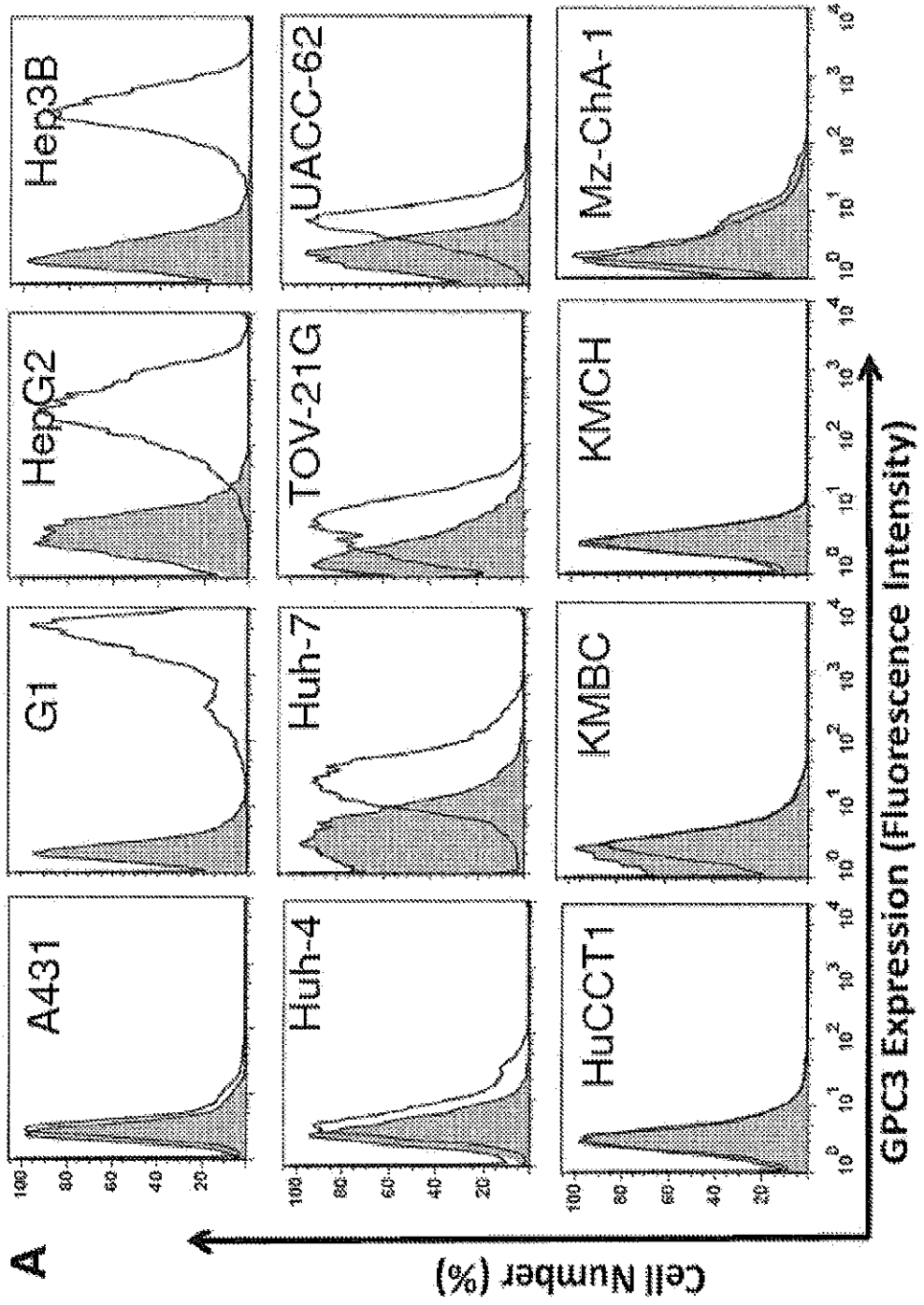

A
A431
G1
HepG2
Hep3B
Huh-4
Huh-7
TOV-21G
UACC-62
HuCCT1
KMBC
KMCH
Mz-ChA-1
Cell Number (%)
GPC3 Expression (Fluorescence Intensity)

FIG. 2B

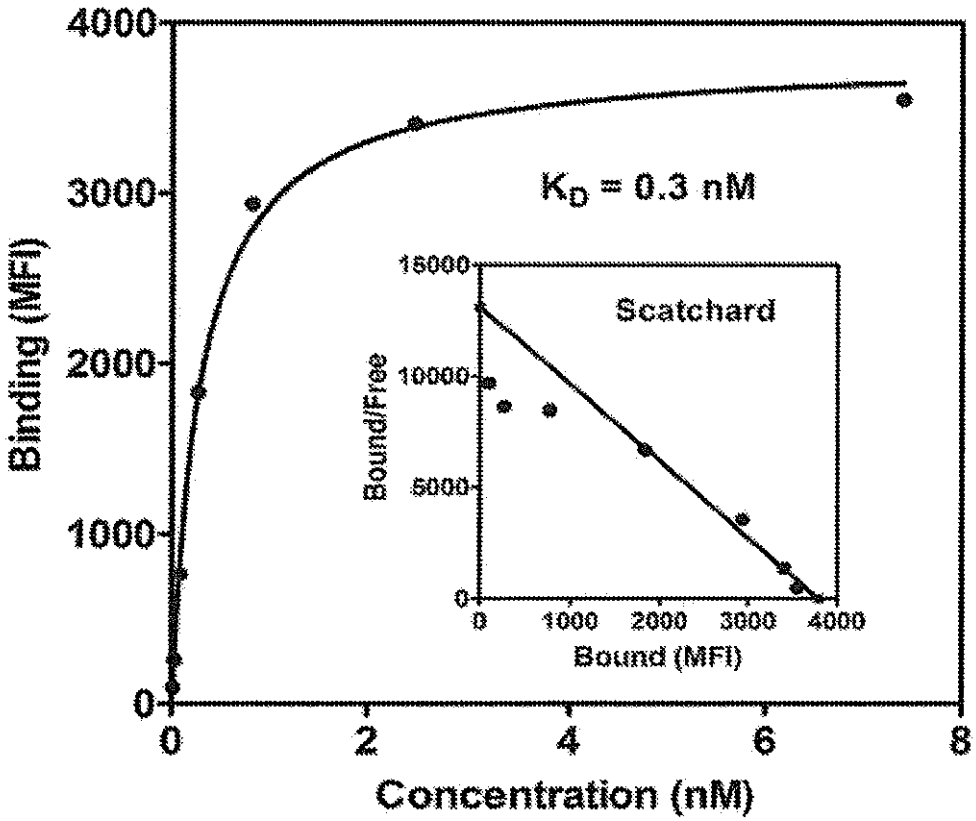

4000
3000
2000
1000
0
Binding (MFI)
K_D = 0.3 nM
15000
10000
5000
0
Bound/Free
Scatchard
0
1000
2000
3000
4000
Bound (MFI)
0
2
4
6
8
Concentration (nM)

FIG. 2C

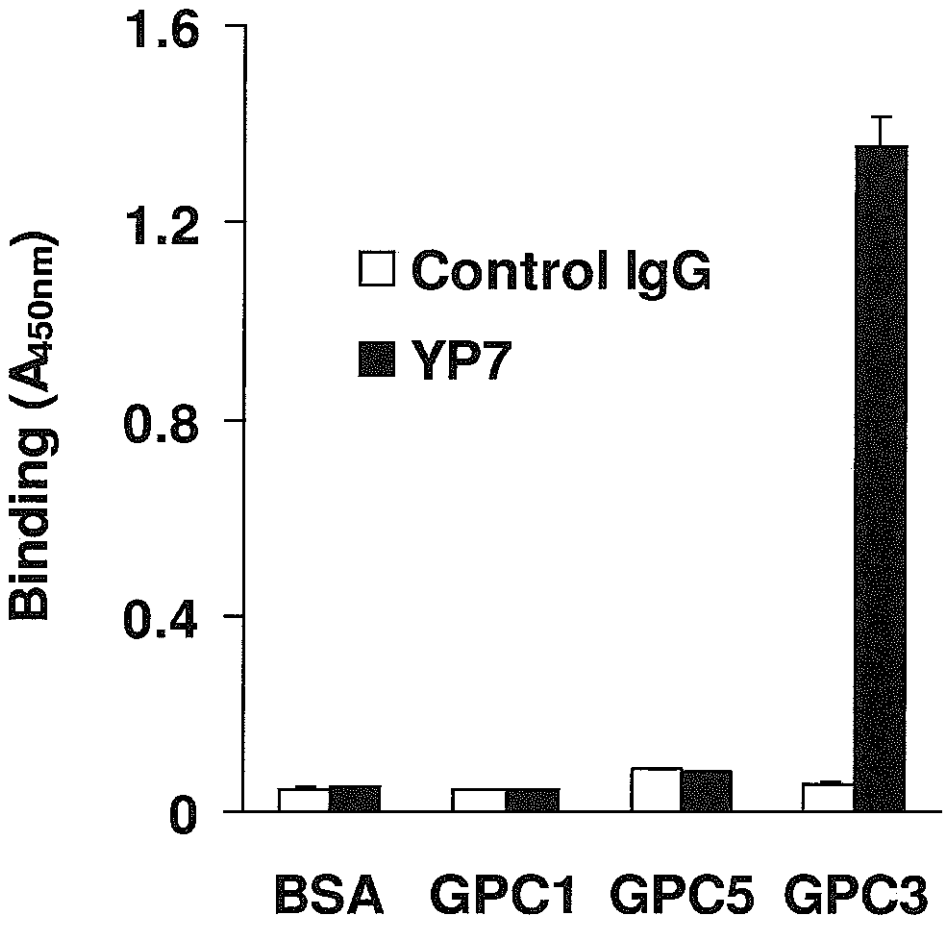

1.6
1.2
0.8
0.4
0
Binding (A_{450nm})
Control IgG
YP7
BSA
GPC1
GPC5
GPC3

FIG. 3A

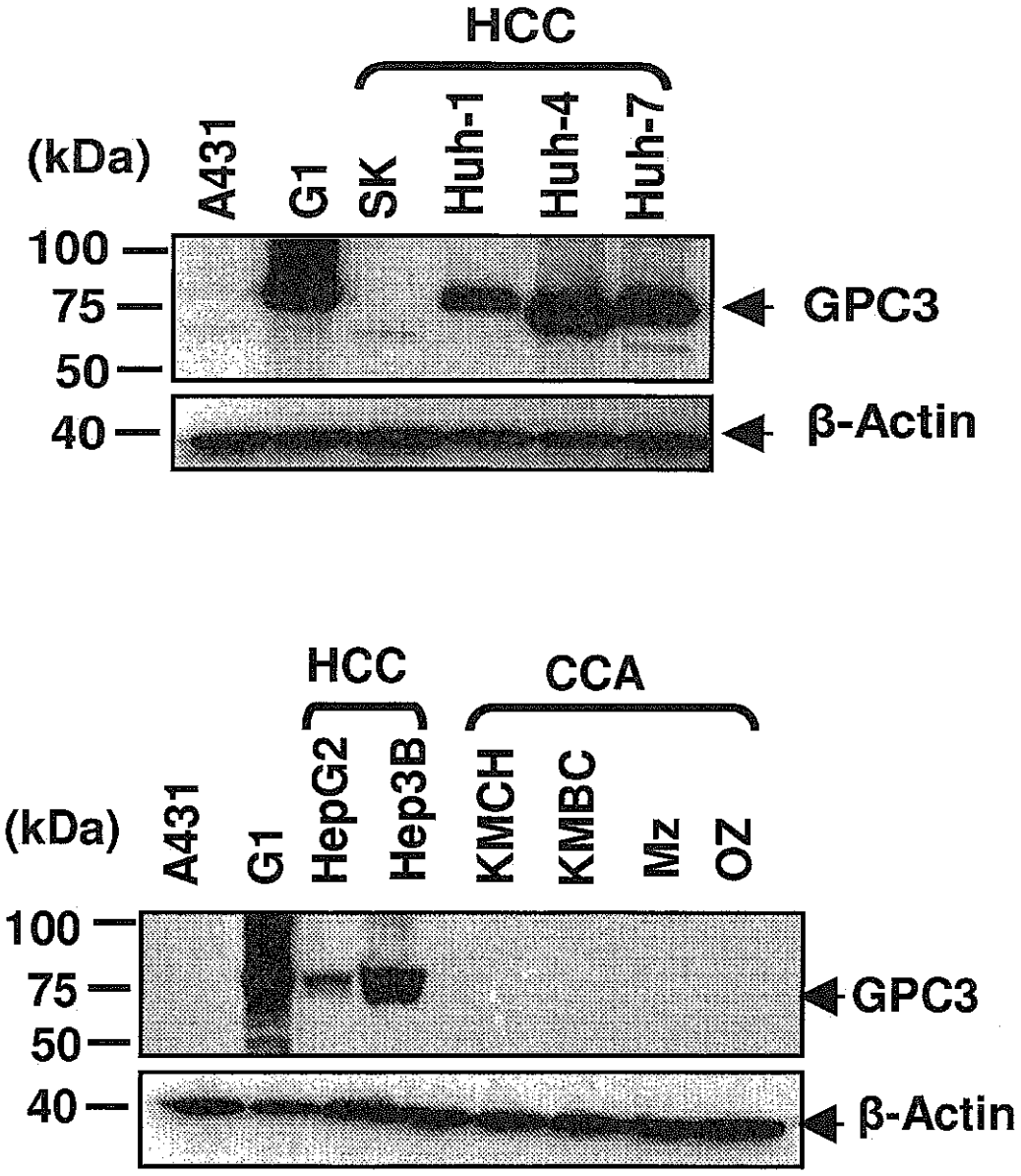

HCC
(kDa)
A431
G1
SK
Huh-1
Huh-4
Huh-7
100
75
50
40
GPC3
β-Actin
HCC
CCA
(kDa)
A431
G1
HepG2
Hep3B
KMCH
KMBC
Mz
OZ
100
75
50
40
GPC3
β-Actin

FIG. 3B

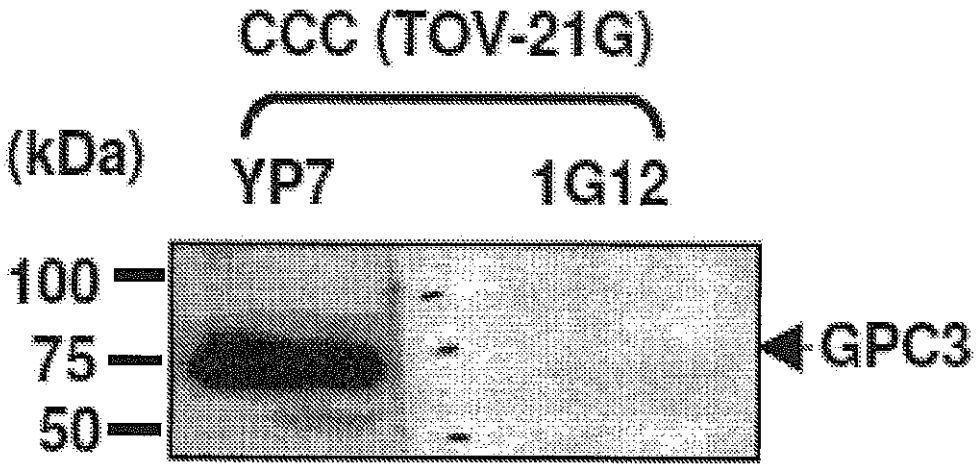
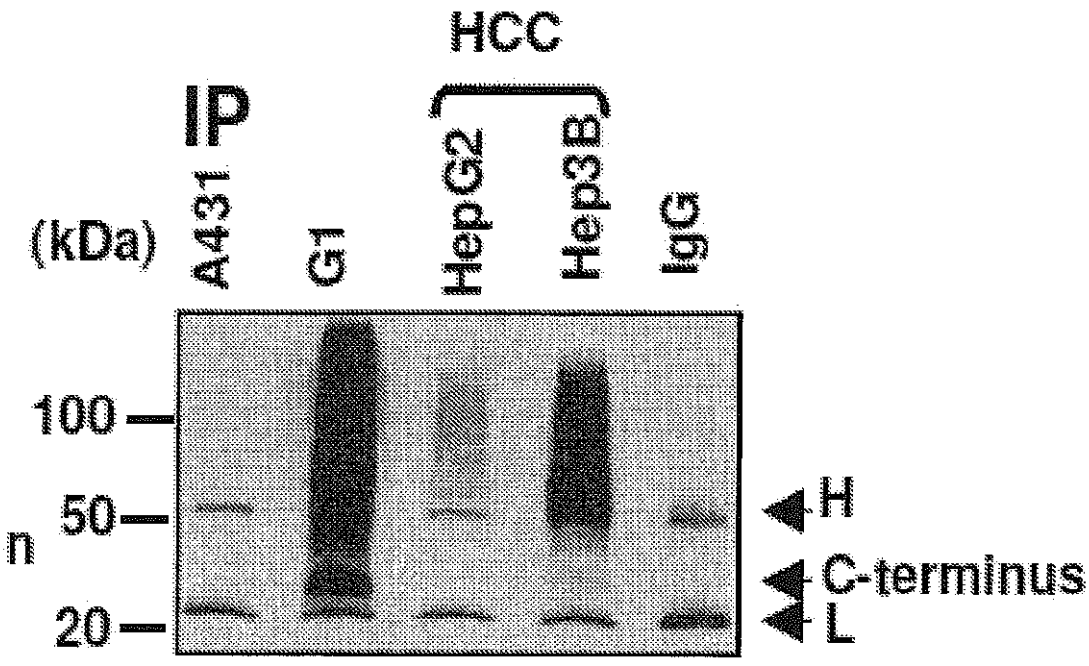

CCC (TOV-21G)
(kDa)
YP7
1G12
100
75
50
GPC3

FIG. 3C


HCC
IP
(kDa)
A431
G1
HepG2
Hep3B
IgG
100
50
20
n
H
C-terminus
L

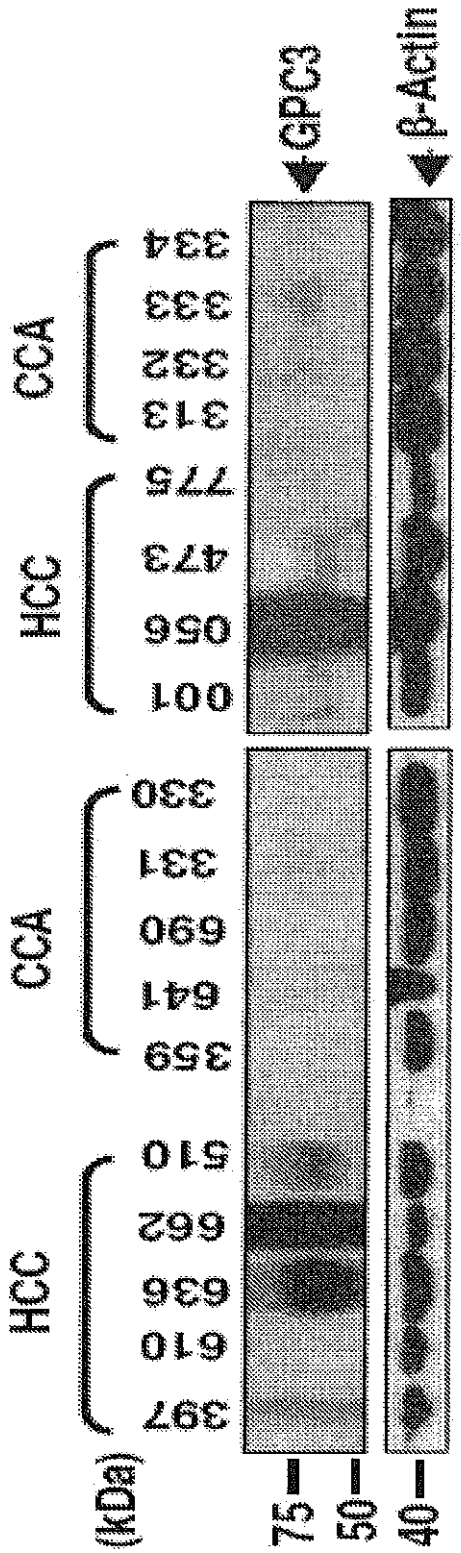

GPC3
β-Actin
CCA
HCC
CCA
HCC
334
333
332
313
775
473
056
001
330
331
690
641
359
510
662
636
610
397
(kDa)
75
50
40

FIG. 3D

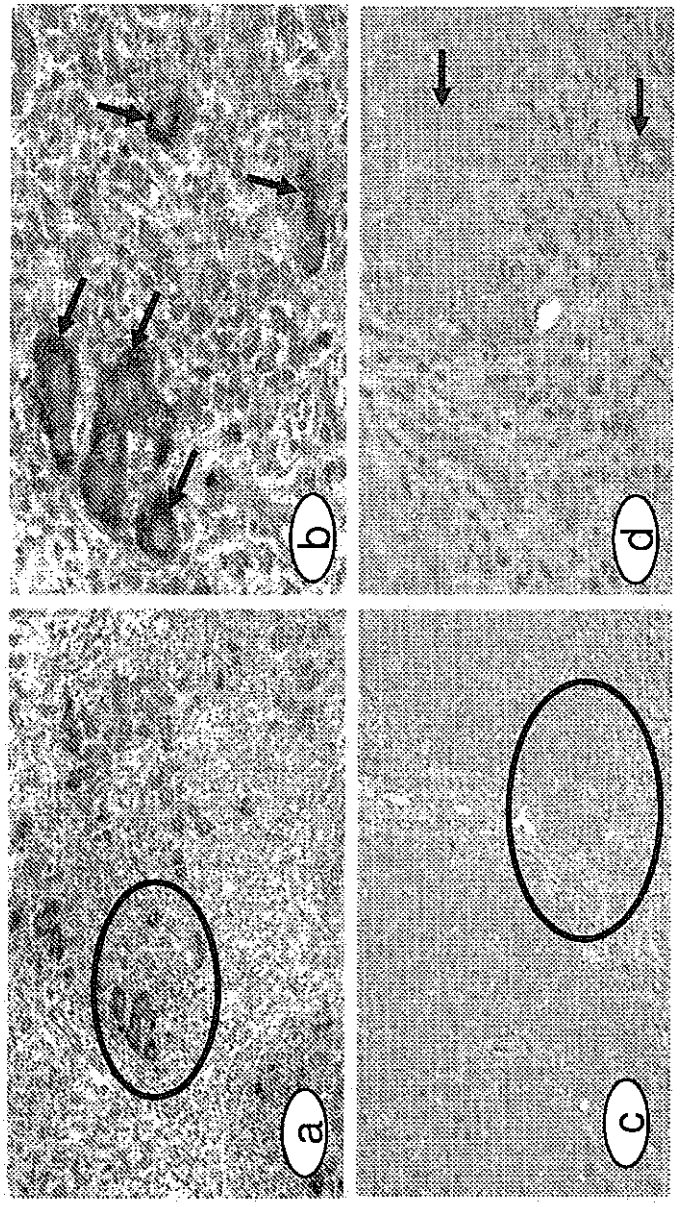


FIG. 3E

FIG. 4A

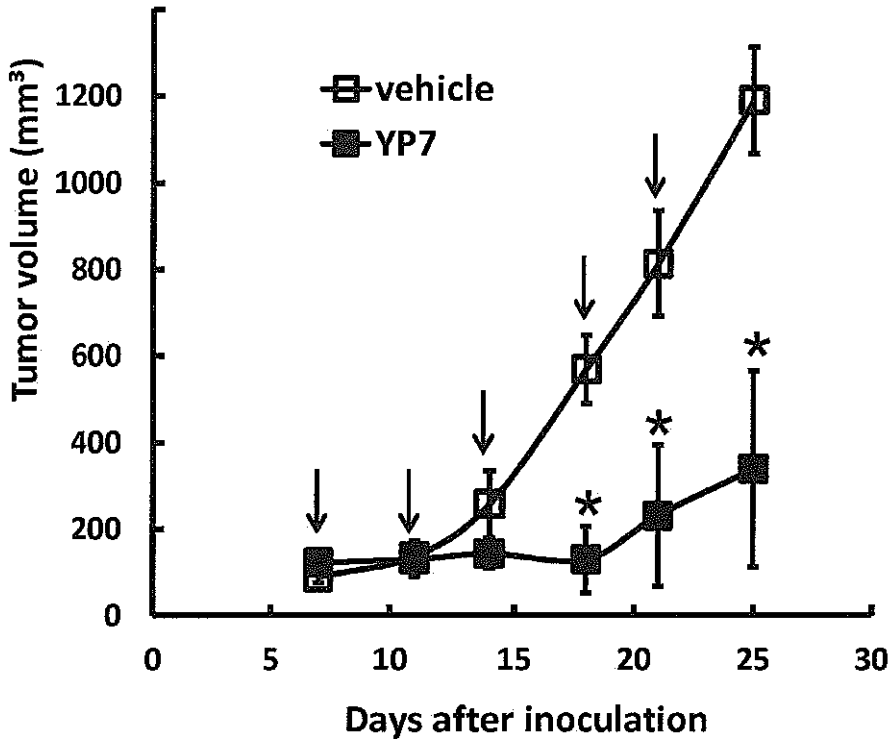

Tumor volume (mm³)
1200
1000
800
600
400
200
0
vehicle
YP7
*
*
*
0
5
10
15
20
25
30
Days after inoculation

FIG. 4B

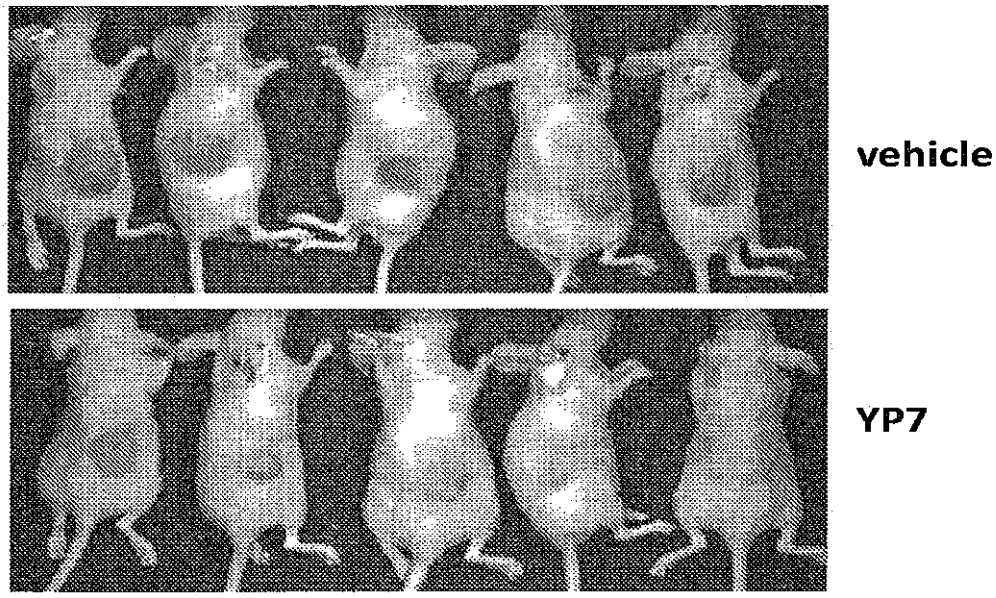

vehicle
YP7

FIG. 5

```
YP6_VH_clone4   GAGGTGCAGCTTGTTGGAAGTGGTGGAGGATTGGTGCAGCCTGAAGGGTCATTGAAACTC 60
YP6_VH_clone7   GAGGTGCAGCTTGTTGGAAGTGGTGGAGGATTGGTGCAGCCTGAAGGGTCATTGAAACTC 60
YP8_VH          GAGGTGCAGCTTGTTGGAAGTGGTGGAGGATTGGTGCAGCCTGAAGGGTCATTGAAACTC 60
YP7_VH          GAGGTGCAGCTTGTTGAGACTGGTGGAGGAATGGTGCAGCCTGAAGGGTCATTGAAACTC 60
YP9_VH          GAGGTCCAGCTTGTTGAGACTGGTGGAGGATTGGTGCAGCCTAAAGGGTCATTGAAACTC 60
YP9.1_VH        GAGGTGCAGCTTGTTGAGACTGGCGGAGGATTGGTGCAGCCTGAAGGGTCATTGAAACTC 60
                ***** **********  * *** ****** ********** ****************

YP6_VH_clone4   TCATGTGCAGCCTCTGGATTCACCTTCAAGACCAATGCCATGAACTGGGTCCGCCAGGCT 120
YP6_VH_clone7   TCATGTGCAGCCTCTGGATTCACCTTCAAGACCAATGCCATGAACTGGGTCCGCCAGGCT 120
YP8_VH          TCATGTGCAGCCTCTGGATTCACCTTCAAGACCAATGCCATGAACTGGGTCCGCCAGGCT 120
YP7_VH          TCATGTGCAGCCTCTGGATTCACCTTCAATAAGAATGCCATGAATTGGGTCCGCCAGGCT 120
YP9_VH          TCATGTGCAGCCTCTGGATTCACCTTCAATACCAATGCCATGAACTGGGTCCGCCAGGCT 120
YP9.1_VH        TCATGTGCAACGTCTGGATTCAACTTCAATACCAATGCCATGAACTGGGTCCGCCAGGCT 120
                ********* * ********** ****** *  *********** ***************

YP6_VH_clone4   CCAGGAAAGGGTTTGGAATGGGTTGCTCGCATAAGAAATAAAACTAATAATTATGCAACA 180
YP6_VH_clone7   CCAGGAAAGGGTTTGGAATGGGTTGCTCGCATAAGAAATAAAACTAATAATTATGCAACA 180
YP8_VH          CCAGGAAAGGGTTTGGAATGGGTTGCTCGCATAAGAAATAAAACTAATAATTATGCAACA 180
YP7_VH          CCAGGAAAGGGTTTGGAATGGGTTGCTCGCATAAGAAATAAAACTAATAATTATGCAACA 180
YP9_VH          CCAGGAAAGGGTTTGCAATGGGTTGCTCGCGTAAGAAATAAAACTAATAATTATGCAACA 180
YP9.1_VH        CCAGGAAAGGGTTTGGAATGGGTTGCTCGCGTAAGAAATAAAACTAATAATTATGCAACA 180
                ************** ************** ******************************

YP6_VH_clone4   TATTATGCCGACTCAGTGAAAGACAGGTTCACCATCTCCAGAGATGATTCACAAAGCATG 240
YP6_VH_clone7   TATTATGCCGACTCAGTGAAAGACAGGTTCACCATCTCCAGAGATGATTCACAAAGCATG 240
YP8_VH          TATTATGCCGACTCAGTGAAAGACAGGTTCACCATCTCCAGAGATGATTCACAAAGCATG 240
YP7_VH          TATTATGCCGATTCAGTGAAAGCCAGGTTTACCATCTCCAGAGATGATTCACAAAGCATG 240
YP9_VH          TATTATGCCGATTCCGTGAAAGACAGGTTCACCATCTCCAGAGATGATTCACAAAGCATG 240
YP9.1_VH        TATTATGCCGATTCAGTGAAAGACAGGTTCACCATCTCCAGAGATGATTCACAAAGAATG 240
                *********** ** ******* ****** ************************** ***

YP6_VH_clone4   CTCTATCTGCAAATGAACAACTTGAAAACTGAAGACACAGCCATGTATTTCTGTGTGGCC 300
YP6_VH_clone7   CTCTATCTGCAAATGAACAACTTGAAAACTGAAGACACAGCCATGTATTTCTGTGTGGCC 300
YP8_VH          CTCTATCTGCAAATGAACAACTTGAAAACTGAAGACACAGCCATGTATTTCTGTGTGGCC 300
YP7_VH          CTCTATCTGCAAATGAACAACTTGAAAATTGAGGACACAGCCATGTACTATTGTGTGGCT 300
YP9_VH          CTCTATCTGCAAATGAACAACTTGAAAACTGAAGACACGGCCATTTATTACTGTGTGGGG 300
YP9.1_VH        GTCTTTCTGCAAATGAATAACTTGAAAACTGAGGACACAGCCATCTATTACTGTGTGGCG 300
                 *** ************ ********** *** ***** ***** ** *  *******

YP6_VH_clone4   GGTAACTCGTTTGCTTACTGGGGCCAGGGGACTCTGGTCACTGTCTCTGCA 351
YP6_VH_clone7   GGTAACTCGTTTGCTTACTTGGGCCAGGGGACTCTGGTCACTGTCTCTGCA 351
YP8_VH          GGTAACTCGTTTGCTTACTGGGGCCAGGGGACTCTGGTCACTGTCTCTGCA 351
YP7_VH          GGTAACTCGTTTGCTTACTGGGGCCAAGGGACTCTGGTCACTGTCTCTGCA 351
YP9_VH          GGTAACTCGTTTGCTTACTGGGGCCAAGGGACTCTGGTCACTGTCTCTGCA 351
YP9.1_VH        GGGAACTCGTTTGCTTATTGGGGCCAAGGGACTCTGGTCACTGTCTCTCCT 351
                ** ************** * ****** ********************** *
```

KABAT CDRs
IMGT CDRs

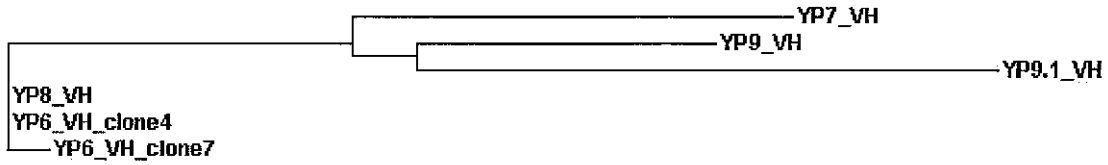


FIG. 6

```
                                                    CDR1                    CDR2
YP6_VH_clone4 EVQLVGSGGGLVQPEGSLKLSCAASGFTFKTNAMNWVRQAPGKGLEWVARIRNKTNNYAT 60
YP6_VH_clone7 EVQLVGSGGGLVQPEGSLKLSCAASGFTFKTNAMNWVRQAPGKGLEWVARIRNKTNNYAT 60
YP8_VH        EVQLVGSGGGLVQPEGSLKLSCAASGFTFKTNAMNWVRQAPGKGLEWVARIRNKTNNYAT 60
YP7_VH        EVQLVETGGGMVQPEGSLKLSCAASGFTFNKNAMNWVRQAPGKGLEWVARIRNKTNNYAT 60
YP9_VH        EVQLVETGGGLVQPKGSLKLSCAASGFTFNTNAMNWVRQAPGKGLQWVARVRNKTNNYAT 60
YP9.1_VH      EVQLVETGGGLVQPEGSLKLSCATSGFNFNTNAMNWVRQAPGKGLEWVARVRNKTNNYAT 60
              ***** :***:***:********:***.*:.***************:****:********* 

                                                          CDR3
YP6_VH_clone4 YYADSVKDRFTISRDDSQSMLYLQMNNLKTEDTAMYFCVAGNSFAYWGQGTLVTVSA 117
YP6_VH_clone7 YYADSVKDRFTISRDDSQSMLYLQMNNLKTEDTAMYFCVAGNSFAYLGQGTLVTVSA 117
YP8_VH        YYADSVKDRFTISRDDSQSMLYLQMNNLKTEDTAMYFCVAGNSFAYWGQGTLVTVSA 117
YP7_VH        YYADSVKARFTISRDDSQSMLYLQMNNLKIEDTAMYYCVAGNSFAYWGQGTLVTVSA 117
YP9_VH        YYADSVKDRFTISRDDSQSMLYLQMNNLKTEDTAIYYCVGGNSFAYWGQGTLVTVSA 117
YP9.1_VH      YYADSVKDRFTISRDDSQRMVFLQMNNLKTEDTAIYYCVAGNSFAYWGQGTLVTVSP 117
              ******* ********** *::******* ****:*:**.****** *********.
```

KABAT CDRs
IMGT CDRs

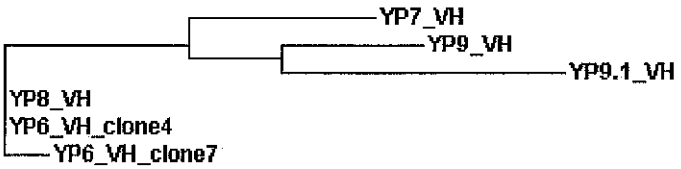


FIG. 7A

```
YP6_VL              GACATTGTGATGTCACAGTCTCCATCCTCCCTAGCTGTGTCAGTTGGAGAGAAGGTTACT 60
YP8_VL              GACATTGTGATGTCACAGTCTCCATCCTCCCTAGCTGTGTCAGTTGGAGAGAAGGTTACT 60
YP9_VL_clone9       GACATTGTGATGTCCCAGTCTCCATCCTCCCTAGCTGTGTCAGTTGGAGAGAAGGTTACT 60
YP9_VL_clone1       GACATTGTGATGTCCCAGTCTCCATCCTCCCTAGCTGTGTCAGTTGGAGAGAAGGTTACT 60
YP9_VL_clone10      GACATTGTGATGTCCCAGTCTCCATCCTCCCTAGCTGTGTCAGTTGGAGAGAAGGTTACT 60
YP9.1_VL            GACATTGTGATGTCACAGTCTCCATCCTCCCTAGCTGTGTCAGTTGGAGAGAGGGTTACT 60
YP7_VL              GACATTGTGATGTCACAGTCTCCATCCTCCCTAGTTGTGTCAATTGGAGAGAAGGTTACT 60
                    ************** ******************** ******* ********* *******

YP6_VL              GTGAACTGCAAGTCCAGTCAGAGCCTTTTATATAGTAACAATCAAAAGAACTACTTGGCC 120
YP8_VL              GTGAACTGCAAGTCCAGTCAGAGCCTTTTATATAGTAACAATCAAAAGAACTACTTGGCC 120
YP9_VL_clone9       ATGAGCTGCAAGTCCAGTCAGAGCCTTTTATATAGTAACAATCAAAAGAACTACTTGGCC 120
YP9_VL_clone1       ATGAGCTGCAAGTCCAGTCAGAGCCTTTTATATAGTAACAATCAAAAGAACTACTTGGCC 120
YP9_VL_clone10      ATGAGCTGCAAGTCCAGTCAGAGCCTTTTATATAGTAACAATCAAAAGAACTACTTGGCC 120
YP9.1_VL            ATGAACTGCAAGTCCAGTCAGAGTCTTTTATATAGTAGCAATCAAAAGAACTACTTGGCC 120
YP7_VL              ATGACCTGCAAGTCCAGTCAGAGCCTTTTATATAGCAGCAATCAAAAGAACTACTTGGCC 120
                     *** ****************** *********** * ********************

YP6_VL              TGGTACCAGCAGAAACCAGGGCAGTCTCCTAAACTGCTGATTTACTGGGCATCAACTAGG 180
YP8_VL              TGGTACCAGCAGAAACCAGGGCAGTCTCCTAAACTGCTGATTTACTGGGCATCAACTAGG 180
YP9_VL_clone9       TGGTACCACCAGAAACCAGGGCAGTCTCCTAAACTGCTGATTTACTGGGCATCCACTAGG 180
YP9_VL_clone1       TGGTACCACCAGAAACCAGGGCAGTCTCCTAAACTGCTGATTTACTGGGCATCCACTAGG 180
YP9_VL_clone10      TGGTACCACCAGAAACCAGGGCAGTCTCCTAAACTGCTGATTTACTGGGCATCCACTAGG 180
YP9.1_VL            TGGTACCAGCAGAAACCAGGGCAGTCTCCTAAACTGCTGATTTACTGGGCATCCACTAGG 180
YP7_VL              TGGTACCAACAGAAACCAGGGCAGTCTCCTAAACTGCTGATTTACTGGGCATCCAGTAGG 180
                    ******** ********************************************* **** 

YP6_VL              GAATATGGGGTCCCTGATCGCTTCACAGGCAGTGGATCTGGGACAGATTTCACTCTCACC 240
YP8_VL              GAATATGGGGTCCCTGATCGCTTCACAGGCAGTGGATCTGGGACAGATTTCACTCTCACC 240
YP9_VL_clone9       GAATCTGGGGTCCCTGATCGCTTCACAGGCAGTGGATCTGGGACAGATTTCACTCTCACC 240
YP9_VL_clone1       GAATCTGGGGTCCCTGATCGCTTCACAGGCAGTGGATCTGGGACAGATTTCACTCTCACC 240
YP9_VL_clone10      GAATCTGGGGTCCCTGATCGCTTCACAGGCAGTGGATCTGGGACAGATTTCACTCTCACC 240
YP9.1_VL            GAATCTGGGGTCCCTGATCGCTTCACAGGCAGTGTATCTGGGACAGATTTCACTCTCACC 240
YP7_VL              GAATCTGGGGTCCCTGATCGCTTCACAGGCAGTGGATCTGGGACAGATTTCACTCTCACC 240
                    **** ***************************** ************************

YP6_VL              ATCAGCAGTGTGAAGGCTGAAGACCTGGCAGTTTATTACTGTCAGCAATATTATAACTAT 300
YP8_VL              ATCAGCAGTGTGAAGGCTGAAGACCTGGCAGTTTATTACTGTCAGCAATATTATAACTAT 300
YP9_VL_clone9       ATCAGCAGTGTGAAGGCTGAAGACCTGGCAGTTTATTACTGTCAGCAATATTATAGCTAT 300
YP9_VL_clone1       ATCAGCAGTGTGAAGGCTGAAGACCTGGCAGTTTATTACTGTCAGCAATATTATAGCTAT 300
YP9_VL_clone10      ATCAGCAGTGTGAAGGCTGAAGACCTGGCAGTTTATTACTGTCAGCAATATTATATCTAT 300
YP9.1_VL            ATCAGCAGTGTGAAGGCTGAAGACCTGGCAGTTTATTACTGTCAGCAATATTATAACTAT 300
YP7_VL              ATCAGCAGTGTGAAGGCTGAAGACCTGGCAGTTTATTACTGTCAGCAATATTATAACTAT 300
                    ************************************************************ ****
```

FIG. 7B

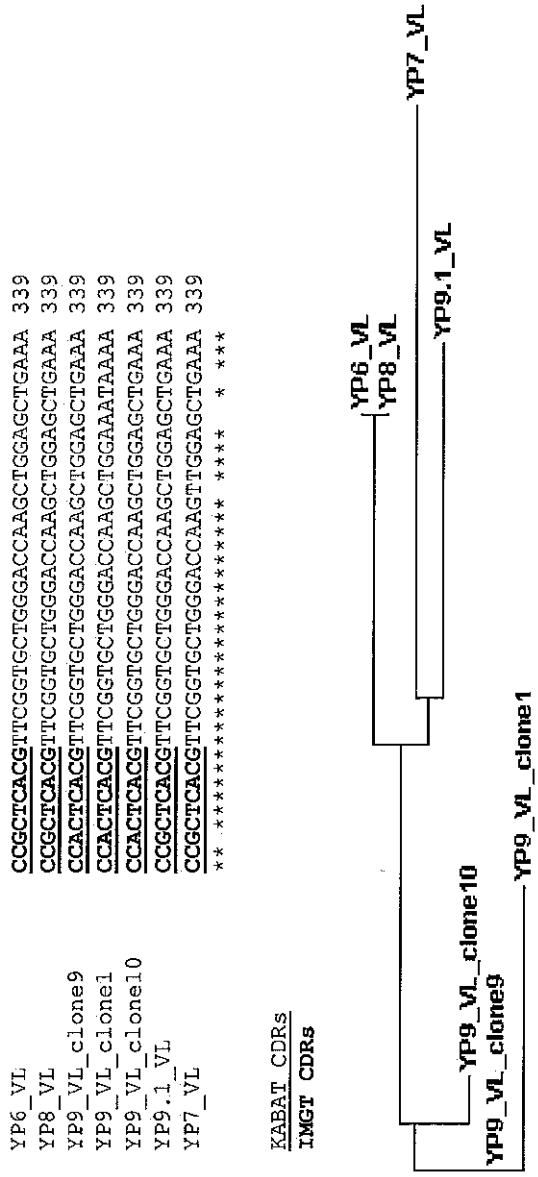

YP6_VL CCGCTCACGTTCGGTGCTGGGACCAAGCTGGAGCTGAAA 339
YP8_VL CCGCTCACGTTCGGTGCTGGGACCAAGCTGGAGCTGAAA 339
YP9_VL_clone9 CCACTCACGTTCGGTGCTGGGACCAAGCTGGAGCTGAAA 339
YP9_VL_clone1 CCACTCACGTTCGGTGCTGGGACCAAGCTGGAAATAAAA 339
YP9_VL_clone10 CCACTCACGTTCGGTGCTGGGACCAAGCTGGAGCTGAAA 339
YP9.1_VL CCGCTCACGTTCGGTGCTGGGACCAAGCTGGAGCTGAAA 339
YP7_VL CCGCTCACGTTCGGTGCTGGGACCAAGTTGGAGCTGAAA 339
KABAT CDRs
IMGT CDRs
YP6_VL
YP8_VL
YP7_VL
YP9.1_VL
YP9_VL_clone10
YP9_VL_clone9
YP9_VL_clone1

FIG. 8

```
YP6                DIVMSQSPSSLAVSVGEKVTVNCKSSQSLLYSNNQKNYLAWYQQKPGQSPKLLIYWASTR 60
YP8_VL             DIVMSQSPSSLAVSVGEKVTVNCKSSQSLLYSNNQKNYLAWYQQKPGQSPKLLIYWASTR 60
YP9_VL_clone9      DIVMSQSPSSLAVSVGEKVTMSCKSSQSLLYSNNQKNYLAWYHQKPGQSPKLLIYWASTR 60
YP9_VL_clone1      DIVMSQSPSSLAVSVGEKVTMSCKSSQSLLYSNNQKNYLAWYHQKPGQSPKLLIYWASTR 60
YP9_VL_clone10     DIVMSQSPSSLAVSVGEKVTMSCKSSQSLLYSNNQKNYLAWYHQKPGQSPKLLIYWASTR 60
YP9.1_VL           DIVMSQSPSSLAVSVGERVTMNCKSSQSLLYSSNQKNYLAWYQQKPGQSPKLLIYWASTR 60
YP7_VL             DIVMSQSPSSLVVSIGEKVTMTCKSSQSLLYSSNQKNYLAWYQQKPGQSPKLLIYWASSR 60
                   ********** .**:**:**:. ********** :********************:*

YP6                EYGVPDRFTGSGSGTDFTLTISSVKAEDLAVYYCQQYYNYPLTFGAGTKLELK 113
YP8_VL             EYGVPDRFTGSGSGTDFTLTISSVKAEDLAVYYCQQYYNYPLTFGAGTKLELK 113
YP9_VL_clone9      ESGVPDRFTGSGSGTDFTLTISSVKAEDLAVYYCQQYSYPLTFGAGTKLELK 113
YP9_VL_clone1      ESGVPDRFTGSGSGTDFTLTISSVKAEDLAVYYCQQYSYPLTFGAGTKLEIK 113
YP9_VL_clone10     ESGVPDRFTGSGSGTDFTLTISSVKAEDLAVYYCQQYIYPLTFGAGTKLELK 113
YP9.1_VL           ESGVPDRFTGSVSGTDFTLTISSVKAEDLAVYYCQQYNYPLTFGAGTKLELK 113
YP7_VL             ESGVPDRFTGSGSGTDFTLTISSVKAEDLAVYYCQQYNYPLTFGAGTKLELK 113
                   * ********** ********** ********** ********** **********:*

KABAT CDRs
IMGT CDRs
```

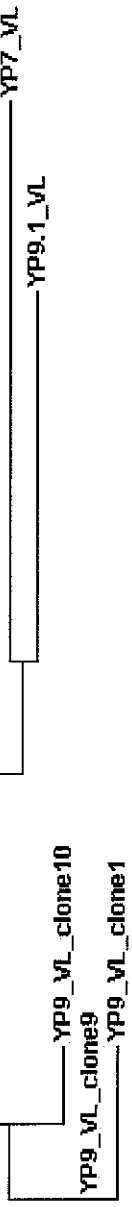
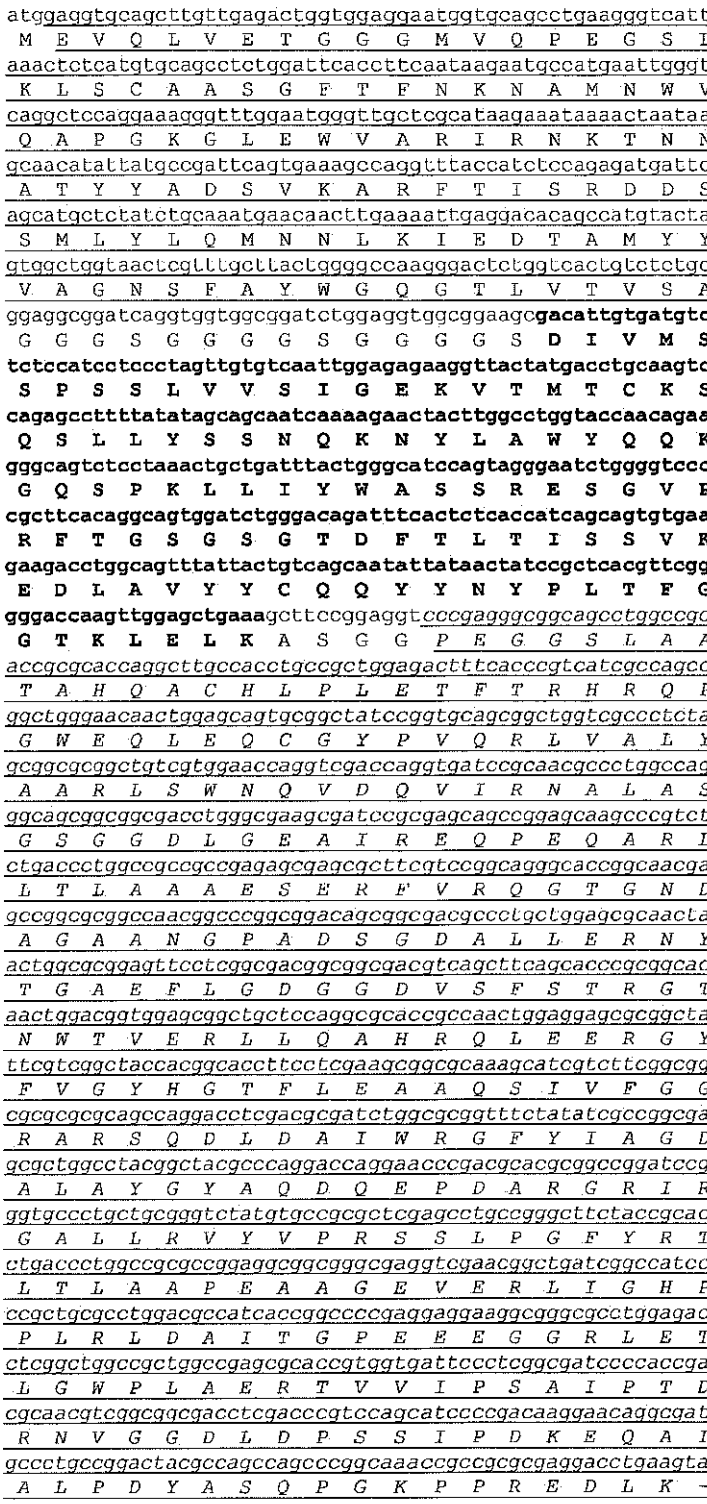


FIG. 9A



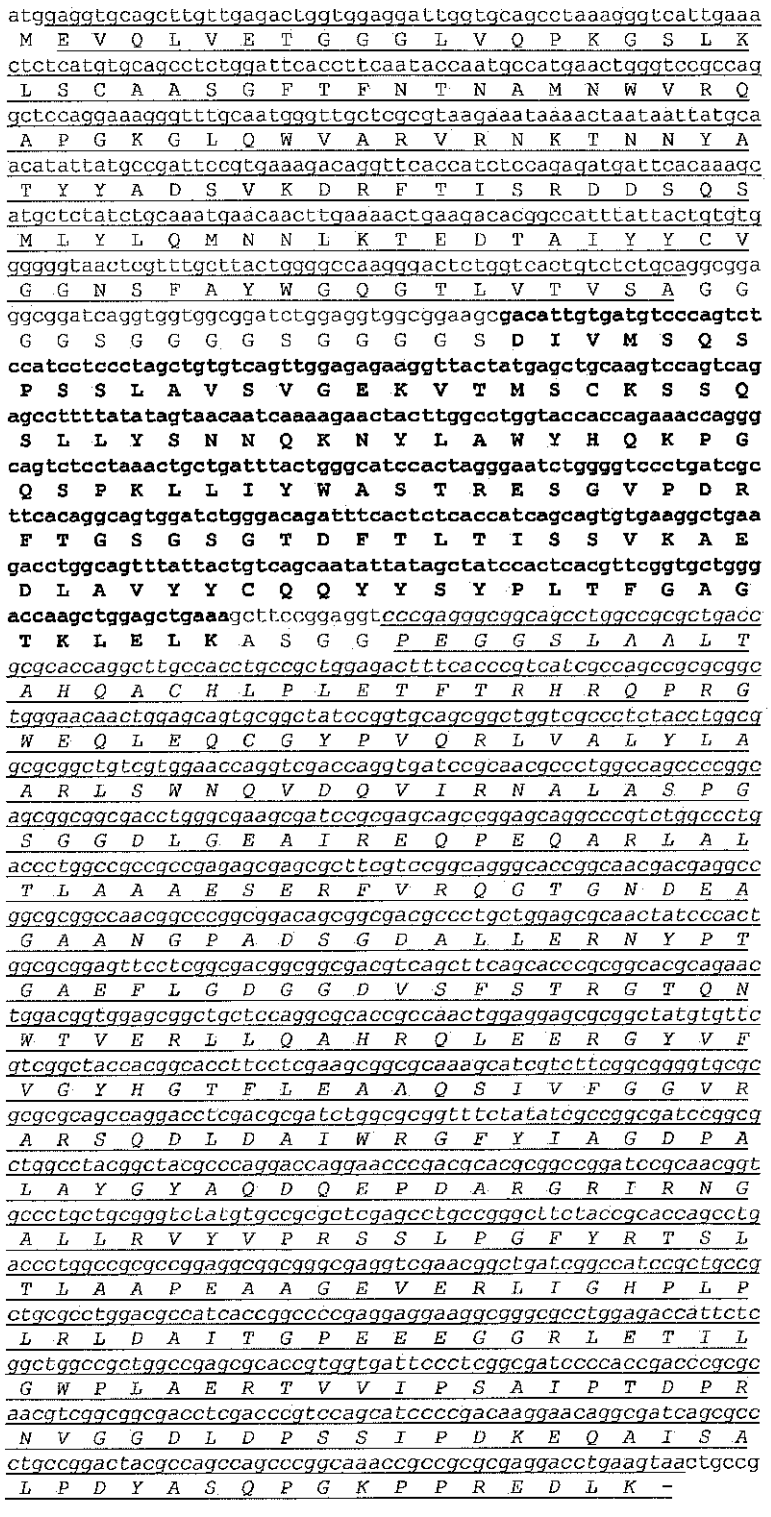
VH
VL
PE38

FIG. 9B

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L S C A A S G F T F K T N A M N W V R Q
gctccaggaaagggtttggaatgggttgctcgcataagaaataaaactaataattatgca
A P G K G L E W V A R I R N K T N N Y A
acatattatgccgactcagtgaaagacaggttcaccatctccagagatgattcacaaagc
T Y Y A D S V K D R F T I S R D D S Q S
atgctctatctgcaaatgaacaacttgaaaactgaagacacagccatgtatttctgtgtg
M L Y L Q M N N L K T E D T A M Y F C V
gccggtaactcgtttgcttactggggccaggggactctggtcactgtctctgcaggcgga
A G N S F A Y W G Q G T L V T V S A G G
ggcggatcaggtggtggcggatctggaggtggcggaagc**gacattgtgatgtcacagtct**
G G S G G G G S G G G G S **D I V M S Q S**
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P S S L A V S V G E K V T V N C K S S Q
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S L L Y S N N Q K N Y L A W Y Q Q K P G
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Q S P K L L I Y W A S T R E Y G V P D R
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F T G S G S G T D F T L T I S S V K A E
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D L A V Y Y C Q Q Y Y N Y P L T F G A G
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T K L E L K A S G G *P E G G S L A A L T*
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A H Q A C H L P L E T F T R H R Q P R G
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S G G D L G E A I R E Q P E Q A R L A L
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T L A A A E S E R F V R Q G T G N D E A
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G A A N G P A D S G D A L L E R N Y P T
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G A E F L G D G G D V S F S T R G T Q N
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W T V E R L L Q A H R Q L E E R G Y V F
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V G Y H G T F L E A A Q S I V F G G V R
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A L L R V Y V P R S S L P G F Y R T S L
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L R L D A I T G P E E E G G R L E T I L
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G W P L A E R T V V I P S A I P T D P R
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L P D Y A S Q P G K P P R E D L K –

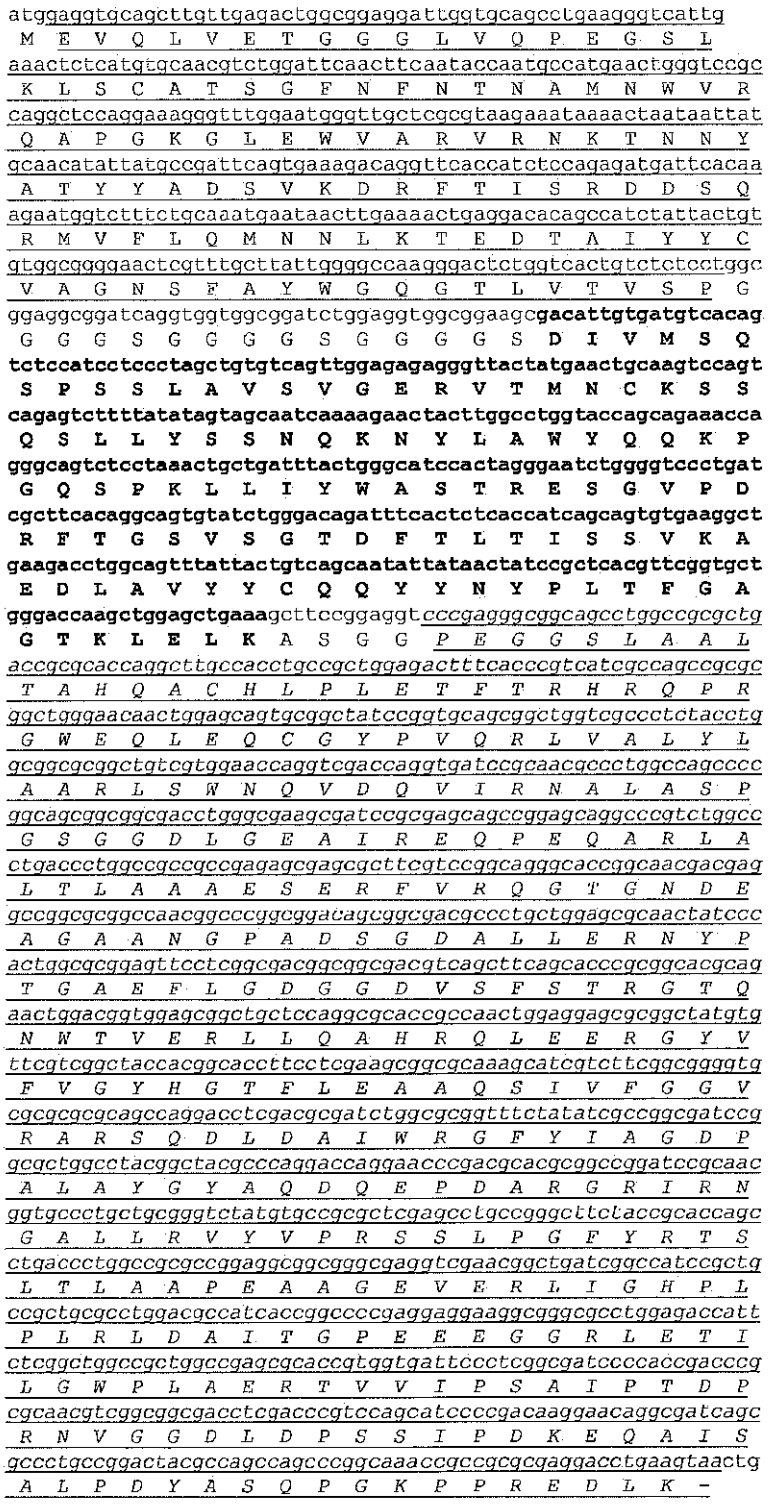
VH
VL
PE38

FIG. 9C



VH
VL
PE38

FIG. 9D



VH
VL
PE38

FIG. 10

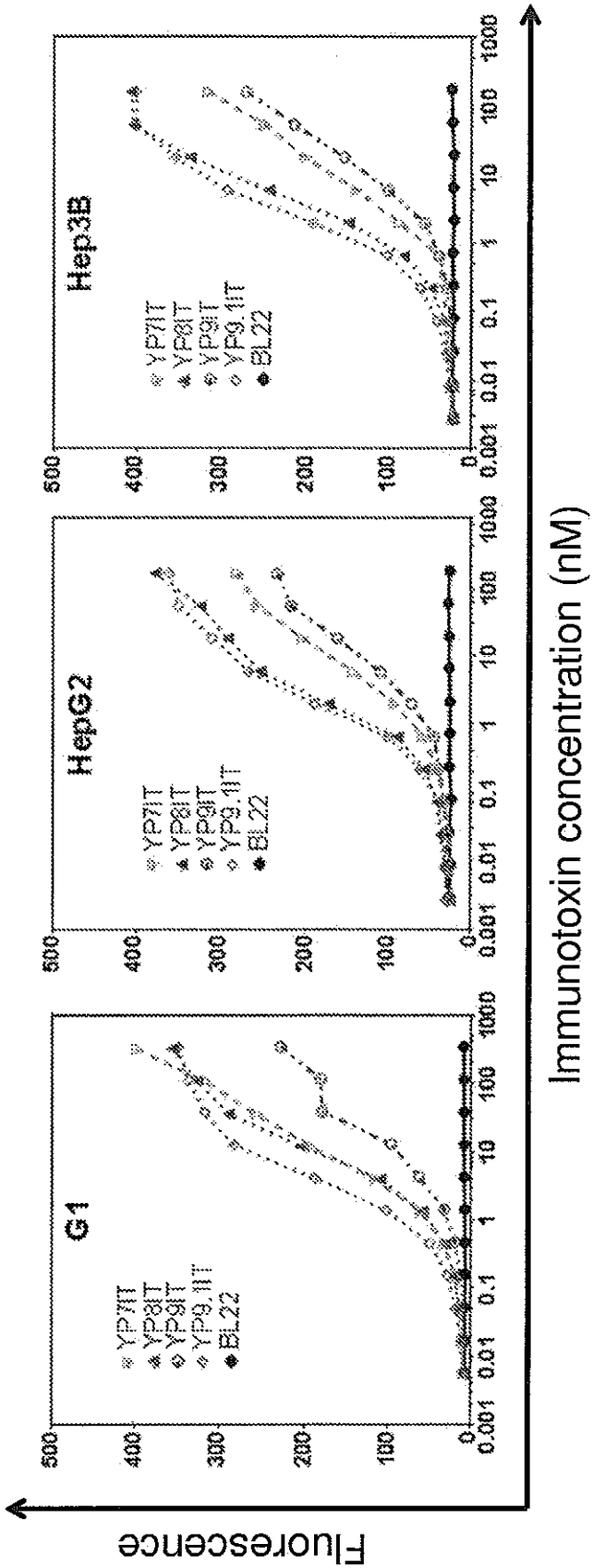
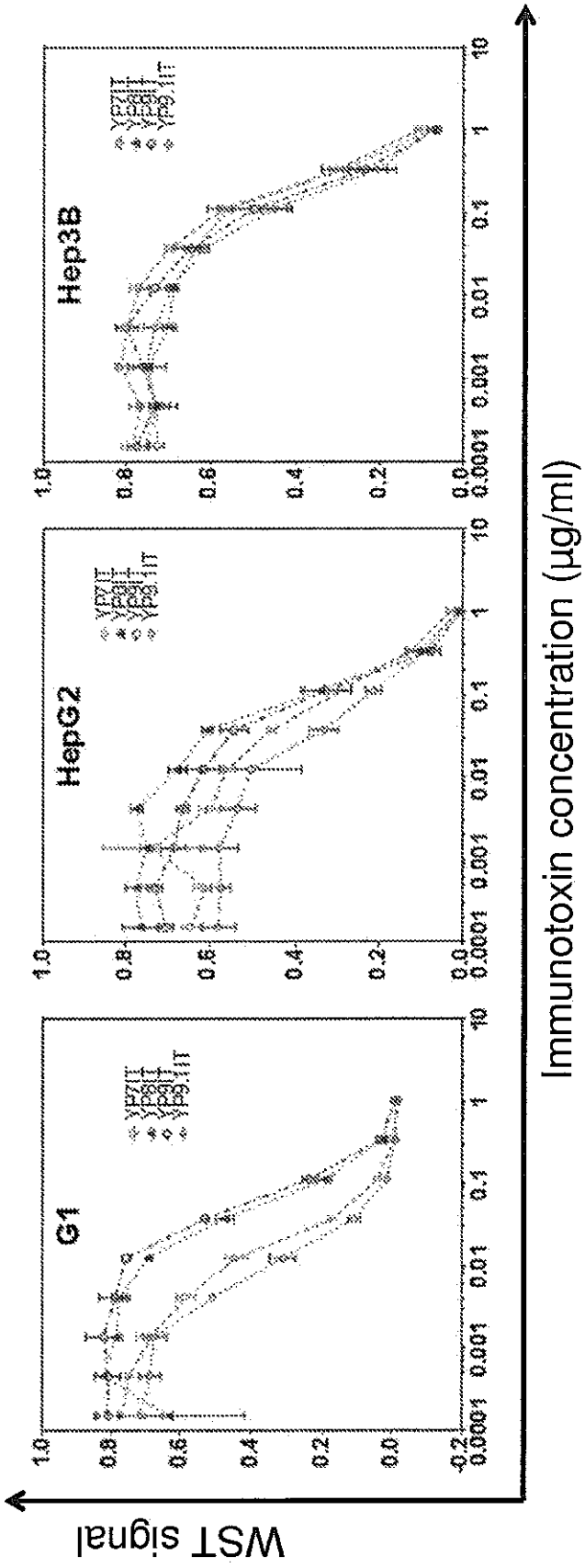

G1
HepG2
Hep3B
YP7IT
YP8IT
YP9IT
YP9.1IT
BL22
Fluorescence
Immunotoxin concentration (nM)

FIG. 11


G1
HepG2
Hep3B
YP2IT
YP5IT
YP9.1IT
WST signal
Immunotoxin concentration (µg/ml)