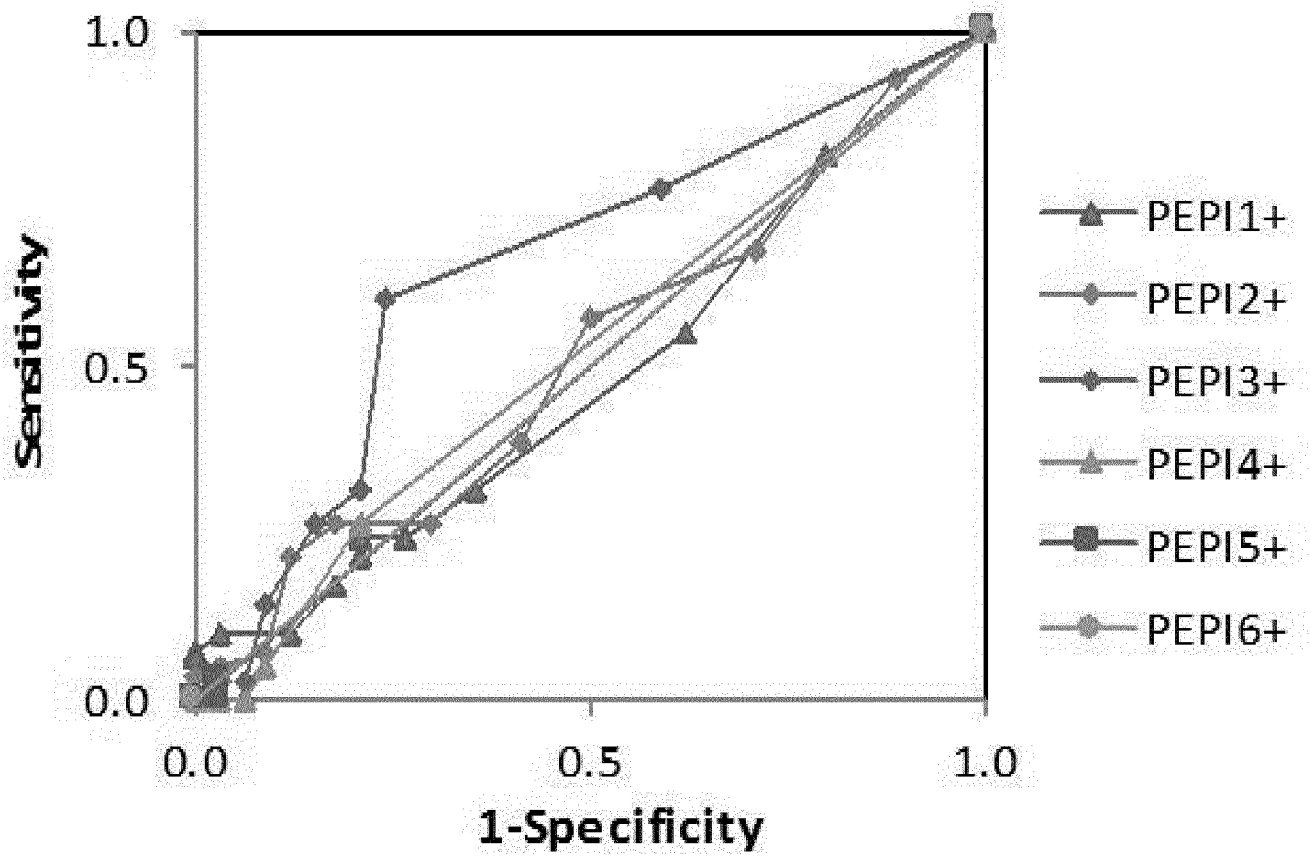
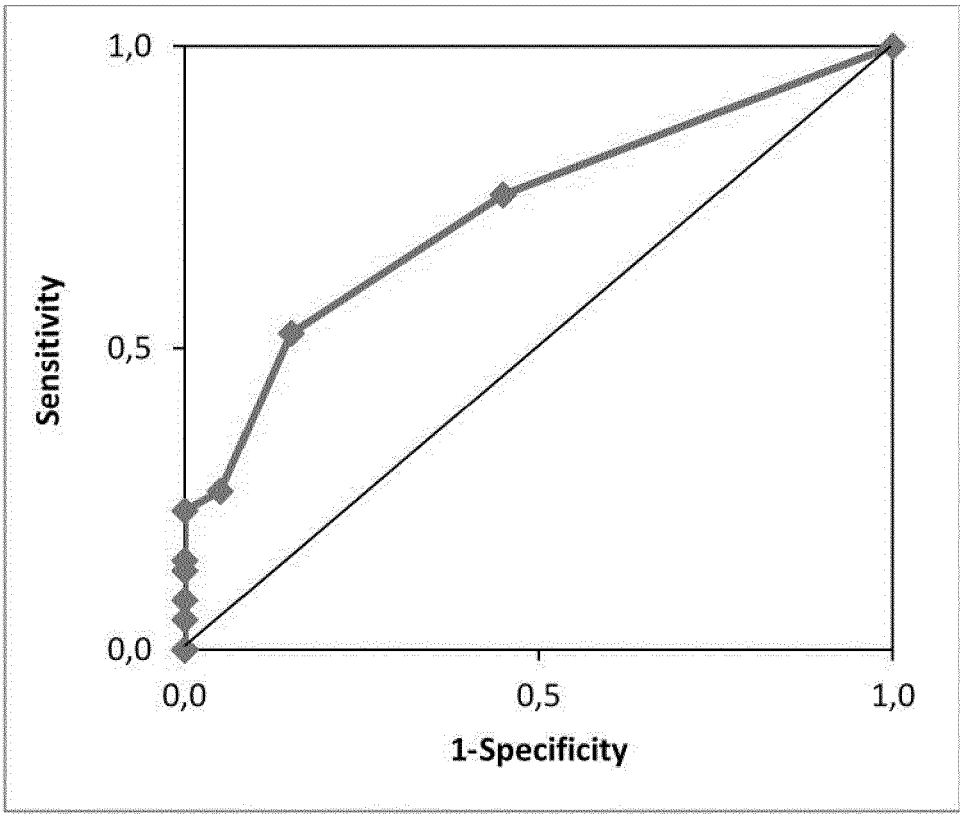
1/25
Figure 1


1.0
0.5
0.0
Sensitivity
0.0
0.5
1.0
1-Specificity
PEPI1+
PEPI2+
PEPI3+
PEPI4+
PEPI5+
PEPI6+

2/25
Figure 2



3/25

Figure 3

A

Patient ID	#epitope / HPV-16 E6 Pools															#epitope / HPV-16 E7 Pools								
	1-19	11-29	21-39	31-49	41-59	51-69	61-79	71-89	81-99	91-109	101-119	111-129	121-139	131-149	141-158	1-19	11-29	21-39	31-49	41-59	51-69	61-79	71-89	81-98
1	TN	TN	TN	FN	TN	FP	TN	TN	TN	TN	FN	TN	TN	TN	TN	FP	TN	TN	TN	FP	TN	TN	TN	TN
2	FN	FN	TN	TN	TN	FP	TN	TN	TN	TN	TN	TN	TN	TN	TN	FP	TN	TN	TN	FP	TN	TN	TN	TN
3	TN	TN	TN	TN	TN	TP	TN	TN	TN	TN	TN	FN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN
6	TN	TN	TN	FN	TN	FP	TN	TN	TN	TN	FN	TN	TN	TN	TN	FP	TN	TN	TN	TN	TN	TN	TN	FP
7	TN	TN	TN	TN	TN	FN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN
8	TN	FN	TN	FN	TN	FN	TN	FP	TN	TN	FN	TN	TN	TN	FN	TN	TN	TN	TN	TP	TN	TN	TN	TN
9	TN	TN	TN	TN	FN	FN	TN	FP	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN
10	TN	TN	TN	TN	TN	TP	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	FP	TN	TN	FP	TN
11	TN	FN	TN	TN	TN	TN	TN	TN	FP	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN
13	TN	TN	TN	TN	TN	FN	TN	TN	TN	FN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN
16	TN	TN	TN	TN	TN	TP	TN	TN	TN	FN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN
18	TN	TN	TN	TN	TN	FP	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TP	TN	TN	TN	TN
22	TN	FN	TN	TN	TN	TP	TN	TN	TN	TN	TN	TN	TN	TN	TN	FP	TN	TN	TN	FP	TN	TN	TN	TN
23	TN	TN	TN	FN	TN	TN	TN	TN	TN	FN	TN	TN	TN	FN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN
27	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN
28	TN	TN	TN	TN	TN	FP	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	FP	TN	TN	TN	TN
29	FN	TN	FN	TN	TN	TN	TN	TN	TN	FN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN
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102	TN	TN	TN	TN	TN	TP	TN	TN	FP	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	FN	TN	TN	TN
103	TN	FN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN
105	TN	TN	TN	TN	TN	TP	FN	TN	TN	TN	TN	TN	TN	TN	TN	FP	TN	TN	TN	FP	TN	TN	TN	TN
107	TN	TN	TN	TN	TN	TN	TN	TN	TN	FN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	TN	FN	TN

B

Patient ID	#epitope / HPV-16 E6 Pools															#epitope / HPV-16 E7 Pools								
	1-19	11-29	21-39	31-40	41-59	51-69	61-79	71-89	81-99	91-109	101-119	111-129	121-139	131-149	141-158	1-19	11-29	21-39	31-40	41-59	51-69	61-79	71-89	81-98
1	TN	FP	FP	TP	FP	FP	FP	FP	FP	FP	TP	FP	TN	TN	FP	FP	FP	TN	TN	FP	FP	FP	FP	FP
2	TP	TP	FP	FP	FP	FP	FP	FP	FP	FP	TN	TN	TN	FP	FP	FP	FP	TN	TN	FP	TN	FP	FP	FP
3	FP	FP	TN	FP	FP	TP	TN	FP	FP	FP	FP	TP	TN	FP	FP	FP	TN	TN	TN	FP	TN	TN	FP	FP
6	FP	FP	FP	FN	FP	FP	FP	FP	FP	FP	FN	TN	TN	TN	TN	FP	FP	TN	FP	FP	TN	FP	FP	FP
7	FP	FP	FP	FP	FP	TP	TN	FP	FP	FP	FP	FP	TN	FP	FP	FP	TN	TN	TN	FP	TN	TN	FP	FP
8	FP	TP	TN	TP	FP	TP	FP	FP	FP	FP	TP	FP	FP	FP	TP	FP	FP	TN	TN	TP	TN	FP	FP	FP
9	FP	FP	TN	FP	TP	TP	TN	FP	FP	FP	FP	FP	FP	FP	FP	FP	FP	TN	TN	FP	TN	FP	FP	FP
10	FP	FP	TN	FP	FP	TP	FP	FP	FP	FP	FP	FP	TN	FP	FP	FP	TN	TN	TN	FP	TN	TN	FP	FP
11	FP	TP	FP	FP	FP	FP	FP	TN	FP	FP	FP	FP	TN	FP	FP	FP	FP	TN	TN	FP	TN	TN	FP	FP
13	FP	FP	FP	FP	FP	TP	FP	FP	FP	TP	FP	FP	TN	FP	FP	FP	FP	TN	TN	FP	FP	TN	FP	FP
16	FP	FP	FP	FP	TN	TP	TN	FP	FP	TP	FP	TN	TN	FP	FP	FP	FP	TN	FP	FP	TN	FP	FP	FP
18	FP	FP	FP	FP	FP	FP	FP	FP	FP	FP	FP	FP	TN	FP	FP	FP	FP	TN	TN	TP	FP	FP	FP	FP
22	FP	TP	FP	FP	FP	TP	FP	FP	FP	FP	FP	FP	TN	FP	FP	FP	FP	TN	TN	FP	TN	FP	FP	FP
23	TN	FP	FP	TP	FP	FP	FP	FP	FP	TP	FP	FP	TN	TP	FP	FP	FP	TN	FP	FP	FP	TN	FP	FP
27	FP	FP	FP	FP	FP	FP	FP	FP	FP	FP	FP	FP	TN	FP	FP	FP	FP	TN	TN	FP	TN	FP	FP	FP
28	FP	FP	TN	TN	FP	FP	FP	FP	FP	FP	TN	FP	TN	FP	FP	FP	TN	TN	TN	FP	FP	TN	FP	FP
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30	FP	FP	FP	FP	FP	FP	FP	FP	FP	FP	FP	TN	TN	TN	FP	FP	FP	TN	TN	FP	FP	TN	FP	FP
100	FP	FP	FP	FP	FP	TP	FP	FP	FP	FP	TN	TN	FP	FP	FP	FP	FP	FP	FP	FP	TN	FP	FP	TN
102	FP	FP	FP	FP	FP	TP	FP	FP	FP	FP	TN	FP	FP	FP	FP	FP	FP	TN	TN	FP	FN	TN	FP	TN
103	FP	TP	FP	FP	FP	FP	FP	FP	FP	FP	FP	FP	TN	FP	FP	FP	FP	TN	TN	FP	TN	TN	FP	FP
105	FP	FP	FP	FP	FP	TP	TP	FP	FP	FP	TN	FP	TN	FP	FP	FP	FP	TN	TN	FP	TN	FP	FP	FP
107	FP	FP	FP	FP	FP	FP	FP	FP	FP	FP	TN	FP	FP	FP	FP	FP	FP	TN	FP	FP	TN	FP	TP	FP

Figure 4

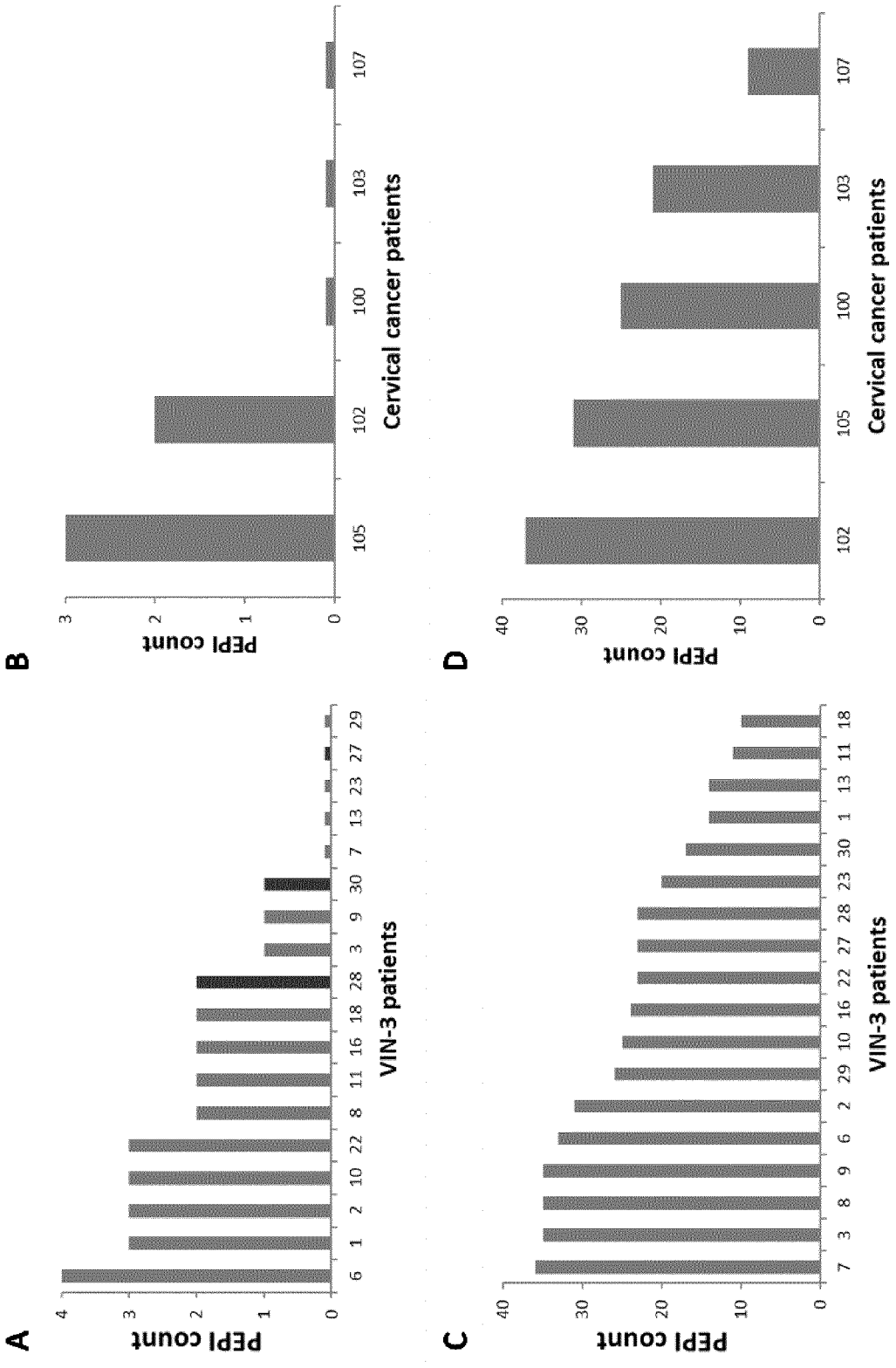
A

Pat ID	#PEPI / HPV-16 E6				E7	
	E6.1	E6.2	E6.3	E6.4	E7.1	E7.2
1	FP	TP	TP	FN	TN	FN
2	FP	TP	TP	TN	TN	TP
3	TP	TP	TP	TP	TN	TP
6	TP	TP	TP	FN	TP	TP
7	TP	TP	TP	TP	TN	TP
8	TP	TP	TP	FN	FP	TP
9	TP	TP	TP	FN	FP	TP
10	FP	TP	TP	FN	TN	TP
11	TP	TP	FN	FN	TN	TP
13	TP	TP	FN	FN	TN	FN
16	TP	TP	TP	FN	FP	TP
18	FP	TP	FN	FN	FN	TP
22	TP	TP	TP	FN	FN	FN
23	FP	TP	TP	FN	TN	TN
27	TP	TP	TP	FN	FN	FN
28	TP	TP	TP	FN	TN	FN
29	FP	TP	TP	FN	FP	TP
30	FP	FP	TN	TN	FN	FN
100	TP	TP	TP	FN	TN	TP
102	TP	TP	TP	FN	FN	TP
103	TP	TP	TP	FN	TN	TN
105	TP	TP	TP	TP	TN	TN
107	TP	TP	FN	FN	TN	FN

B

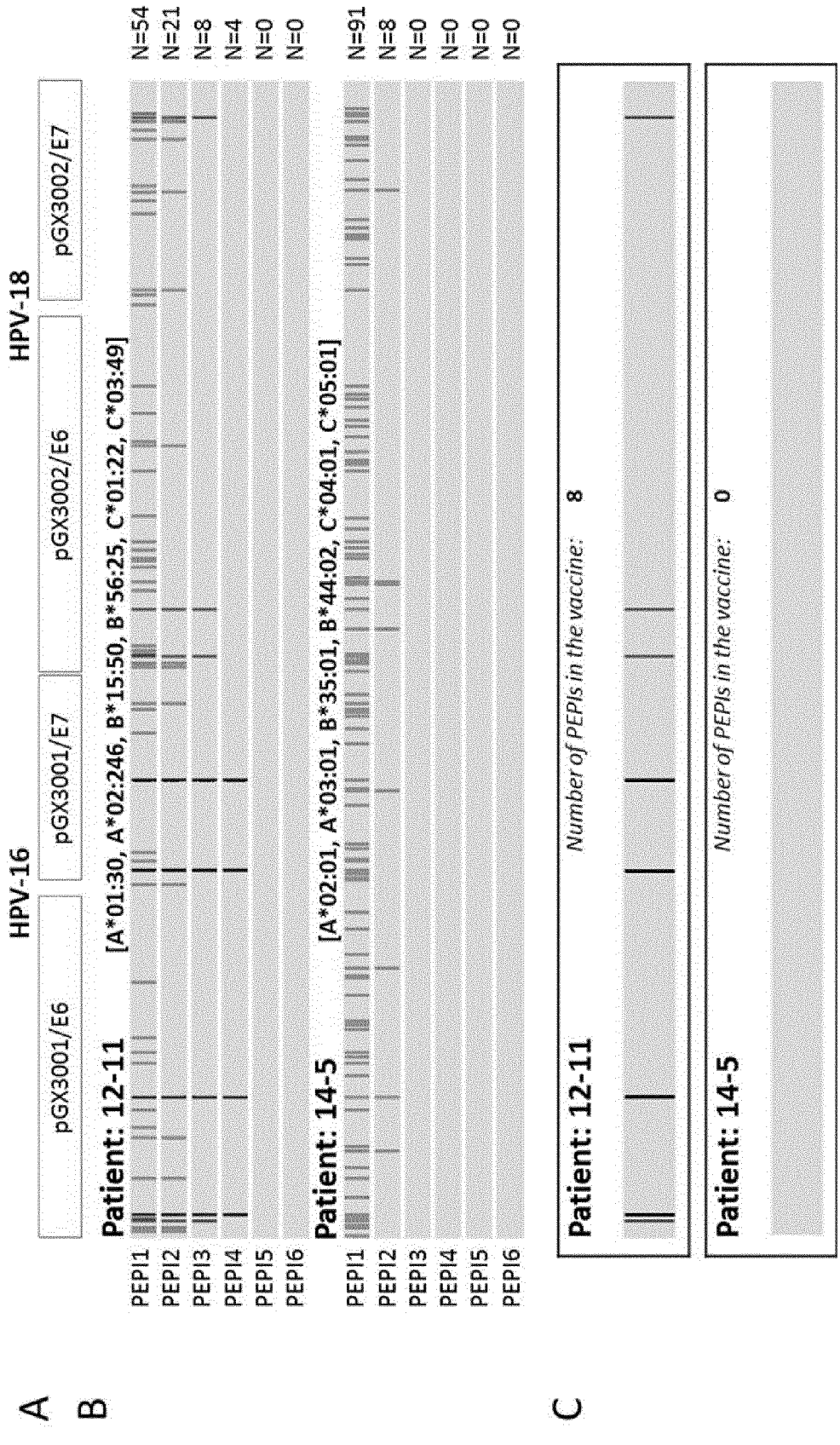
Patient ID	# epitope / HPV-16 E6&E7 pools					
	E6.1	E6.2	E6.3	E6.4	E7.1	E7.2
1	FP	TP	TP	FN	FP	TP
2	FP	TP	TP	TN	TN	TP
3	TP	TP	TP	FN	FP	TP
6	TP	TP	TP	FN	TP	TP
7	TP	TP	TP	FN	FP	TP
8	TP	TP	TP	FN	FP	TP
9	TP	TP	TP	FN	FP	TP
10	FP	TP	TP	FN	FP	TP
11	TP	TP	TP	FN	FP	TP
13	TP	TP	TP	FN	TN	TP
16	TP	TP	TP	FN	TN	TP
18	FP	TP	TP	FN	FN	TP
22	TP	TP	TP	FN	TP	TP
23	FP	TP	TP	FN	FP	FP
27	TP	TP	TP	FN	TP	TP
28	TP	TP	TP	FN	FP	TP
29	FP	TP	TP	FN	FP	TP
30	FP	FP	FP	TN	FN	TP
100	TP	TP	TP	FN	FP	TP
102	TP	TP	TP	FN	TP	TP
103	TP	TP	TP	FN	TN	FP
105	TP	TP	TP	FN	TN	FP
107	TP	TP	TP	FN	FP	TP

5/25
Figure 5


A
PEPI count
VIN-3 patients
B
PEPI count
Cervical cancer patients
C
PEPI count
VIN-3 patients
D
PEPI count
Cervical cancer patients

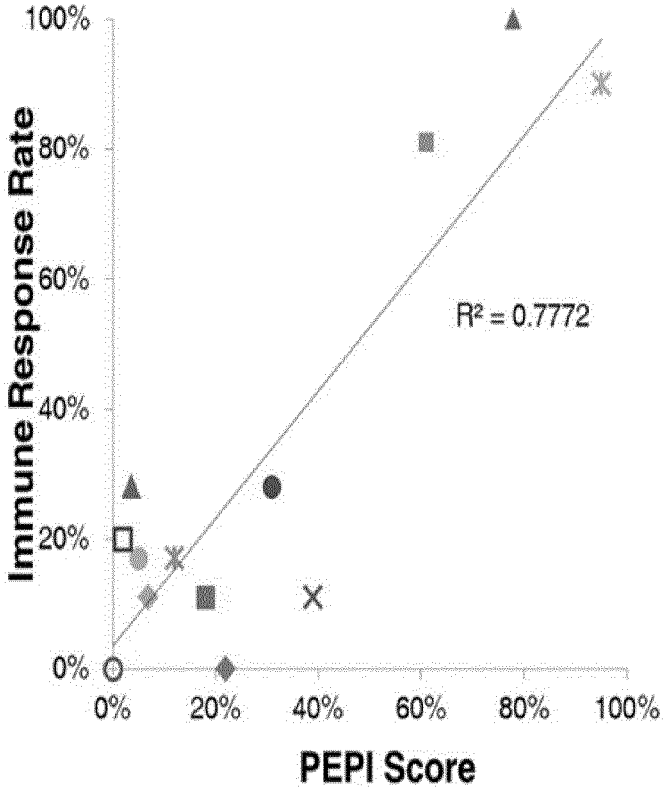
6/25

Figure 6


A
B
C
HPV-16
HPV-18
pGX3001/E6
pGX3001/E7
pGX3002/E6
pGX3002/E7
Patient: 12-11
[A*01:30, A*02:246, B*15:50, B*56:25, C*01:22, C*03:49]
PEPI1
PEPI2
PEPI3
PEPI4
PEPI5
PEPI6
N=54
N=21
N=8
N=4
N=0
N=0
Patient: 14-5
[A*02:01, A*03:01, B*35:01, B*44:02, C*04:01, C*05:01]
N=91
N=8
N=0
N=0
N=0
N=0
Patient: 12-11
Number of PEPIs in the vaccine: 8
Patient: 14-5
Number of PEPIs in the vaccine: 0

7/25

Figure 7



◆ MMNLMQPKTQQTYTYD (JUP)

■ GRGSTTTNYLLDRDDYRNTSD (ADA17)

◆ LKKGAADGGKLDGNAKLNRSLK (BAP31)

✕ FPPKDDHTLKFLYDDNQRPYPP (TOP2A)

● QRPPFSQLHRFLADALNT (DDR1)

✕ RYRKPDYTLDDGHGLLRFKST (Abl-2)

● ALDQCKTSCALMQQHYDQTSCFSSP (ITGB8)

□ STAPPAHGVTSAPDTRPAPGSTAPP (Muc-1)

▲ YLEPGPVTA (gp-100)

✕ MTPGTQSPFFLLLLLTVLTVV (Muc-1)

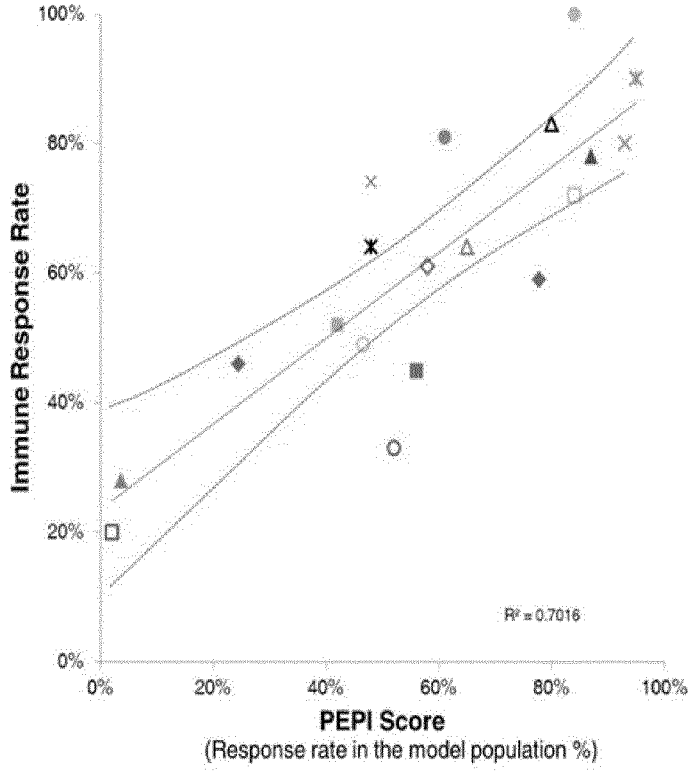
○ SSKALQRPV (Bcr-abl)

▲ RMFPNAPYL (WT1)

■ RMFPNAPYL (WT1, HLA-A*0201)

8/25

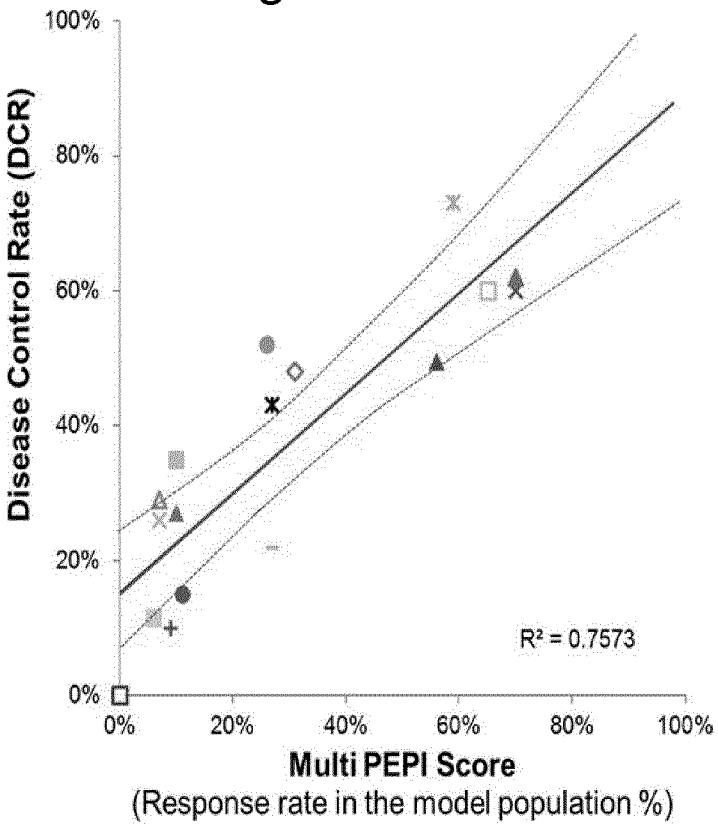
Figure 8



StimuVax (Merck)
gp100 vaccine (Sloan-Kettering Institute)
IMA901 (phase I, Immatics)
IMA901 (phase II, Immatics)
ICT107 (Cedars-Sinai Medical Center)
ProstVac (Bavarian Nordic)
Synchrotope TA2M (Mannkind Co.)
MELITAC 12.1 (Fred Hutchinson CRC)
WT1 vaccine (NCRC Hospital, Tokyo)
Iplilimumab (NY-ESO-1, MSKCC)
VGX-3100 (Inovio)
HIVIS-1 (Karolinska)
ImMucin (VaxilBio)
NY-ESO-1 OLP (Osaka University)
GVX301 (University Genoa)
WT1 vaccine (MSKCC)
WT1 vaccine (CBF)
DPX-0907 (ImmunoVaccine Inc.)
Melanoma peptide vaccine (University of Virginia)

9/25

Figure 9



IMA901 (phase I, Immatics)

IMA901 (phase II, Immatics)

Iplilimumab (NY-ESO-1, MSKCC)

HPV-SLP (Leiden University)

HPV-SLP (Leiden University)

gp100 - 2 peptides (BMS)

ImMucin (VaxilBio)

StimuVax (Merck)

VGX-3100 (Inovio) [7]

TSPP (Siena University)

KIF20A-66 peptide (Chiba Tokushukai Hospital)

Peptide vaccine (Kumamoto University)

7-peptide cocktail vaccine (Kinki University)

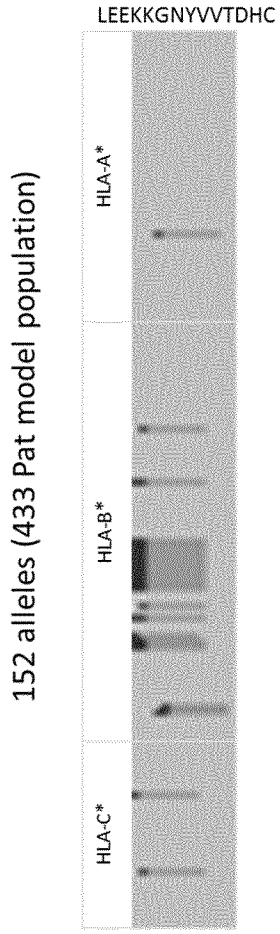
GVX301 (University Genoa)

MAGE-A3 Trojan (Abramson Cancer Center)

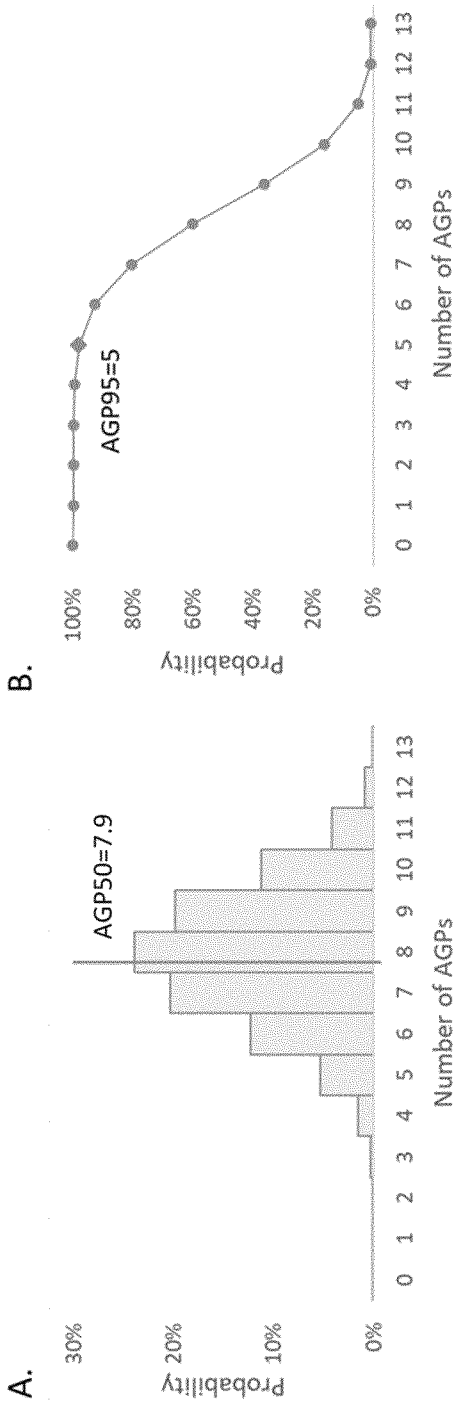
PepCan (University of Arkansas)

Melanoma peptide vaccine (University of Virginia)

10/25
Figure 10

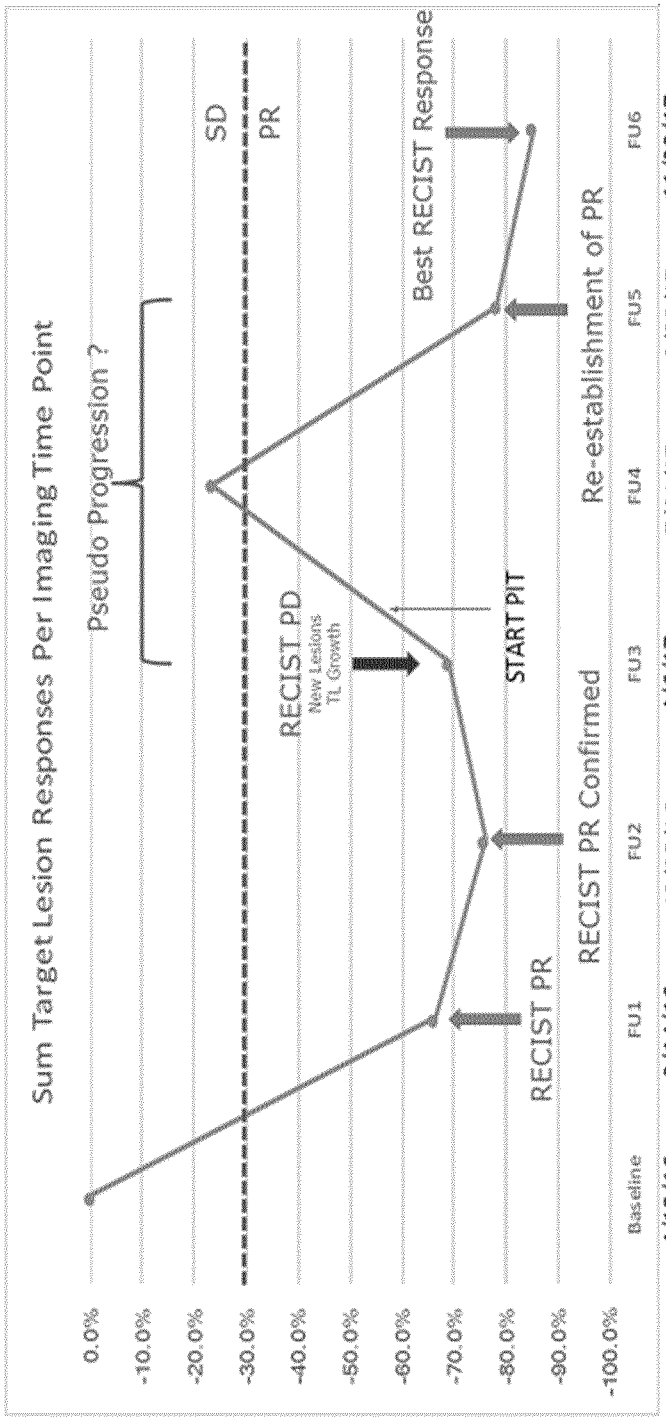


11/25
Figure 11

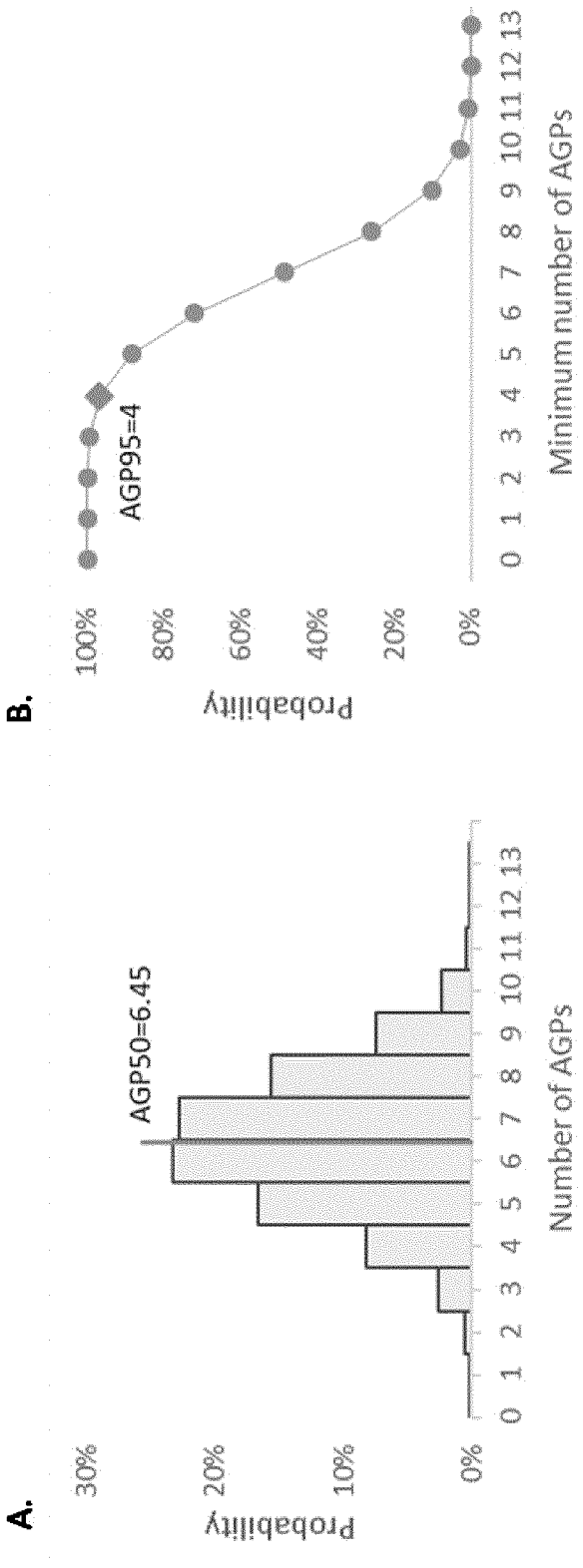


12/25

Figure 12



13/25
Figure 13



14/25
Figure 14

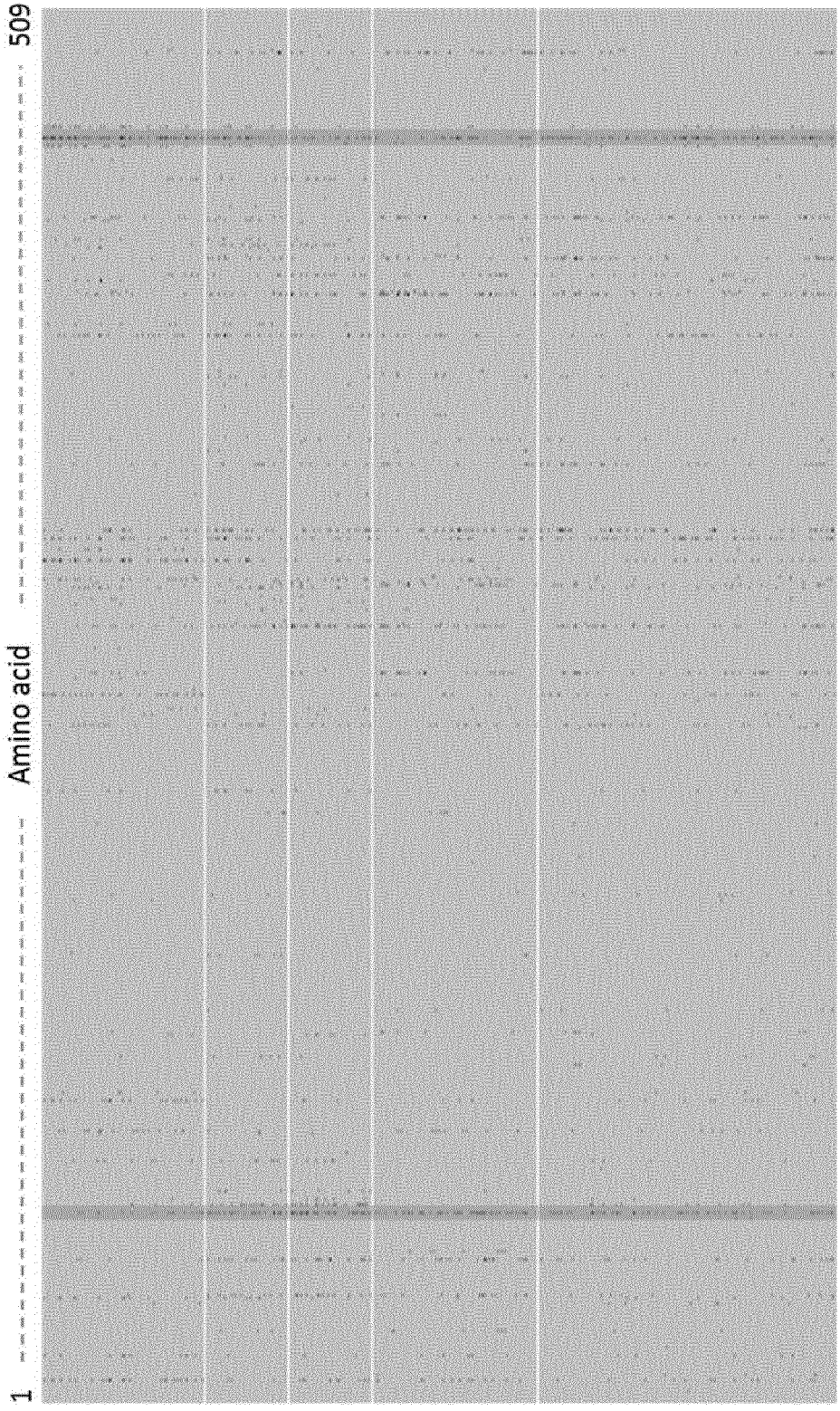


Figure 15

Antigens	Expression rate
Cancer testis antigens	Determined from 1053 tumor samples
AKAP-4	85%
BORIS	71%
SPAG9	88%
PRAME	55%
NY-SAR-35	48%
MAGE-A9	44%
NY-BR-1	47%
SURVIVIN	71%
MAGE-A11	59%
HOM-TES-85	47%

Conclusion

1. 99% of breast tumors express ≥3 antigens
2. No biopsy is needed

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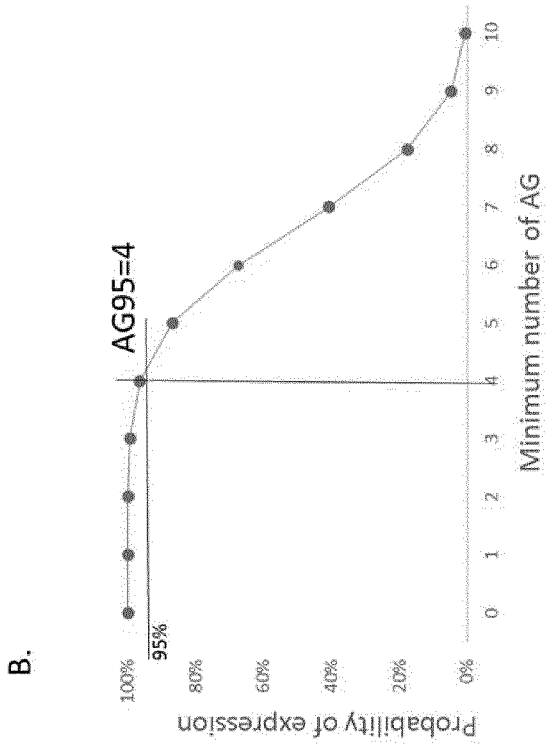
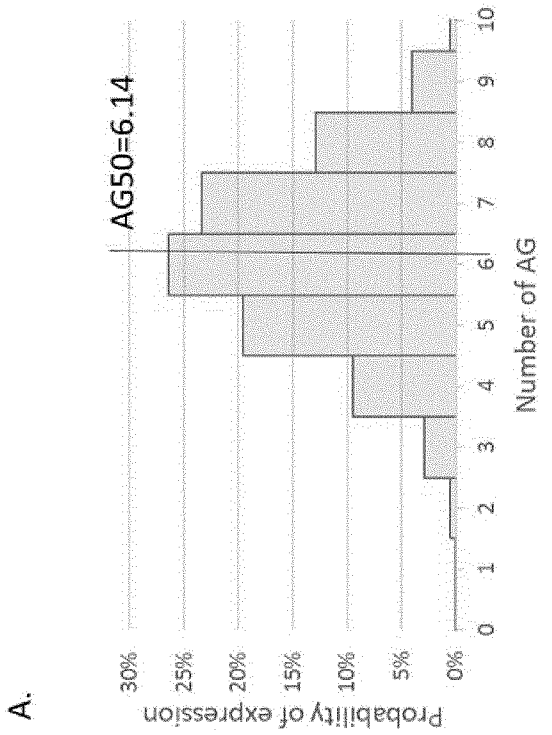
Figure 16





17/25
Figure 17

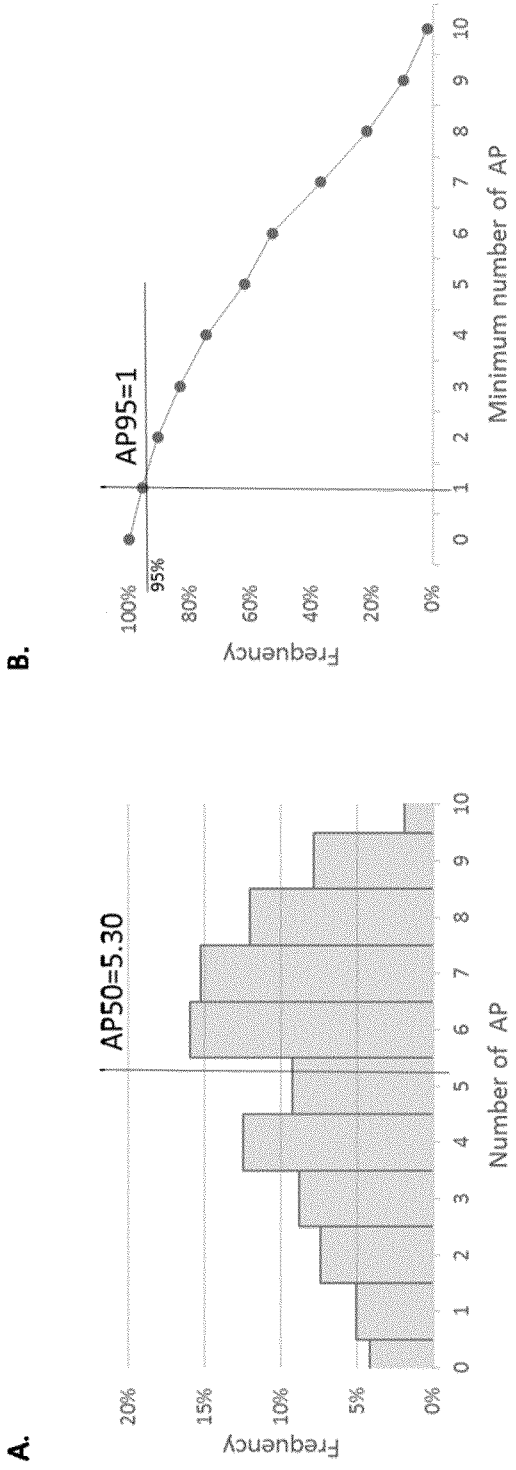
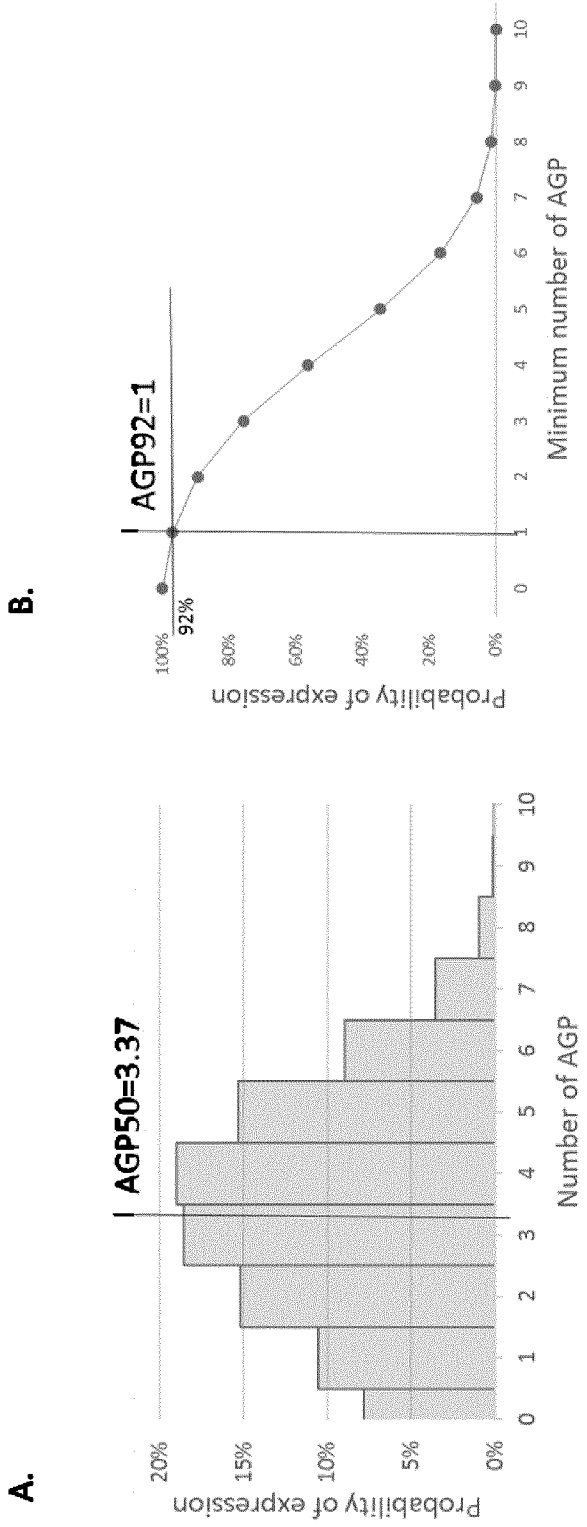


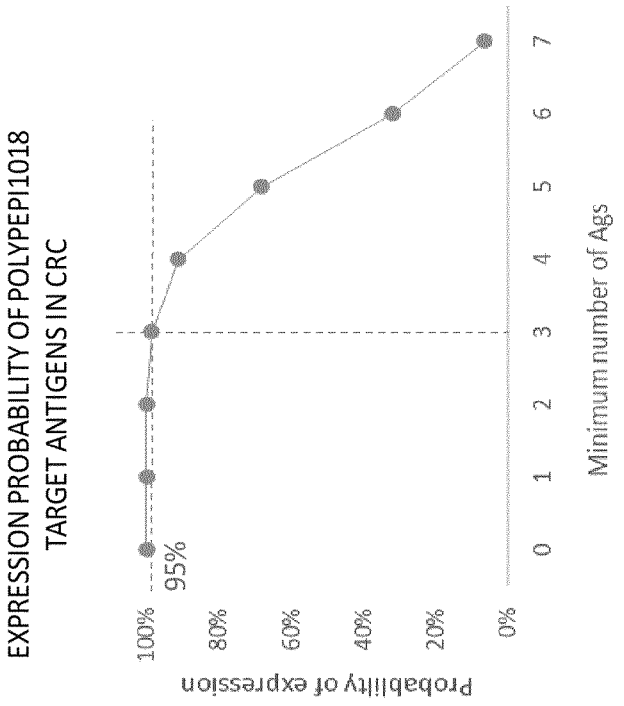
Figure 18


B.
AGP92=1
92%
100%
80%
60%
40%
20%
0%
Probability of expression
0
1
2
3
4
5
6
7
8
9
10
Minimum number of AGP
A.
AGP50=3.37
20%
15%
10%
5%
0%
Probability of expression
0
1
2
3
4
5
6
7
8
9
10
Number of AGP

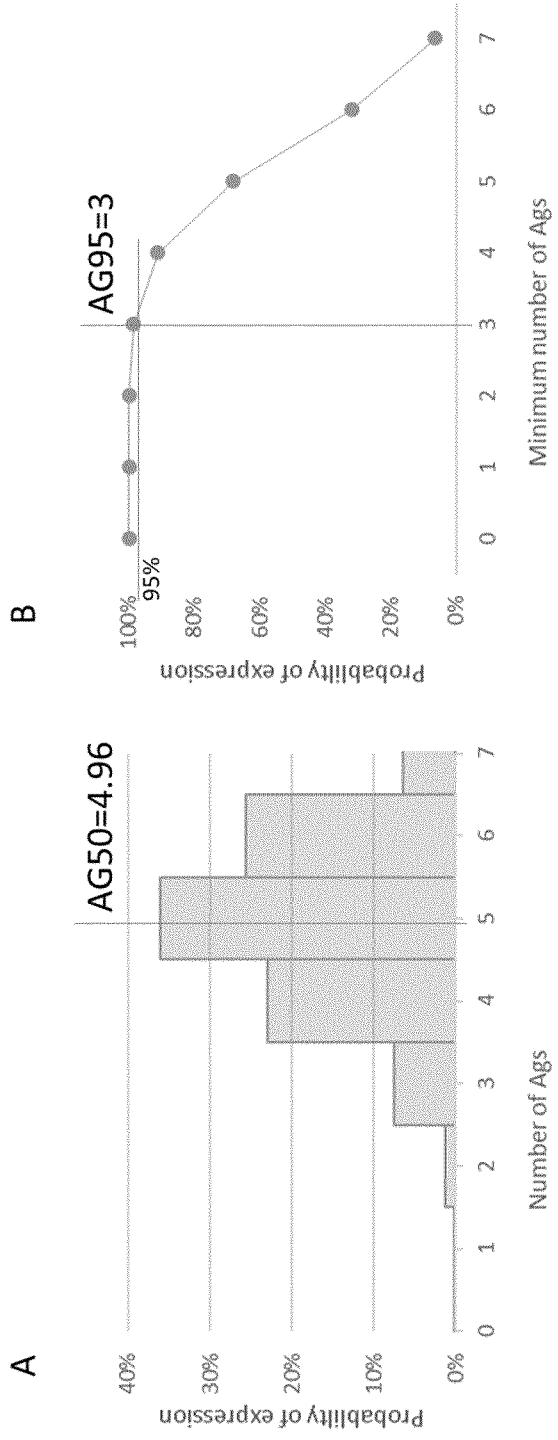
19/25
Figure 19

EXPRESSION RATES OF POLYPEPI1018
TARGET ANTIGENS IN CRC

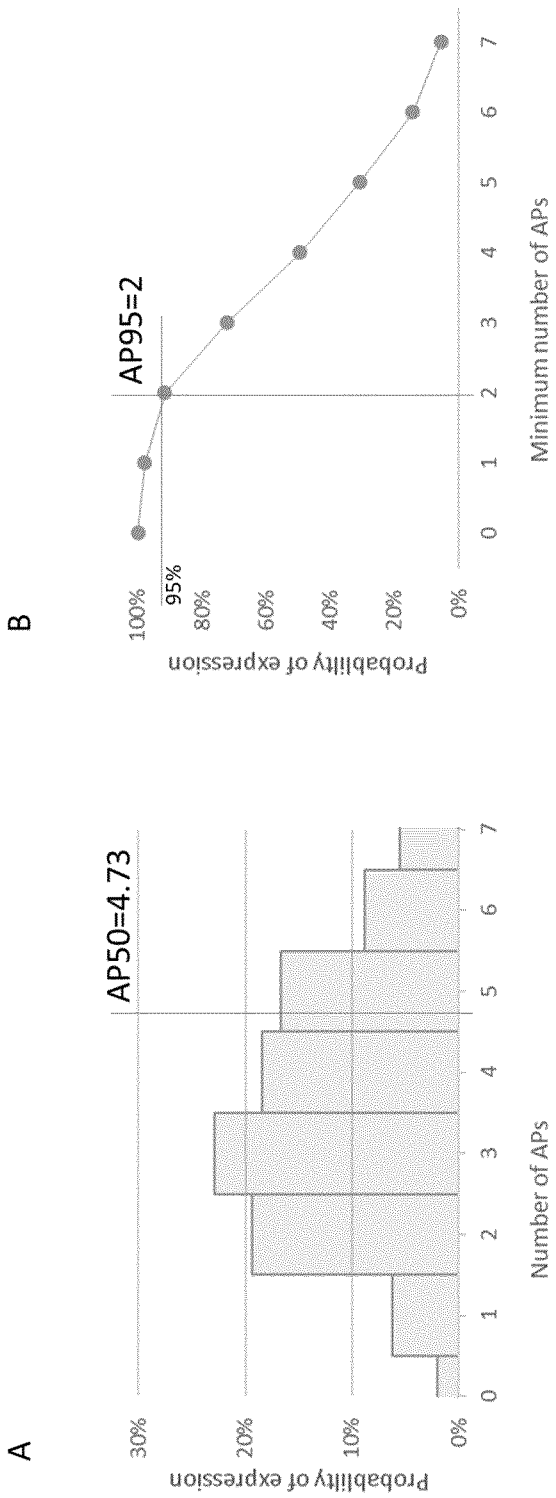
TSP50	89.47%
EpCAM	88.35%
Survivin	87.28%
CAGE1	74.47%
SPAG9	74.36%
FBXO39	38.60%
MAGE-A8	43.75%



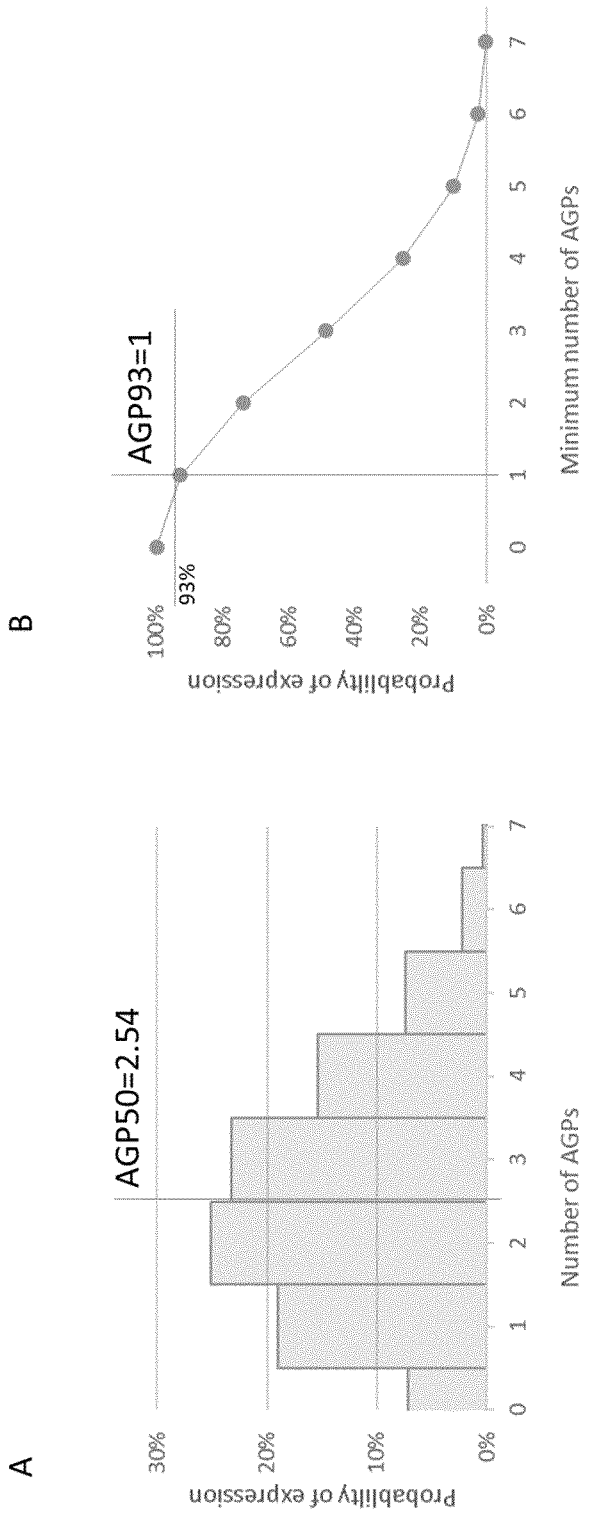
20/25
Figure 20



21/25
Figure 21



22/25
Figure 22



23/25
Figure 23

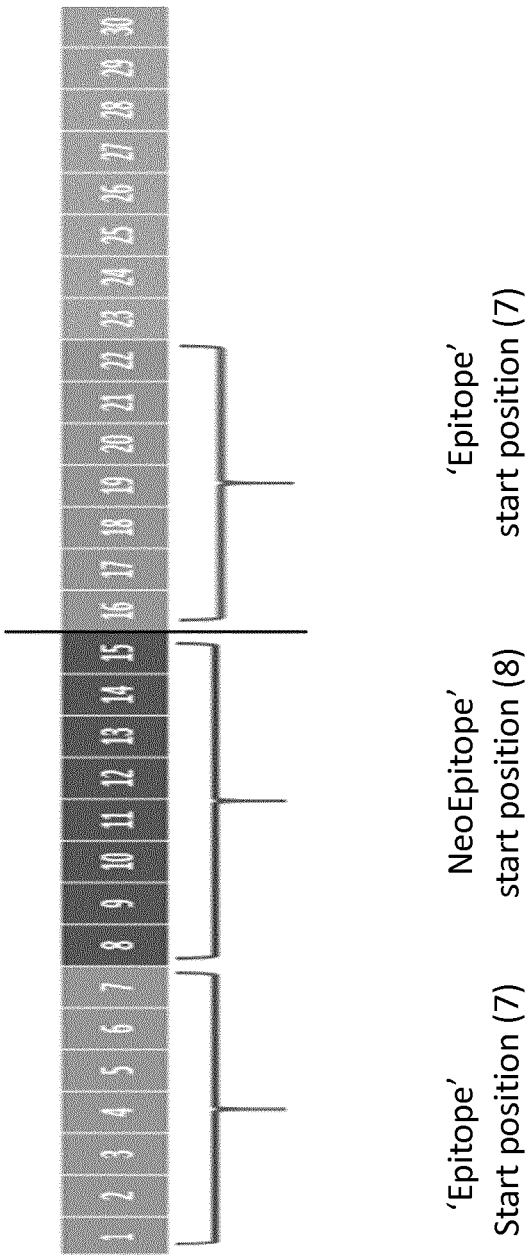
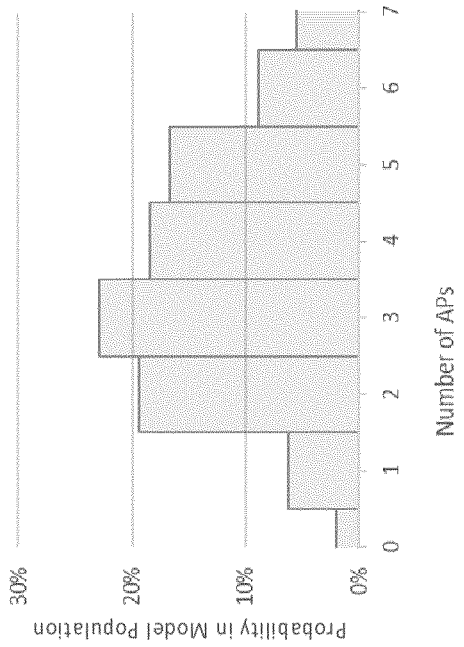


Figure 24


30%
20%
10%
0%
Probability in Model Population
0
1
2
3
4
5
6
7
Number of APs

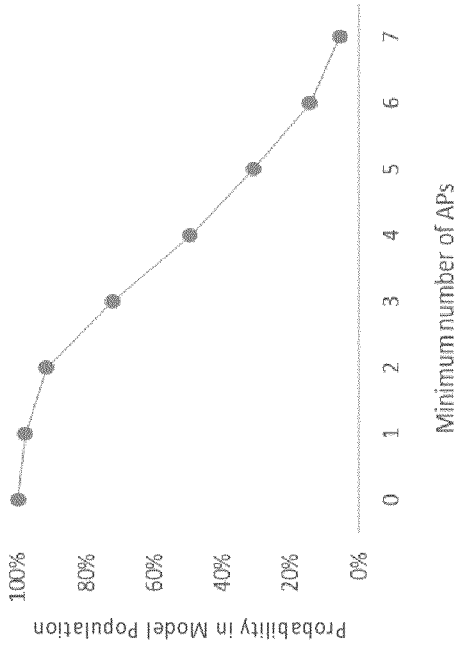
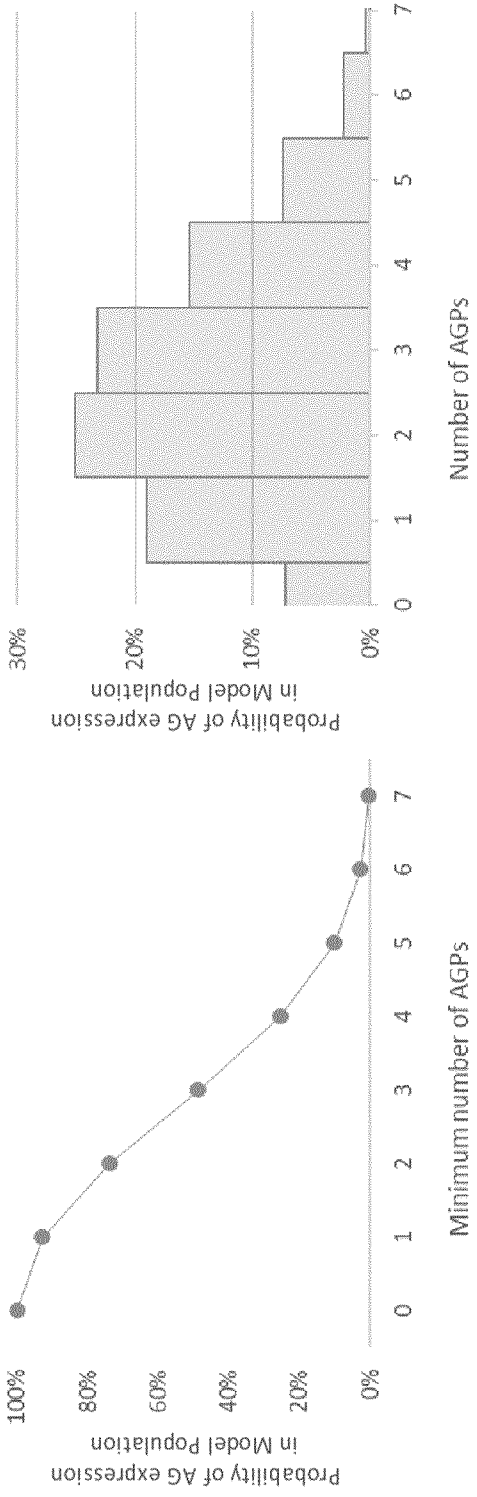

100%
80%
60%
40%
20%
0%
Probability in Model Population
0
1
2
3
4
5
6
7
Minimum number of APs

Figure 25


Probability of AG expression in Model Population
30%
20%
10%
0%
0
1
2
3
4
5
6
7
Number of AGPs
Probability of AG expression in Model Population
100%
80%
60%
40%
20%
0%
0
1
2
3
4
5
6
7
Minimum number of AGPs