FIG. 1

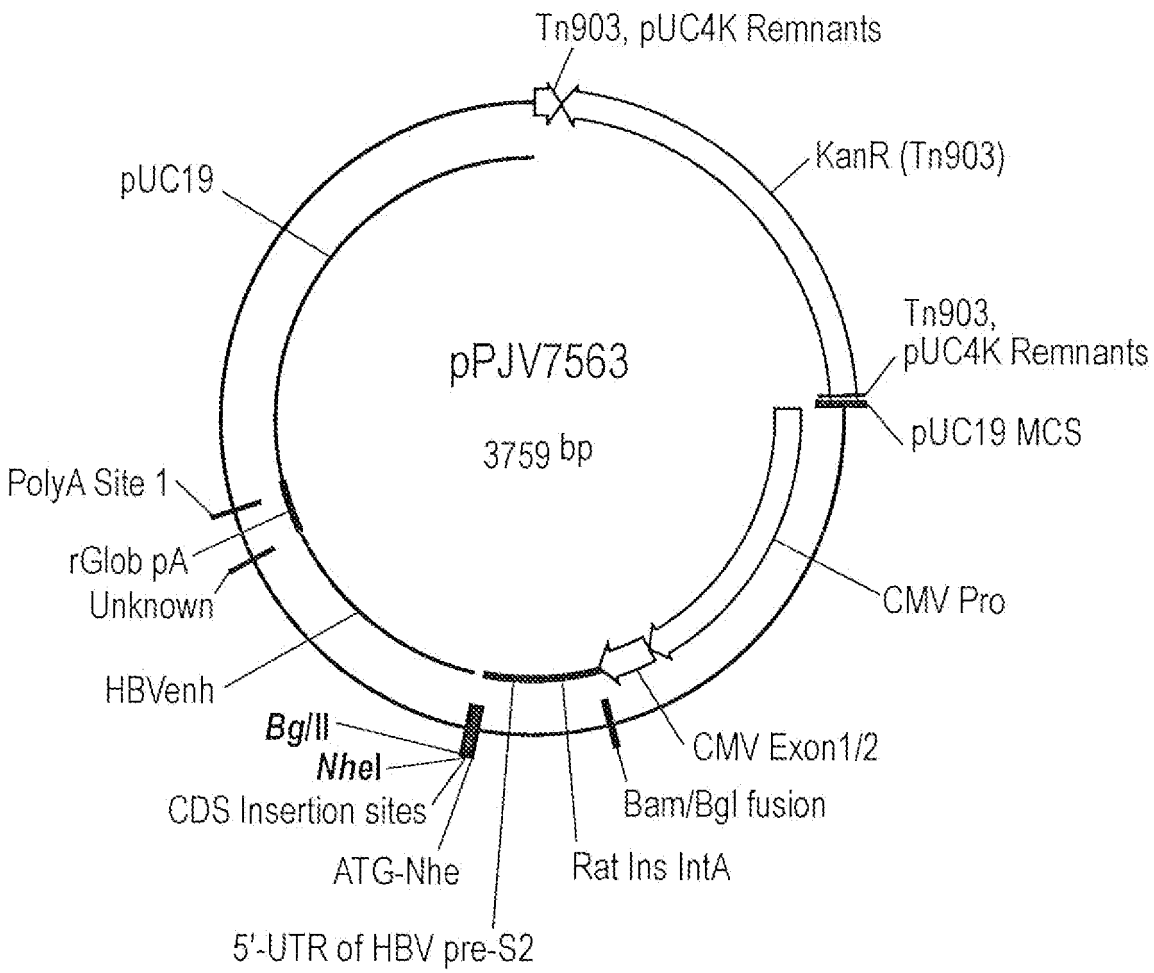

Tn903, pUC4K Remnants
KanR (Tn903)
pUC19
Tn903,
pUC4K Remnants
pPJV7563
3759 bp
pUC19 MCS
PolyA Site 1
rGlob pA
Unknown
CMV Pro
HBVenh
Bg/II
NheI
CMV Exon1/2
CDS Insertion sites
Bam/Bgl fusion
ATG-Nhe
Rat Ins IntA
5'-UTR of HBV pre-S2

FIG. 2

```
                    10                  20
--------------------+-------------------+--
Q T L N F D L L K L A G D V E S N P G * P  FMDV 2A
- - E G R G S L L T C G D V E E N P G * P  TAV 2A
H Y A G Y F A D L L I H D I E T N P G * P  EMCV 2A
Q C T N Y A L L K L A G D V E S N P G * P  ERAV 2A
- A T N F S L L K Q A G D V E E N P G * P  PTV 2A
```

FIG. 3

5′UAACGUUACUGGCCGAAGCCGCUUGGAAUAAGGCCGGUGUGCGUUUGUCUAU
AUGUUAUUUUCCACCAUAUUGCCGUCUUUUGGCAAUGUGAGGGCCCGGAAACCU
GGCCCUGUCUUCUUGACGAGCAUUCCUAGGGGUCUUUCCCCUCUCGCCAAAGG
AAUGCAAGGUCUGUUGAAUGUCGUGAAGGAAGCAGUUCCUCUGGAAGCUUCUU
GAAGACAAACAACGUCUGUAGCGACCCUUUGCAGGCAGCGGAACCCCCCACCUG
GCGACAGGUGCCUCUGCGGCCAAAAGCCACGUGUAUAAGAUACACCUGCAAAGG
CGGCACAACCCCAGUGCCACGUUGUGAGUUGGAUAGUUGUGGAAAGAGUCAAAU
GGCUCUCCUCAAGCGUAUUCAACAAGGGGCUGAAGGAUGCCCAGAAGGUACCCC
AUUGUAUGGGAUCUGAUCUGGGGCCUCGGUGCACAUGCUUUACAUGUGUUUAG
UCGAGGUUAAAAAACGUCUAGGCCCCCCGAACCACGGGGACGUGGUUUUCCUUU
GAAAAACACGAUGAUAAU*AUGGCCACAACCAUG3′

FIG. 4

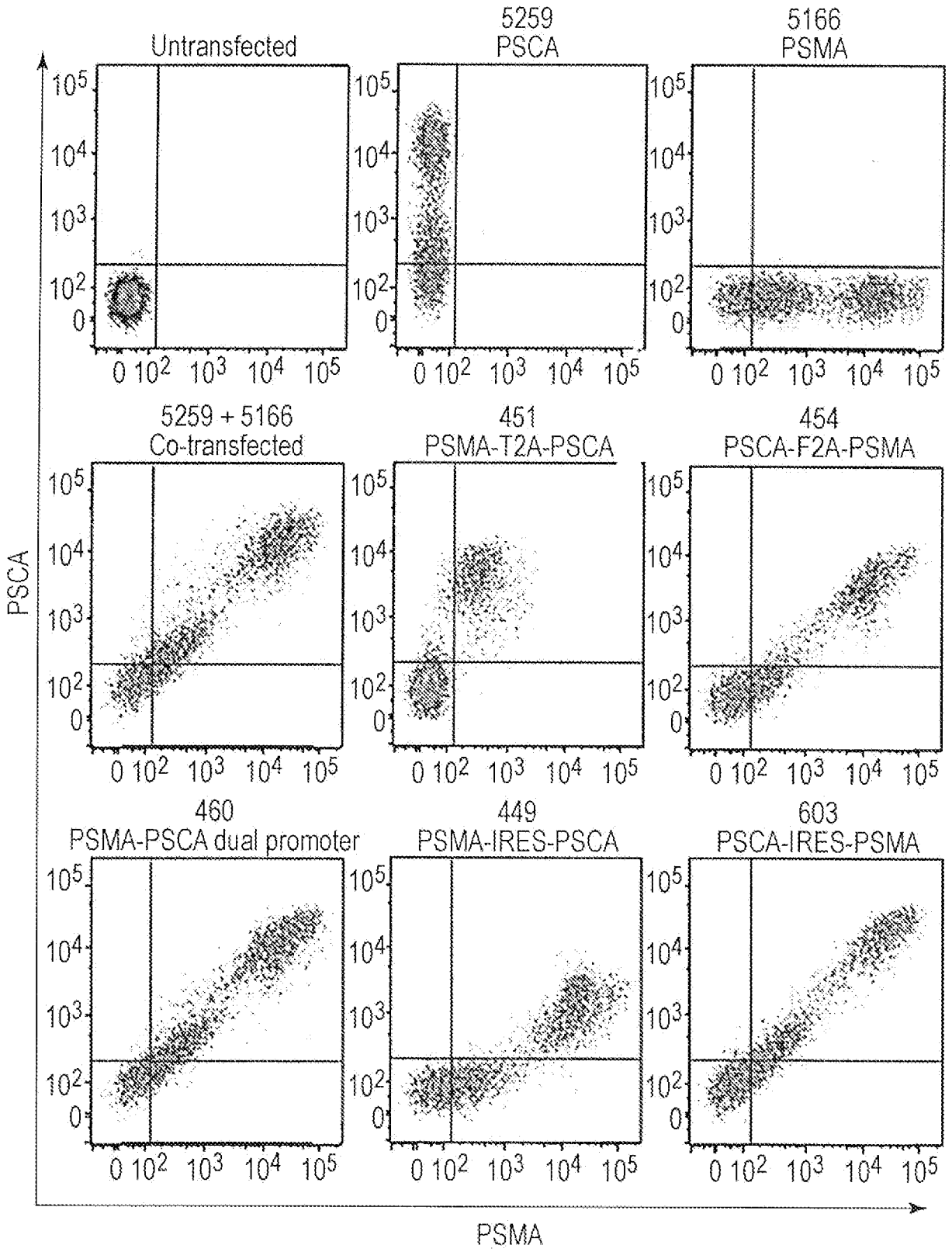

Untransfected
5259
PSCA
5166
PSMA
5259 + 5166
Co-transfected
451
PSMA-T2A-PSCA
454
PSCA-F2A-PSMA
460
PSMA-PSCA dual promoter
449
PSMA-IRES-PSCA
603
PSCA-IRES-PSMA
PSCA
PSMA
0 10^2 10^3 10^4 10^5

FIG. 5A

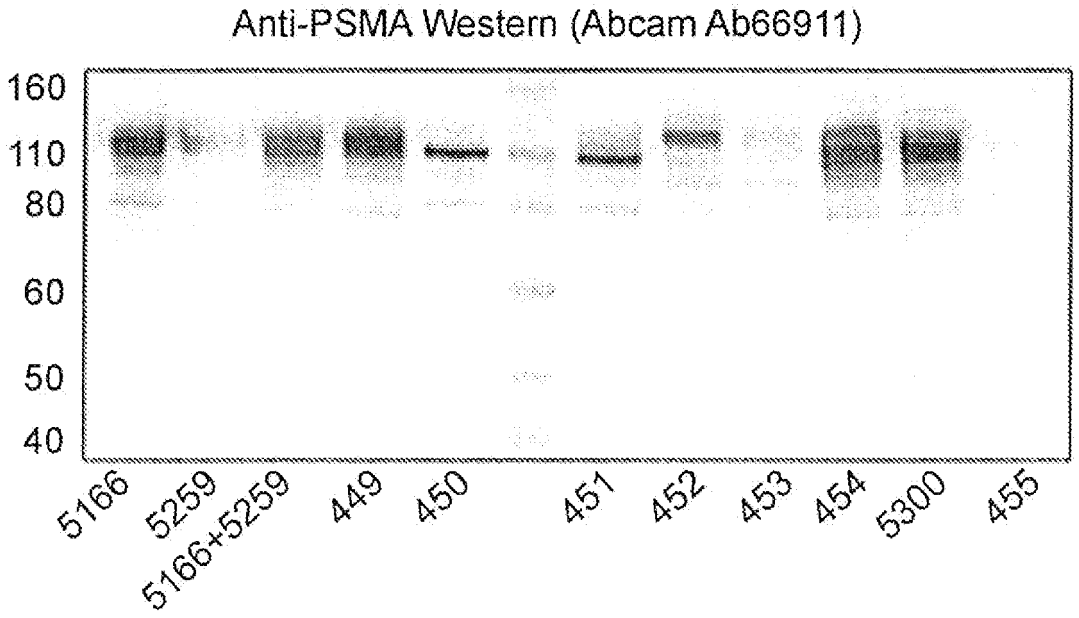

Anti-PSMA Western (Abcam Ab66911)
160
110
80
60
50
40
5166
5259
5166+5259
449
450
451
452
453
454
5300
455

FIG. 5B

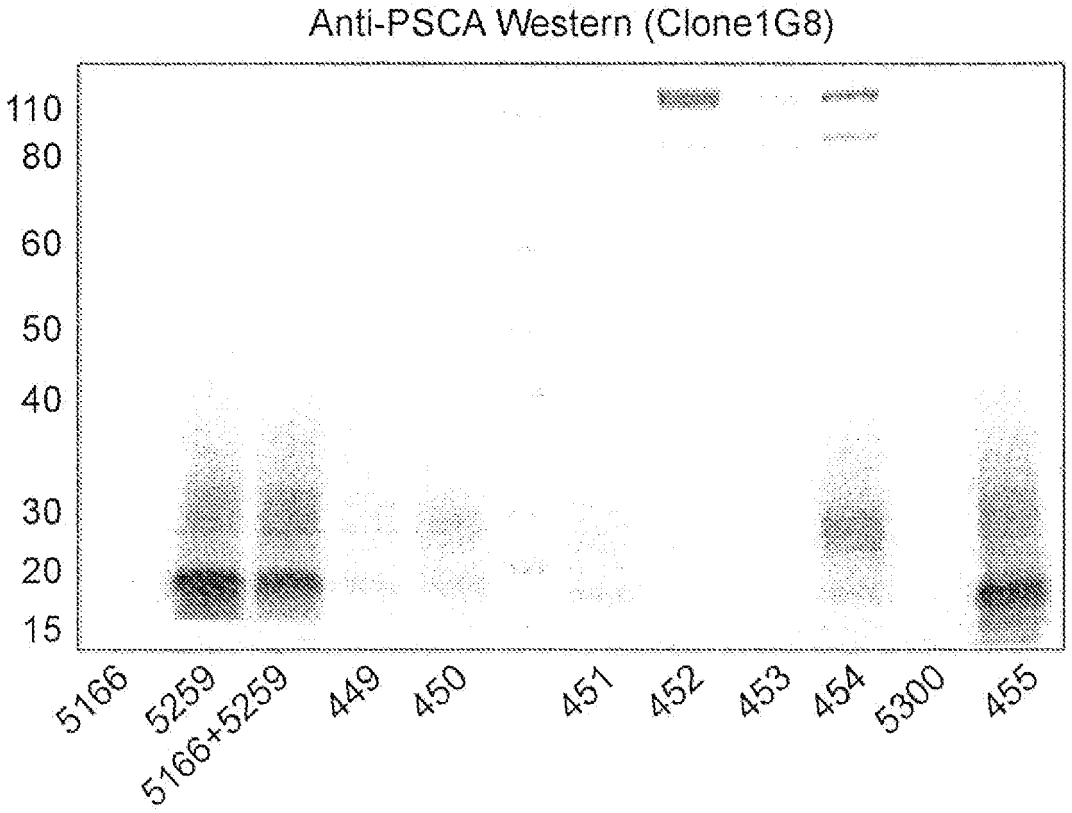

Anti-PSCA Western (Clone1G8)
110
80
60
50
40
30
20
15
5166
5259
5166+5259
449
450
451
452
453
454
5300
455

FIG. 6

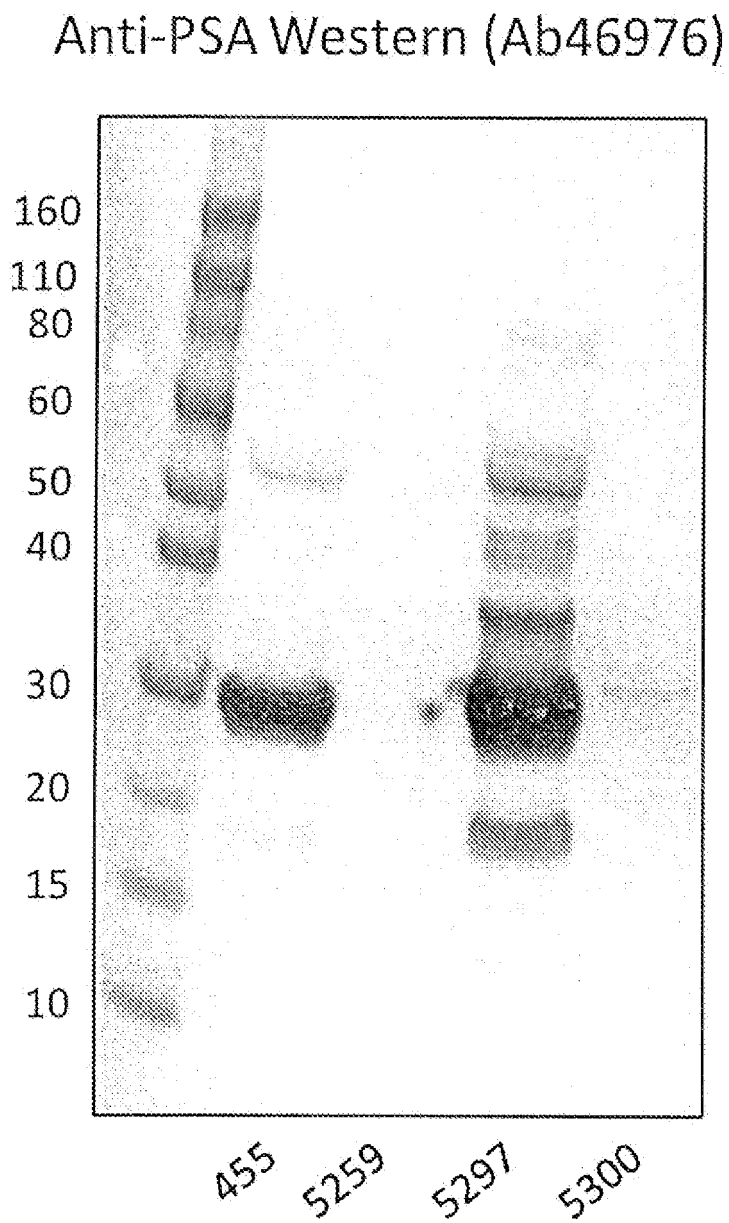

Anti-PSA Western (Ab46976)
160
110
80
60
50
40
30
20
15
10
455
5259
5297
5300

FIG. 7A

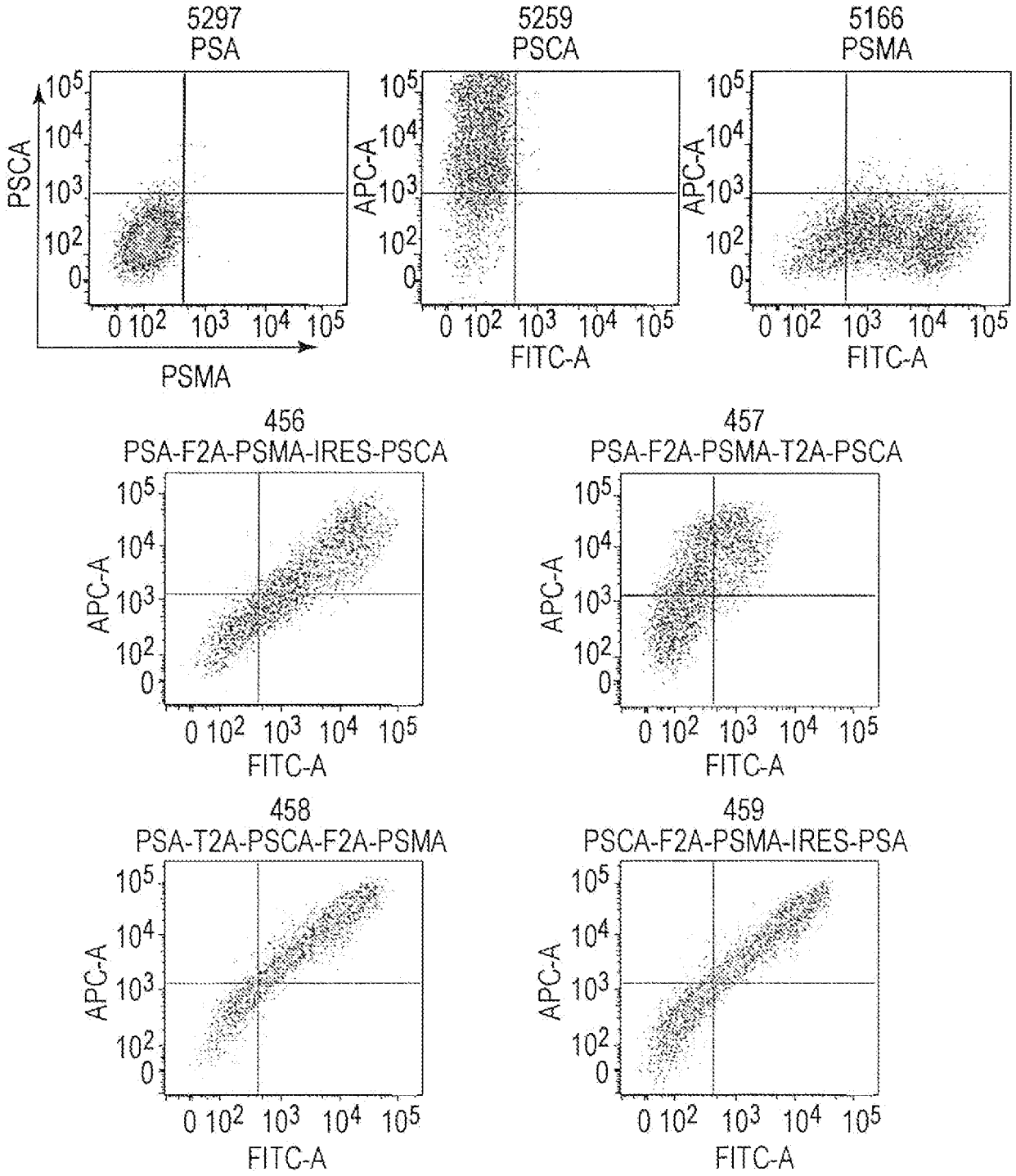

5297
PSA
PSCA
PSMA
5259
PSCA
APC-A
FITC-A
5166
PSMA
APC-A
FITC-A
456
PSA-F2A-PSMA-IRES-PSCA
APC-A
FITC-A
457
PSA-F2A-PSMA-T2A-PSCA
APC-A
FITC-A
458
PSA-T2A-PSCA-F2A-PSMA
APC-A
FITC-A
459
PSCA-F2A-PSMA-IRES-PSA
APC-A
FITC-A

FIG. 7B

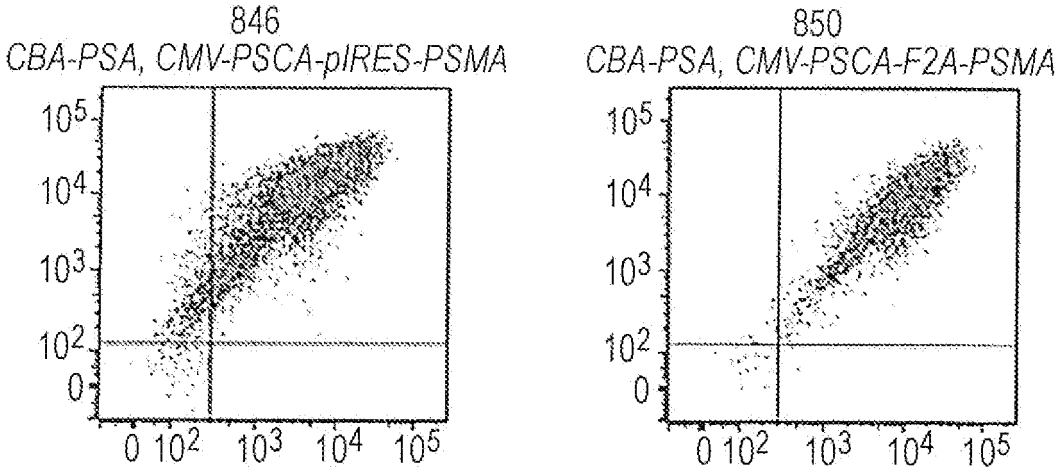

846
CBA-PSA, CMV-PSCA-pIRES-PSMA
10^5
10^4
10^3
10^2
0
0 10^2 10^3 10^4 10^5
850
CBA-PSA, CMV-PSCA-F2A-PSMA
10^5
10^4
10^3
10^2
0
0 10^2 10^3 10^4 10^5

FIG. 8A

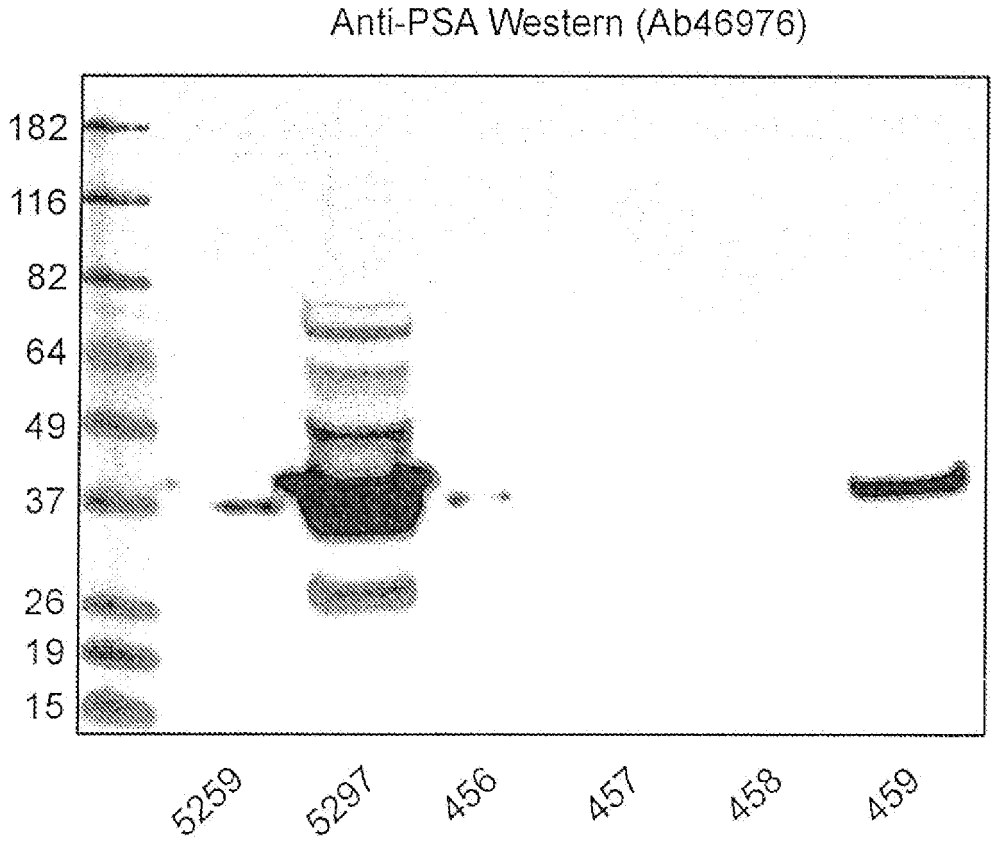

Anti-PSA Western (Ab46976)
182
116
82
64
49
37
26
19
15
5259
5297
456
457
458
459

FIG. 8B

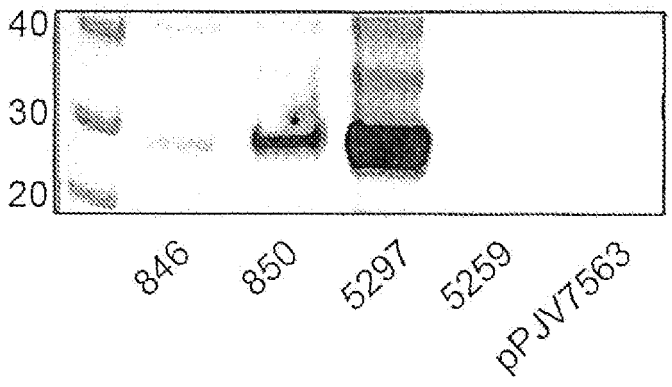

40
30
20
846
850
5297
5259
pPJV7563

FIG. 9A

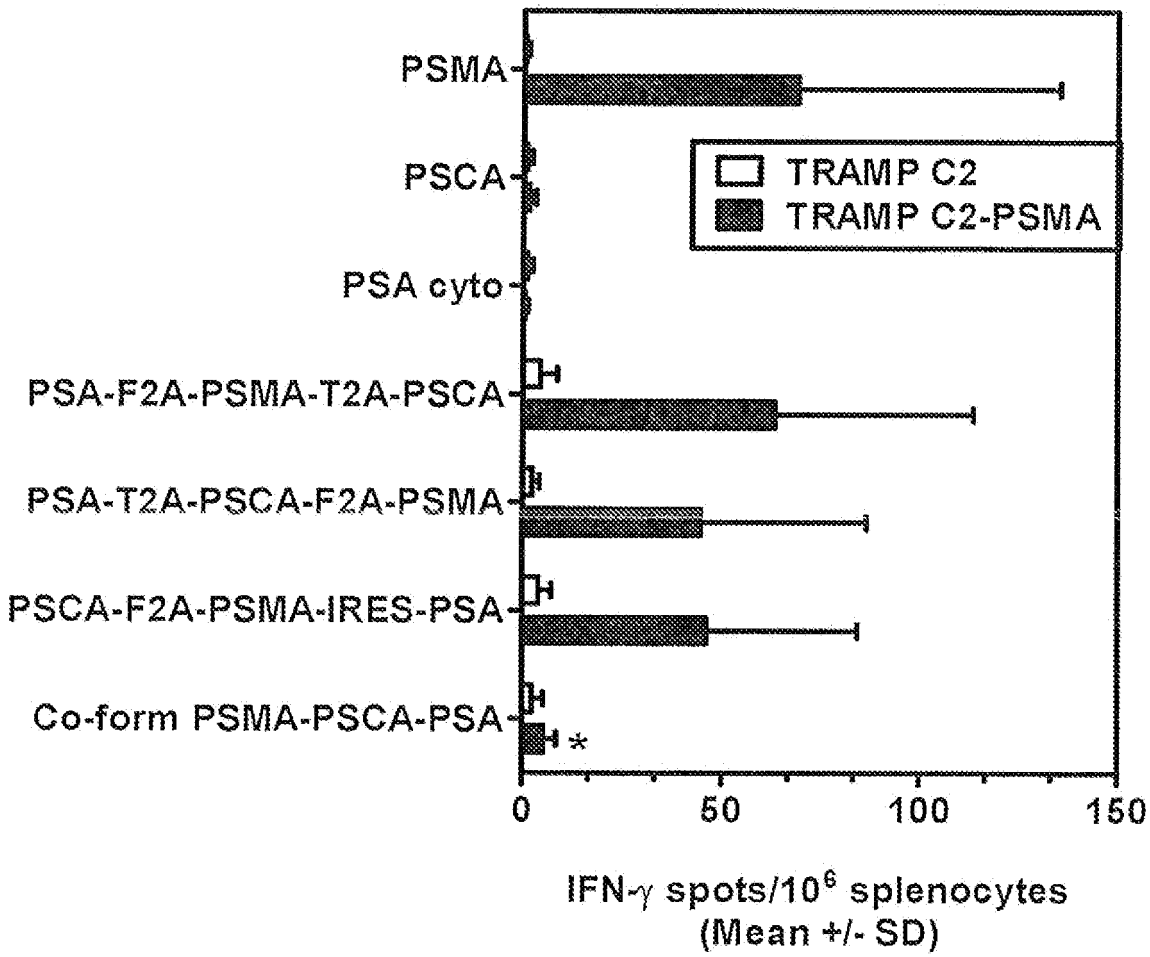

PSMA
PSCA
PSA cyto
PSA-F2A-PSMA-T2A-PSCA
PSA-T2A-PSCA-F2A-PSMA
PSCA-F2A-PSMA-IRES-PSA
Co-form PSMA-PSCA-PSA
*
TRAMP C2
TRAMP C2-PSMA
0
50
100
150
IFN-γ spots/10^6 splenocytes
(Mean +/- SD)

FIG. 9B

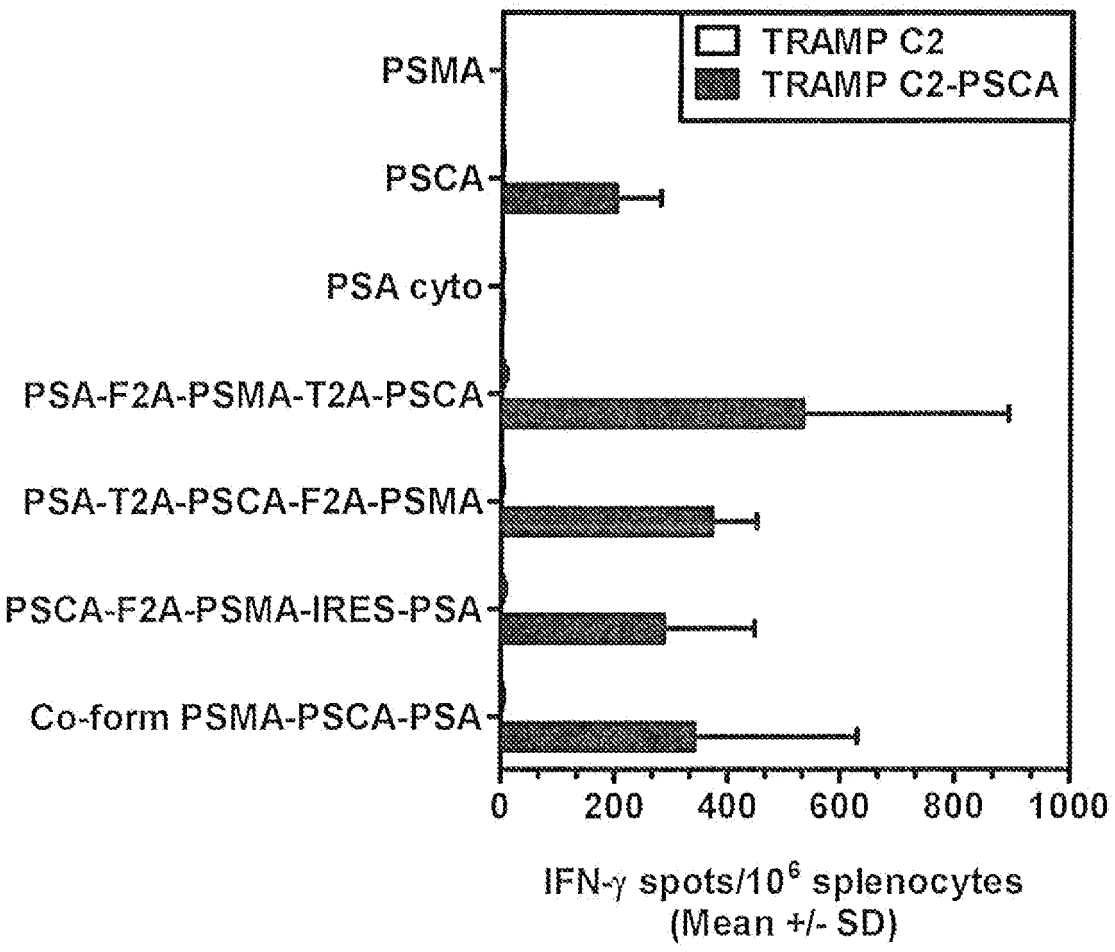

TRAMP C2
TRAMP C2-PSCA
PSMA
PSCA
PSA cyto
PSA-F2A-PSMA-T2A-PSCA
PSA-T2A-PSCA-F2A-PSMA
PSCA-F2A-PSMA-IRES-PSA
Co-form PSMA-PSCA-PSA
0
200
400
600
800
1000
IFN-γ spots/10^6 splenocytes
(Mean +/- SD)

FIG. 9C

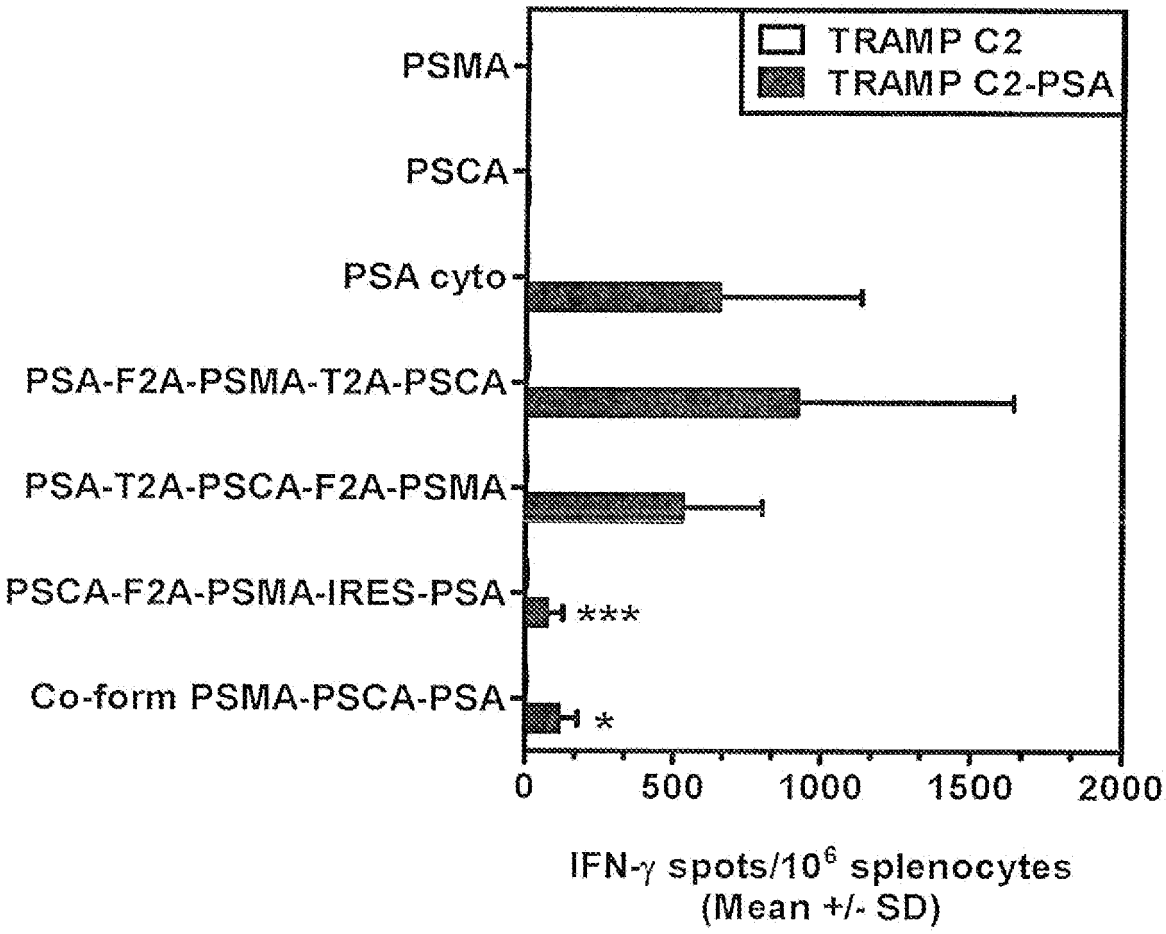

TRAMP C2
TRAMP C2-PSA
PSMA
PSCA
PSA cyto
PSA-F2A-PSMA-T2A-PSCA
PSA-T2A-PSCA-F2A-PSMA
PSCA-F2A-PSMA-IRES-PSA
***
Co-form PSMA-PSCA-PSA
*
0
500
1000
1500
2000
IFN-γ spots/10^6 splenocytes
(Mean +/- SD)

FIG. 9D

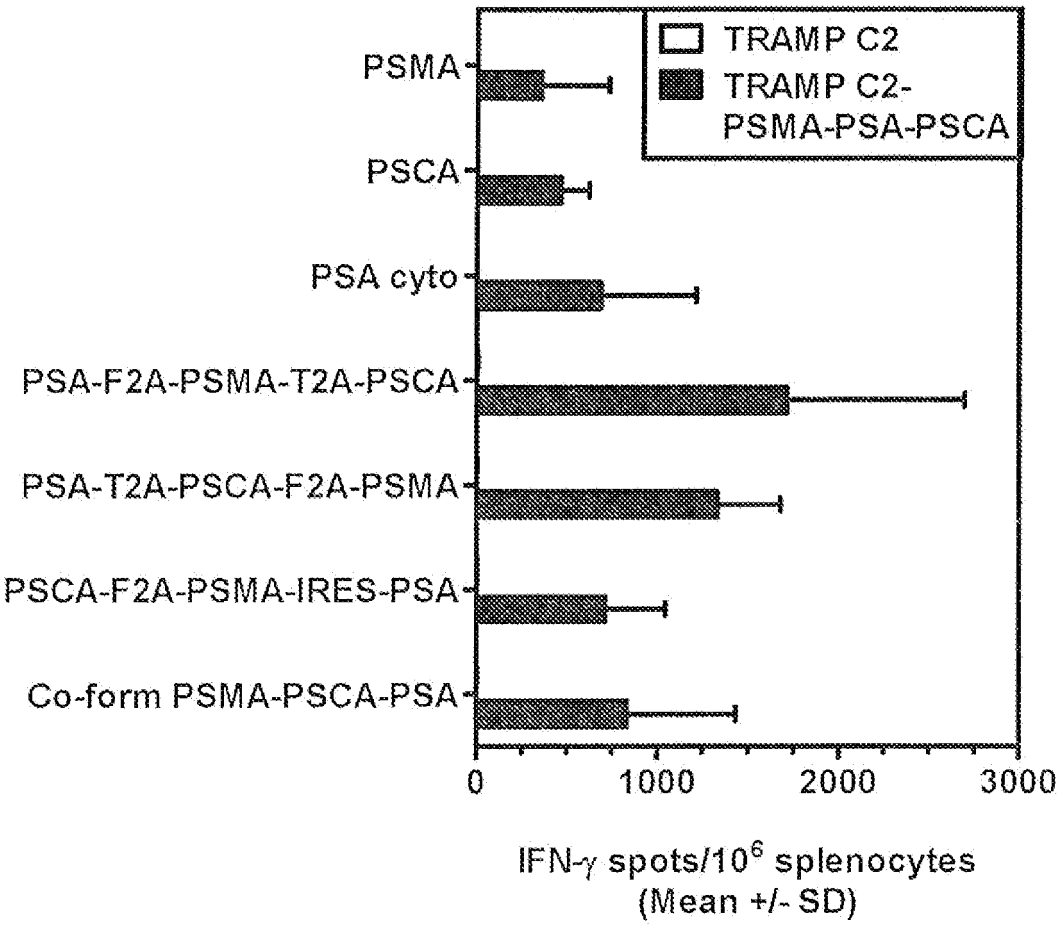

TRAMP C2
TRAMP C2-PSMA-PSA-PSCA
PSMA
PSCA
PSA cyto
PSA-F2A-PSMA-T2A-PSCA
PSA-T2A-PSCA-F2A-PSMA
PSCA-F2A-PSMA-IRES-PSA
Co-form PSMA-PSCA-PSA
0
1000
2000
3000
IFN-γ spots/10^6 splenocytes
(Mean +/- SD)

FIG. 10A

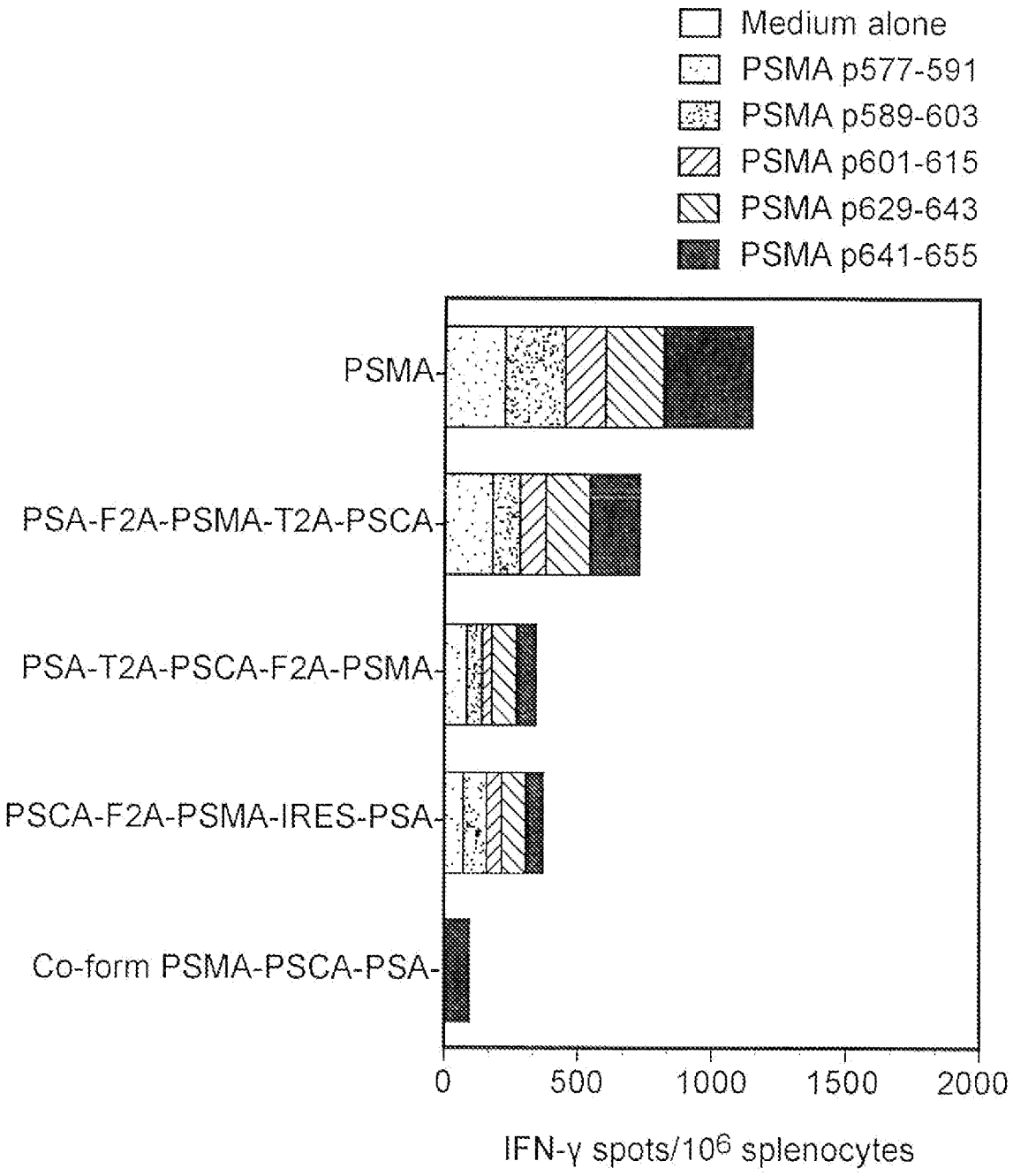

Medium alone
PSMA p577-591
PSMA p589-603
PSMA p601-615
PSMA p629-643
PSMA p641-655
PSMA-
PSA-F2A-PSMA-T2A-PSCA-
PSA-T2A-PSCA-F2A-PSMA-
PSCA-F2A-PSMA-IRES-PSA-
Co-form PSMA-PSCA-PSA-
0
500
1000
1500
2000
IFN-γ spots/10^6 splenocytes

FIG. 10B

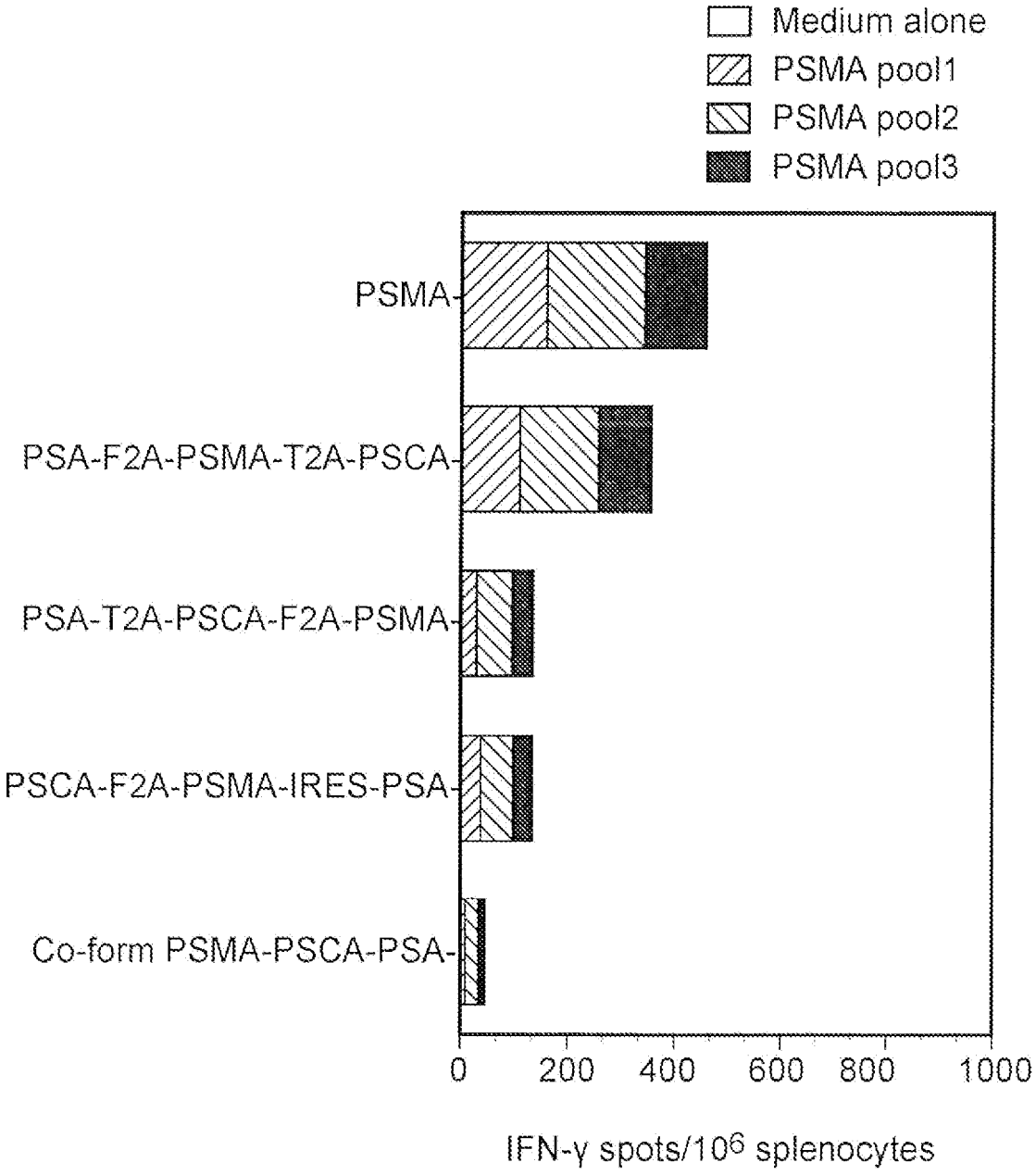

Medium alone
PSMA pool1
PSMA pool2
PSMA pool3
PSMA-
PSA-F2A-PSMA-T2A-PSCA-
PSA-T2A-PSCA-F2A-PSMA-
PSCA-F2A-PSMA-IRES-PSA-
Co-form PSMA-PSCA-PSA-
0
200
400
600
800
1000
IFN-γ spots/10^6 splenocytes

FIG. 10C

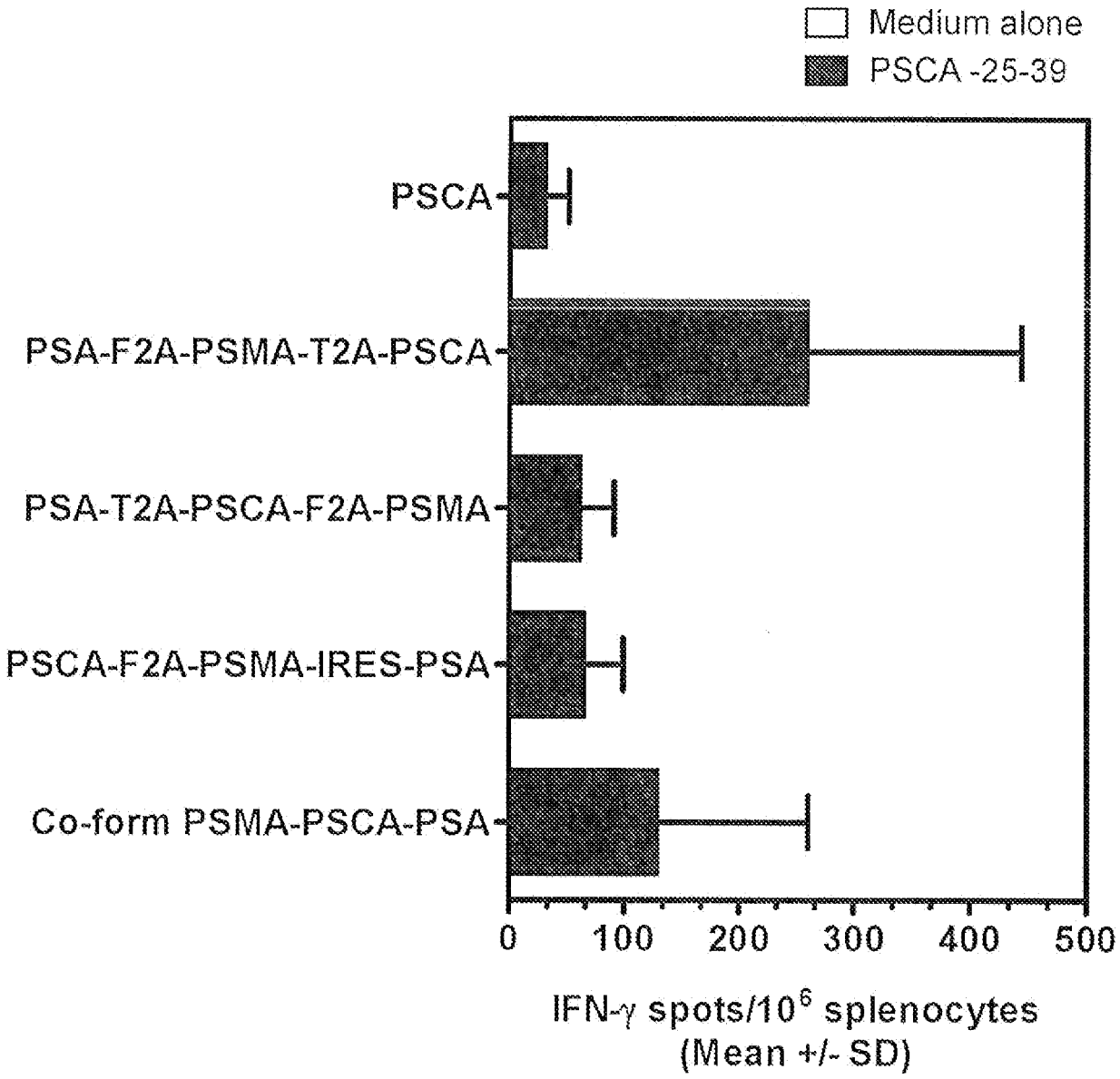

Medium alone
PSCA -25-39
PSCA
PSA-F2A-PSMA-T2A-PSCA
PSA-T2A-PSCA-F2A-PSMA
PSCA-F2A-PSMA-IRES-PSA
Co-form PSMA-PSCA-PSA
0
100
200
300
400
500
IFN-γ spots/10^6 splenocytes
(Mean +/- SD)

FIG. 10D

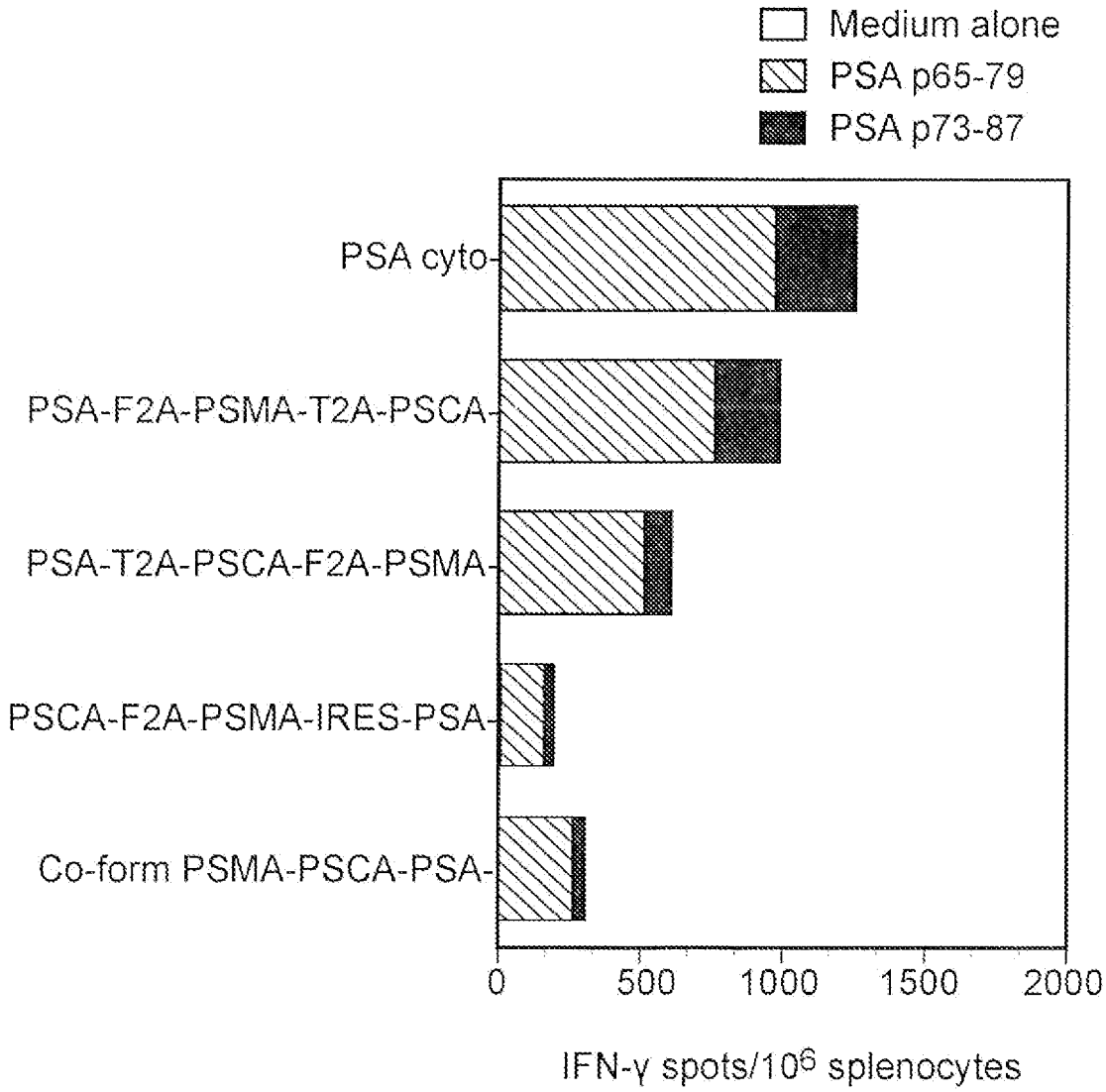

Medium alone
PSA p65-79
PSA p73-87
PSA cyto-
PSA-F2A-PSMA-T2A-PSCA-
PSA-T2A-PSCA-F2A-PSMA-
PSCA-F2A-PSMA-IRES-PSA-
Co-form PSMA-PSCA-PSA-
0
500
1000
1500
2000
IFN-γ spots/10^6 splenocytes

FIG. 11

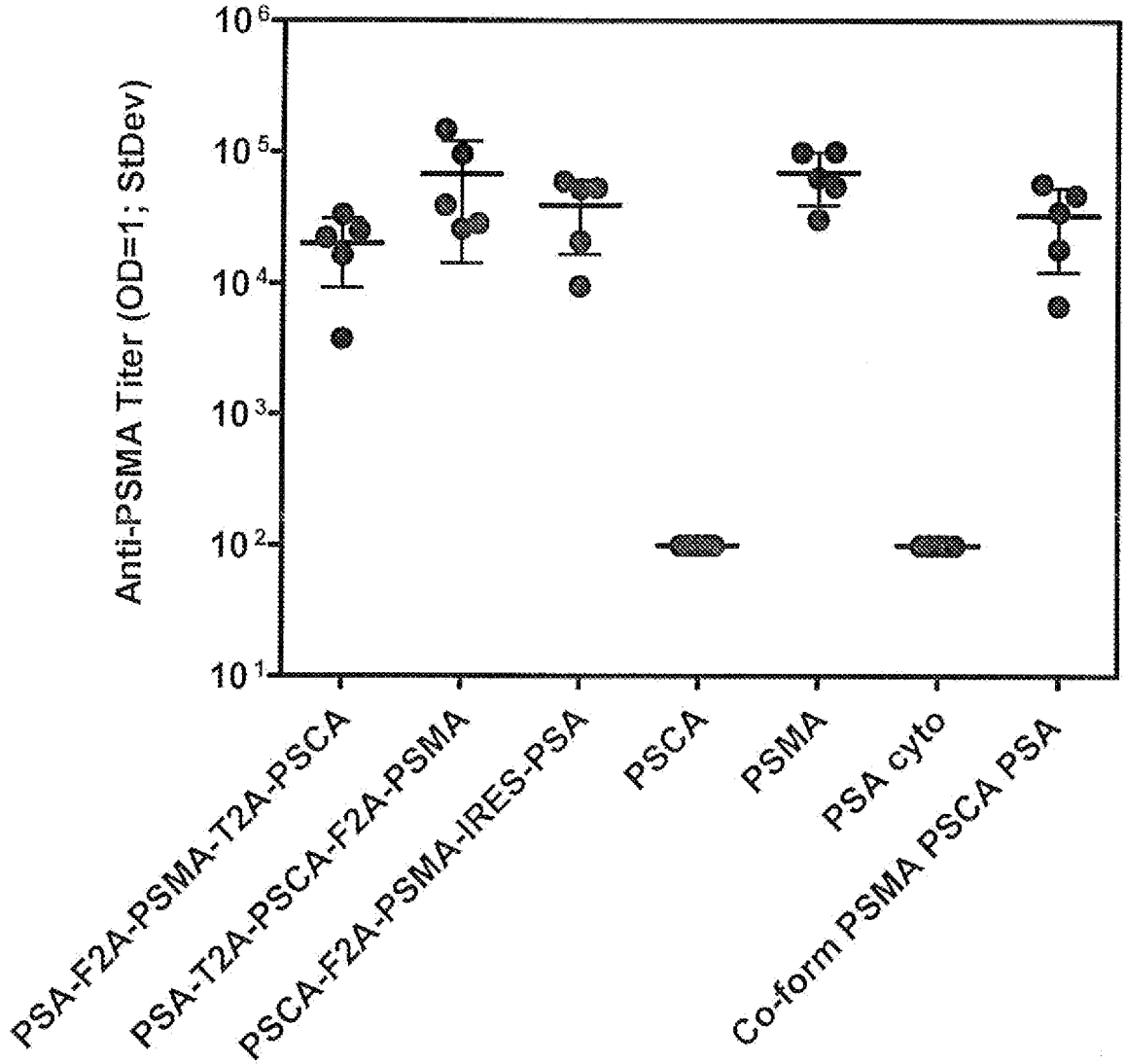

Anti-PSMA Titer (OD=1; StDev)
10^6
10^5
10^4
10^3
10^2
10^1
PSA-F2A-PSMA-T2A-PSCA
PSA-T2A-PSCA-F2A-PSMA
PSCA-F2A-PSMA-IRES-PSA
PSCA
PSMA
PSA cyto
Co-form PSMA PSCA PSA

FIG. 12

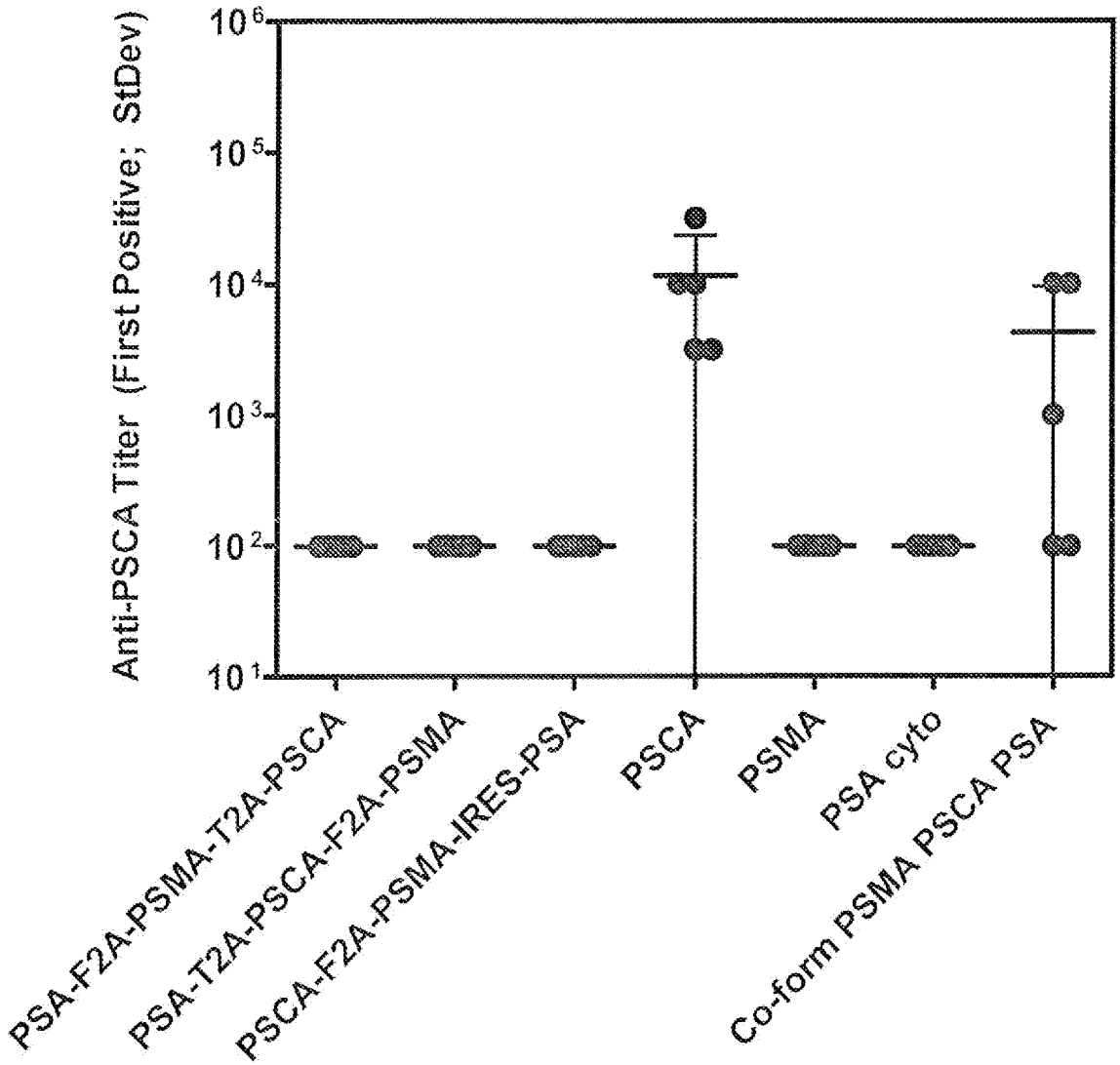

Anti-PSCA Titer (First Positive; StDev)
10^6
10^5
10^4
10^3
10^2
10^1
PSA-F2A-PSMA-T2A-PSCA
PSA-T2A-PSCA-F2A-PSMA
PSCA-F2A-PSMA-IRES-PSA
PSCA
PSMA
PSA cyto
Co-form PSMA PSCA PSA

FIG. 13

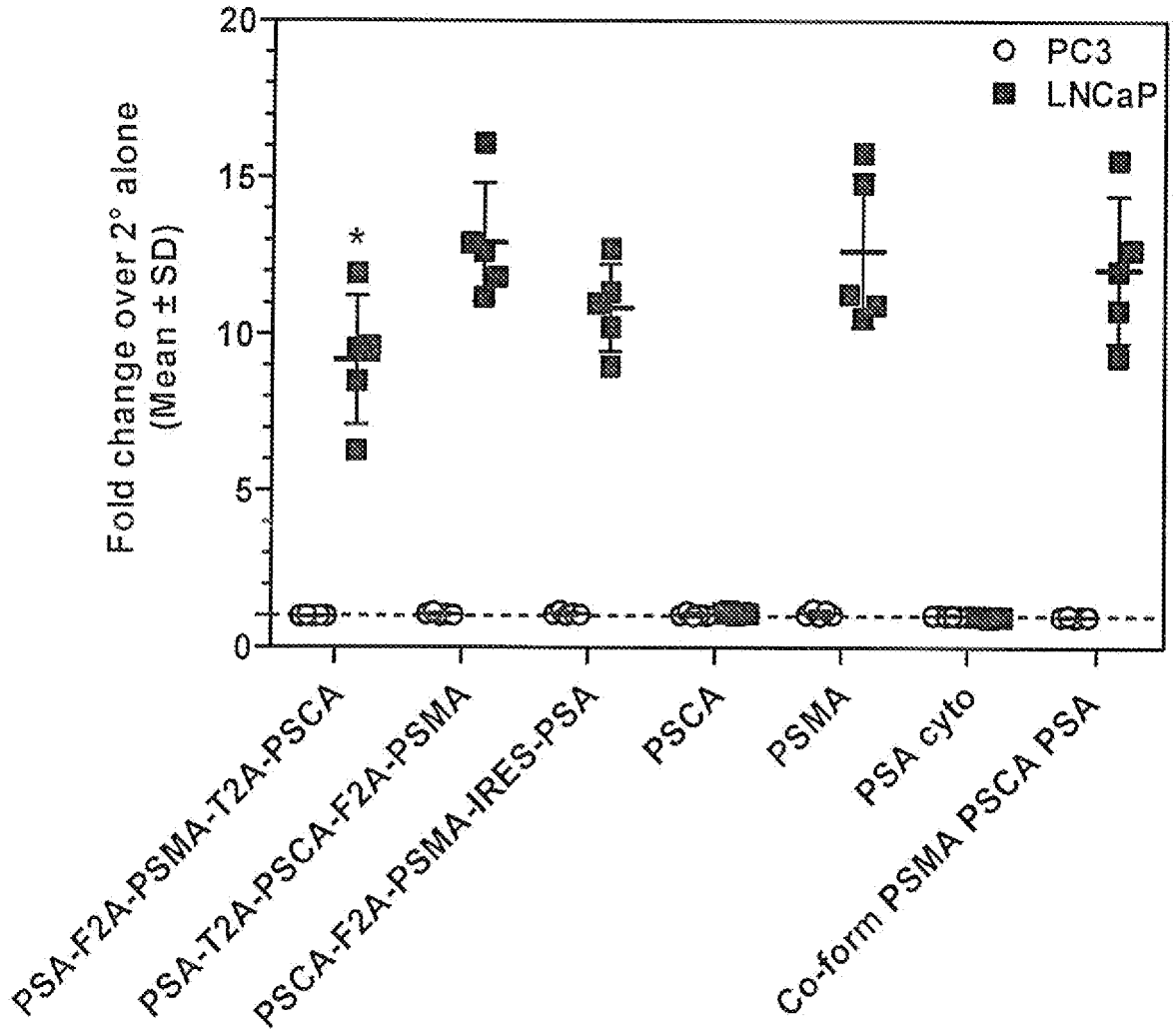

Fold change over 2° alone
(Mean ± SD)
20
15
10
5
0
*
PC3
LNCaP
PSA-F2A-PSMA-T2A-PSCA
PSA-T2A-PSCA-F2A-PSMA
PSCA-F2A-PSMA-IRES-PSA
PSCA
PSMA
PSA cyto
Co-form PSMA PSCA PSA

FIG. 14

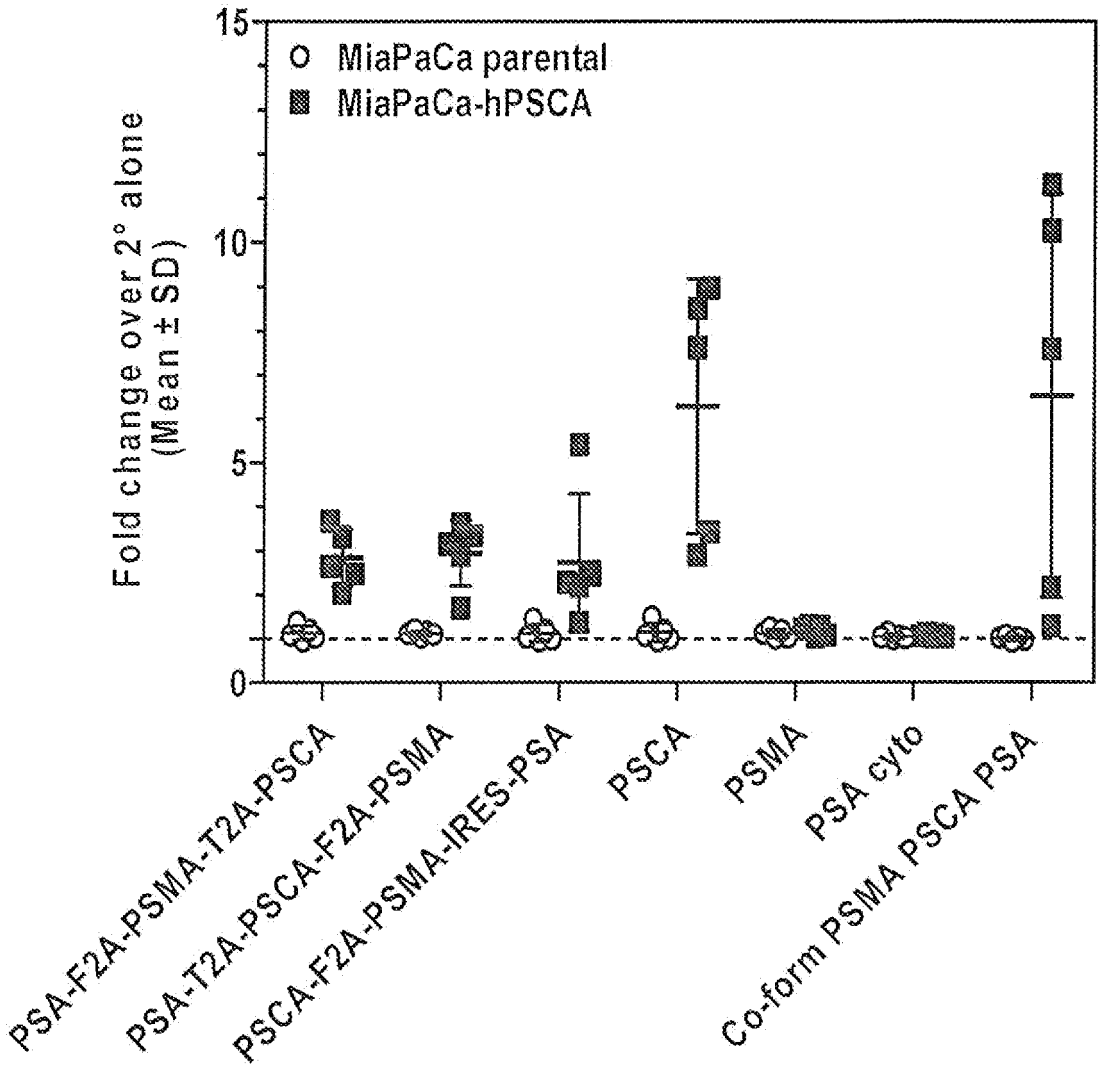

15
10
5
0
MiaPaCa parental
MiaPaCa-hPSCA
Fold change over 2° alone
(Mean ± SD)
PSA-F2A-PSMA-T2A-PSCA
PSA-T2A-PSCA-F2A-PSMA
PSCA-F2A-PSMA-IRES-PSA
PSCA
PSMA
PSA cyto
Co-form PSMA PSCA PSA

FIG. 15A

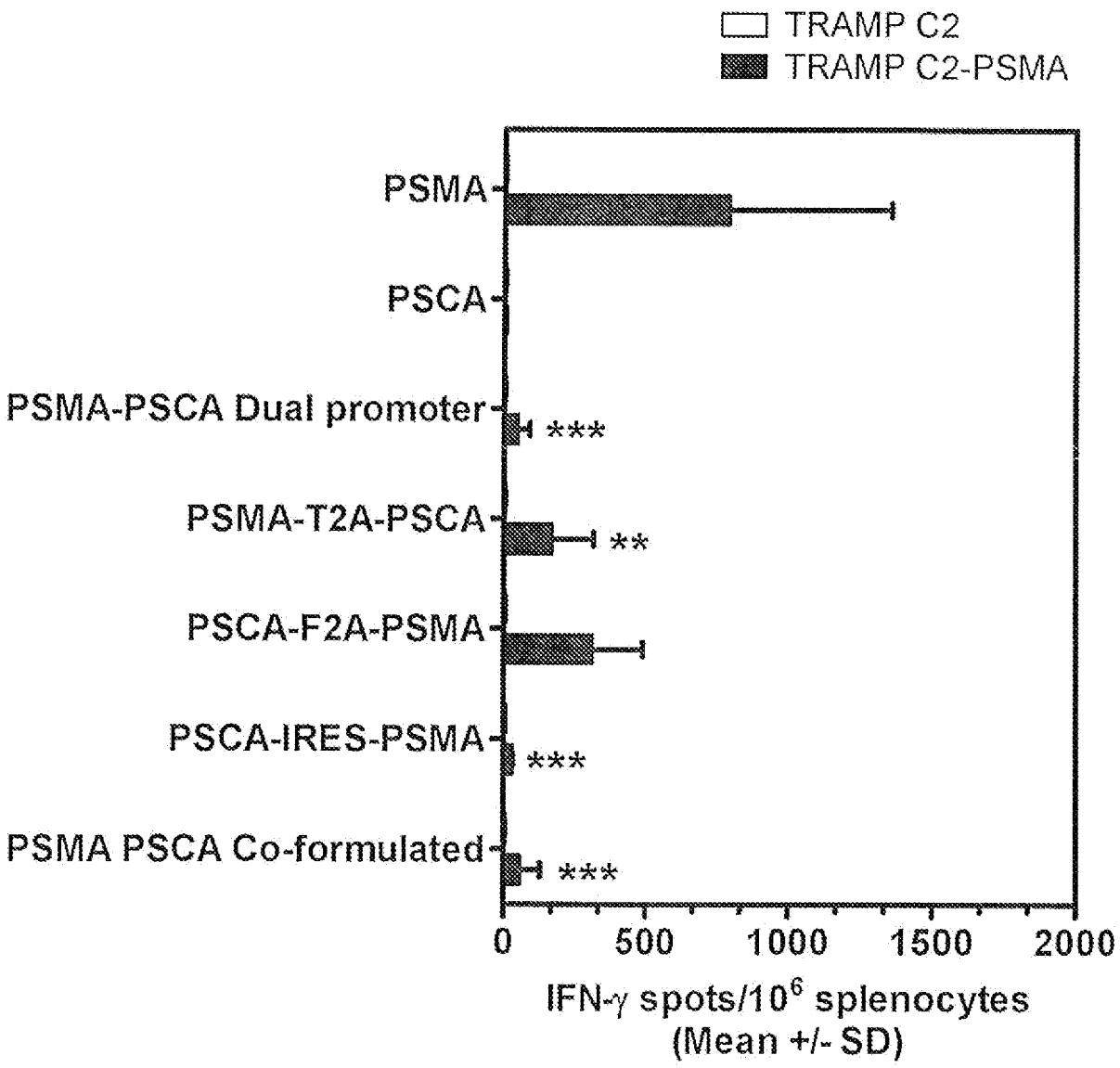

TRAMP C2
TRAMP C2-PSMA
PSMA
PSCA
PSMA-PSCA Dual promoter
***
PSMA-T2A-PSCA
**
PSCA-F2A-PSMA
PSCA-IRES-PSMA
***
PSMA PSCA Co-formulated
***
0
500
1000
1500
2000
IFN-γ spots/10^6 splenocytes
(Mean +/- SD)

FIG. 15B

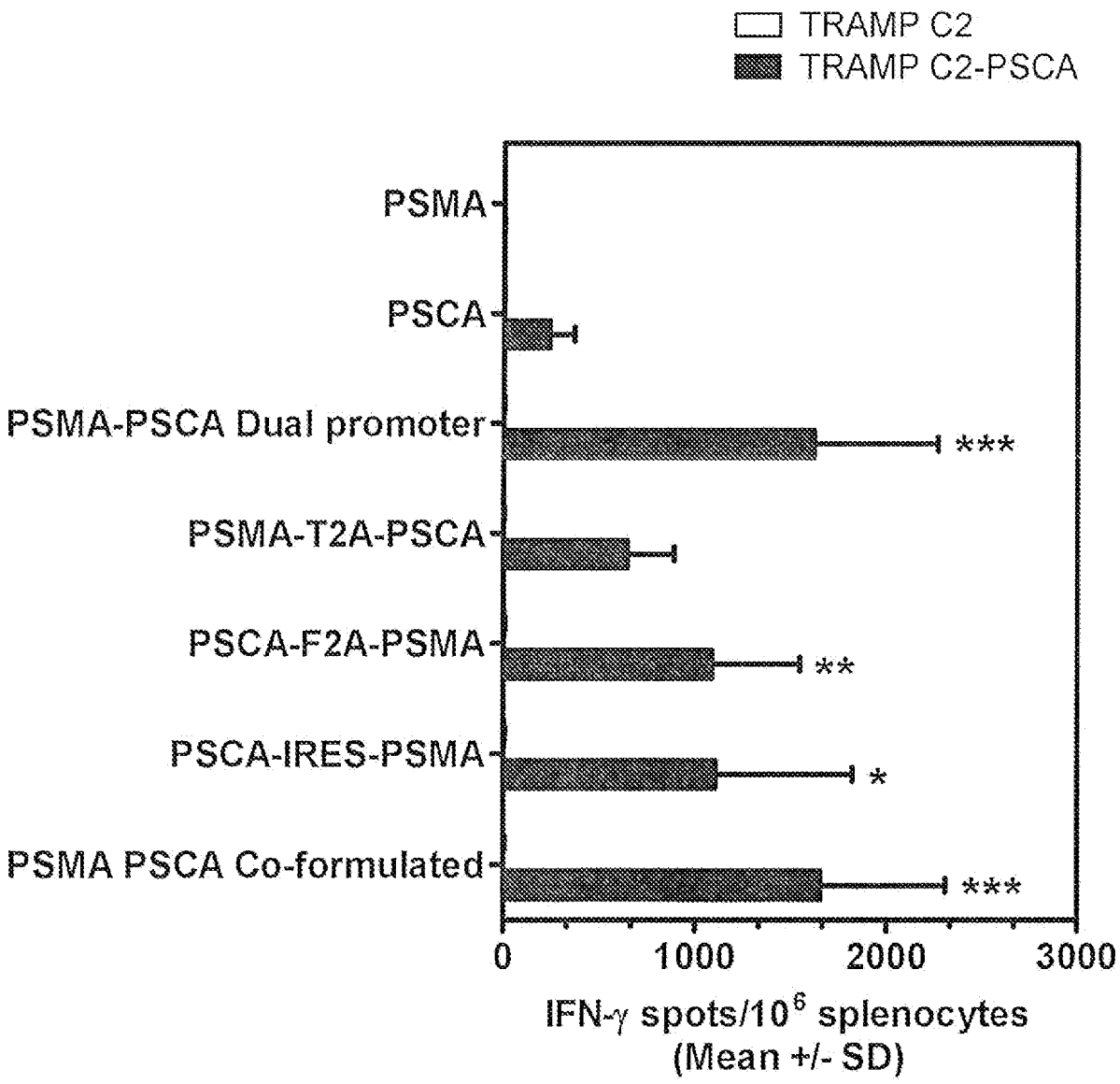

TRAMP C2
TRAMP C2-PSCA
PSMA
PSCA
PSMA-PSCA Dual promoter
PSMA-T2A-PSCA
PSCA-F2A-PSMA
PSCA-IRES-PSMA
PSMA PSCA Co-formulated
***
**
*
***
0
1000
2000
3000
IFN-γ spots/10^6 splenocytes
(Mean +/- SD)

FIG. 15C

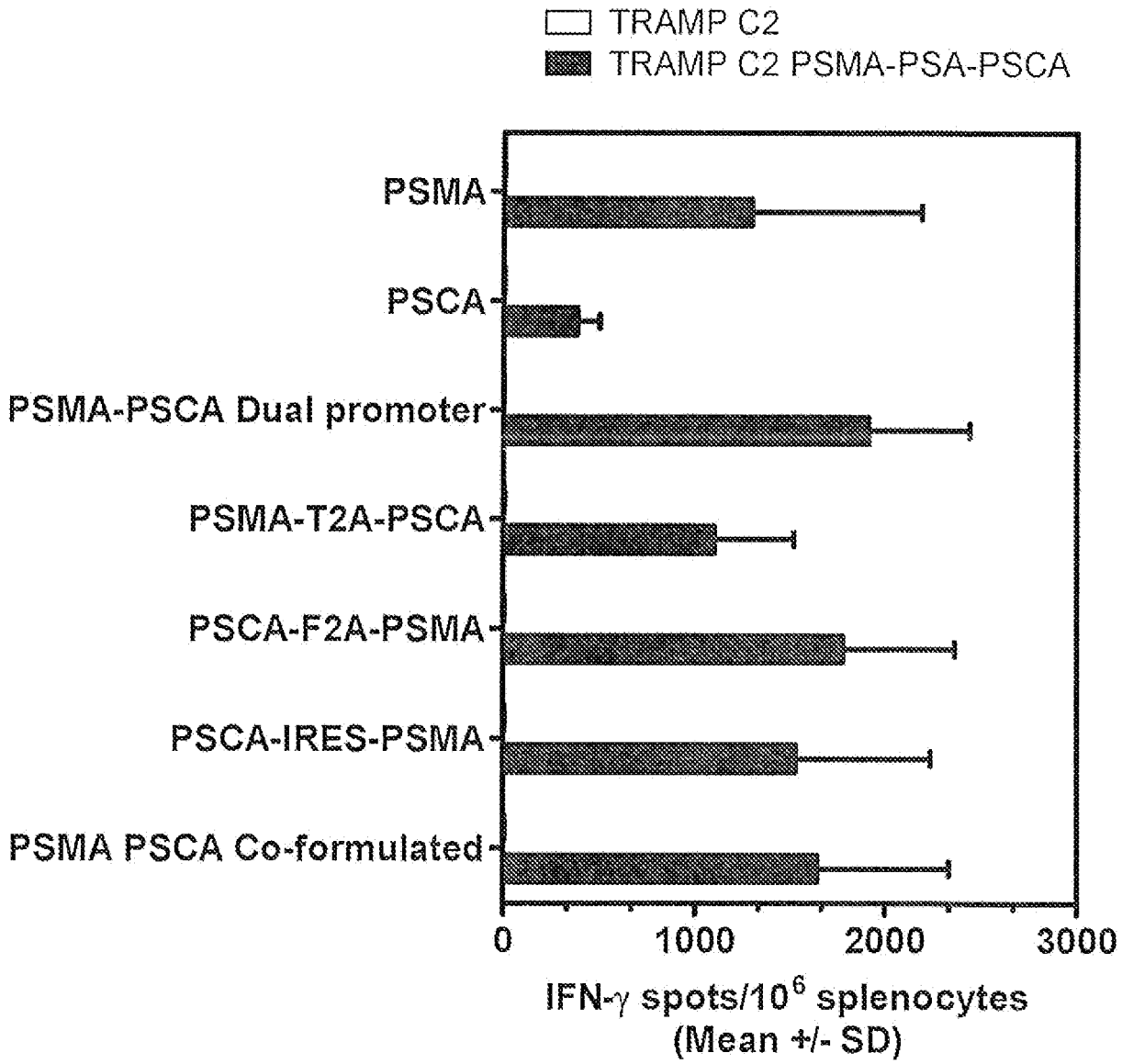

TRAMP C2
TRAMP C2 PSMA-PSA-PSCA
PSMA
PSCA
PSMA-PSCA Dual promoter
PSMA-T2A-PSCA
PSCA-F2A-PSMA
PSCA-IRES-PSMA
PSMA PSCA Co-formulated
0
1000
2000
3000
IFN-γ spots/10^6 splenocytes
(Mean +/- SD)

FIG. 16A

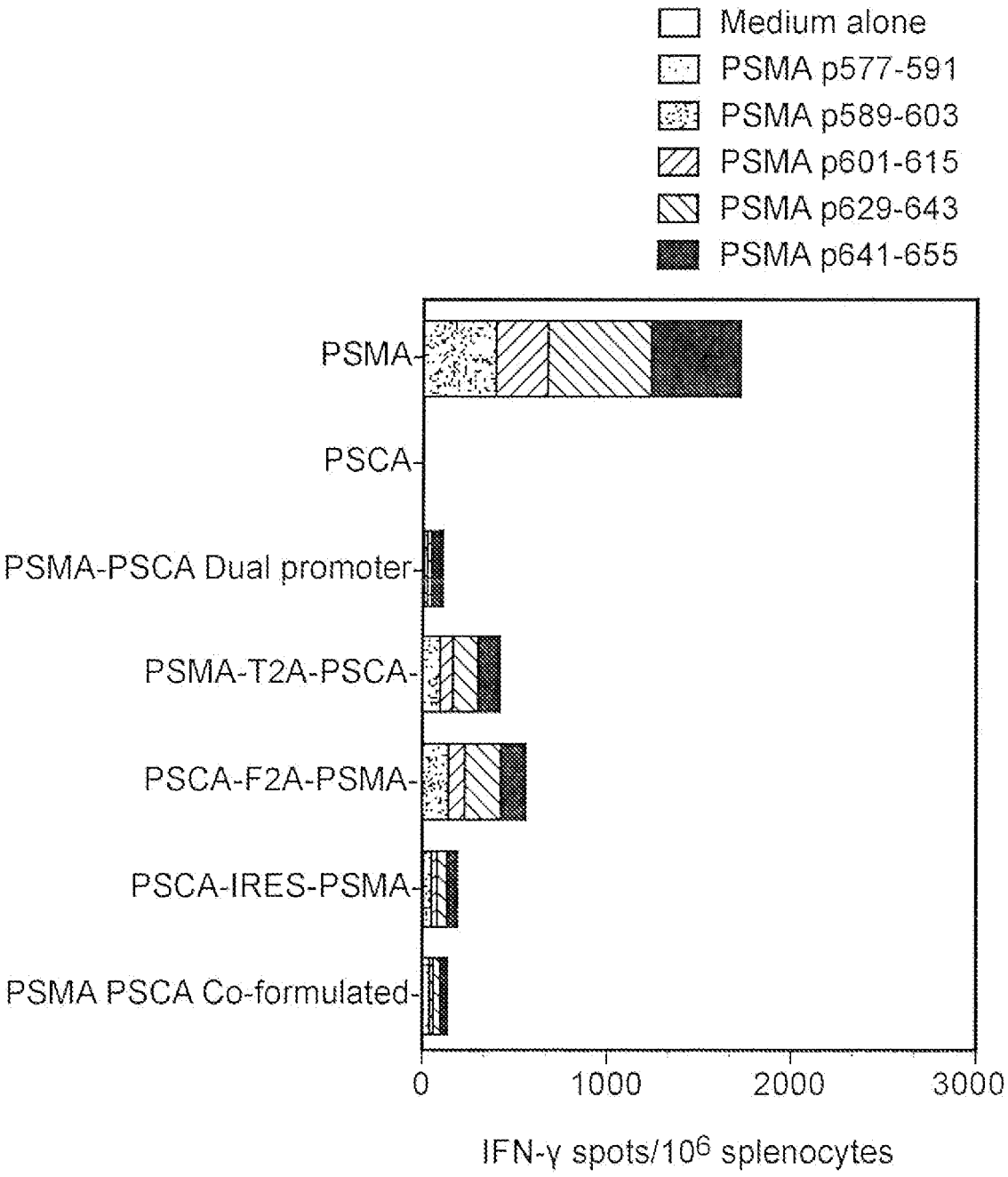

Medium alone
PSMA p577-591
PSMA p589-603
PSMA p601-615
PSMA p629-643
PSMA p641-655
PSMA-
PSCA-
PSMA-PSCA Dual promoter-
PSMA-T2A-PSCA-
PSCA-F2A-PSMA-
PSCA-IRES-PSMA-
PSMA PSCA Co-formulated-
0
1000
2000
3000
IFN-γ spots/10^6 splenocytes

FIG. 16B

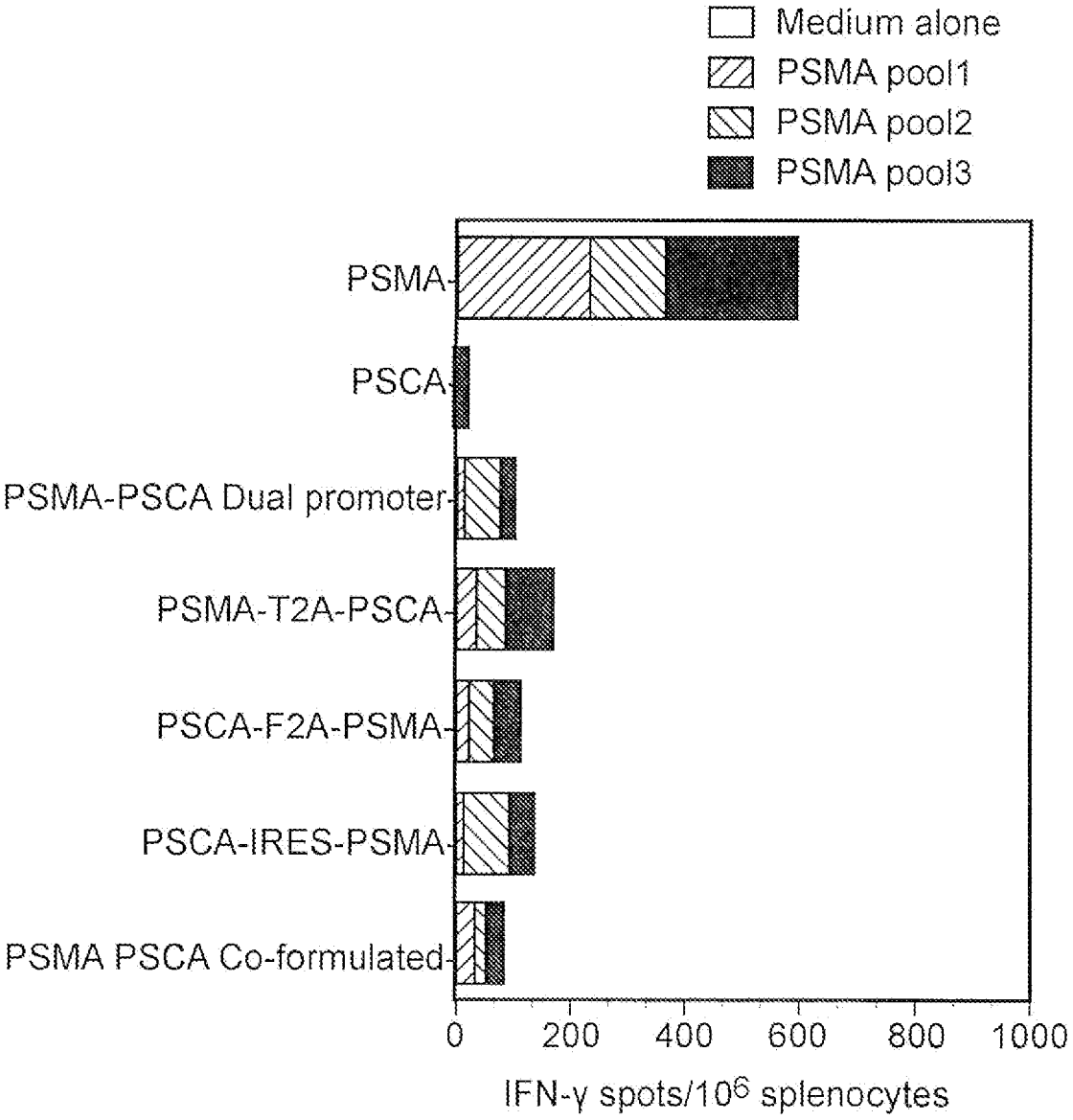

Medium alone
PSMA pool1
PSMA pool2
PSMA pool3
PSMA
PSCA
PSMA-PSCA Dual promoter
PSMA-T2A-PSCA
PSCA-F2A-PSMA
PSCA-IRES-PSMA
PSMA PSCA Co-formulated
0
200
400
600
800
1000
IFN-γ spots/10^6 splenocytes

FIG. 16C

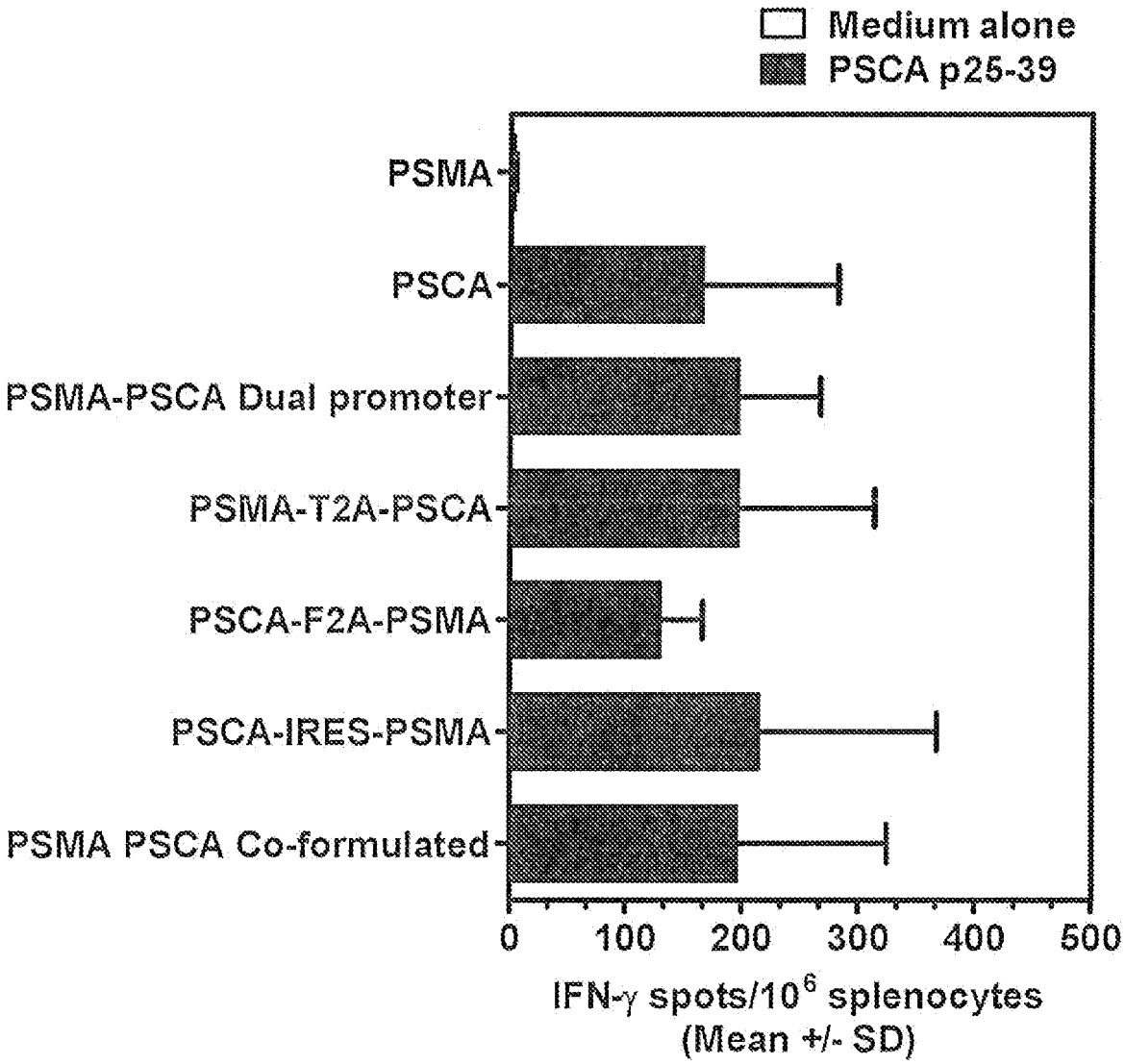

Medium alone
PSCA p25-39
PSMA
PSCA
PSMA-PSCA Dual promoter
PSMA-T2A-PSCA
PSCA-F2A-PSMA
PSCA-IRES-PSMA
PSMA PSCA Co-formulated
0
100
200
300
400
500
IFN-γ spots/10^6 splenocytes
(Mean +/- SD)

FIG. 17

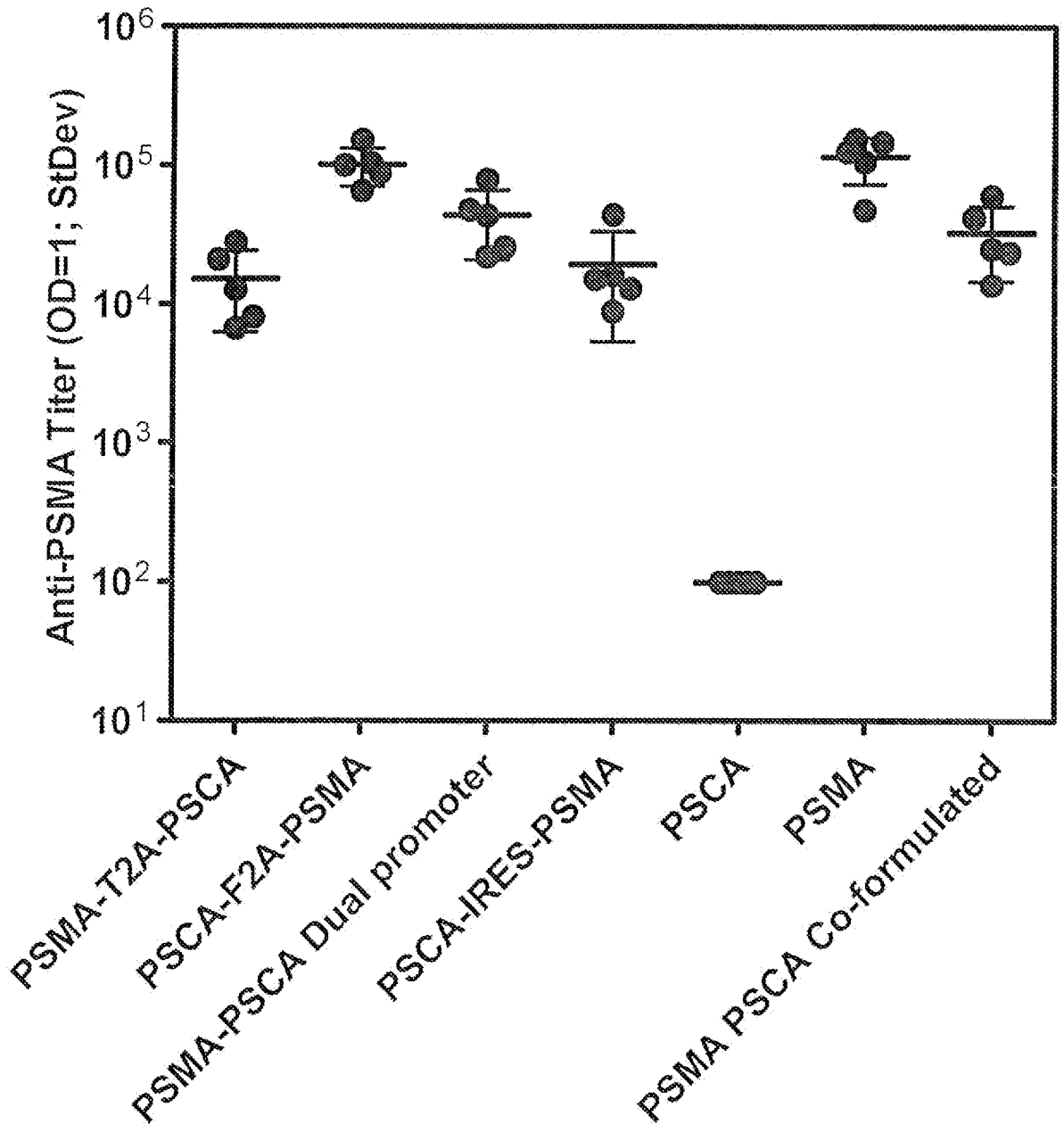

Anti-PSMA Titer (OD=1; StDev)
10^6
10^5
10^4
10^3
10^2
10^1
PSMA-T2A-PSCA
PSCA-F2A-PSMA
PSMA-PSCA Dual promoter
PSCA-IRES-PSMA
PSCA
PSMA
PSMA PSCA Co-formulated

FIG. 18

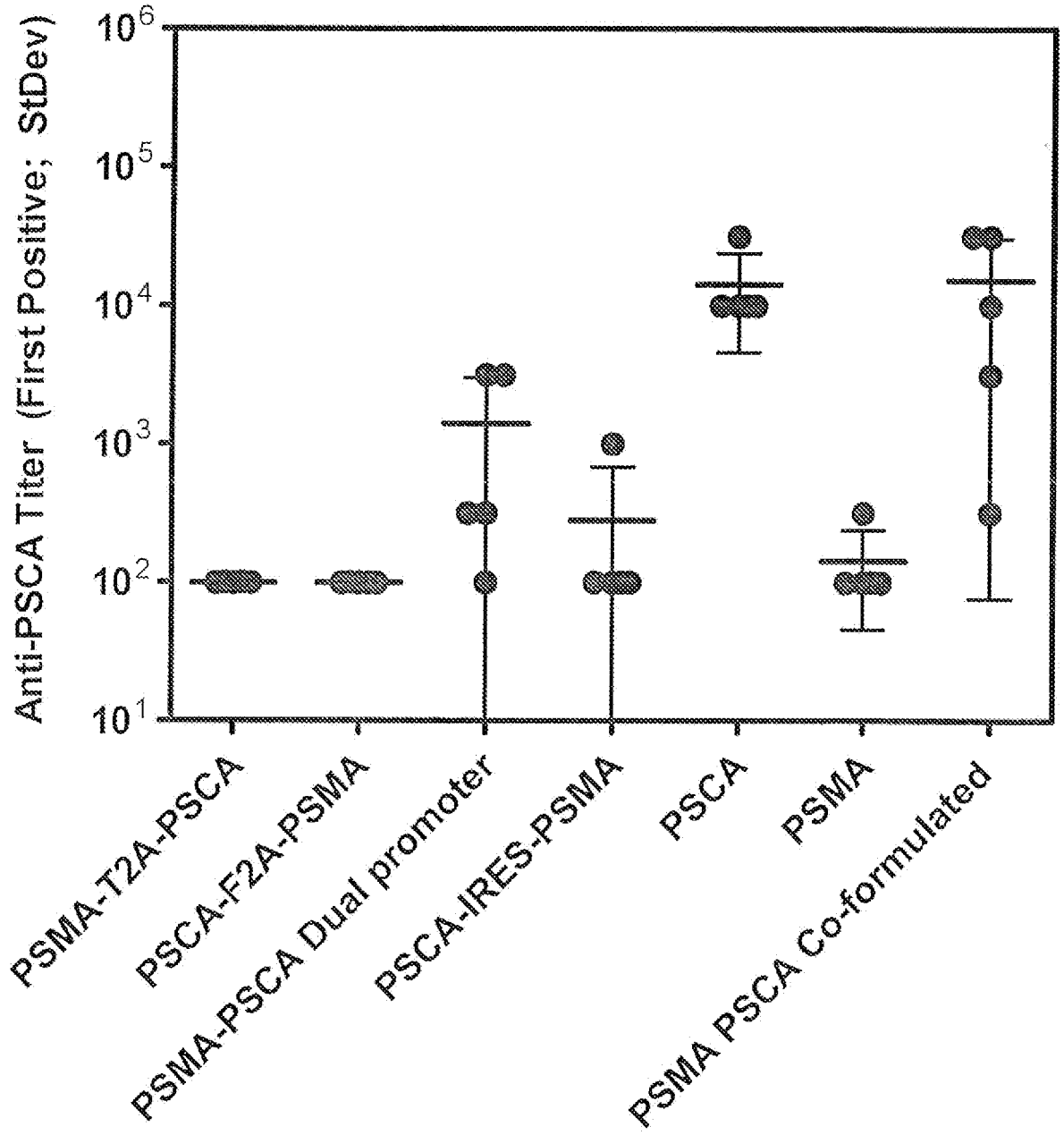

Anti-PSCA Titer (First Positive; StDev)
10^6
10^5
10^4
10^3
10^2
10^1
PSMA-T2A-PSCA
PSCA-F2A-PSMA
PSMA-PSCA Dual promoter
PSCA-IRES-PSMA
PSCA
PSMA
PSMA PSCA Co-formulated

FIG. 19

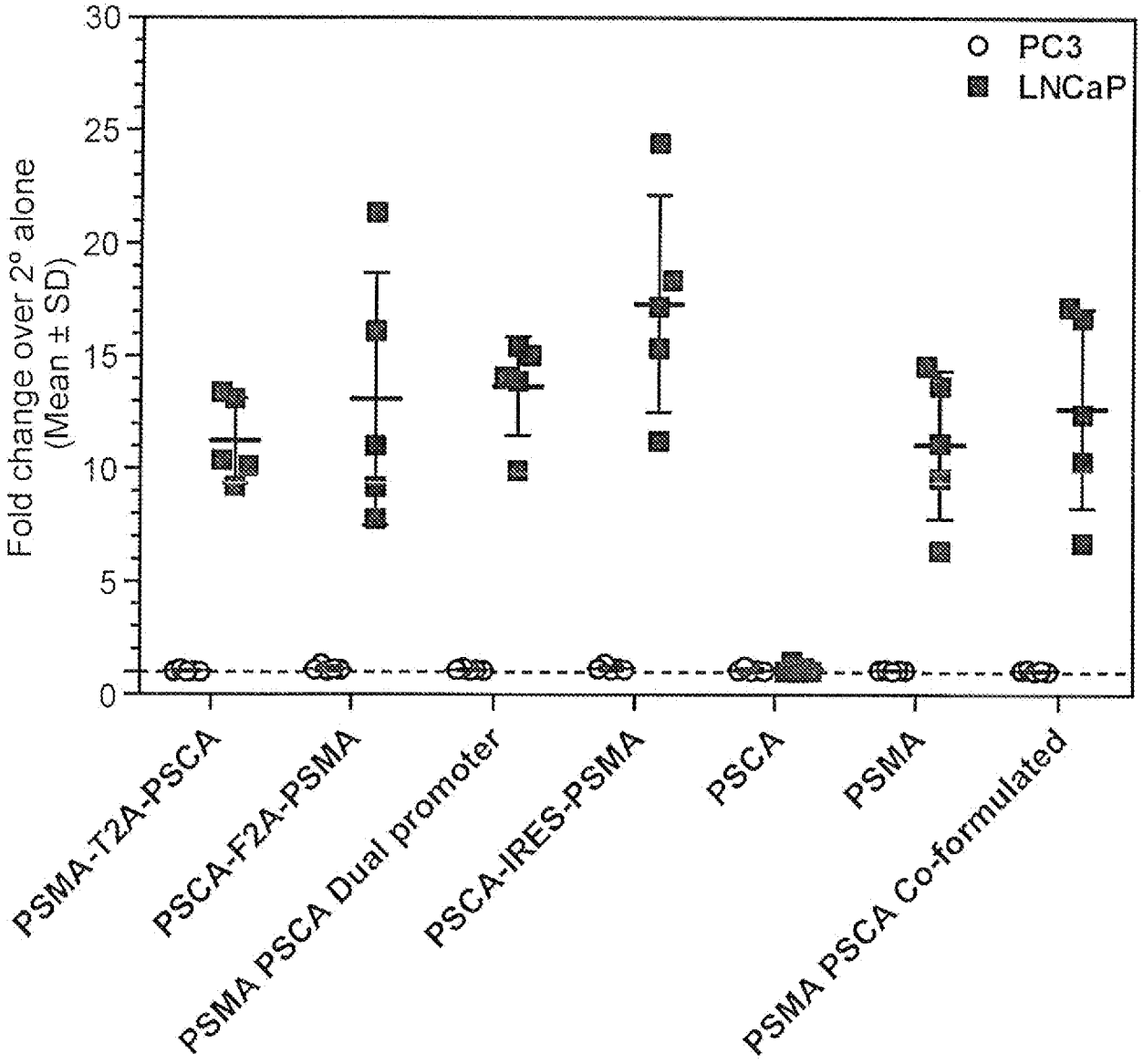

Fold change over 2° alone
(Mean ± SD)
30
25
20
15
10
5
0
PC3
LNCaP
PSMA-T2A-PSCA
PSCA-F2A-PSMA
PSMA PSCA Dual promoter
PSCA-IRES-PSMA
PSCA
PSMA
PSMA PSCA Co-formulated

FIG. 20

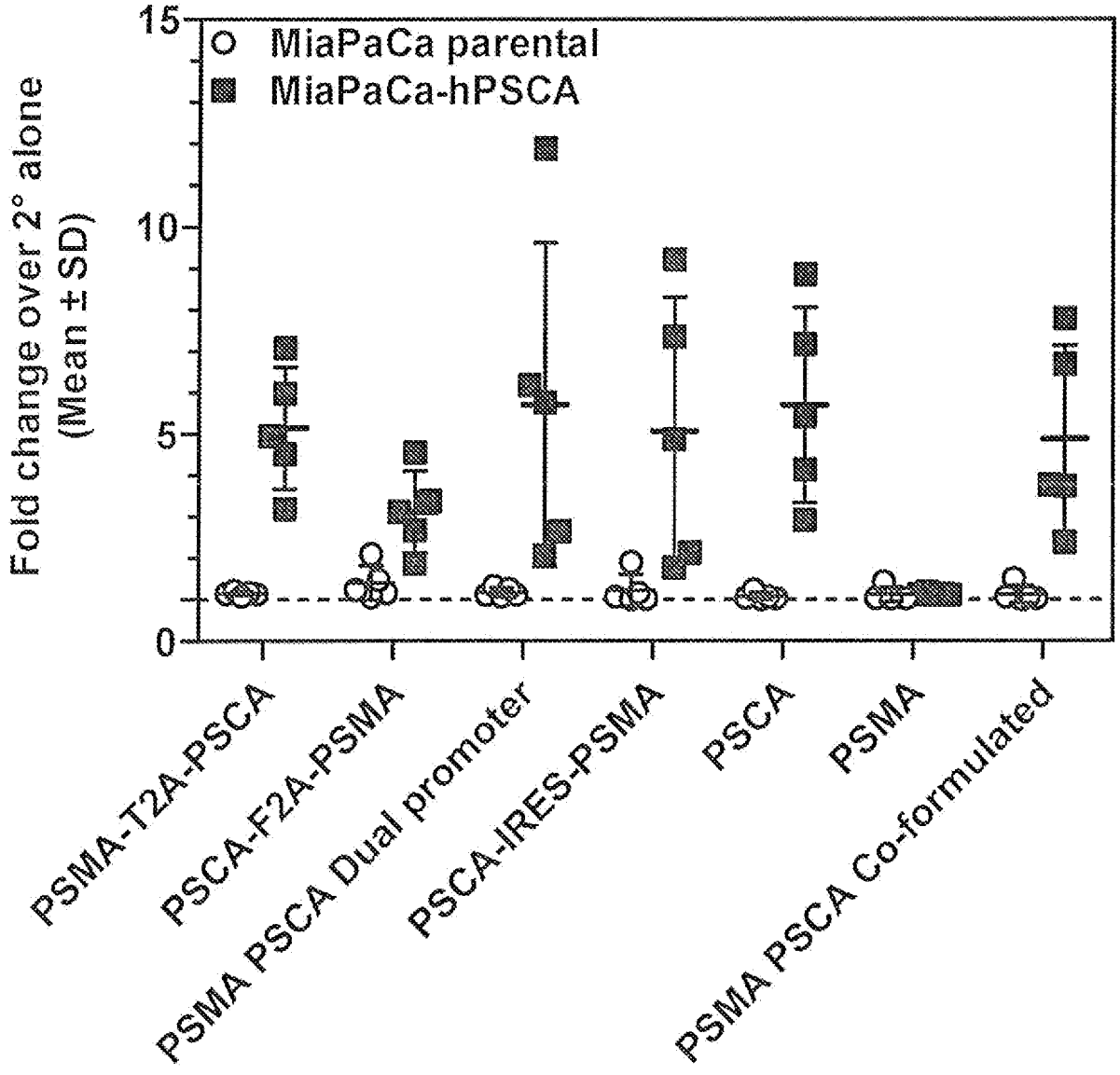

Fold change over 2° alone
(Mean ± SD)
15
10
5
0
MiaPaCa parental
MiaPaCa-hPSCA
PSMA-T2A-PSCA
PSCA-F2A-PSMA
PSMA PSCA Dual promoter
PSCA-IRES-PSMA
PSCA
PSMA
PSMA PSCA Co-formulated

FIG. 21A

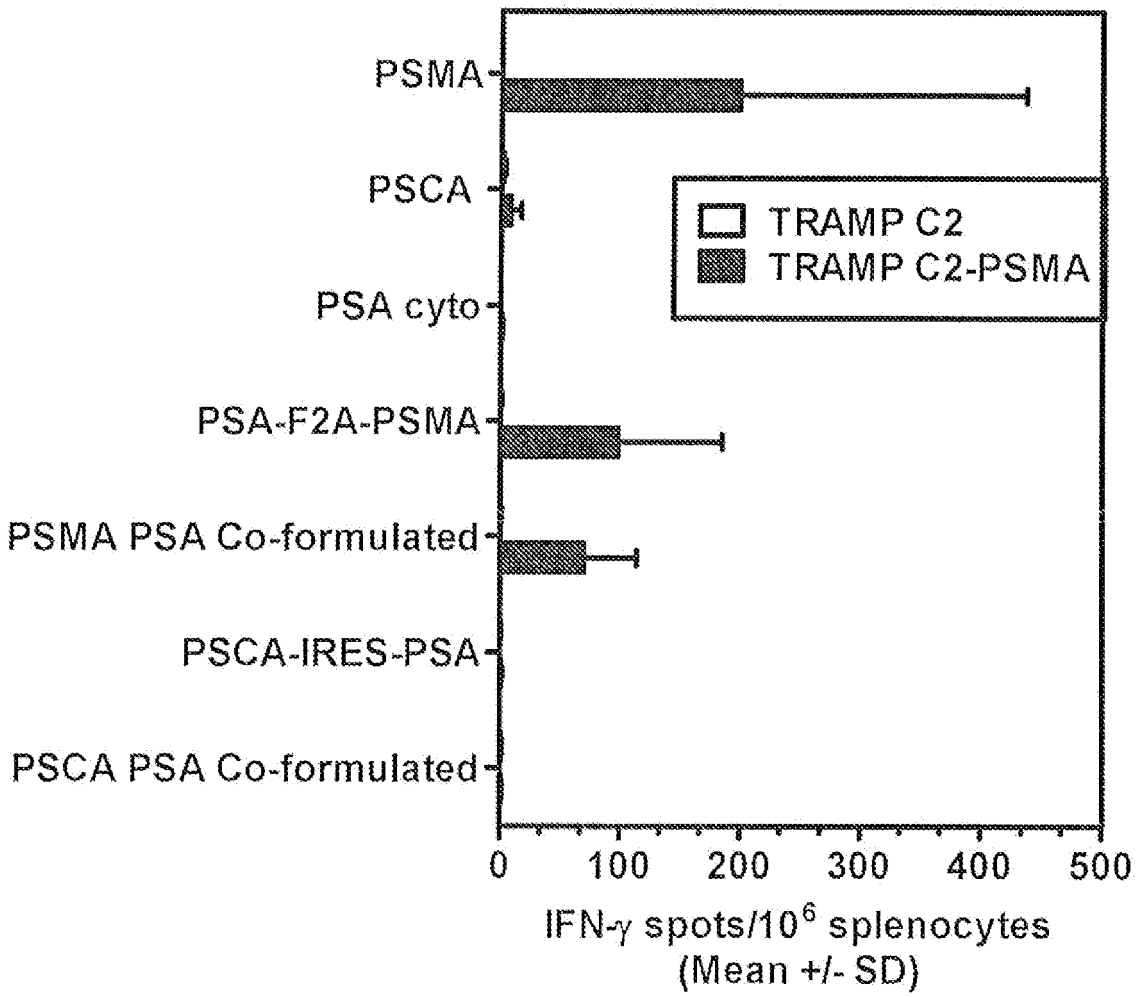

PSMA
PSCA
PSA cyto
PSA-F2A-PSMA
PSMA PSA Co-formulated
PSCA-IRES-PSA
PSCA PSA Co-formulated
TRAMP C2
TRAMP C2-PSMA
0
100
200
300
400
500
IFN-γ spots/10^6 splenocytes
(Mean +/- SD)

FIG. 21B

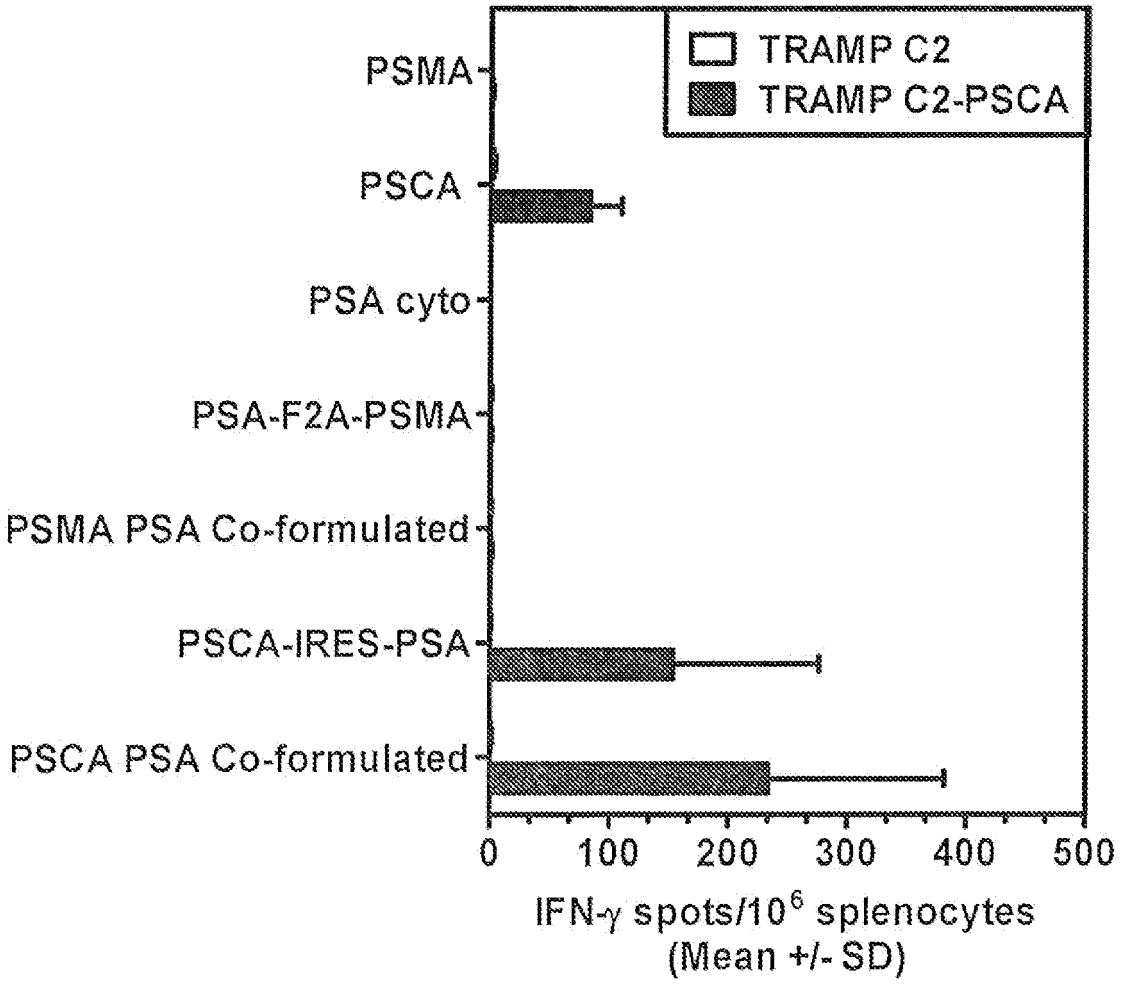

TRAMP C2
TRAMP C2-PSCA
PSMA
PSCA
PSA cyto
PSA-F2A-PSMA
PSMA PSA Co-formulated
PSCA-IRES-PSA
PSCA PSA Co-formulated
0
100
200
300
400
500
IFN-γ spots/10^6 splenocytes
(Mean +/- SD)

FIG. 21C

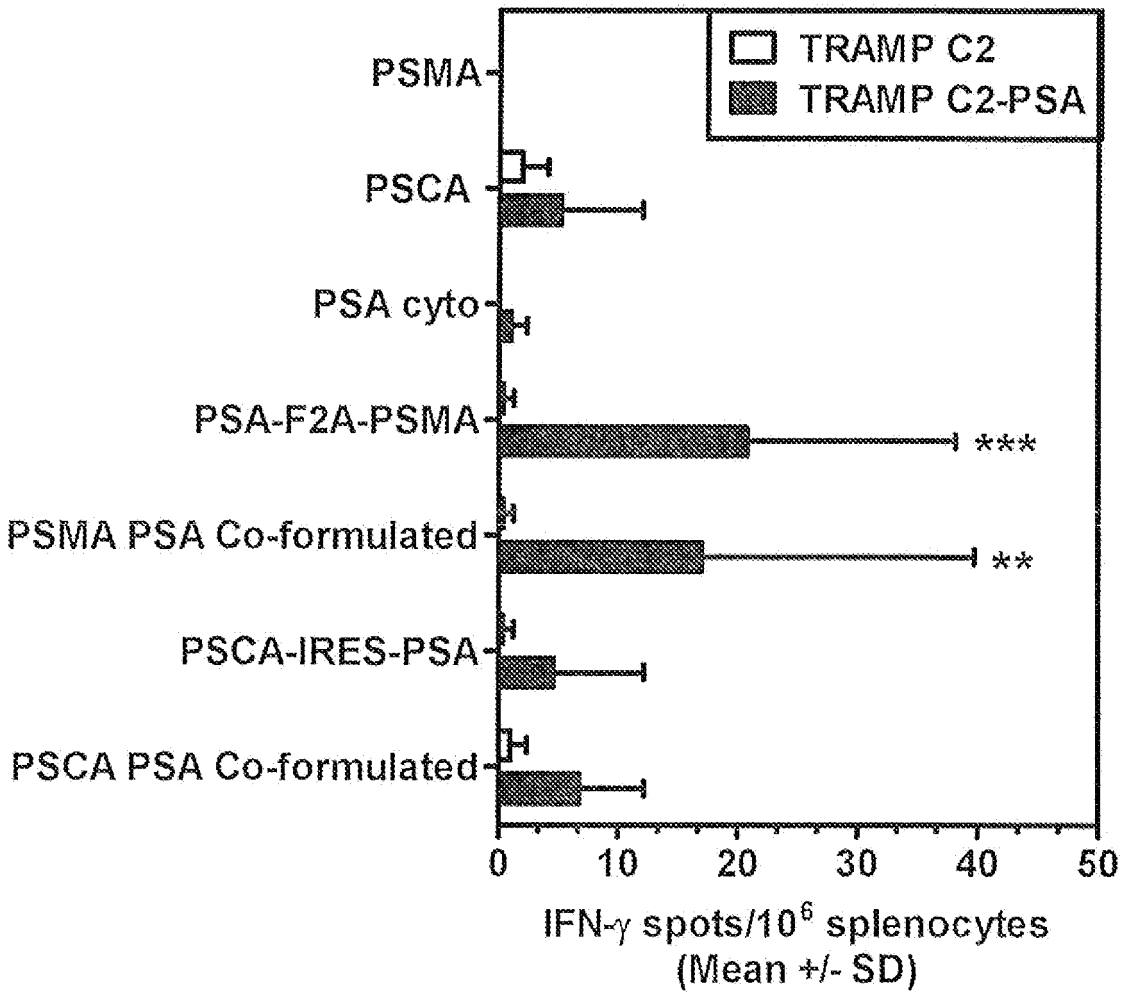

TRAMP C2
TRAMP C2-PSA
PSMA
PSCA
PSA cyto
PSA-F2A-PSMA
***
PSMA PSA Co-formulated
**
PSCA-IRES-PSA
PSCA PSA Co-formulated
0
10
20
30
40
50
IFN-γ spots/10^6 splenocytes
(Mean +/- SD)

FIG. 21D

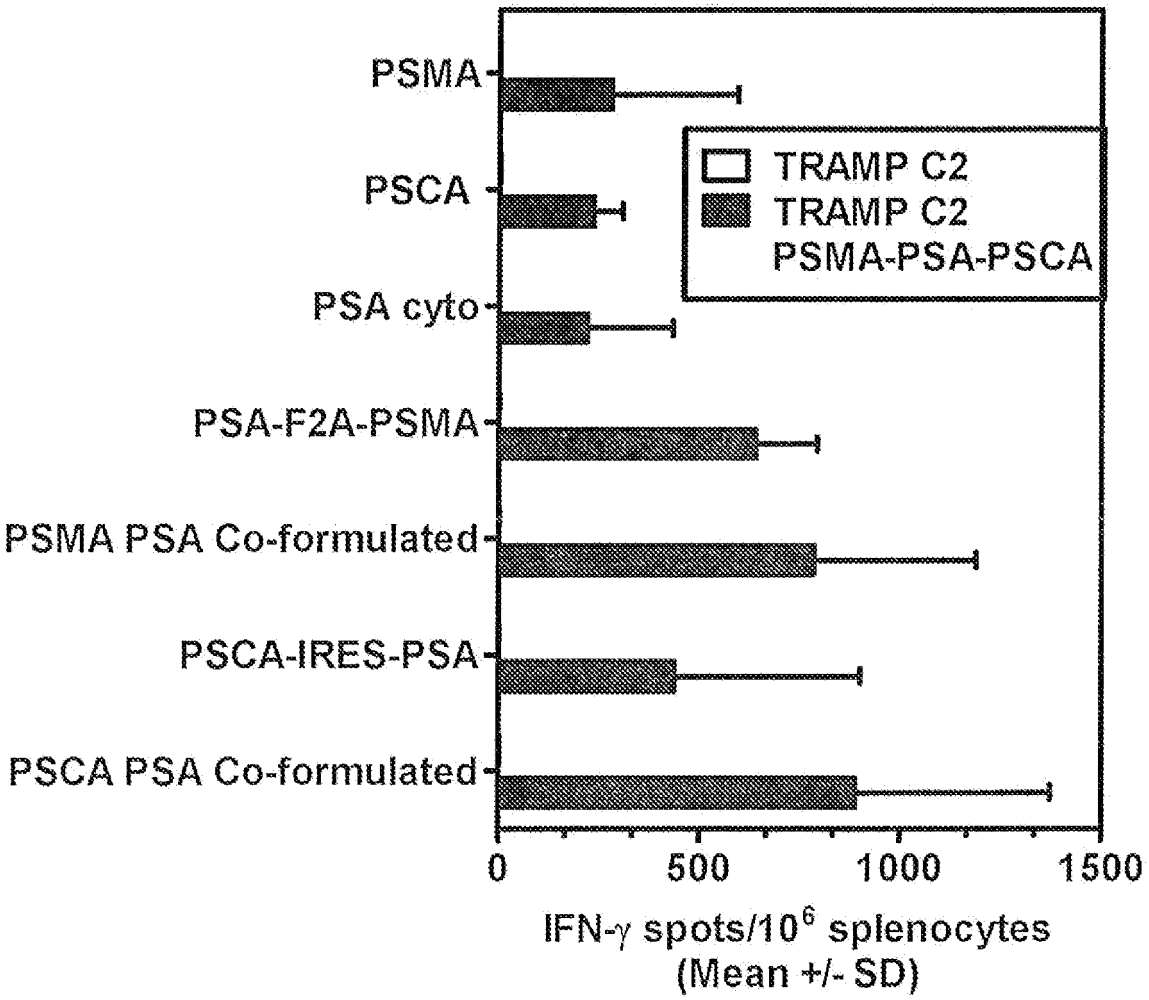

PSMA
PSCA
PSA cyto
PSA-F2A-PSMA
PSMA PSA Co-formulated
PSCA-IRES-PSA
PSCA PSA Co-formulated
TRAMP C2
TRAMP C2
PSMA-PSA-PSCA
0
500
1000
1500
IFN-γ spots/10^6 splenocytes
(Mean +/- SD)

FIG. 22

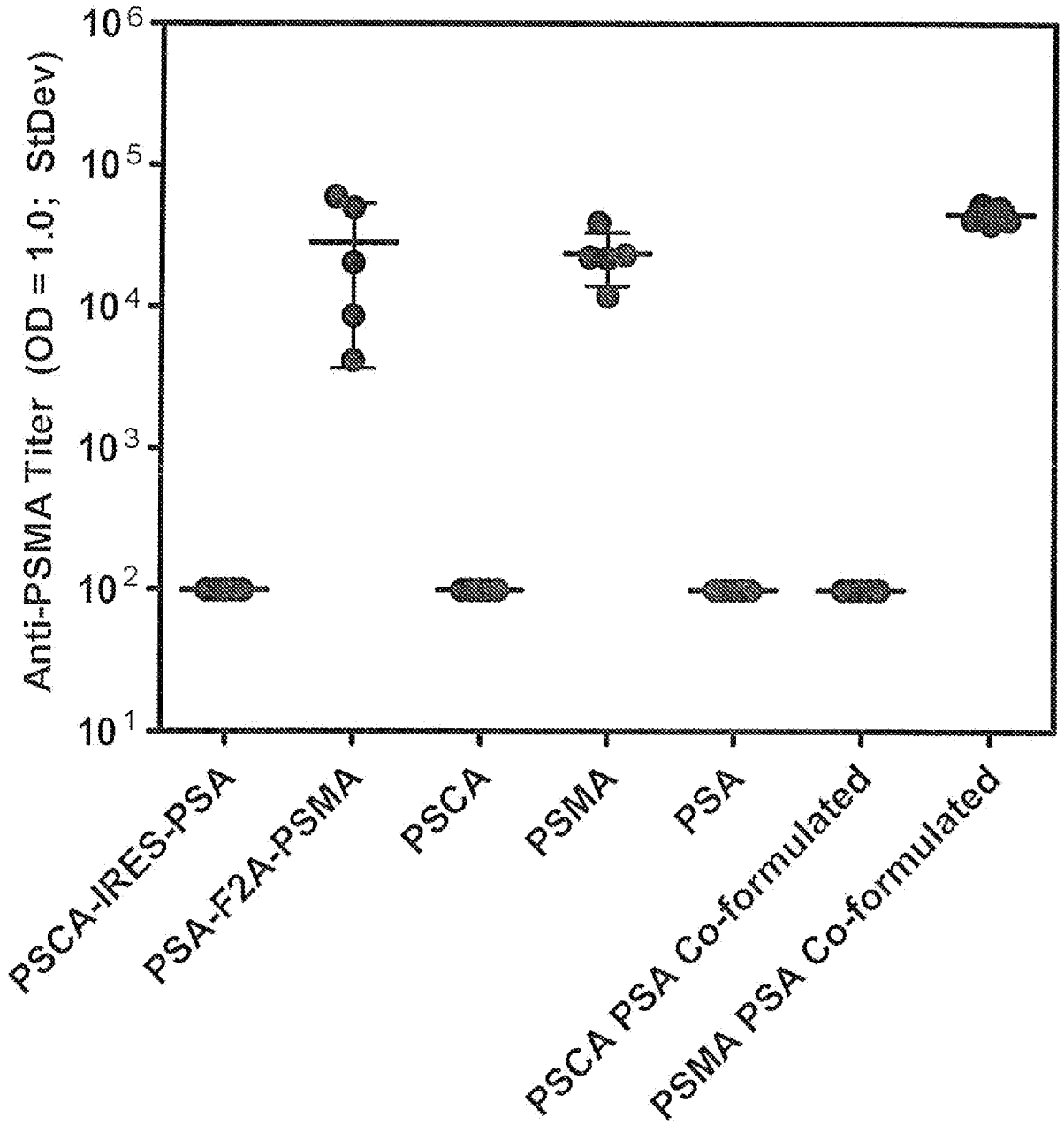

Anti-PSMA Titer (OD = 1.0; StDev)
10^6
10^5
10^4
10^3
10^2
10^1
PSCA-IRES-PSA
PSA-F2A-PSMA
PSCA
PSMA
PSA
PSCA PSA Co-formulated
PSMA PSA Co-formulated

FIG. 23

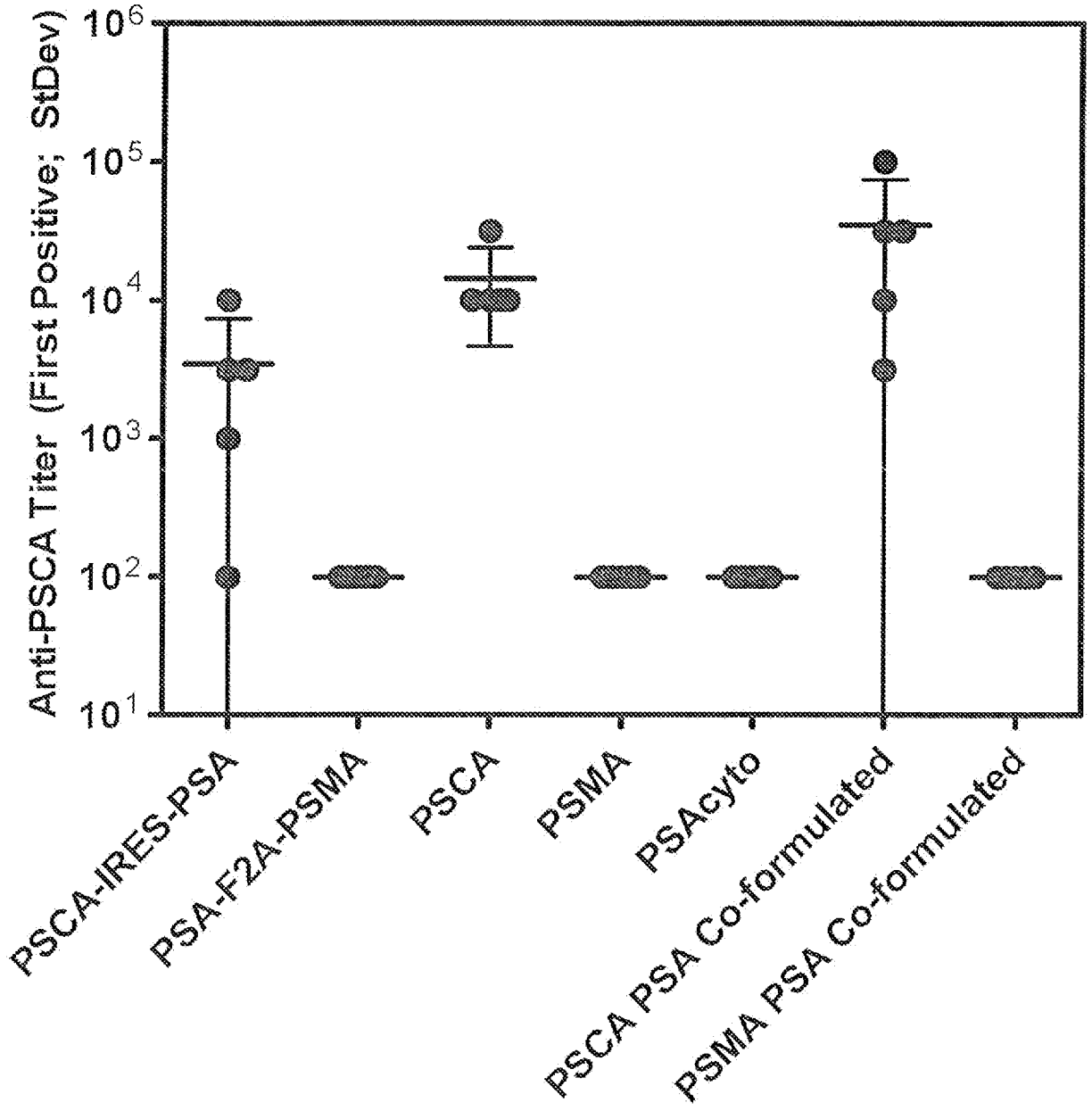

Anti-PSCA Titer (First Positive; StDev)
10^6
10^5
10^4
10^3
10^2
10^1
PSCA-IRES-PSA
PSA-F2A-PSMA
PSCA
PSMA
PSAcyto
PSCA PSA Co-formulated
PSMA PSA Co-formulated

FIG. 24

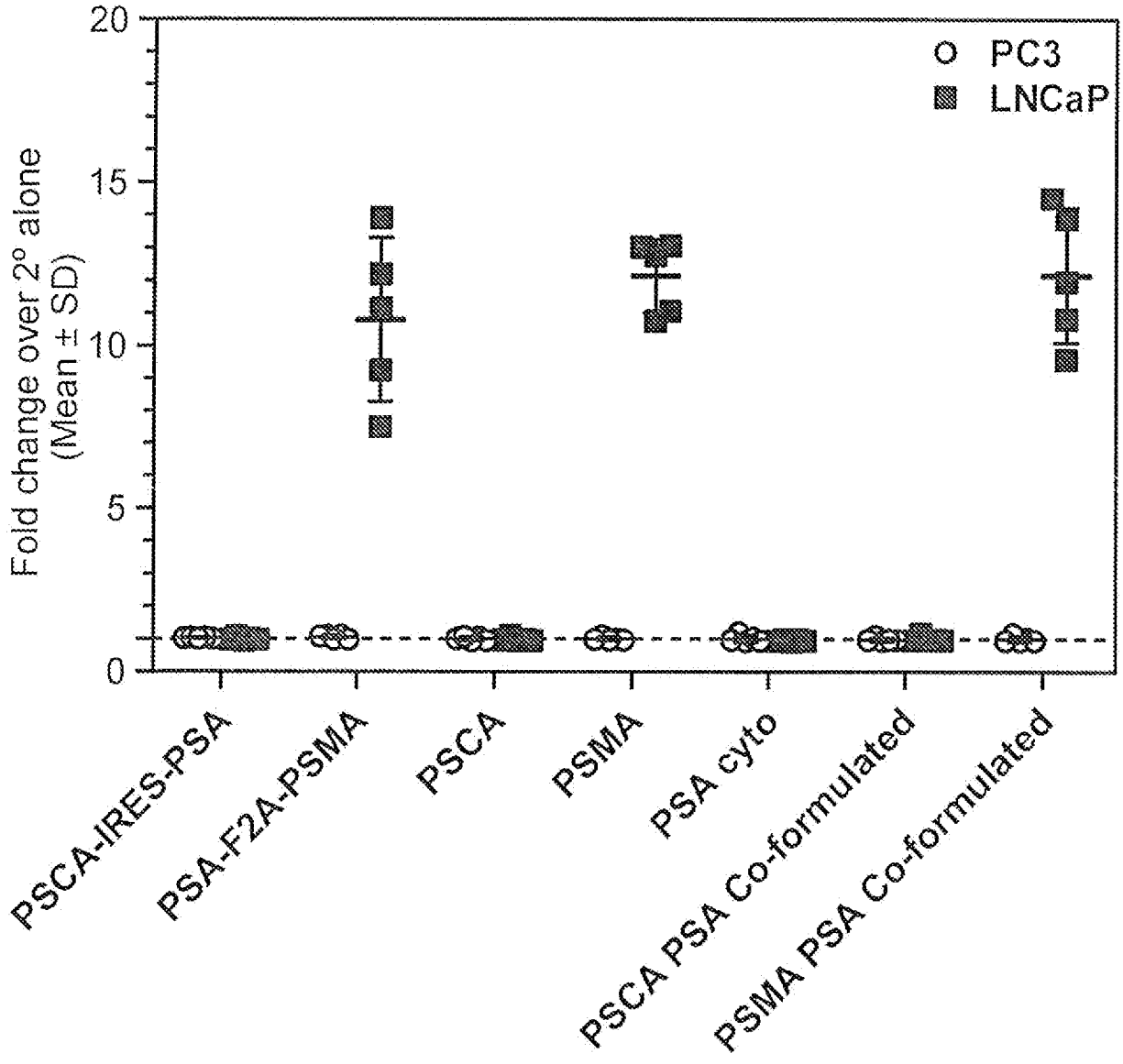

Fold change over 2° alone
(Mean ± SD)
20
15
10
5
0
PC3
LNCaP
PSCA-IRES-PSA
PSA-F2A-PSMA
PSCA
PSMA
PSA cyto
PSCA PSA Co-formulated
PSMA PSA Co-formulated

FIG. 25

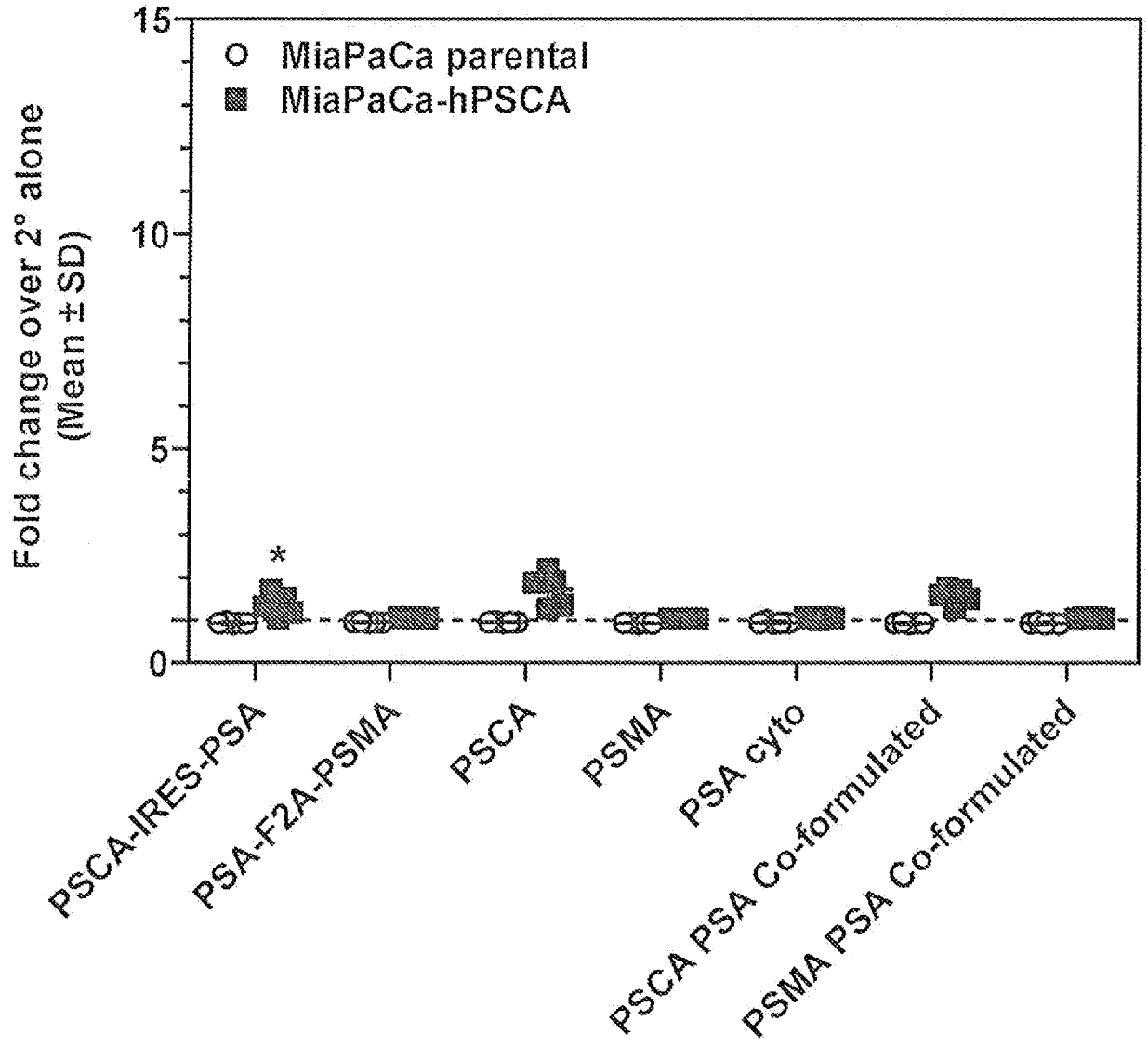

15
10
5
0
MiaPaCa parental
MiaPaCa-hPSCA
Fold change over 2° alone
(Mean ± SD)
*
PSCA-IRES-PSA
PSA-F2A-PSMA
PSCA
PSMA
PSA cyto
PSCA PSA Co-formulated
PSMA PSA Co-formulated

FIG. 26

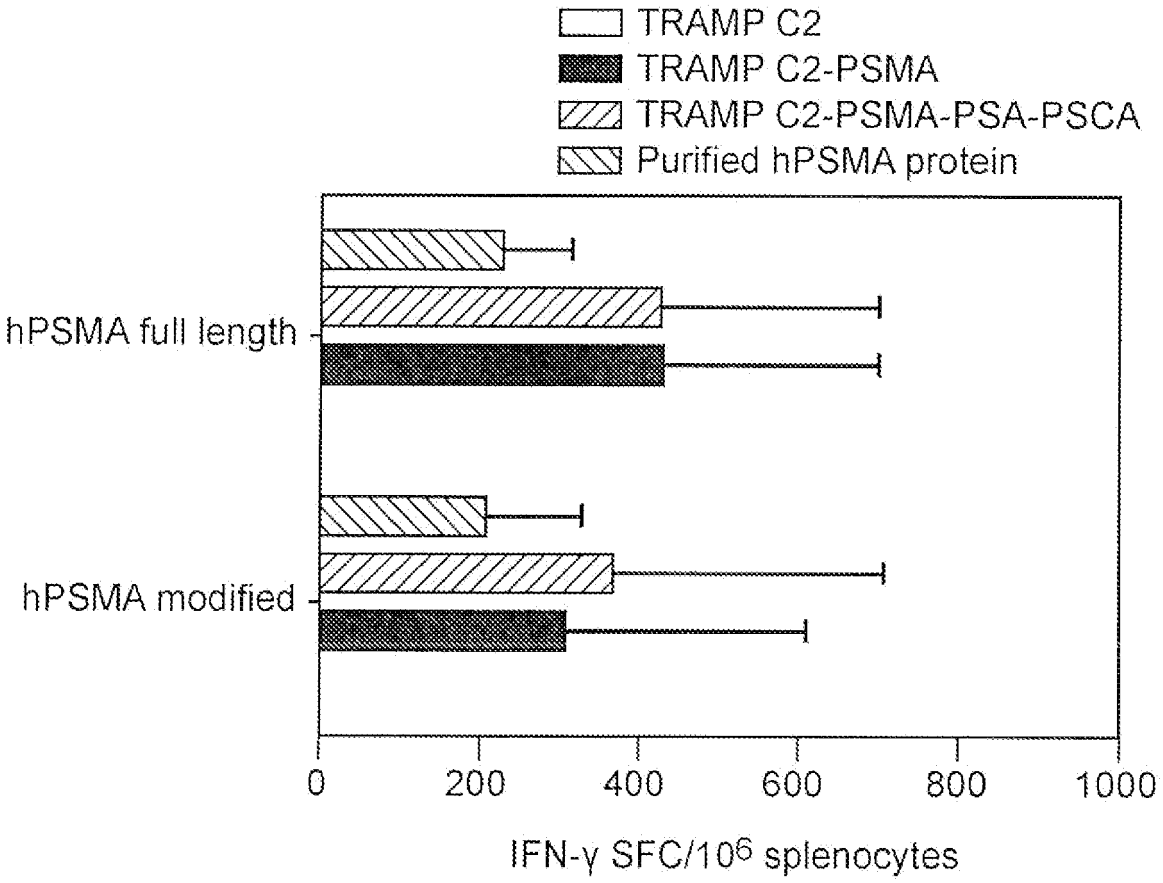

TRAMP C2
TRAMP C2-PSMA
TRAMP C2-PSMA-PSA-PSCA
Purified hPSMA protein
hPSMA full length
hPSMA modified
0
200
400
600
800
1000
IFN-γ SFC/10^6 splenocytes

FIG. 27A

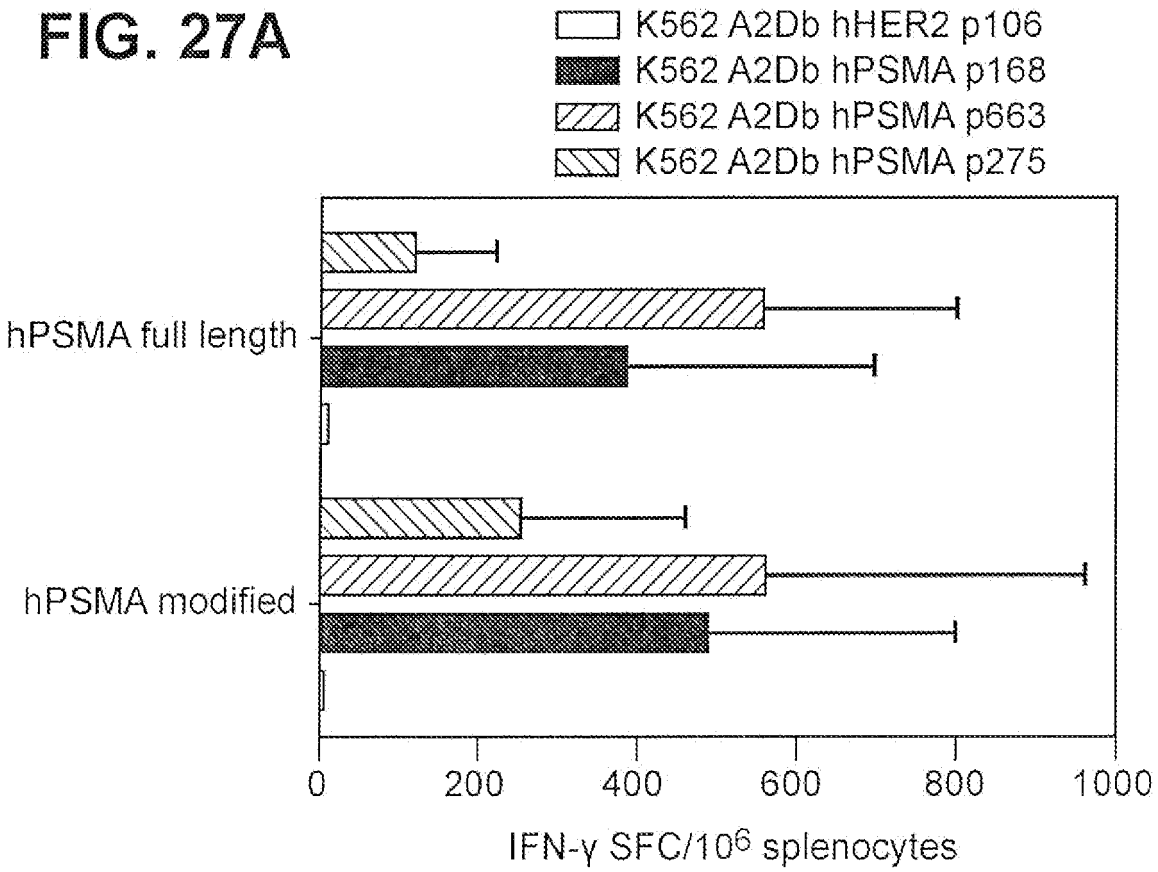


FIG. 27B

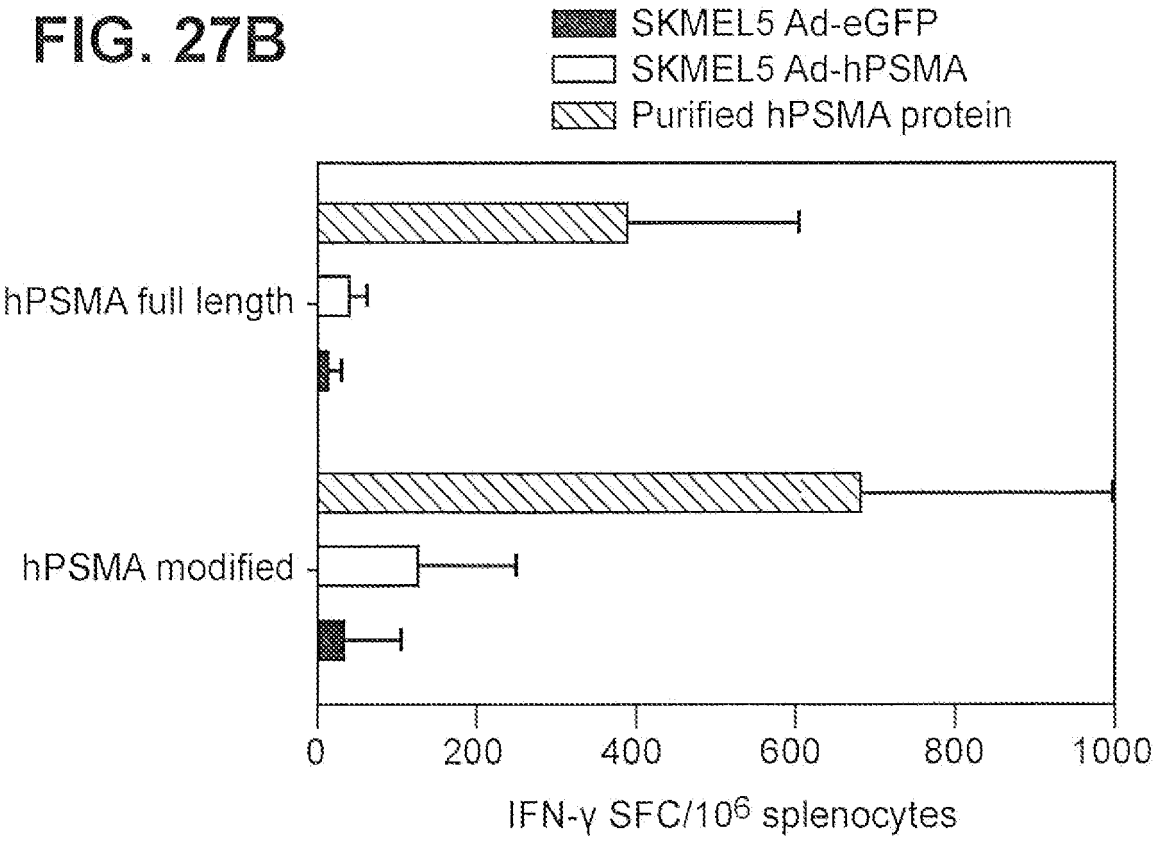


FIG. 28

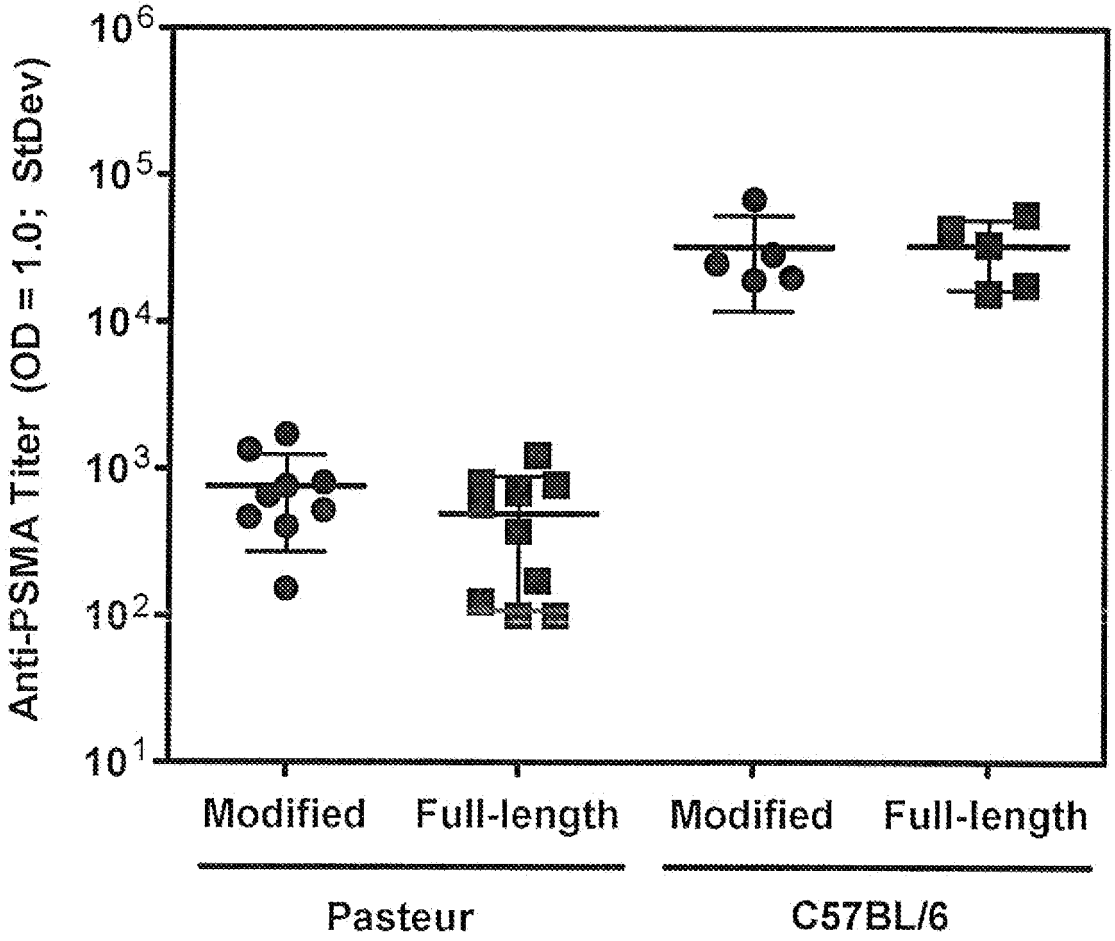

Anti-PSMA Titer (OD = 1.0; StDev)
10^6
10^5
10^4
10^3
10^2
10^1
Modified
Full-length
Modified
Full-length
Pasteur
C57BL/6

FIG. 29

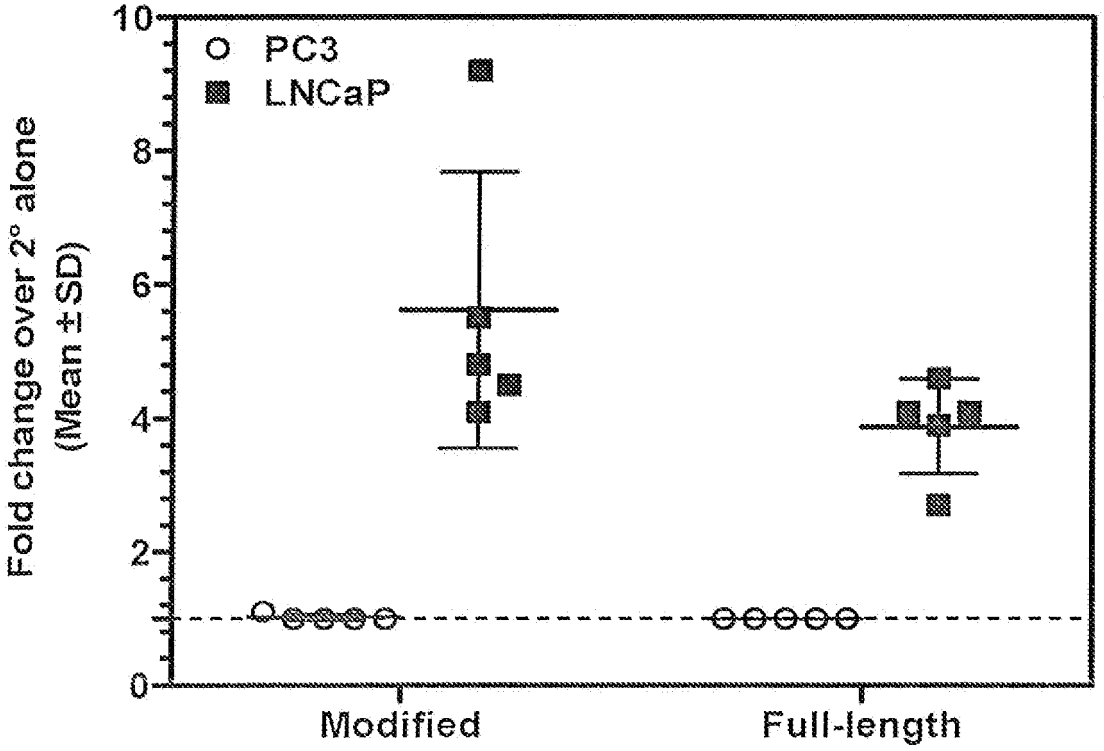

PC3
LNCaP
Fold change over 2° alone
(Mean ± SD)
0
2
4
6
8
10
Modified
Full-length

FIG. 30

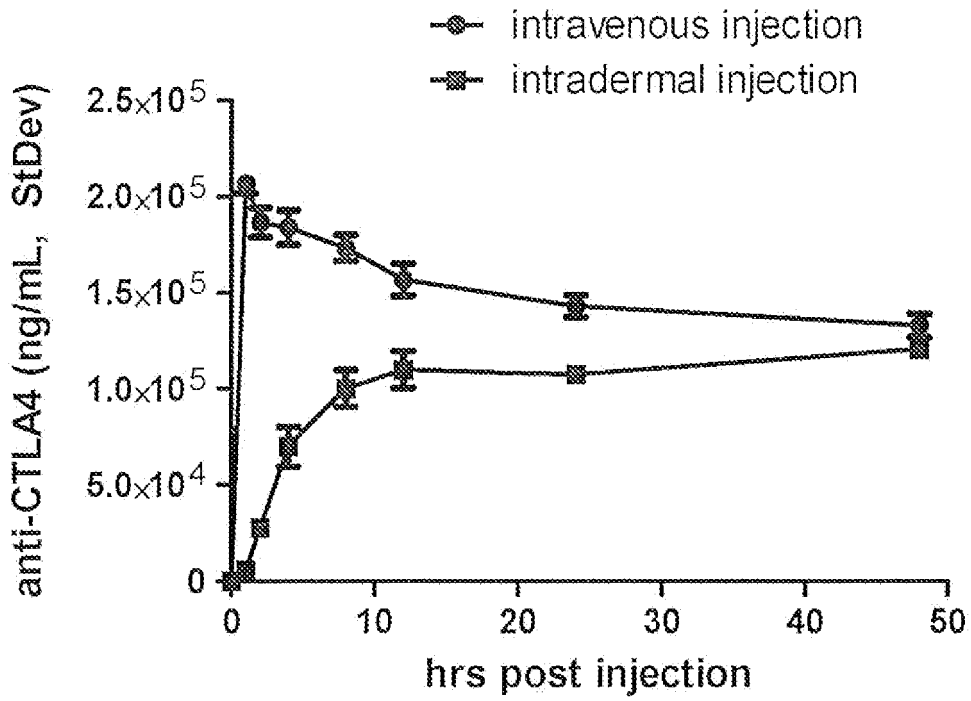

intravenous injection
intradermal injection
anti-CTLA4 (ng/mL, StDev)
2.5x10^5
2.0x10^5
1.5x10^5
1.0x10^5
5.0x10^4
0
0
10
20
30
40
50
hrs post injection

FIG. 31A rHer-2 specific polyfunctional CD8 T cells

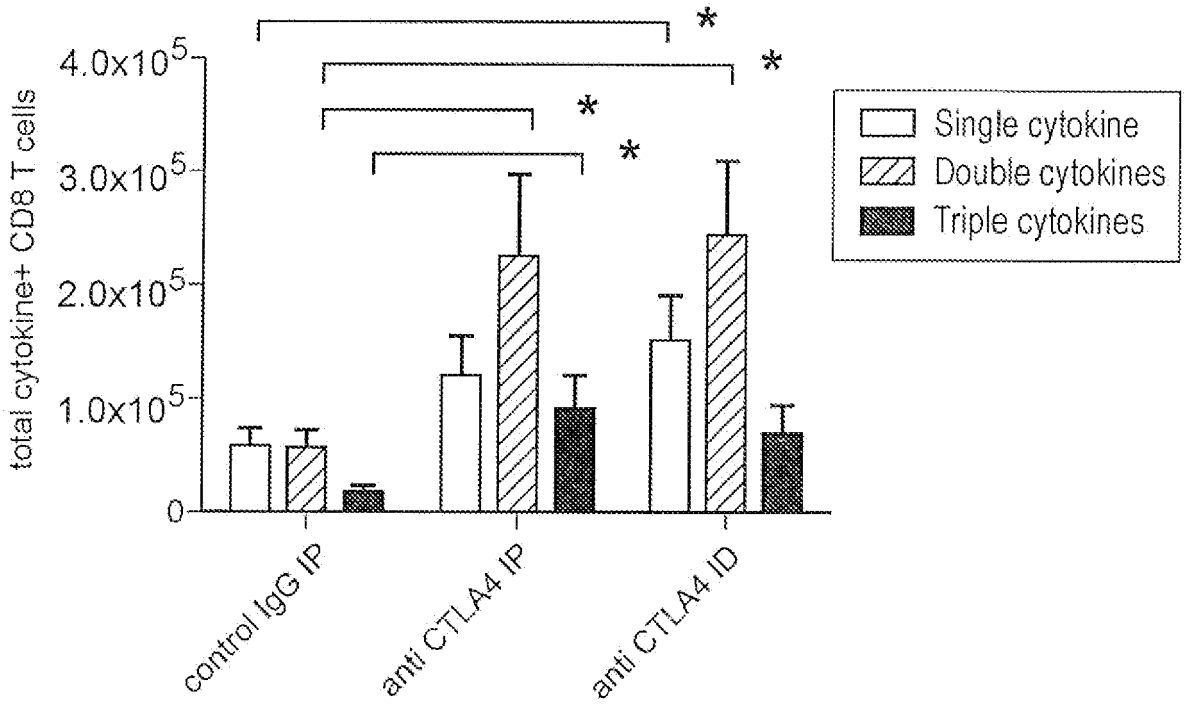


FIG. 31B rHer-2 specific polyfunctional CD4 T cells

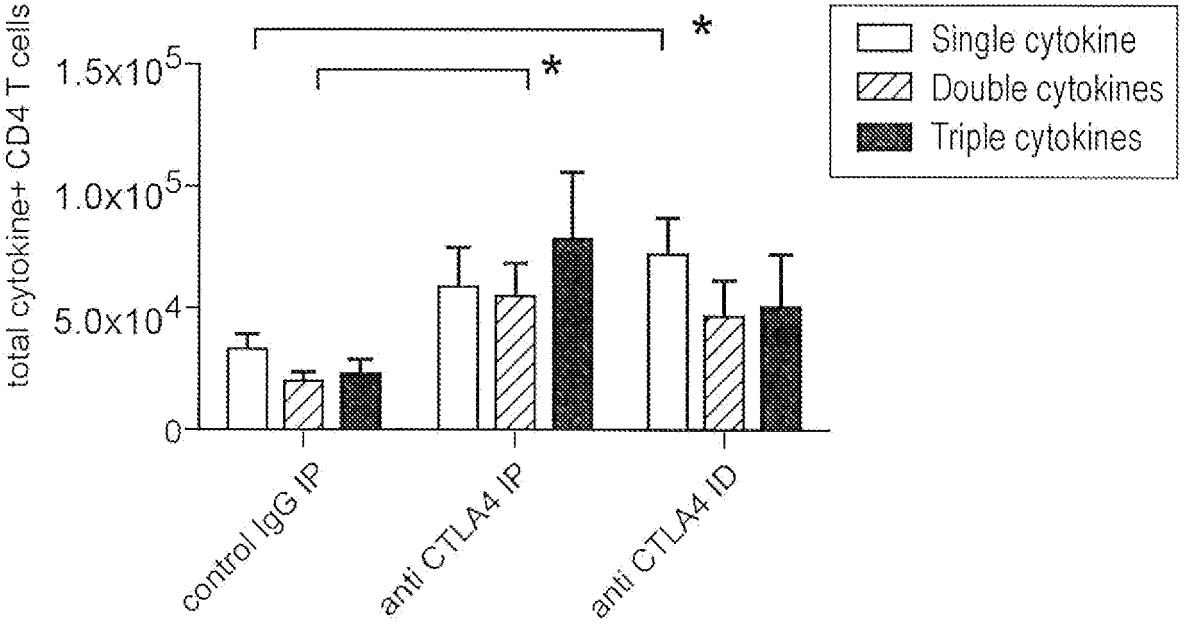


FIG. 32

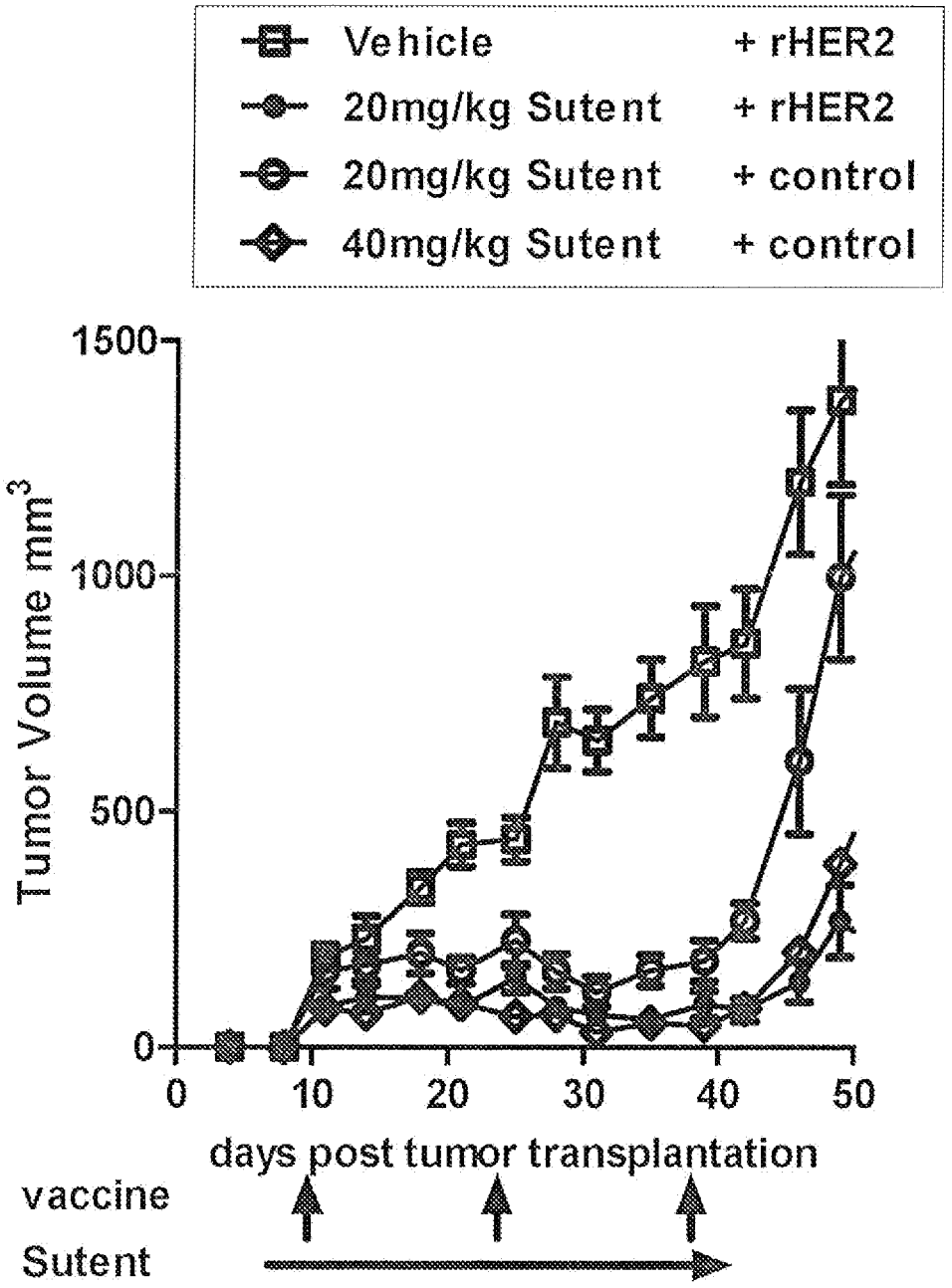

Vehicle + rHER2
20mg/kg Sutent + rHER2
20mg/kg Sutent + control
40mg/kg Sutent + control
Tumor Volume mm3
1500
1000
500
0
0
10
20
30
40
50
days post tumor transplantation
vaccine
Sutent

FIG. 33A — vehicle + control

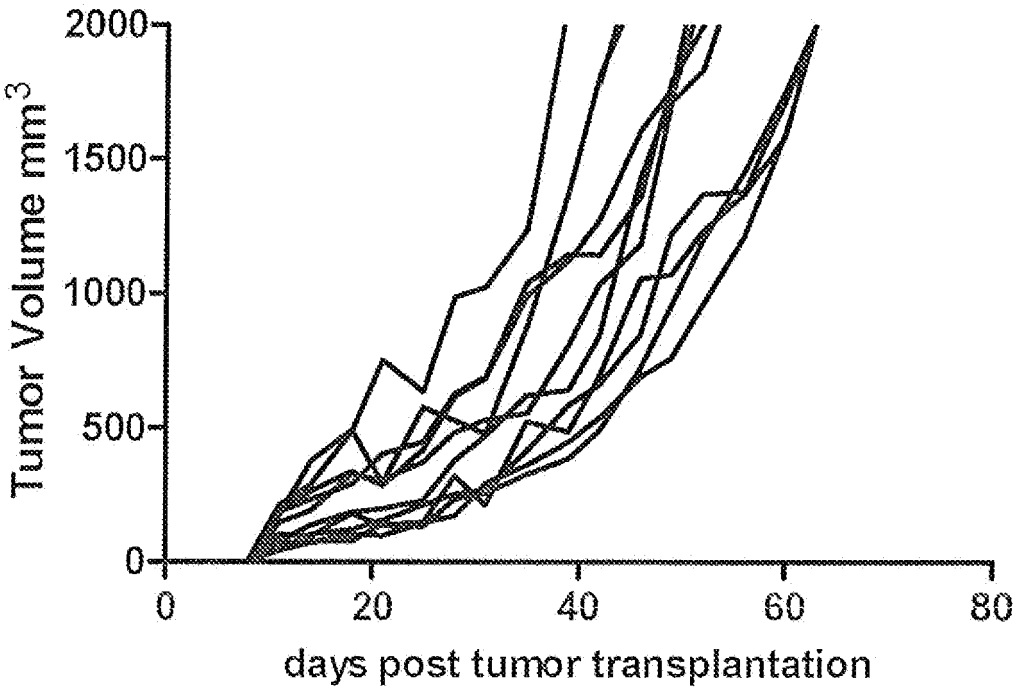


FIG. 33B — Sutent + Control

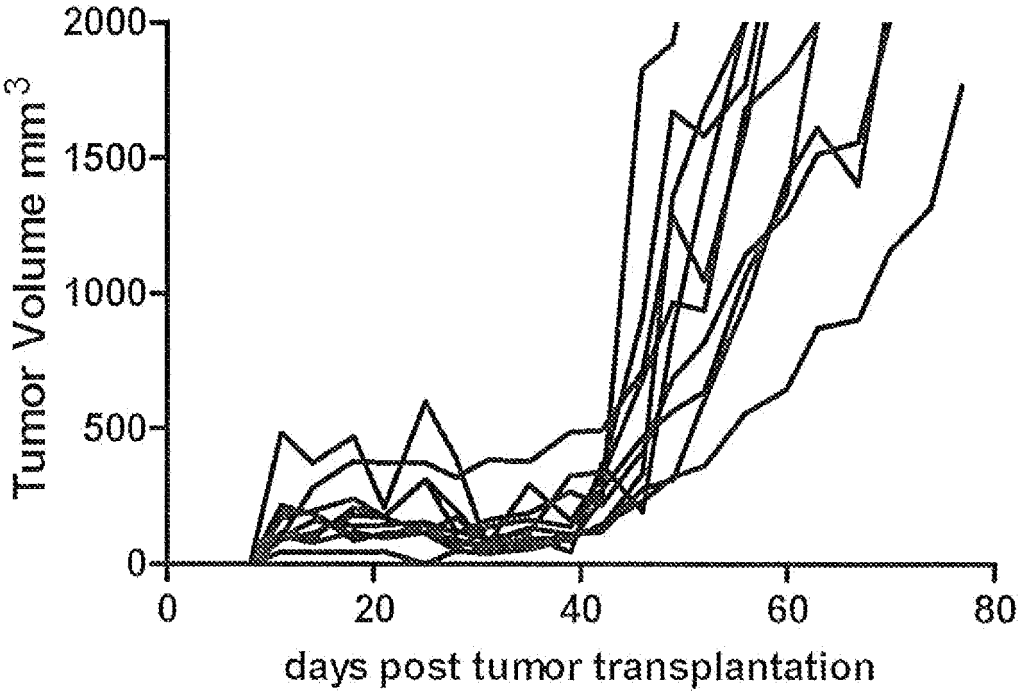


FIG. 33C — vehicle + rHER2

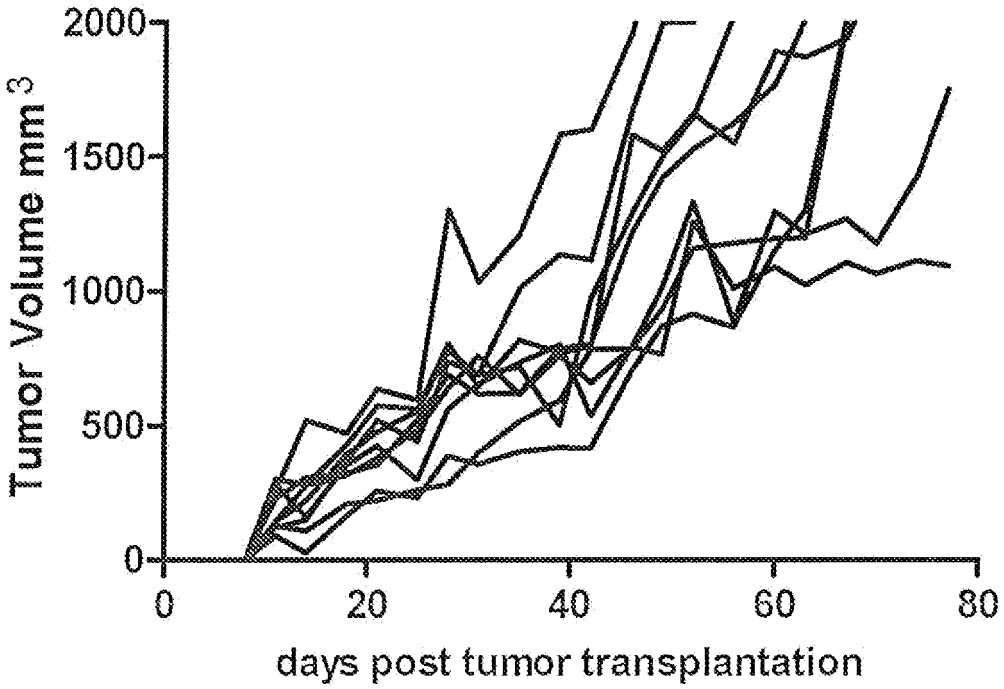


FIG. 33D — Sutent + rHER2

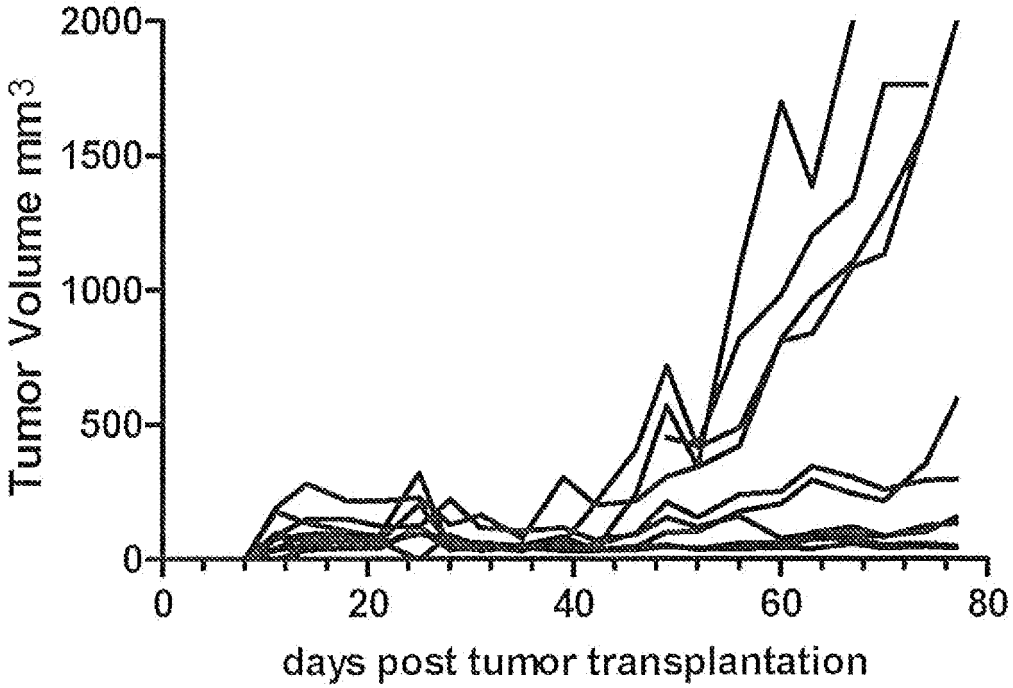


FIG. 34

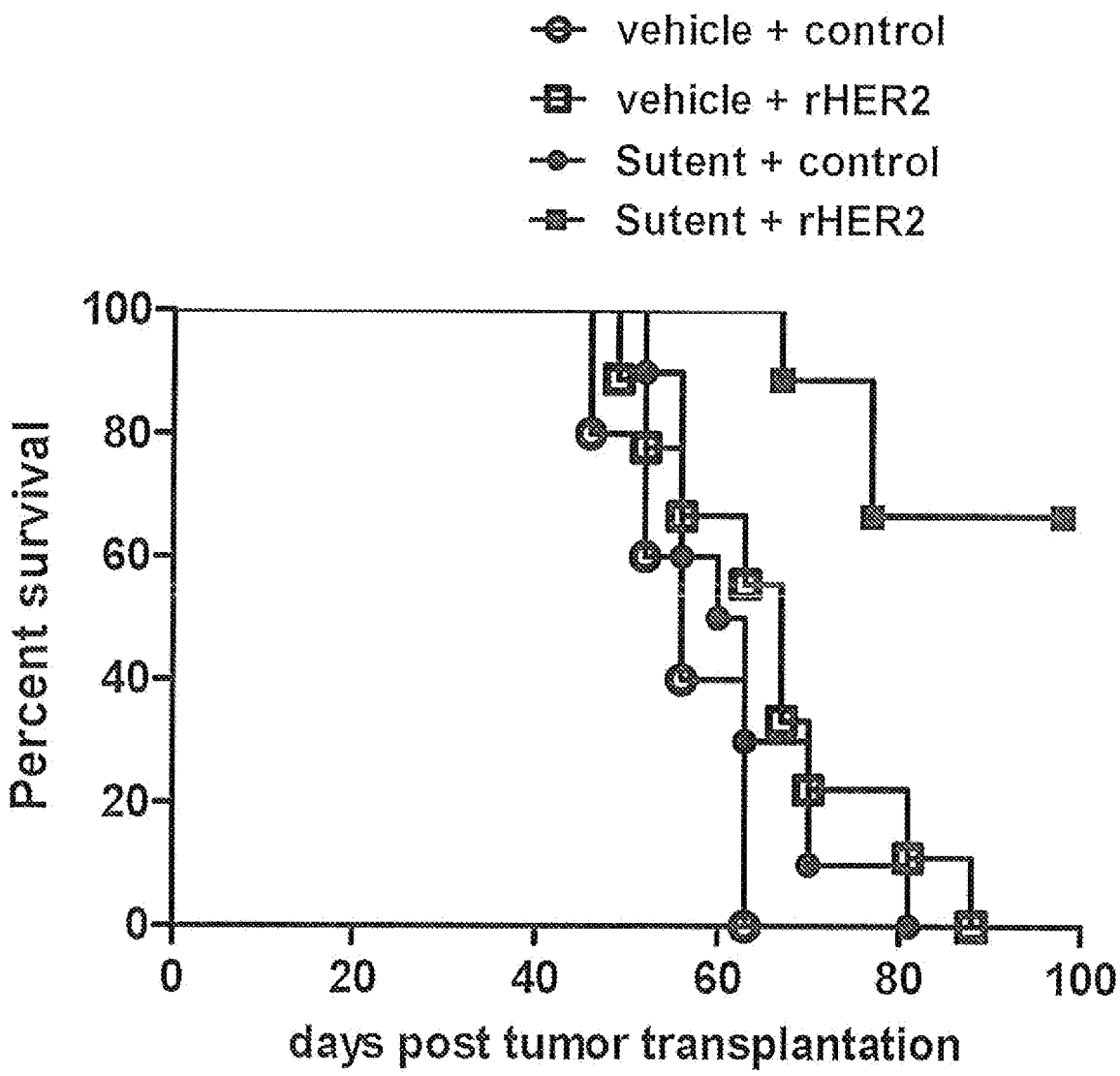

vehicle + control
vehicle + rHER2
Sutent + control
Sutent + rHER2
Percent survival
100
80
60
40
20
0
0
20
40
60
80
100
days post tumor transplantation

FIG. 35A

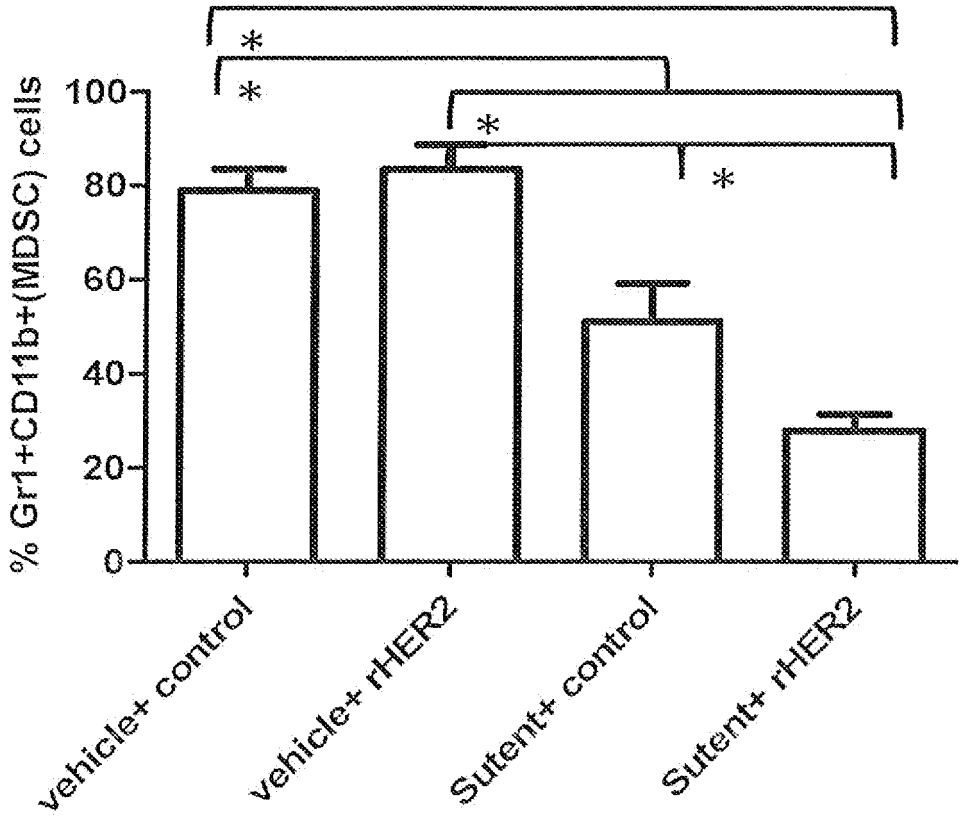


FIG. 35B

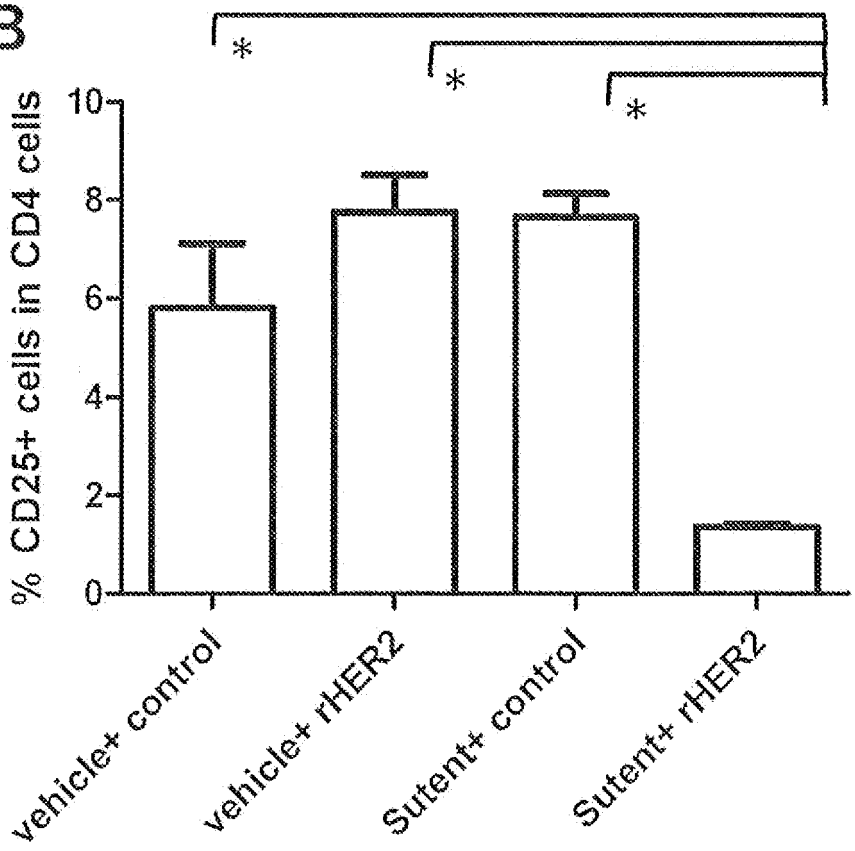


FIG. 36A

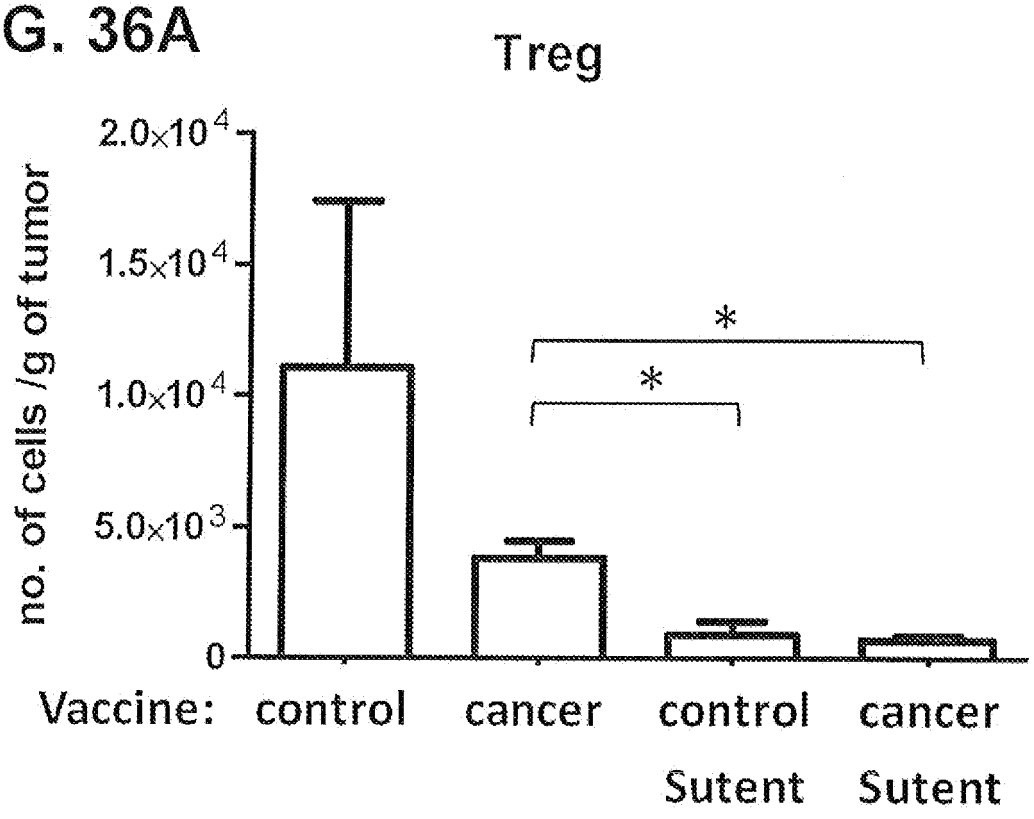


FIG. 36B

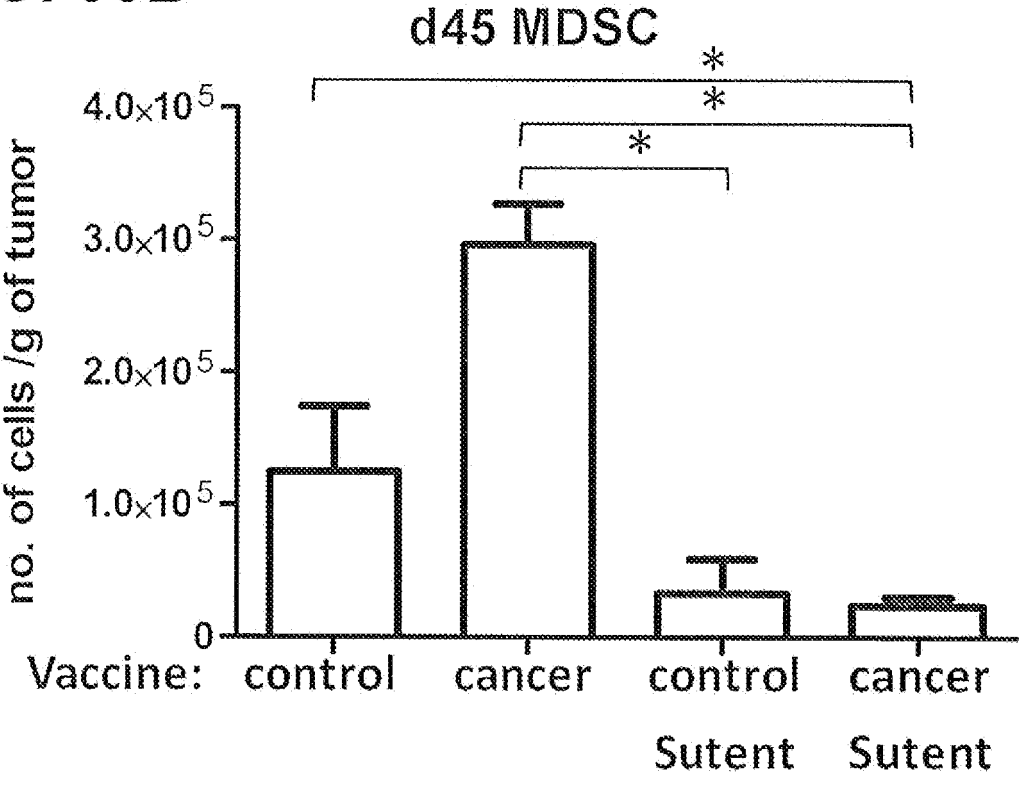


FIG. 36C

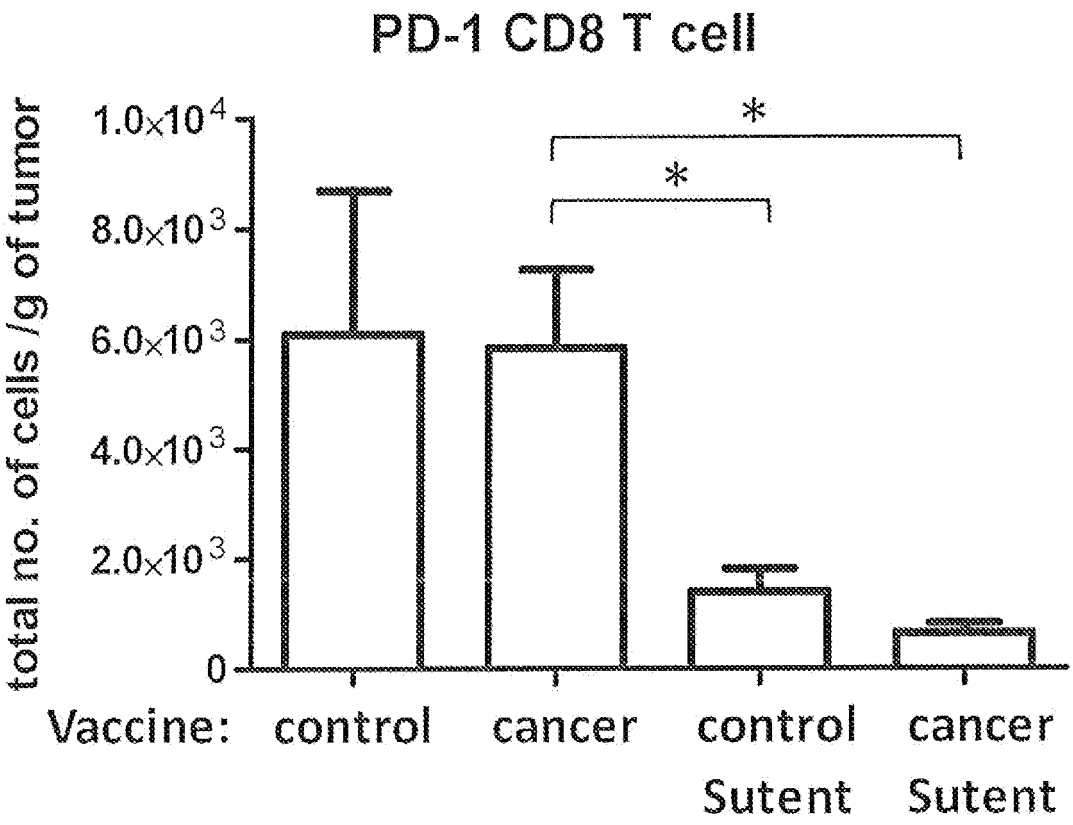

PD-1 CD8 T cell
total no. of cells /g of tumor
1.0×10^4
8.0×10^3
6.0×10^3
4.0×10^3
2.0×10^3
0
*
*
Vaccine: control
cancer
control Sutent
cancer Sutent

FIG. 37

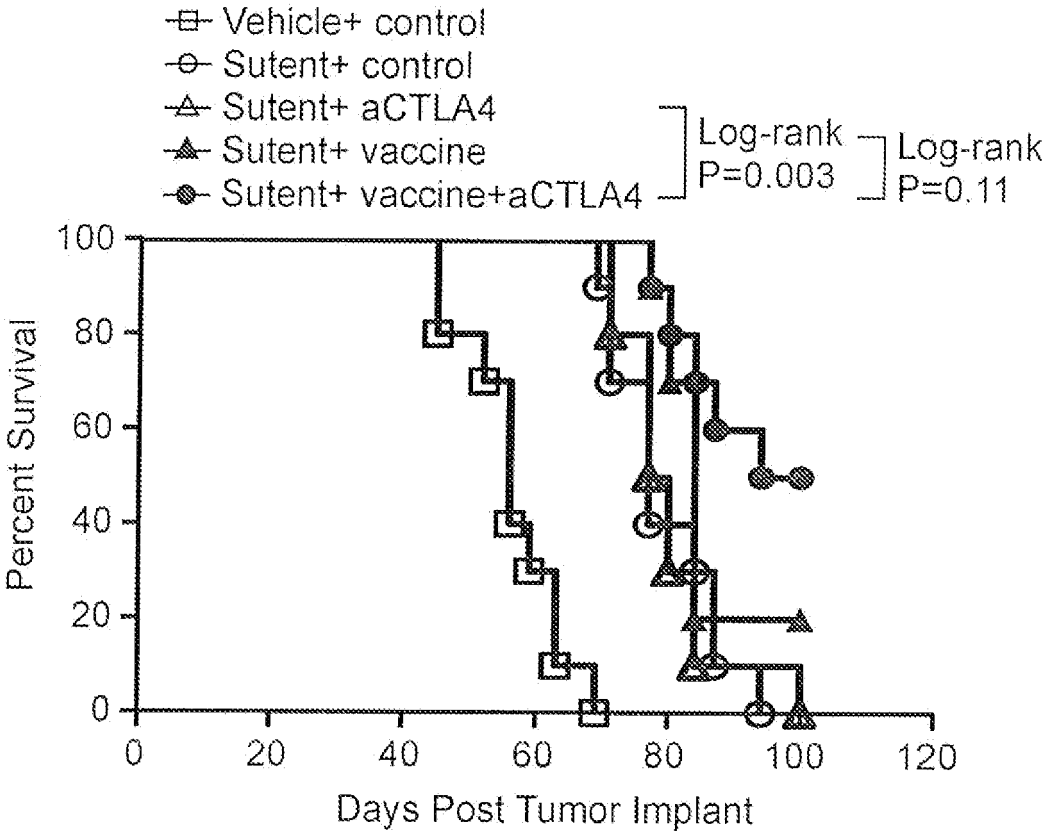

Vehicle+ control
Sutent+ control
Sutent+ aCTLA4
Sutent+ vaccine
Sutent+ vaccine+aCTLA4
Log-rank P=0.003
Log-rank P=0.11
Percent Survival
100
80
60
40
20
0
0
20
40
60
80
100
120
Days Post Tumor Implant

FIG. 38

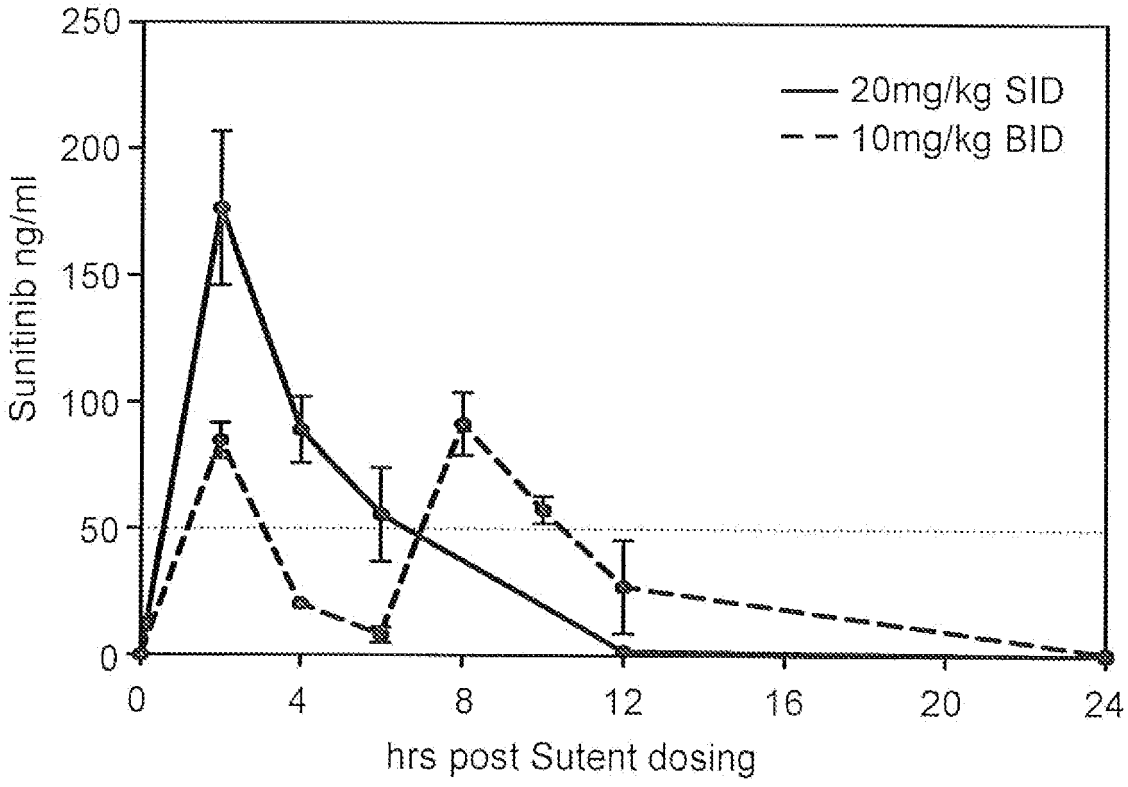

20mg/kg SID
10mg/kg BID
Sunitinib ng/ml
250
200
150
100
50
0
0
4
8
12
16
20
24
hrs post Sutent dosing

FIG. 39

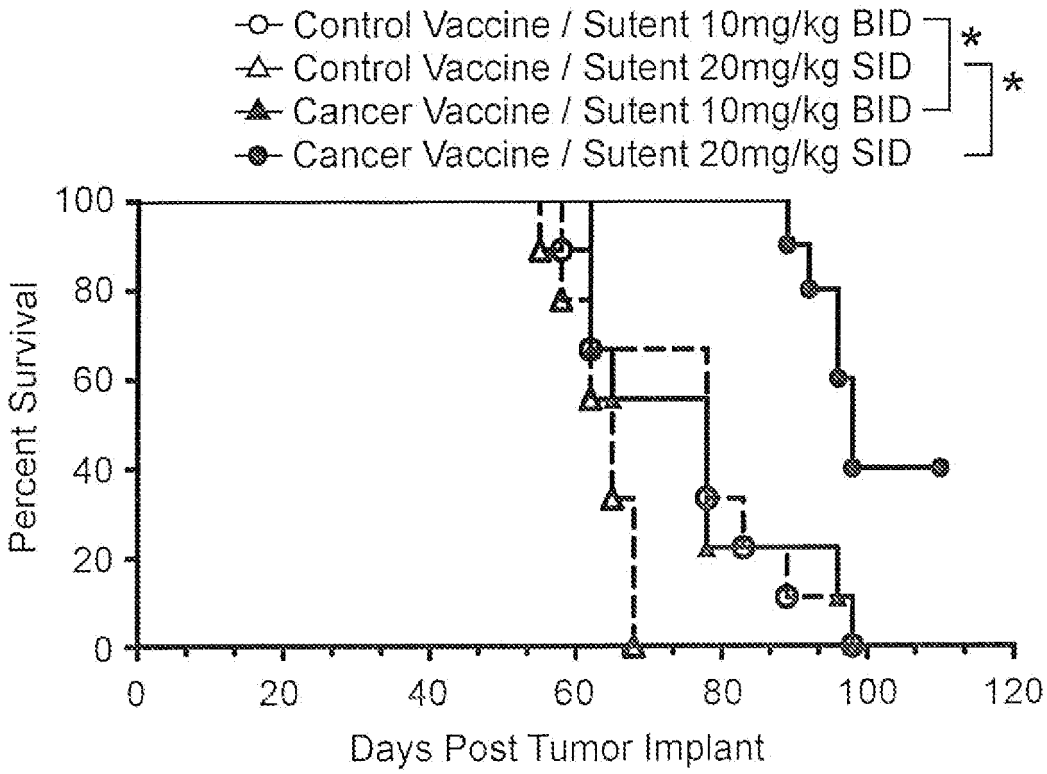

Control Vaccine / Sutent 10mg/kg BID
Control Vaccine / Sutent 20mg/kg SID
Cancer Vaccine / Sutent 10mg/kg BID
Cancer Vaccine / Sutent 20mg/kg SID
*
*
Percent Survival
100
80
60
40
20
0
0
20
40
60
80
100
120
Days Post Tumor Implant

FIG. 40

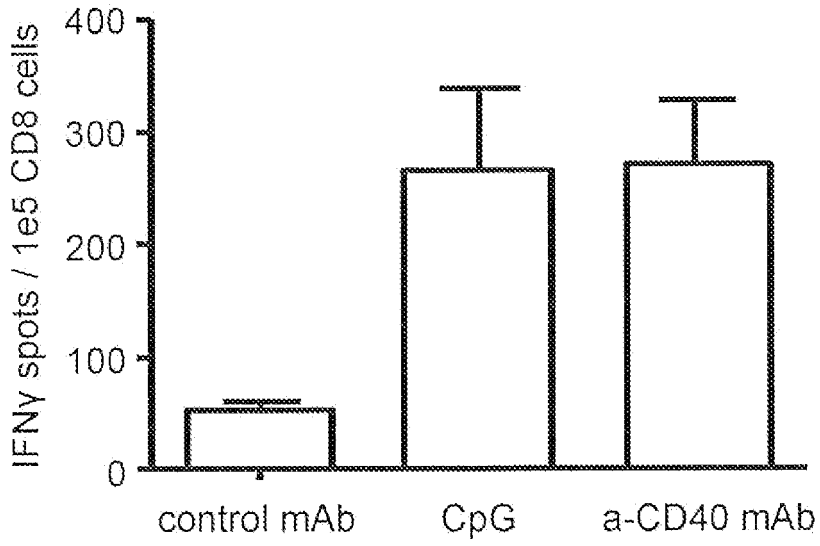

IFNγ spots / 1e5 CD8 cells
400
300
200
100
0
control mAb
CpG
a-CD40 mAb

FIG. 41A

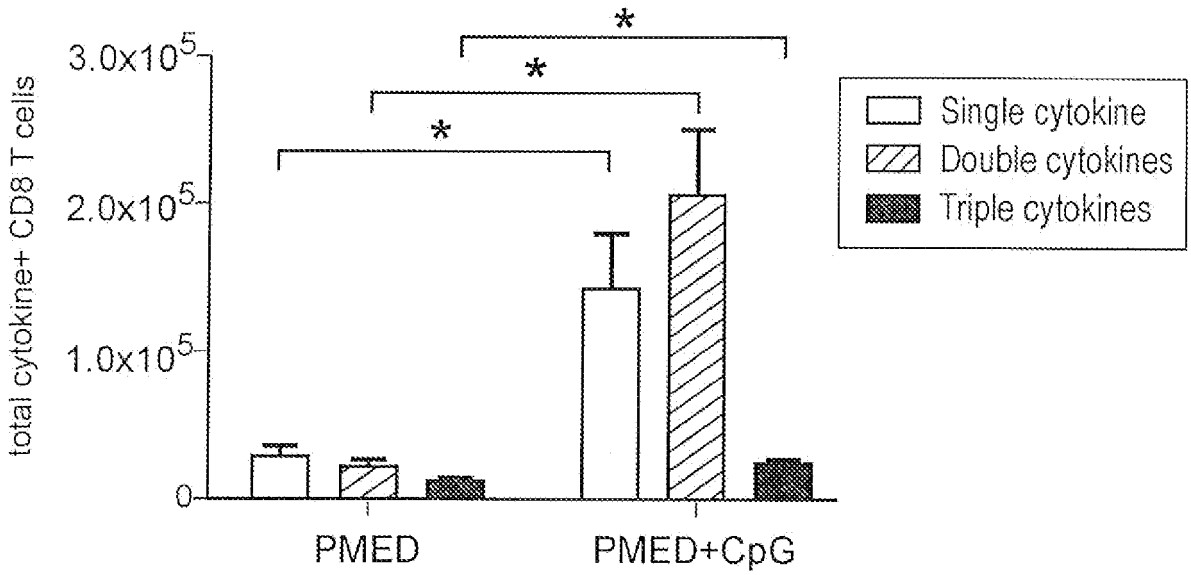


FIG. 41B

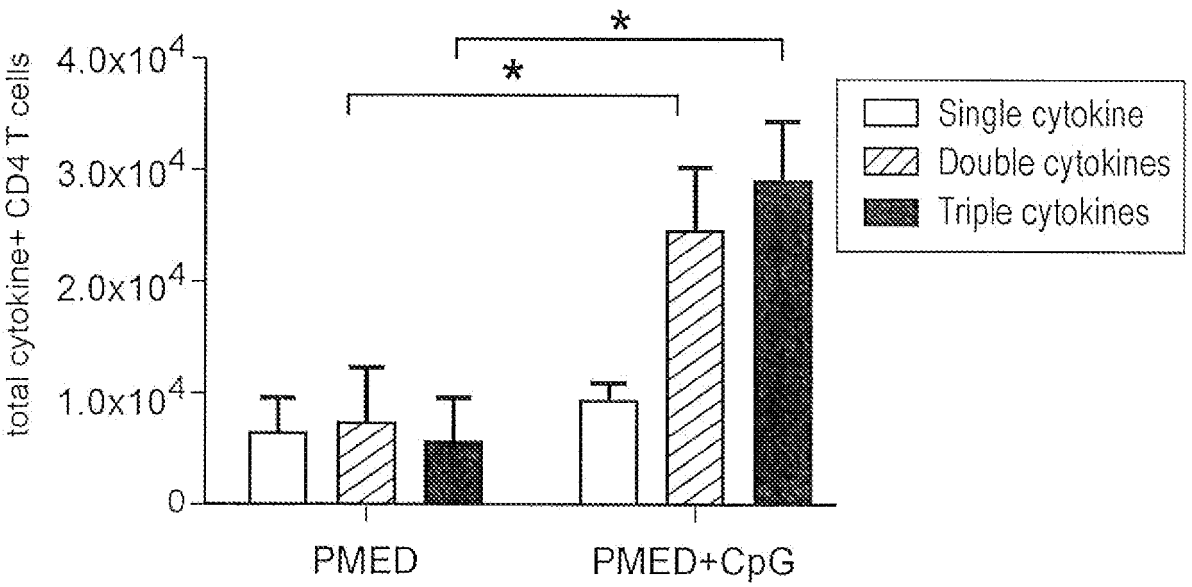


FIG. 42A

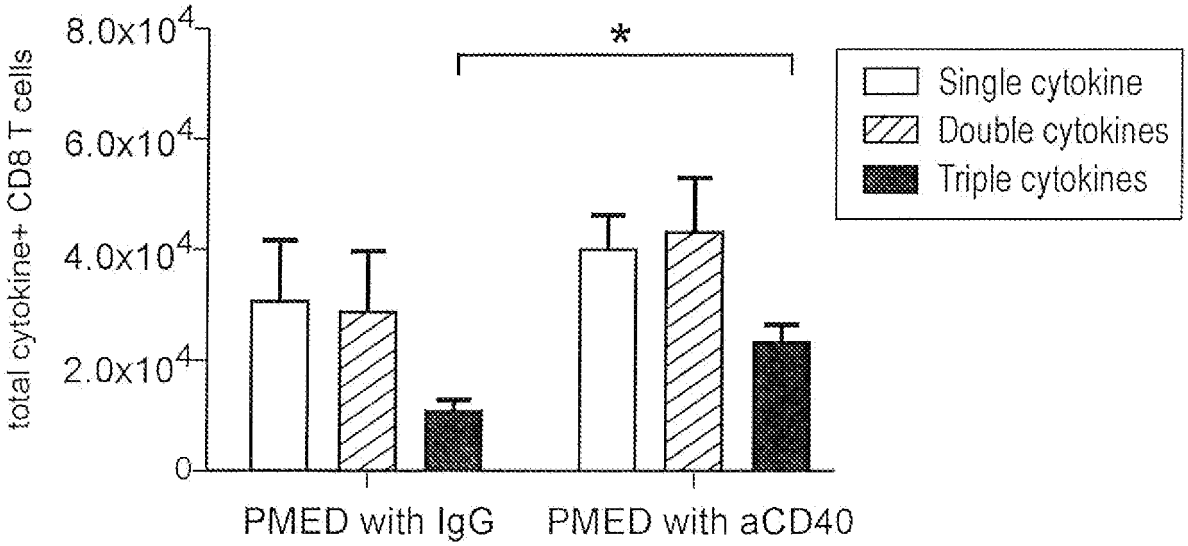


FIG. 42B

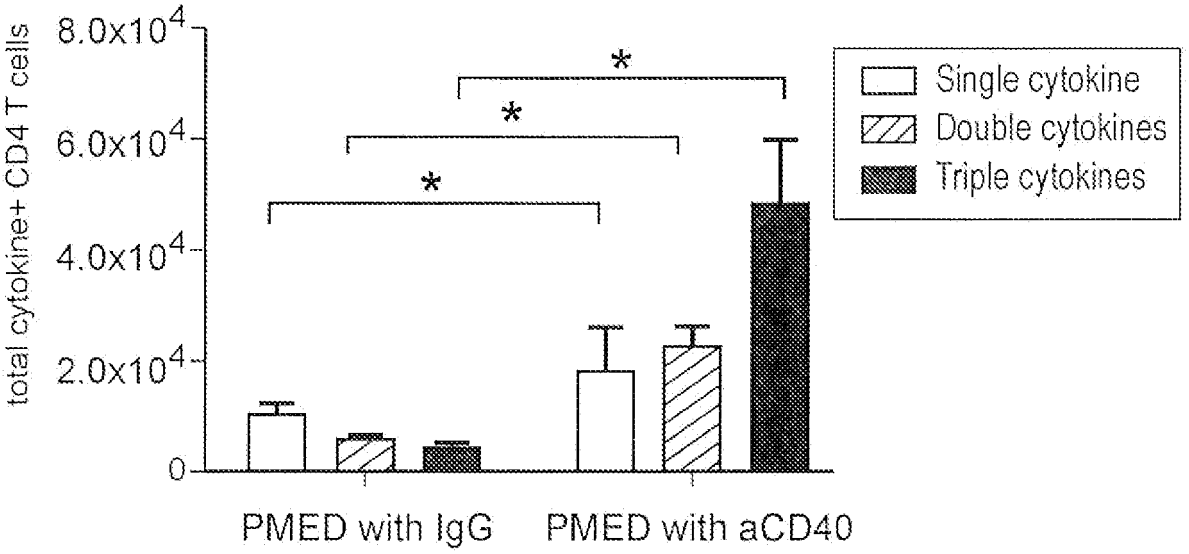
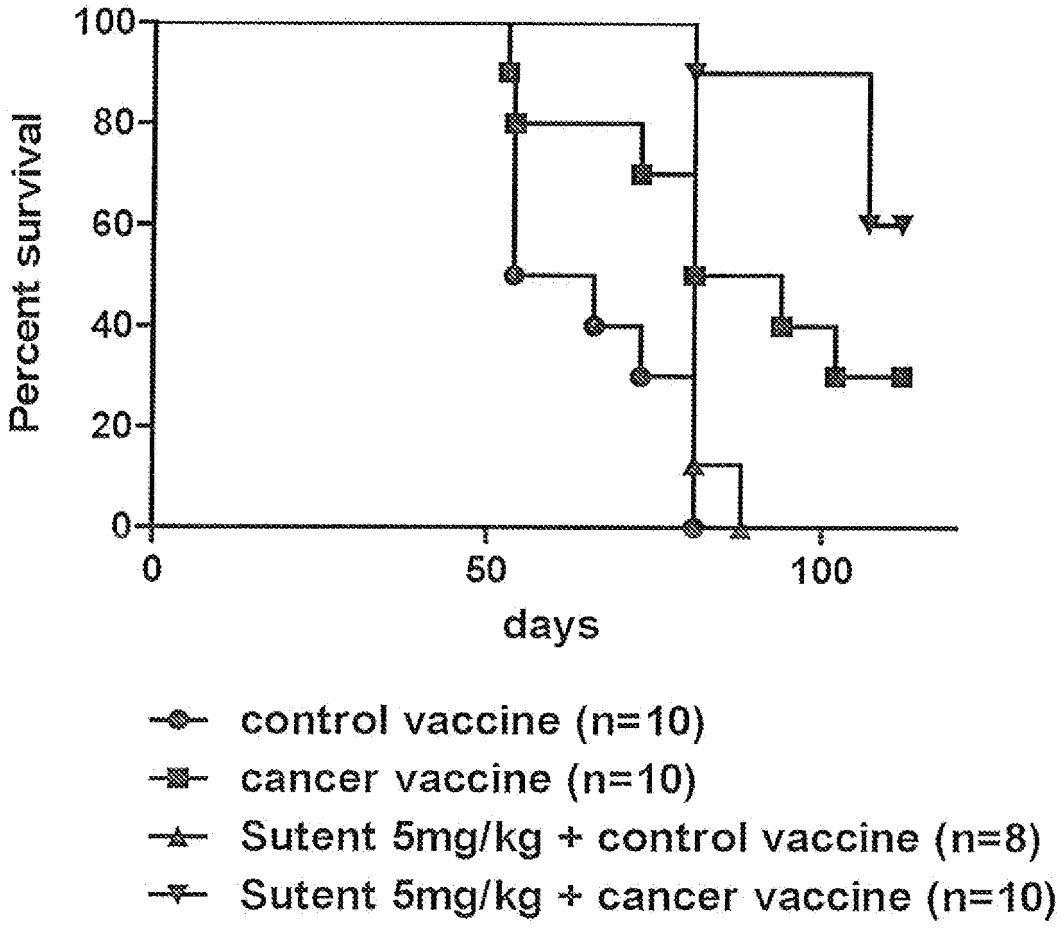


FIG. 43


100
80
60
40
20
0
Percent survival
0
50
100
days
control vaccine (n=10)
cancer vaccine (n=10)
Sutent 5mg/kg + control vaccine (n=8)
Sutent 5mg/kg + cancer vaccine (n=10)