

Figure 1A-2 continued

HA0_A-California-7-09_H1N1	YVWTLVEPGDKITFEATGNLVVPRYAFAMERNAGSGIIISDTPVHDCNTTCQTPKGAIN	288
HA0_A-Idaho-7-18_H1N1	YVWTLVEPGDKITFEATGNLVVPRYAFAMERNAGSGIIISDTPVHDCNTTCQTPKGAIN	288
HA0_A-Brisbane-02-18	YVWTLVEPGDKITFEATGNLVVPRYAFAMERNAGSGIIISDTPVHDCNTTCQTAEGAIN	288
HA0_A-Indonesia-5-05_H5N1	FFWTILKPNDAINFESNGNFIAPENAYKIVKKGDSAIMKSELEYNCNTKCQTPMGAINS	287
HA0_A-Egypt-N04915-14_H5N1	FFWTILKSNDAINFESNGNFIAPENAYKIVKKGDSAIMKSELEYNCNTKCQTPIGAINS	286
HA0_A-Shanghai-2-13_H7N9	FHWLMLNPNDTVTSFNAGFIAPDRASFL-RGKSMGIQSGVQVDANCEGDCYHSGGTIIS	281
HA0_A-Hangzhou-1-13_H7N9	FHWLMLNPNDTVTSFNAGFIAPDRASFL-RGKSMGIQSGVQVDANCEGDCYHSGGTIIS	281
HA0_A-Kansas-14-17_H3N2	IYWTIVKPGDILLINSTGNLIAPRGYFKI-RSGKSSIMRSDAPIGKCKSECITPNGSIPN	290
HA0_A-Minnesota-41-19_H3N2	IYWTIVKPGDILLINSTGNLIAPRGYFKI-RSGKSSIMRSDAPIGKCKSECITPNGSIPN	290
	. * : : : . * : : . * : : : . * : : . * : : . * : : .	
HA0_A-California-7-09_H1N1	SLPFQNIHPITIGKCPKVVKSTKRLRLATGLRNIPSIQ-----SRGLFGAIAGFIEGGWTGM	344
HA0_A-Idaho-7-18_H1N1	SLPFQNVHPITIGKCPKVVKSTKRLRLATGLRNVPISIQ-----SRGLFGAIAGFIEGGWTGM	344
HA0_A-Brisbane-02-18	SLPFQNVHPVTIGKCPKVVKSTKRLRLATGLRNVPISIQ-----SRGLFGAIAGFIEGGWTGM	344
HA0_A-Indonesia-5-05_H5N1	SMPFHNHPLTIGECPKVVKSNRLVLATGLRNSPQRESRRKKRGLFGAIAGFIEGGWQGM	347
HA0_A-Egypt-N04915-14_H5N1	SMPFHNHPLTIGECPKVVKSNRLVLATGLRNSPQGEKRRKKRGLFGAIAGFIEGGWQGM	346
HA0_A-Shanghai-2-13_H7N9	NLPFQNIIDSRAVGKCPRYVKQRSLLLATGMKNVPEIP---KGRGLFGAIAGFIEGWEG	338
HA0_A-Hangzhou-1-13_H7N9	NLPFQNIIDSRAVGKCPRYVKQRSLLLATGMKNVPEIP---KGRGLFGAIAGFIEGWEG	338
HA0_A-Kansas-14-17_H3N2	DKPFQNVNRITYGACPRVVKQSTLKLATGMNRNUPER----QTRGIFGAIAGFIENGWEGM	346
HA0_A-Minnesota-41-19_H3N2	DKPFQNVNRITYGACPRVVKQSTLKLATGMNRNVEK-----QTRGIFGAIAGFIENGWEGM	346
	. * : : : . * : : . * : : : . * : : . * : : . * : : .	

Figure 1A-4 continued

HA0_A-California-7-09_H1N1	FEFYHKCDNTCMESVKNGTYDVPKYSEEA	KLNREEIDGVKLESTRIYQILAIYSTVASSL	524
HA0_A-Idaho-7-18_H1N1	FEFYHKCDNTCMESVKNGTYDVPKYSEEA	KLNREKIDGVKLESTRIYQILAIYSTVASSL	524
HA0_A-Brisbane-02-18	FEFYHKCDNTCMESVKNGTYDVPKYSEEA	KLNREKIDGVKLESTRIYQILAIYSTVASSL	524
HA0_A-Indonesia-5-05_H5N1	FEFYHKCDNECMESIRNGTYNVPQYSEEAR	LKREEISGVKLESIGTYQILSIYSTVASSL	527
HA0_A-Egypt-N04915-14_H5N1	FEFYHRCDCNECMESVRNGTYDVPQYSEEAR	LKREEISGVKLESIGTYQILSIYSTVASSL	526
HA0_A-Shanghai-2-13_H7N9	FEIFHKCDDDCMASIRNNTYDHSKYREEA	MQNRIDPVKLSSGYKDVI-LWFSFGASCF	517
HA0_A-Hangzhou-1-13_H7N9	FEIFHKCDDDCMASIRNNTYDHSKYREEA	MQNRIDPVKLSSGYKDVI-LWFSFGASCF	517
HA0_A-Kansas-14-17_H3N2	FKIYHKCDNACMGSI	RNGTYDHNVYRDEALNNRFQIKGVELKSGYKDVI-LWISFAISCF	525
HA0_A-Minnesota-41-19_H3N2	FKIYHKCDNACIGSIR	NETYDHNVYRDEALNNRFQIKGVELKSGYKDVI-LWISFAISCF	525
	:::,**,*:	*:*:*:*:*:*:*:*:*:*:*:*:	
HA0_A-California-7-09_H1N1	VLVSLGAISFWMCSNGSLQCRICI		549
HA0_A-Idaho-7-18_H1N1	VLVSLGAISFWMCSNGSLQCRICI		549
HA0_A-Brisbane-02-18	VLVSLGAISFWMCSNGSLQCRICI		549
HA0_A-Indonesia-5-05_H5N1	ALAIMMAGLSLWMCSNGSLQCRICI		552
HA0_A-Egypt-N04915-14_H5N1	ALAIMVAGLSLWMCSNGSLQCRICI		551
HA0_A-Shanghai-2-13_H7N9	ILLAIIVMGLVFCVKNGNMRCITICI		542
HA0_A-Hangzhou-1-13_H7N9	ILLAIIVMGLVFCVKNGNMRCITICI		542
HA0_A-Kansas-14-17_H3N2	LLCVALLGFIMWACQKGNIRCNICI		550
HA0_A-Minnesota-41-19_H3N2	LLCVALLGFIMWACQKGNIRCNICI		550
	*: : : : *	: : : : *	

Figure 1B

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HA_B-Phuket-3703-13_Yam      DRICGIISSSPHVVKTAIQGEVNVTVGIPLITTTPTKSYFANLKGTRTGKLCPCDCLNC 60
HA_B-Singapore-16_0569-16_Yam DRICGIISSSPHVVKTAIQGEVNVTVGIPLITTTPTKSYFANLKGTRTGKLCPCDCLNC 60
HA_B-Maryland-15-16_Vic     DRICGIISSSPHVVKTAIQGEVNVTVGIPLITTTPTKSHFANLKGTEIRGLCPKCILNC 60
HA_B-Victoria-705-18_Vic    DRICGIISSSPHVVKTAIQGEVNVTVGIPLITTTPTKSHFANLKGTEIRGLCPKCILNC 60
HA_B-Washington-12-19_Vic   DRICGIISSSPHVVKTAIQGEVNVTVGIPLITTTPTKSHFANLKGTEIRGLCPKCILNC 60
HA_B-Darwin-08-19_Vic       DRICGIISSSPHVVKTAIQGEVNVTVGIPLITTTPTKSHFANLKGTEIRGLCPKCILNC 60
HA_B-Darwin-20-19_Vic       DRICGIISSSPHVVKTAIQGEVNVTVGIPLITTTPTKSHFANLKGTEIRGLCPKCILNC 60
*****;*****.*****.****

TDL DVALGRPMC VGTTPSAKAS ILHEVRPV TSGCFFPIMH DRTKIRQLPN LLRGYE KIRLS 120
TDL DVALGRPMC VGTTPSAKAS ILHEVRPV TSGCFFPIMH DRTKIRQLPN LLRGYE KIRLS 120
TDL DVALGRPKCTGKI PSARVS ILHEVRPV TSGCFFPIMH DRTKIRQLPN LLRGYEHV RLS 120
TDL DVALSRPKCTGKI PSARVS ILHEVRPV TSGCFFPIMH DRTKIRQLPN LLRGYEHV RLS 120
TDL DVALGRPKCTGKI PSARVS ILHEVRPV TSGCFFPIMH DRTKIRQLPN LLRGYEHV RLS 120
TDL DVALGRPKCTGKI PSARVS ILHEVRPV TSGCFFPIMH DRTKIRQLPN LLRGYEHV RLS 120
TDL DVALGRPKCTGKI PSARVS ILHEVRPV TSGCFFPIMH DRTKIRQLPN LLRGYEHV RLS 120
TDL DVALGRPKCTGKI PSARVS ILHEVRPV TSGCFFPIMH DRTKIRQLPN LLRGYEHV RLS 120
***** ** * *.***: *****

```


Figure 1B-2 continued

HA_B-Phuket-3703-13_Yam	QSGRIVVDMVQKPGKTGTIVYQRGVLLPQKVWCASGRSKVIKGSPLIGEADCLHEEYG	300
HA_B-Singapore-16_0569-16_Yam	QSGRIVVDMVQKPGKTGTIVYQRGVLLPQKVWCASGRSKVIKGSPLIGEADCLHEEYG	300
HA_B-Maryland-15-16_Vic	QSGRIVVDMVQKSGKTGTITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYG	299
HA_B-Victoria-705-18_Vic	QSGRIVVDMVQKSGKTGTITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYG	298
HA_B-Washington-12-19_Vic	QSGRIVVDMVQKSGKTGTITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYG	298
HA_B-Darwin-08-19_Vic	QSGRIVVDMVQKSGKTGTITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYG	298
HA_B-Darwin-20-19_Vic	QSGRIVVDMVQKSGKTGTITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYG	298
	*****; ** *****. ****; *****; *****; **	8/198
HA_B-Phuket-3703-13_Yam	GLNKSPPYTGKHAKAIGNCPIWVKTPLKLANGTKYRPPAKLLKERGFFGAIAGFLEGGW	360
HA_B-Singapore-16_0569-16_Yam	GLNKSPPYTGKHAKAIGNCPIWVKTPLKLANGTKYRPPAKLLKERGFFGAIAGFLEGGW	360
HA_B-Maryland-15-16_Vic	GLNKSPPYTGEHAKAIGNCPIWVKTPLKLANGTKYRPPAKLLKERGFFGAIAGFLEGGW	359
HA_B-Victoria-705-18_Vic	GLNKSPPYTGEHAKAIGNCPIWVKTPLKLANGTKYRPPAKLLKERGFFGAIAGFLEGGW	358
HA_B-Washington-12-19_Vic	GLNKSPPYTGEHAKAIGNCPIWVKTPLKLANGTKYRPPAKLLKERGFFGAIAGFLEGGW	358
HA_B-Darwin-08-19_Vic	GLNKSPPYTGEHAKAIGNCPIWVKTPLKLANGTKYRPPAKLLKERGFFGAIAGFLEGGW	358
HA_B-Darwin-20-19_Vic	GLNKSPPYTGEHAKAIGNCPIWVKTPLKLANGTKYRPPAKLLKERGFFGAIAGFLEGGW	35
	*****; *****; *****; *****; *****; *****	

Figure 1B-3 continued

HA_B-Phuket-3703-13_Yam
HA_B-Singapore-16_0569-16_Yam
HA_B-Maryland-15-16_Vic
HA_B-Victoria-705-18_Vic
HA_B-Washington-12-19_Vic
HA_B-Darwin-08-19_Vic
HA_B-Darwin-20-19_Vic

EGMIAGNHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGAMDELH 420
EGMIAGNHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGAMDELH 420
EGMIAGNHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGAMDELH 419
EGMIAGNHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGAMDELH 418
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9/198

HA_B-Phuket-3703-13_Yam
HA_B-Singapore-16_0569-16_Yam
HA_B-Maryland-15-16_Vic
HA_B-Victoria-705-18_Vic
HA_B-Washington-12-19_Vic
HA_B-Darwin-08-19_Vic
HA_B-Darwin-20-19_Vic

NEILELDEKVVDDLADTSSQIELAVLLSNEGIINSEDEHLLALERKCLKMLGPSAVDIG 480
NEILELDEKVVDDLADTSSQIELAVLLSNEGIINSEDEHLLALERKCLKMLGPSAVDIG 480
NEILELDEKVVDDLADTSSQIELAVLLSNEGIINSEDEHLLALERKCLKMLGPSAVEIG 479
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NEILELDEKVVDDLADTSSQIELAVLLSNEGIINSEDEHLLALERKCLKMLGPSAVEIG 478
NEILELDEKVVDDLADTSSQIELAVLLSNEGIINSEDEHLLALERKCLKMLGPSAVEIG 47-
*****;

Figure 1B-4 continued

HA_B-Phuket-3703-13_Yam	NGCFETKHKCNQTC	LDRIAAGTFNAGEFSLPTF	DSLNITAA	SLNDDGLDNHT	ILYYSTA	540
HA_B-Singapore-16_0569-16_Yam	NGCFETKHKCNQTC	LDRIAAGTFNAGEFSLPTF	DSLNITAA	SLNDDGLDNHT	ILYYSTA	540
HA_B-Maryland-15-16_Vic	NGCFETKHKCNQTC	LDKIAAGTFDAGEFSLPTF	DSLNITAA	SLNDDGLDNHT	ILYYSTA	539
HA_B-Victoria-705-18_Vic	NGCFETKHKCNQTC	LDRIAAGTFDAGEFSLPTF	DSLNITAA	SLNDDGLDNHT	ILYYSTA	538
HA_B-Washington-12-19_Vic	NGCFETKHKCNQTC	LDRIAAGTFDAGEFSLPTF	DSLNITAA	SLNDDGLDNHT	ILYYSTA	538
HA_B-Darwin-08-19_Vic	NGCFETKHKCNQTC	LDRIAAGTFDAGEFSLPTF	DSLNITAA	SLNDDGLDNHT	ILYYSTA	538
HA_B-Darwin-20-19_Vic	NGCFETKHKCNQTC	LDRIAAGTFDAGEFSLPTF	DSLNITAA	SLNDDGLDNHT	ILYYSTA	538
	*****;	*****;	*****;	*****;	*****;	
HA_B-Phuket-3703-13_Yam	ASSLAVT	MLAIFIVYMVSRDNV	SCSICL			569
HA_B-Singapore-16_0569-16_Yam	ASSLAVT	MLAIFIVYMVSRDNV	SCSICL			569
HA_B-Maryland-15-16_Vic	ASSLAVT	MLAIFVWVMVSRDNV	SCSICL			568
HA_B-Victoria-705-18_Vic	ASSLAVT	MLAIFVWVMVSRDVS	SCSICL			567
HA_B-Washington-12-19_Vic	ASSLAVT	MLAIFVWVMVSRDNV	SCSICL			567
HA_B-Darwin-08-19_Vic	ASSLAVT	MLAIFVWVMVSRDNV	SCSICL			567
HA_B-Darwin-20-19_Vic	ASSLAVT	MLAIFVWVMVSRDNV	SCSICL			567
	*****;	*****;	*****;	*****;	*****;	

Figure 1C

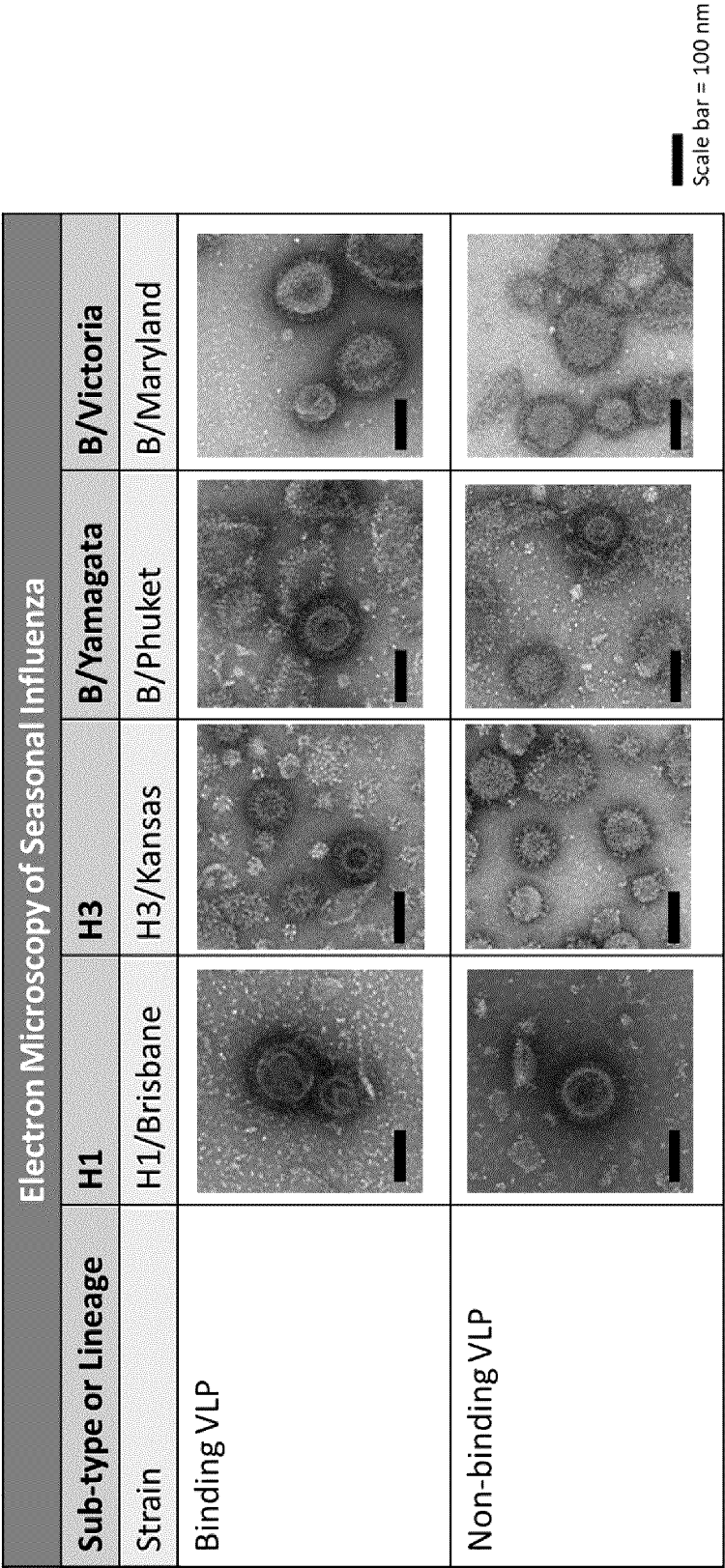


Figure 2A

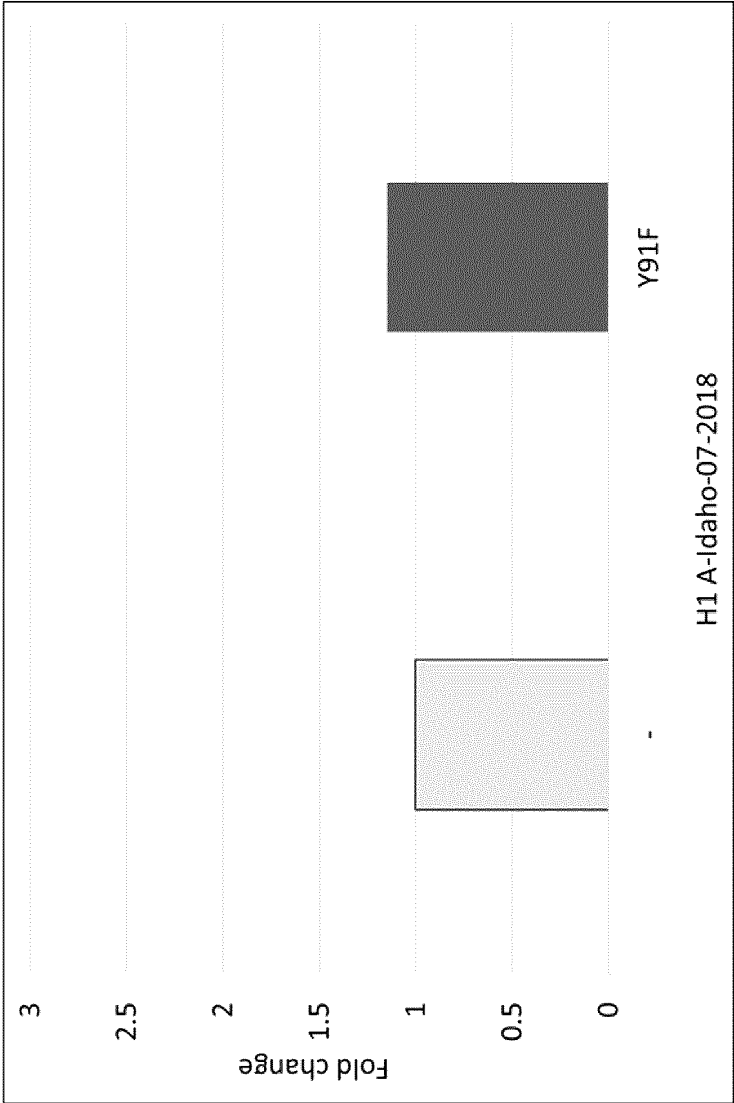


Figure 2B

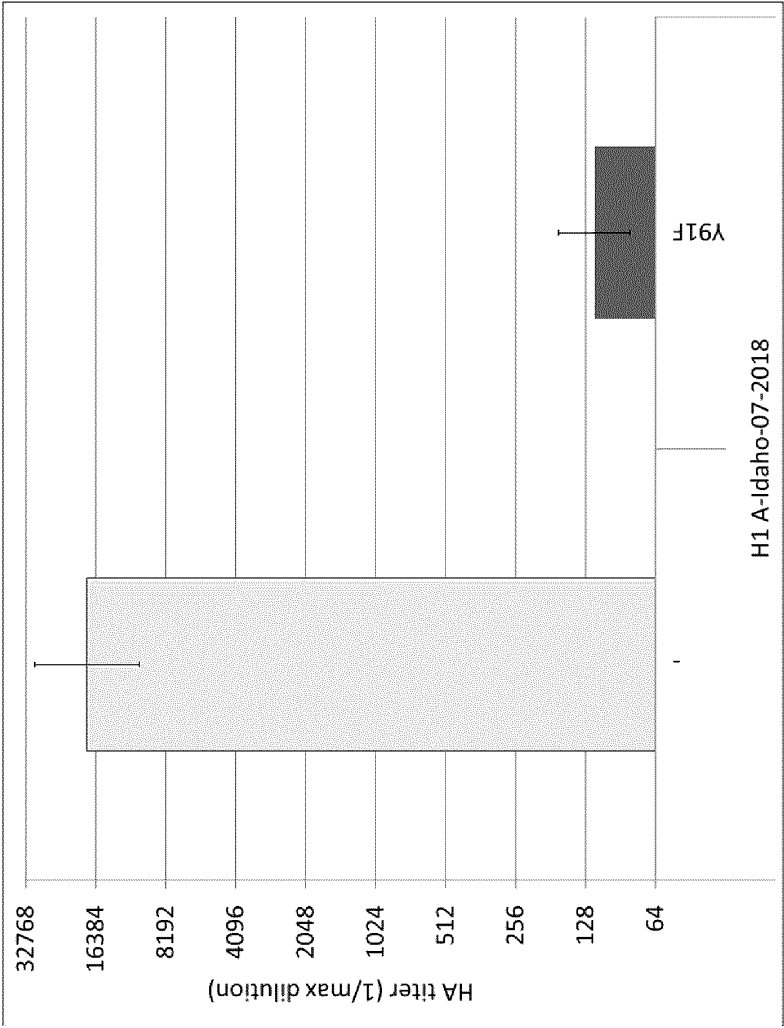


Figure 2C

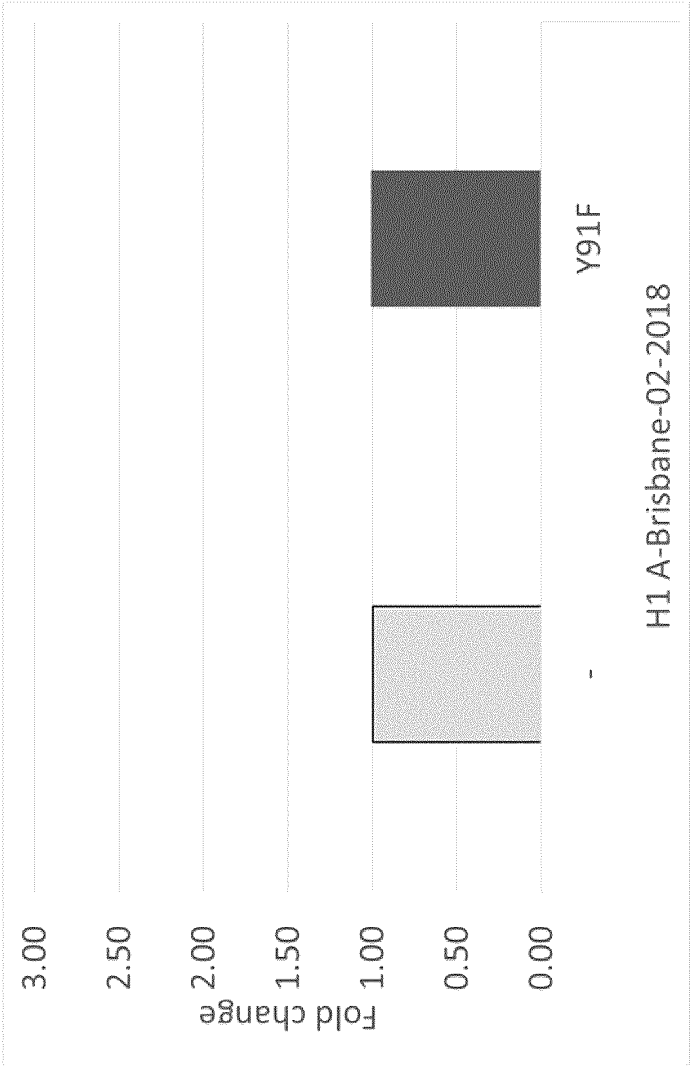


Figure 2D

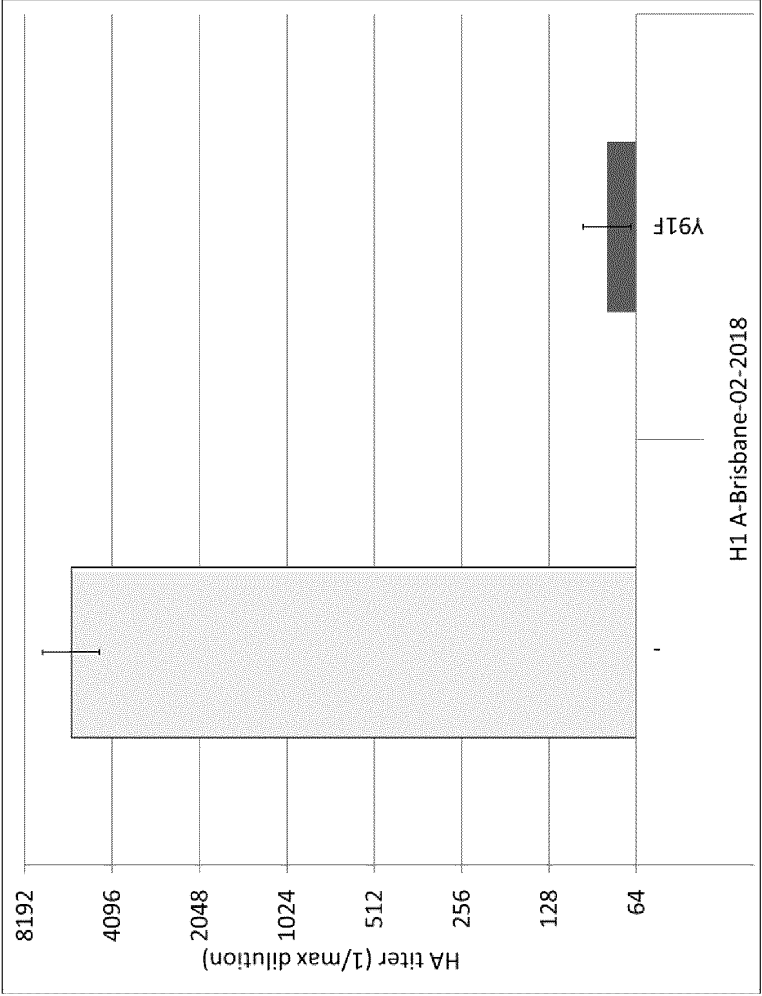


Figure 3A

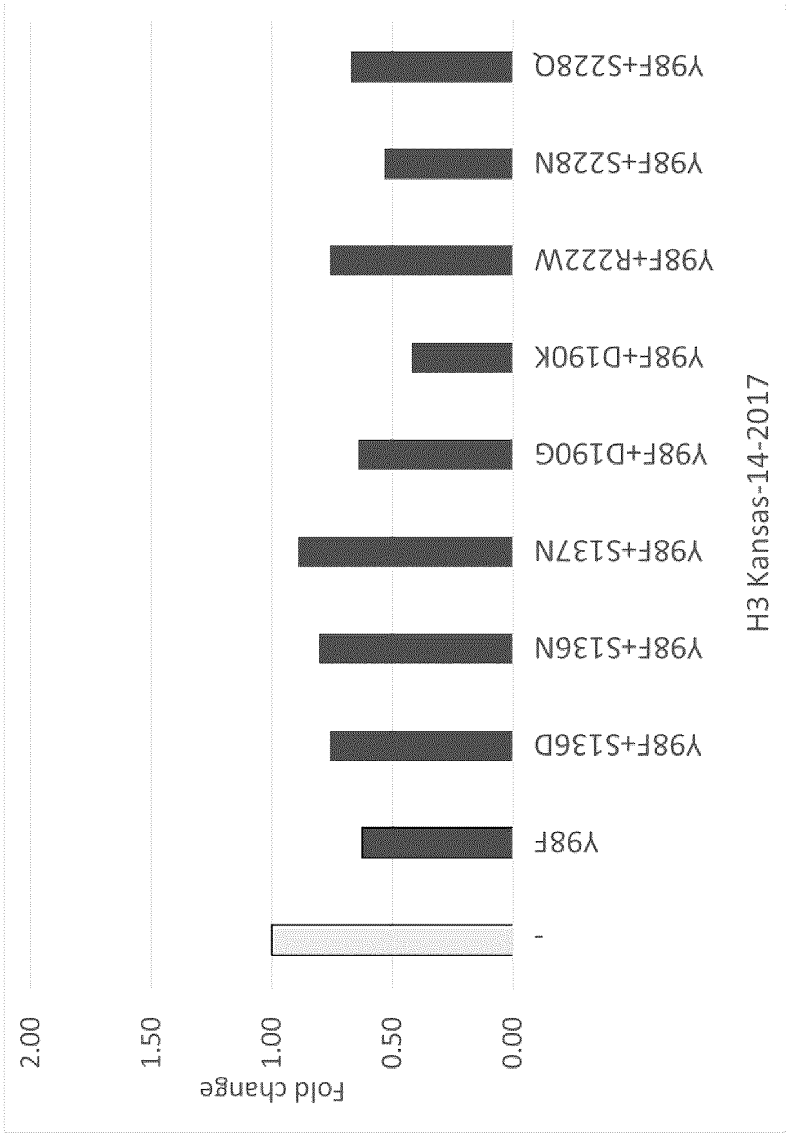


Figure 3B

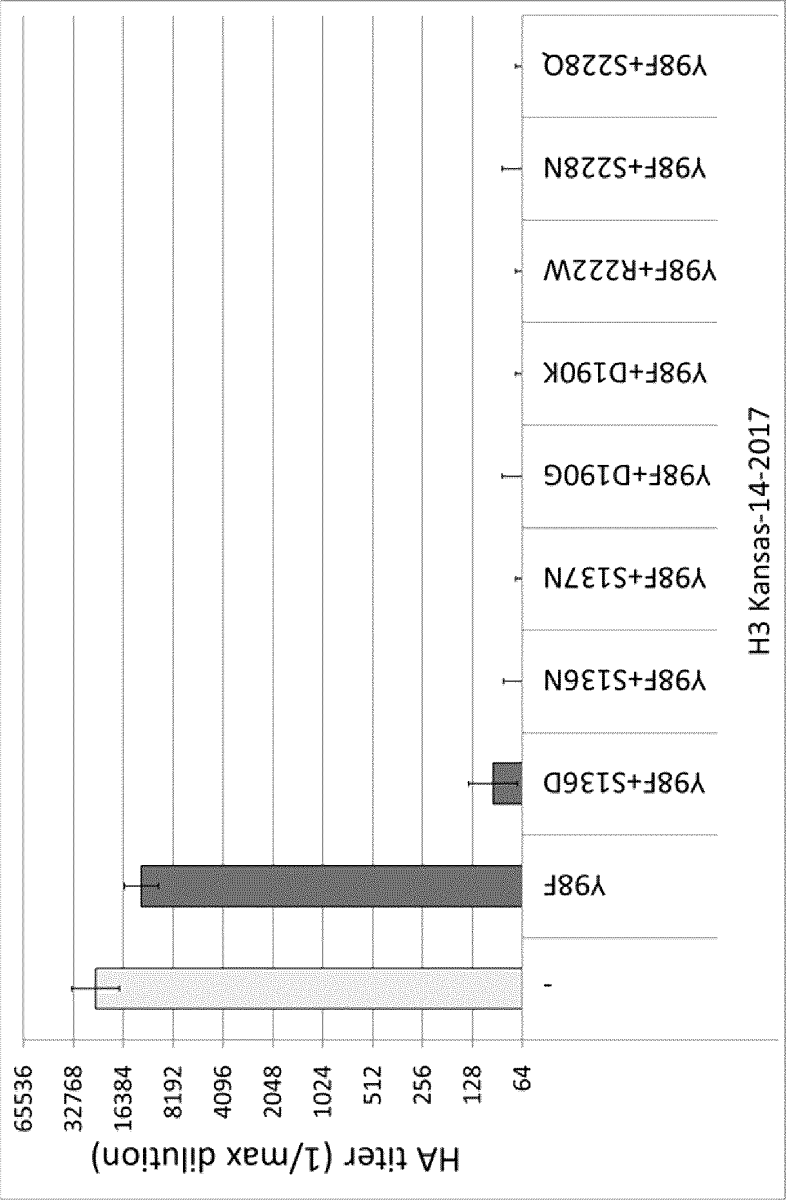


Figure 3C

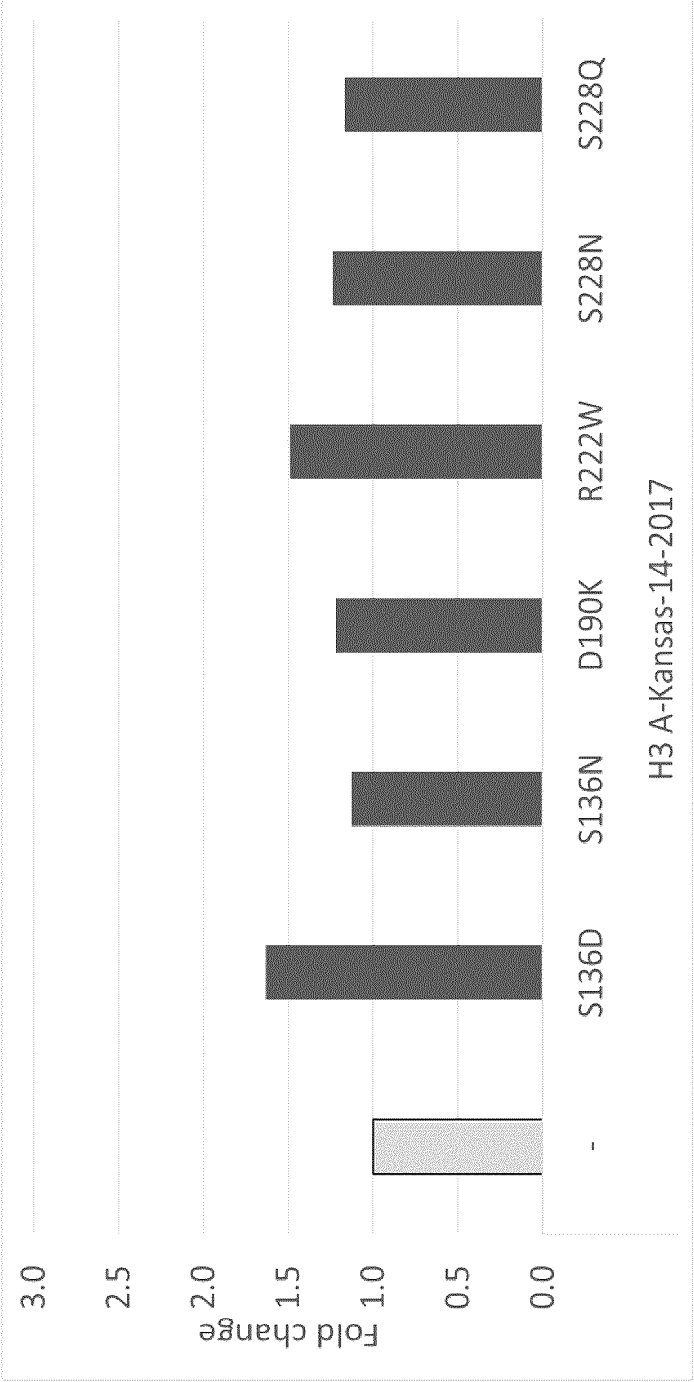


Figure 3D

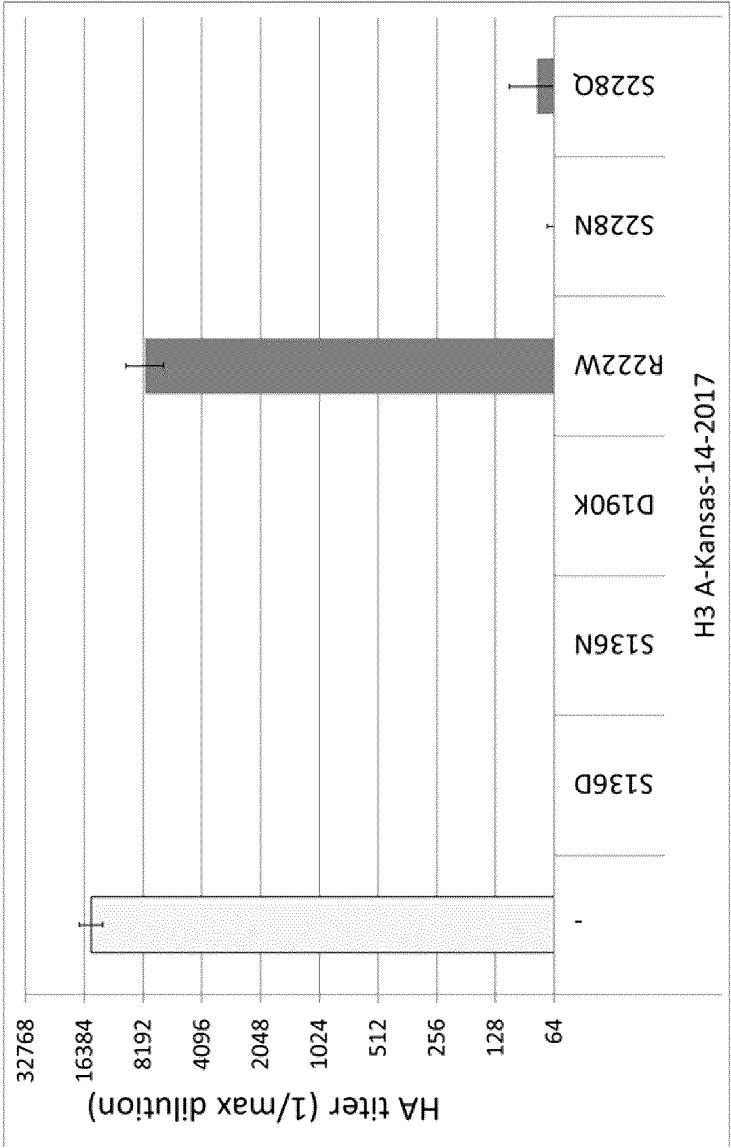


Figure 4A

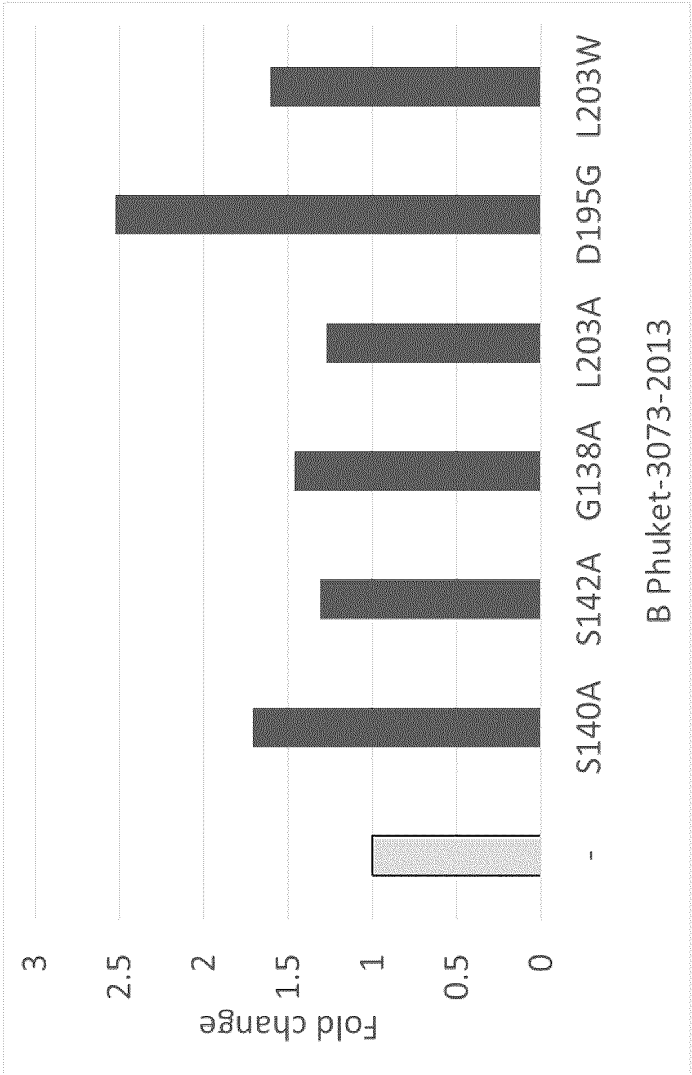


Figure 4B

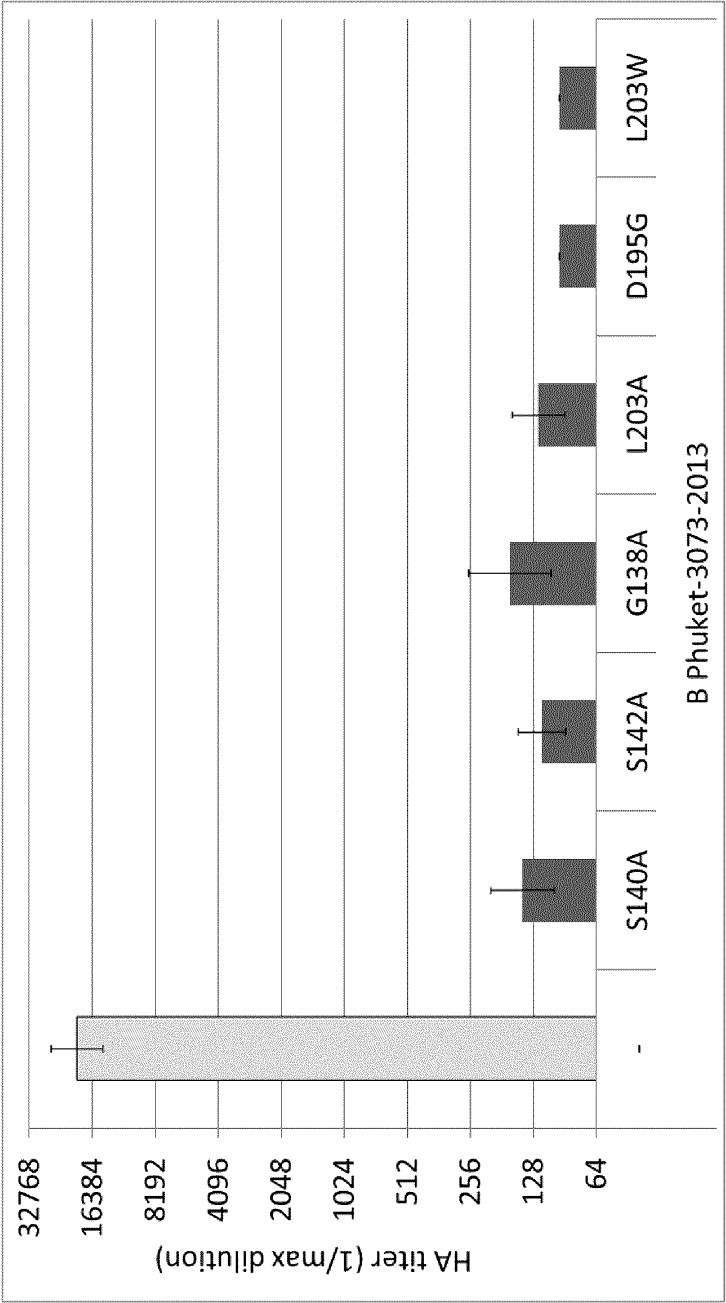


Figure 4C

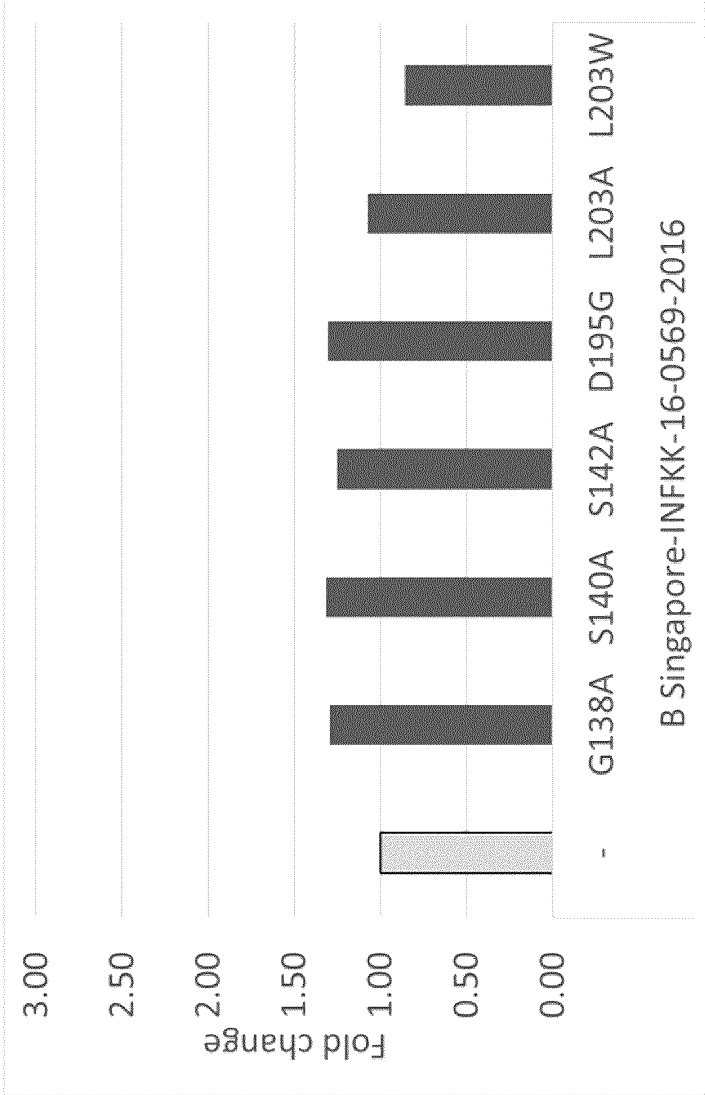


Figure 4D

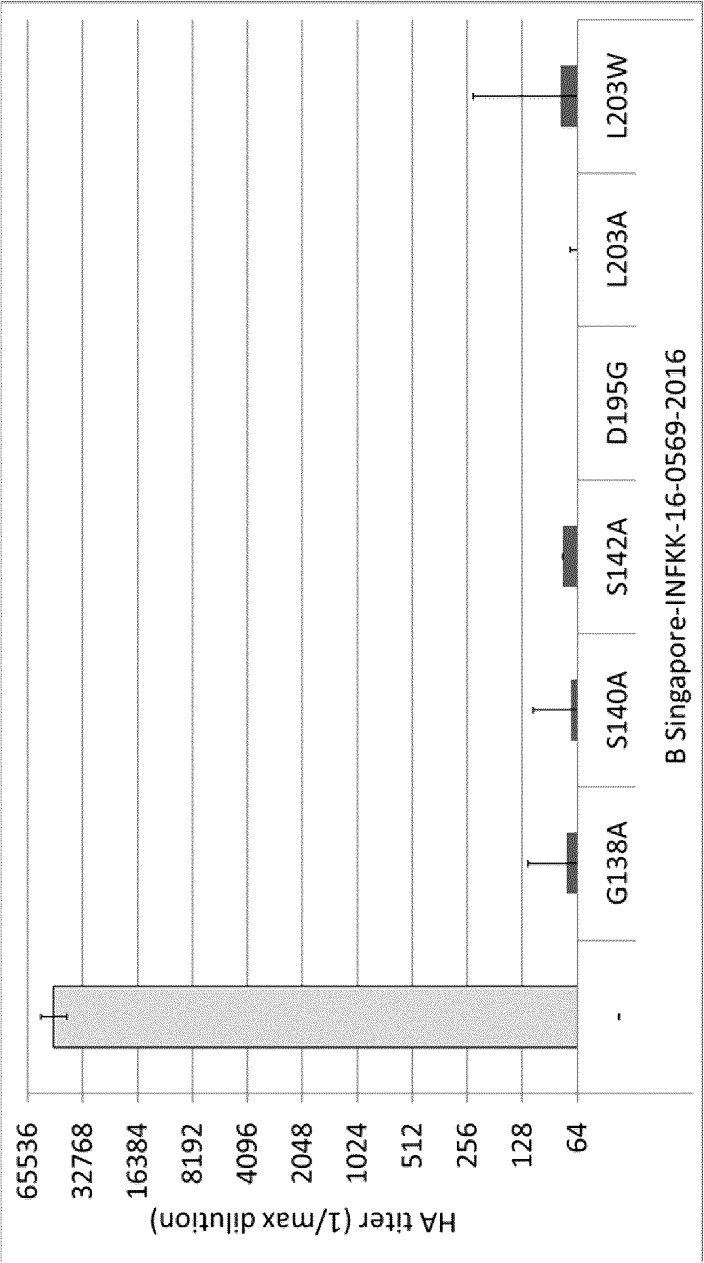


Figure 4E

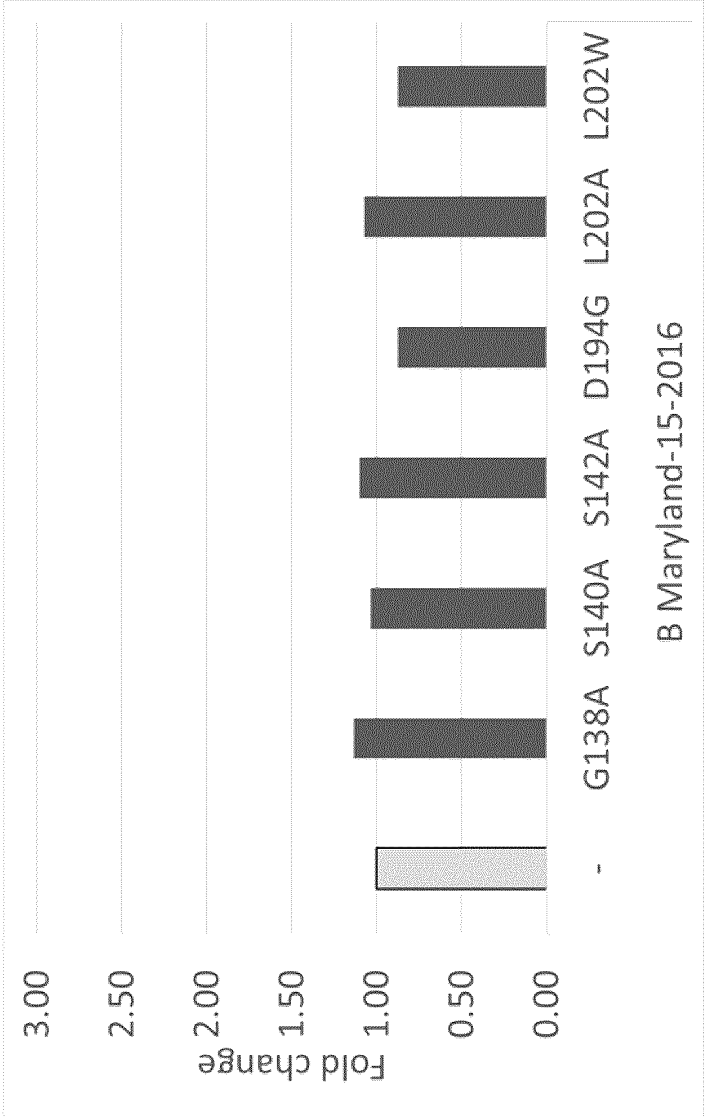


Figure 4F

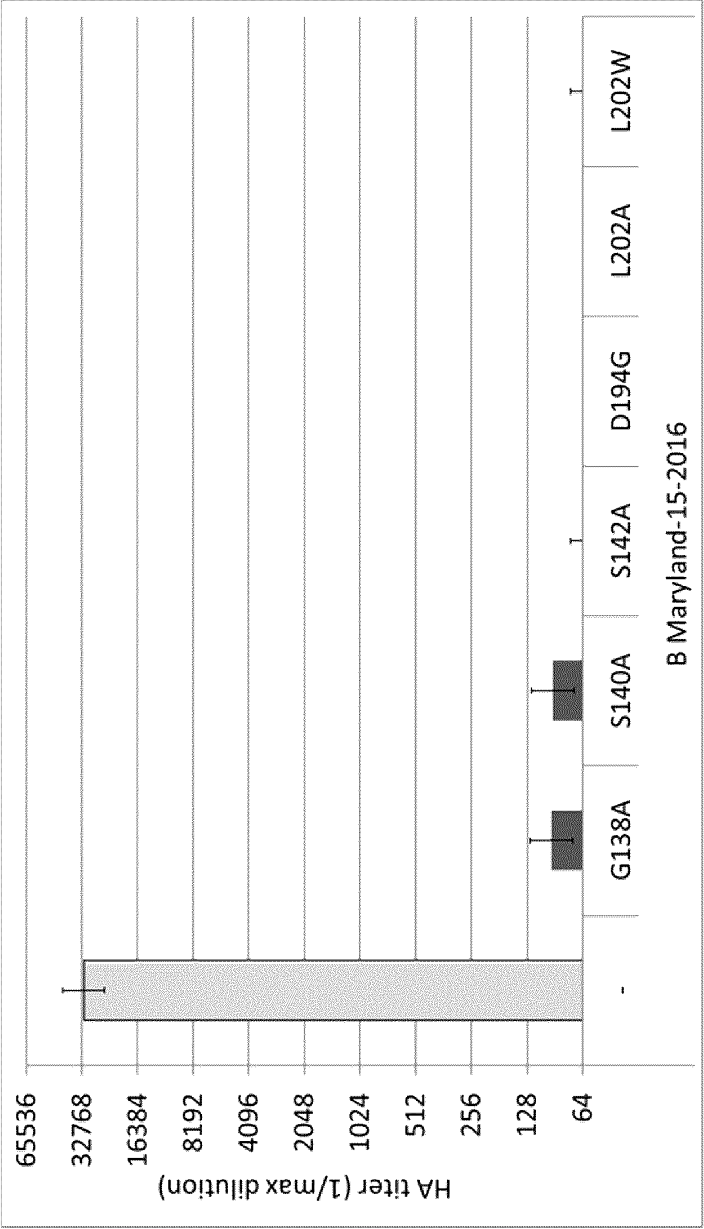


Figure 4G

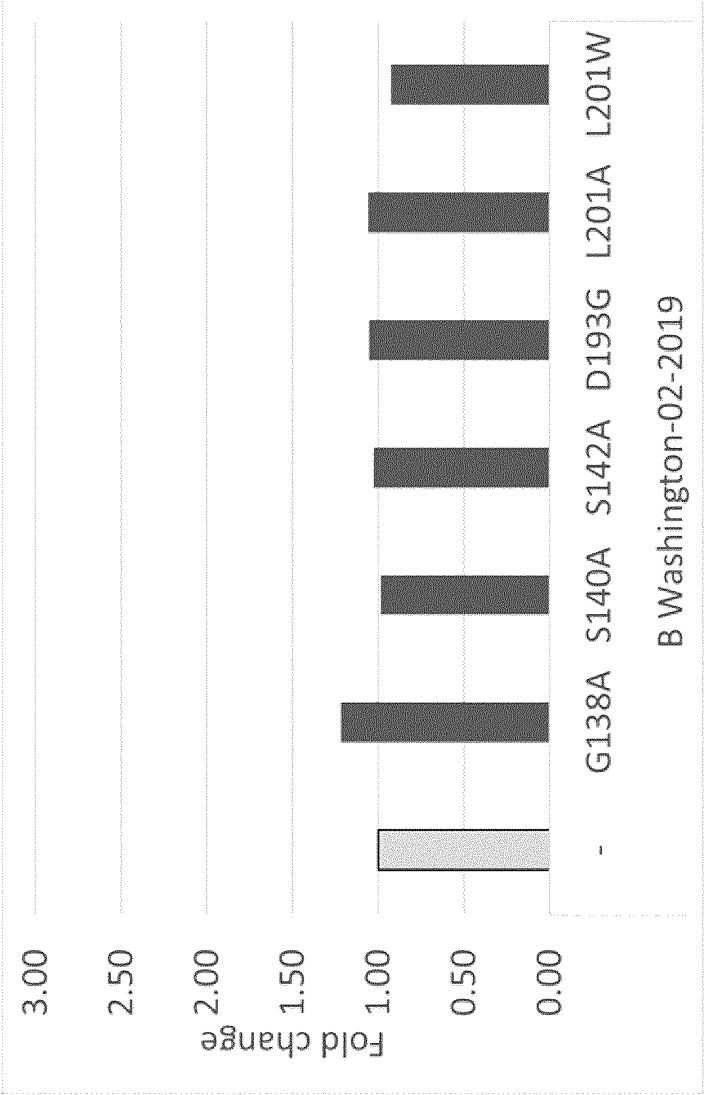


Figure 4H

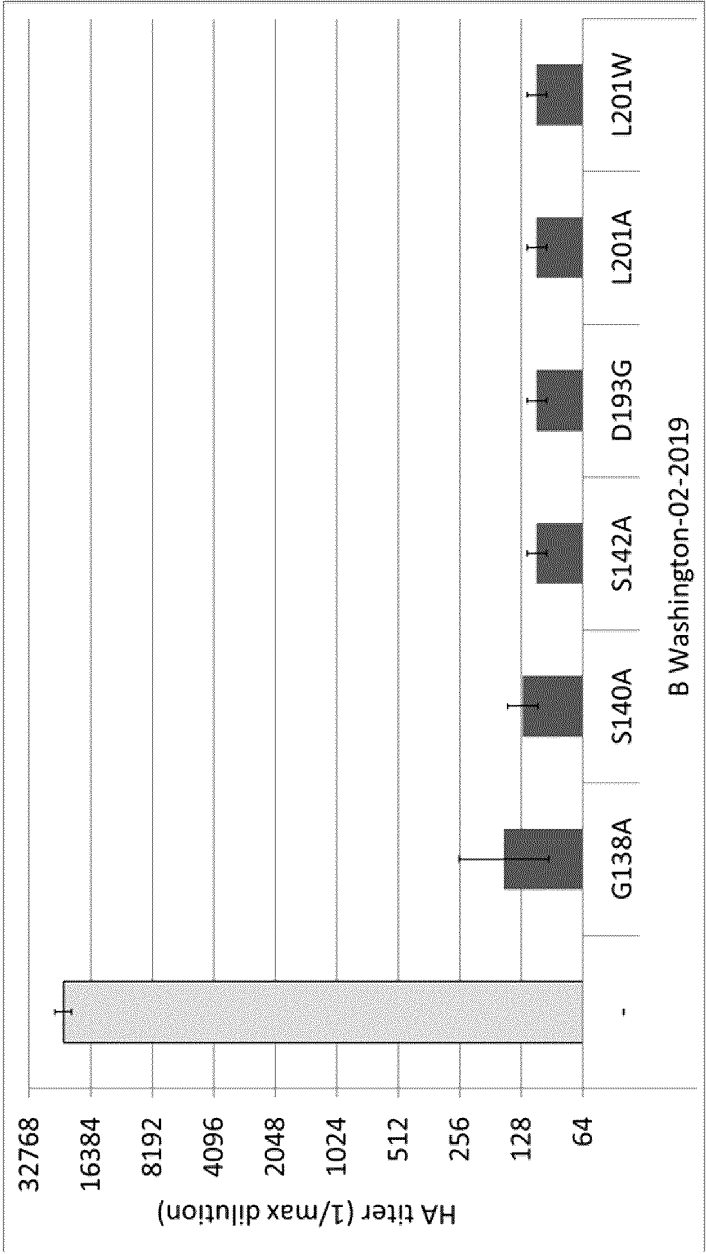


Figure 4I

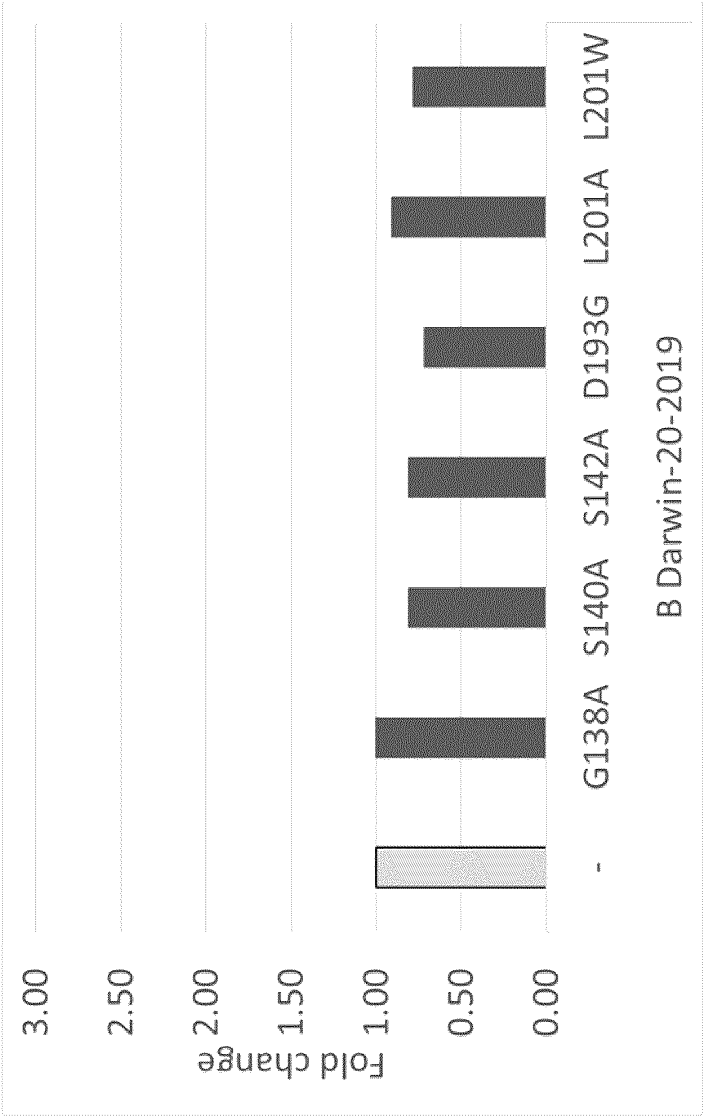


Figure 4J

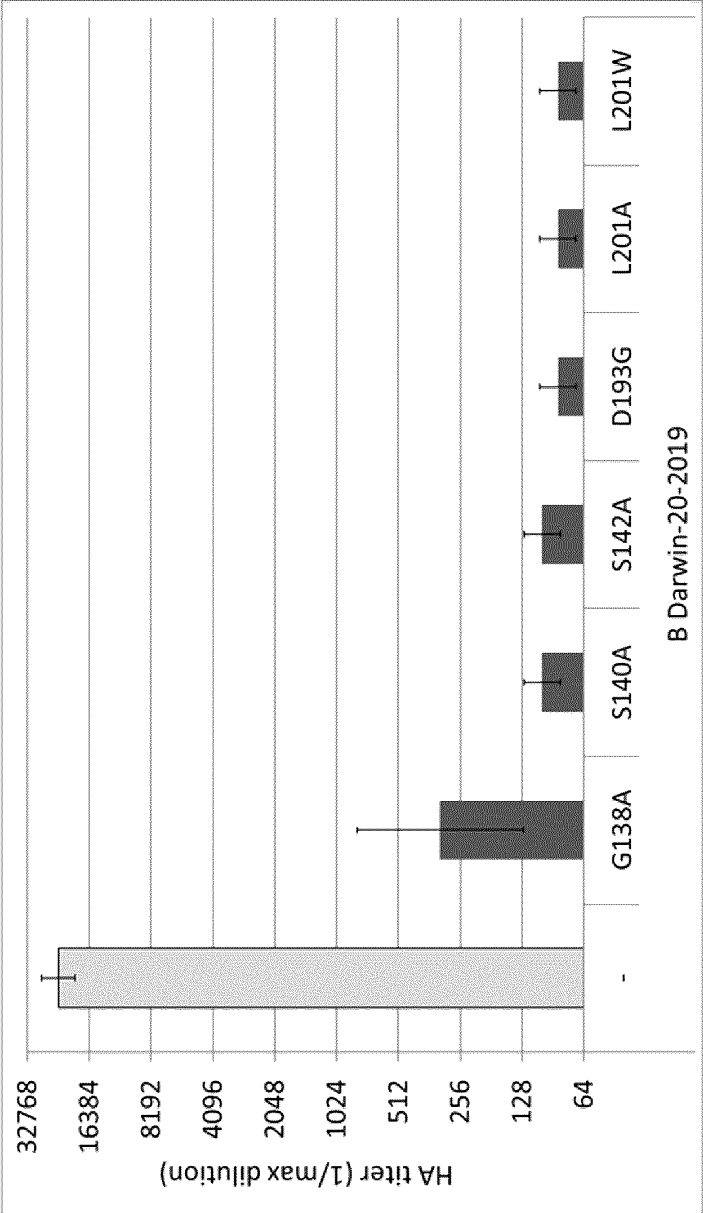


Figure 4K

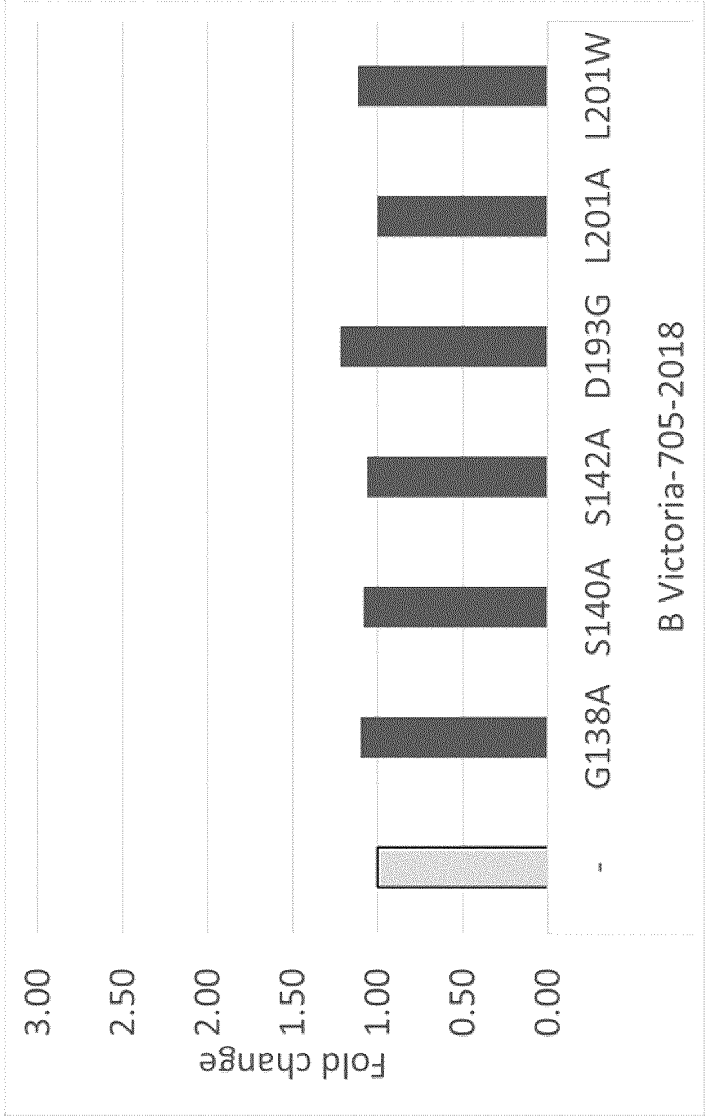


Figure 4L

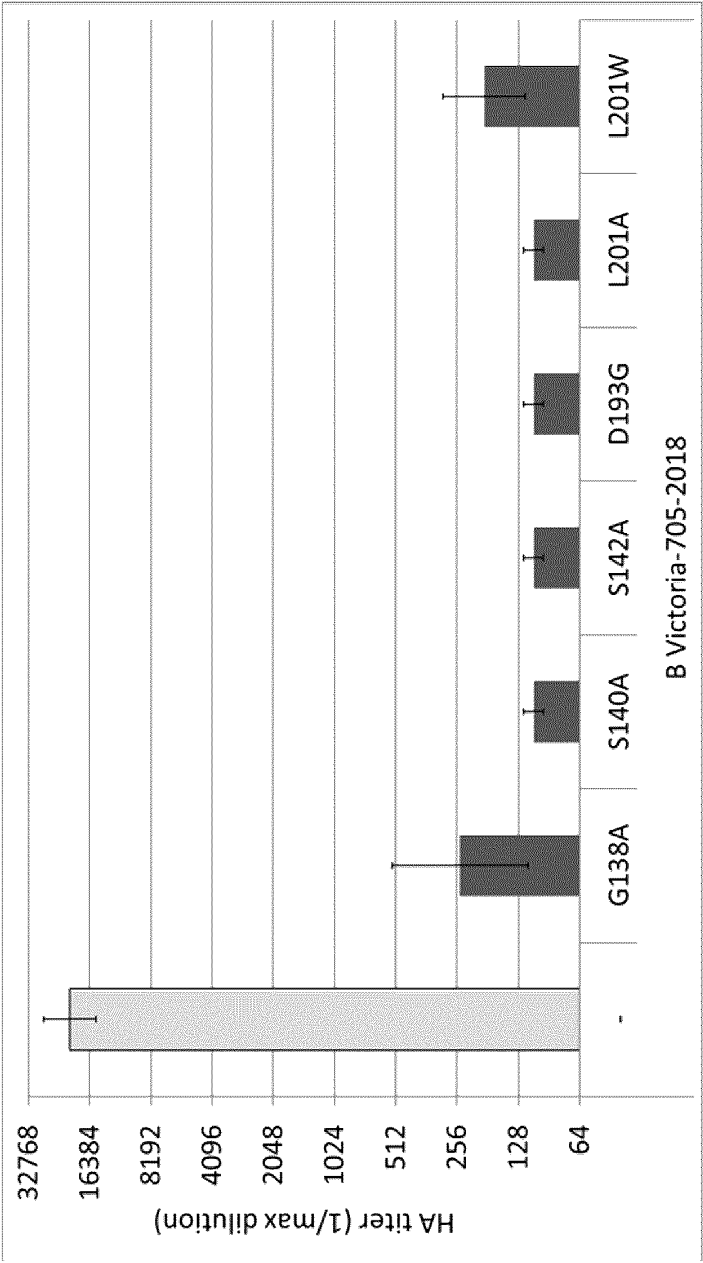


Figure 4M

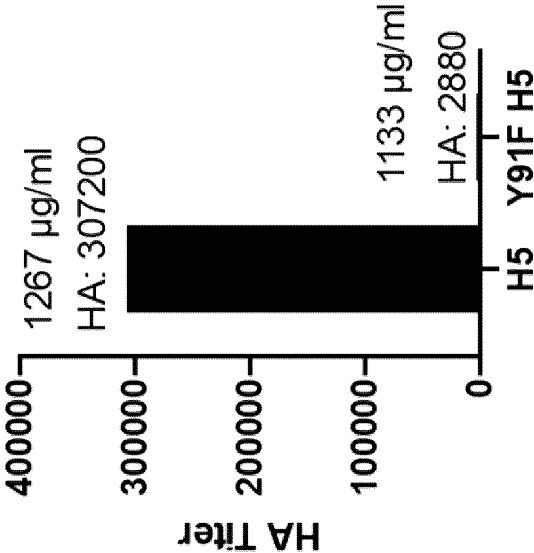


Figure 4N

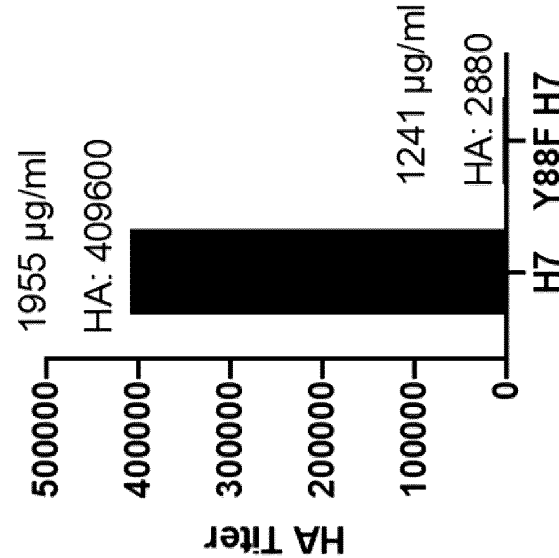
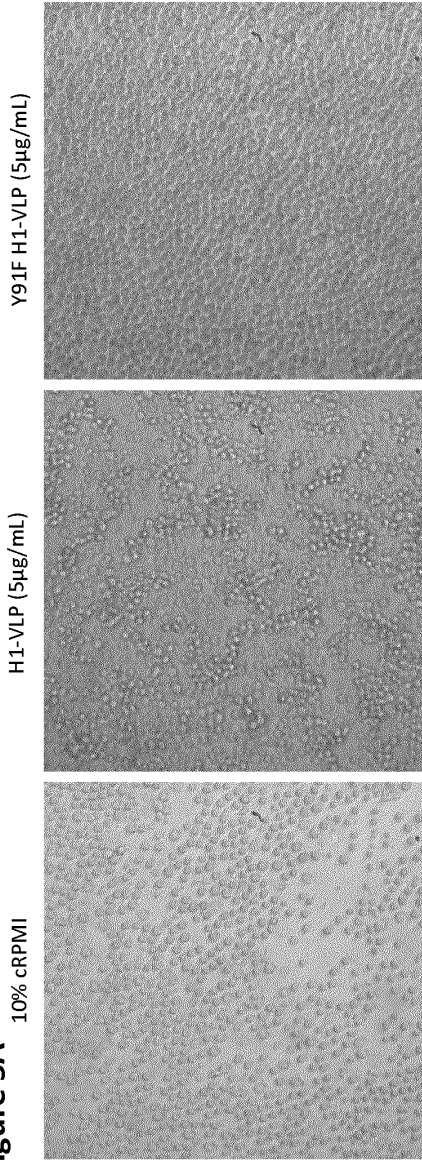


Figure 5A



14

Figure 5B

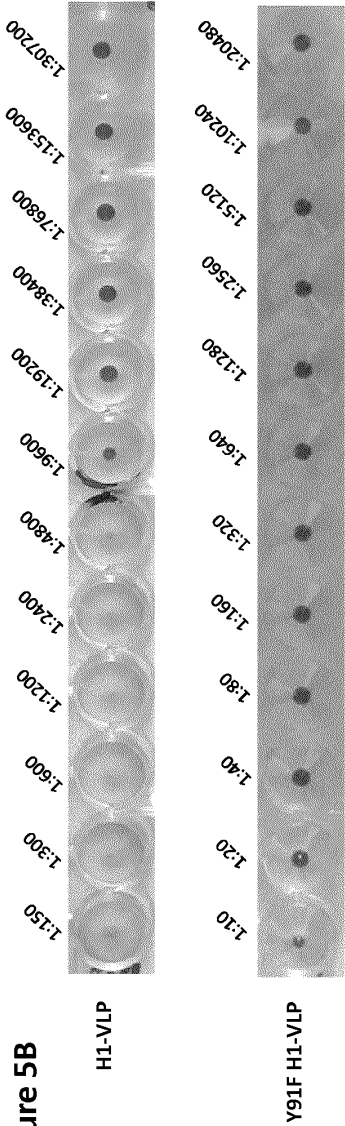


Figure 5C

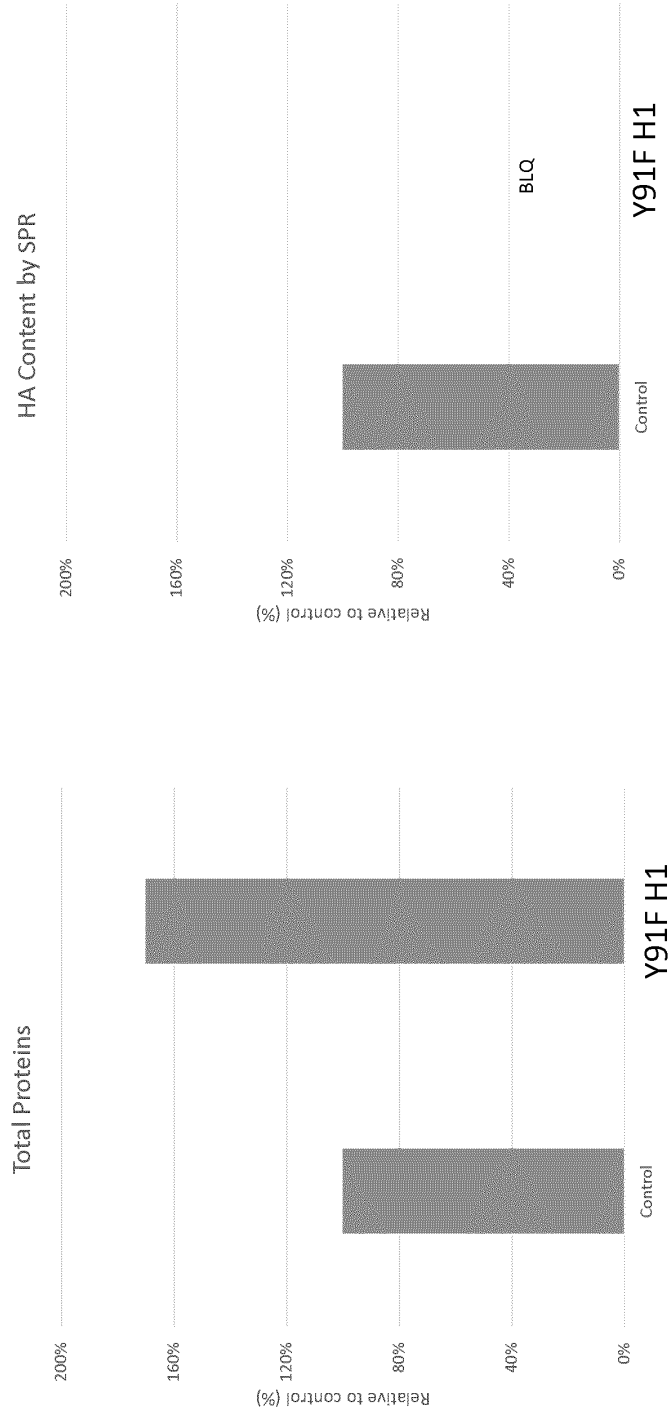


Figure 5D

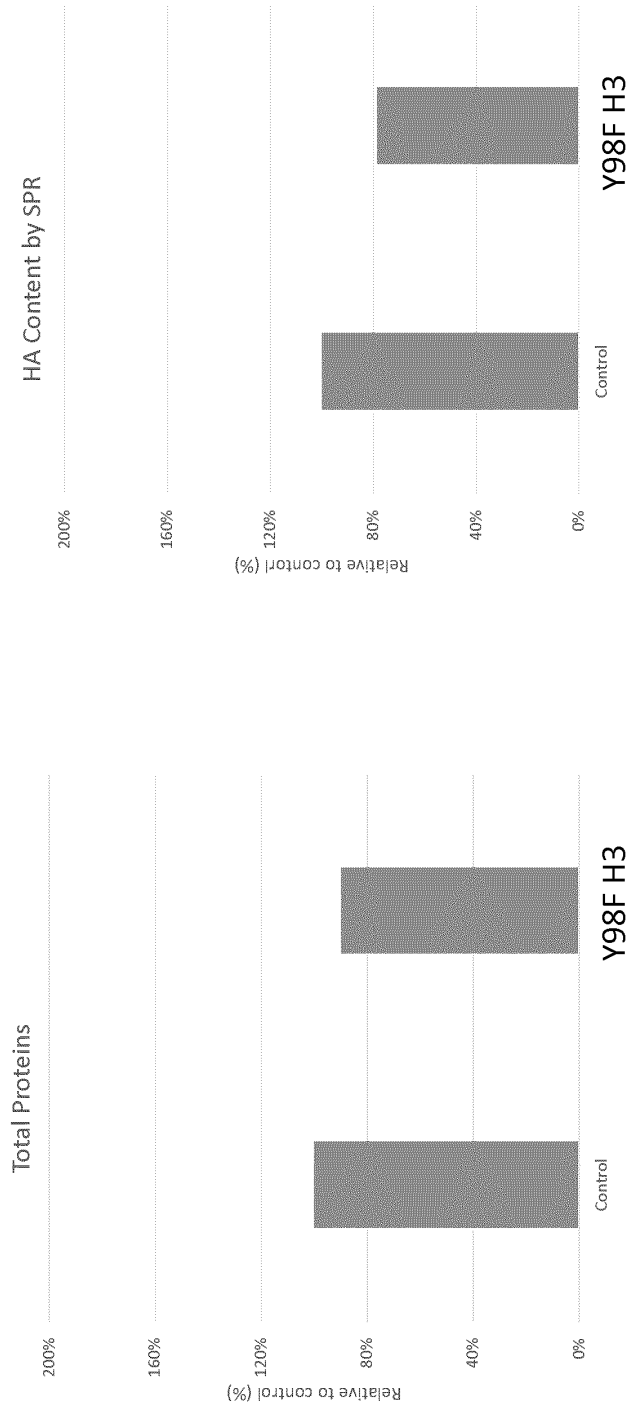


Figure 6

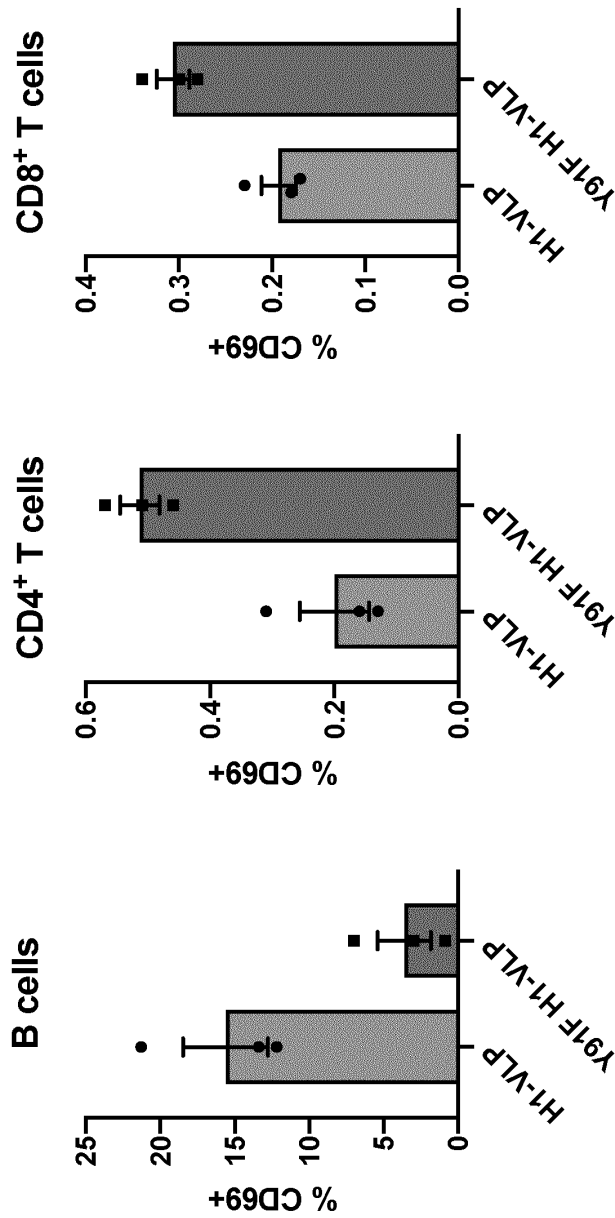


Figure 7A

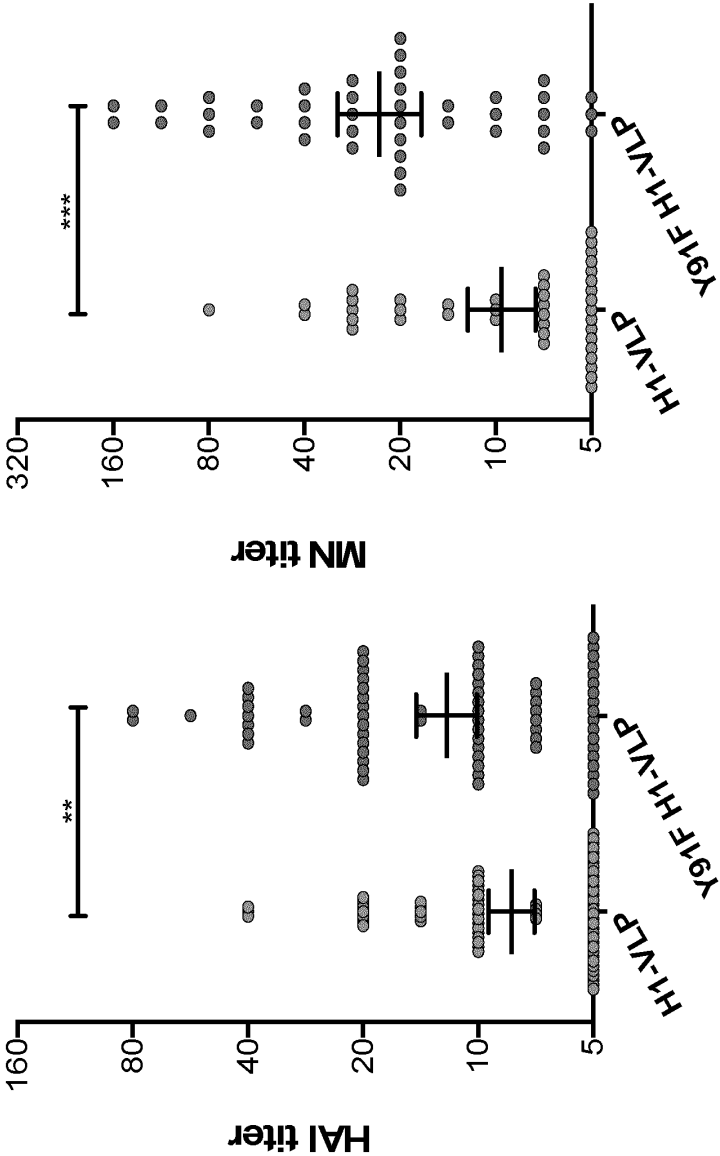


Figure 7B

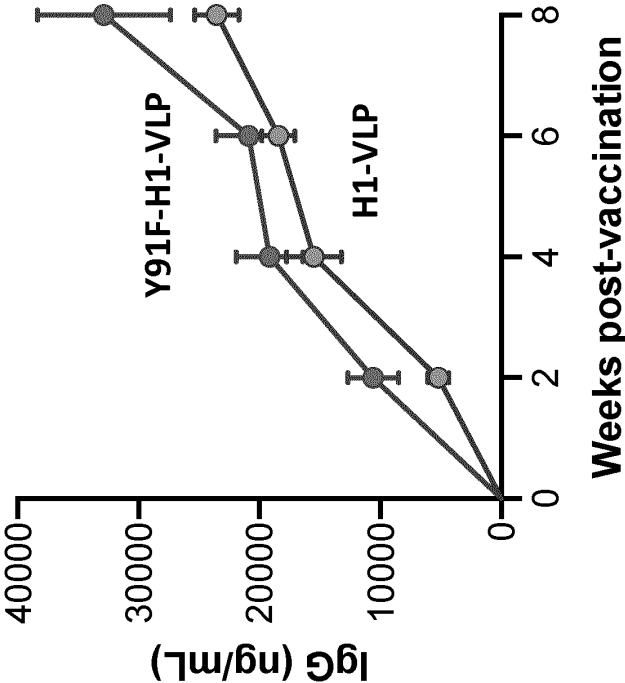


Figure 7C

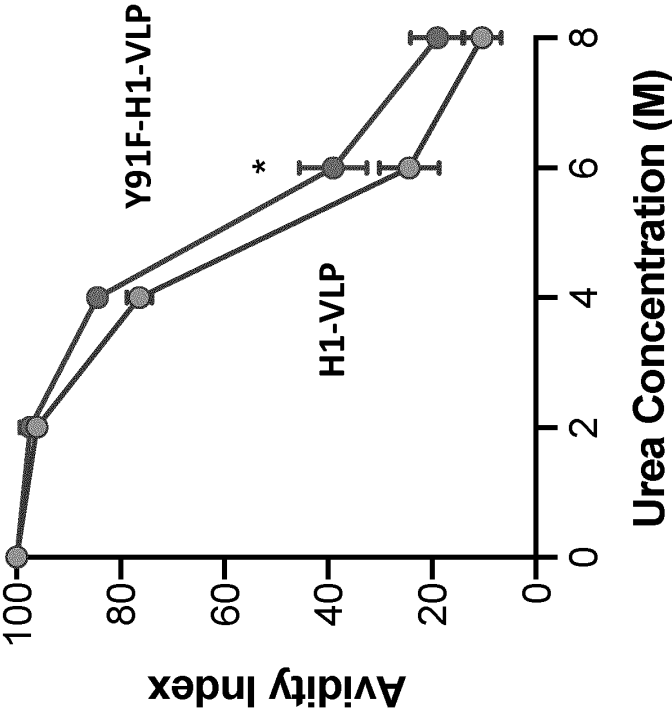


Figure 7D

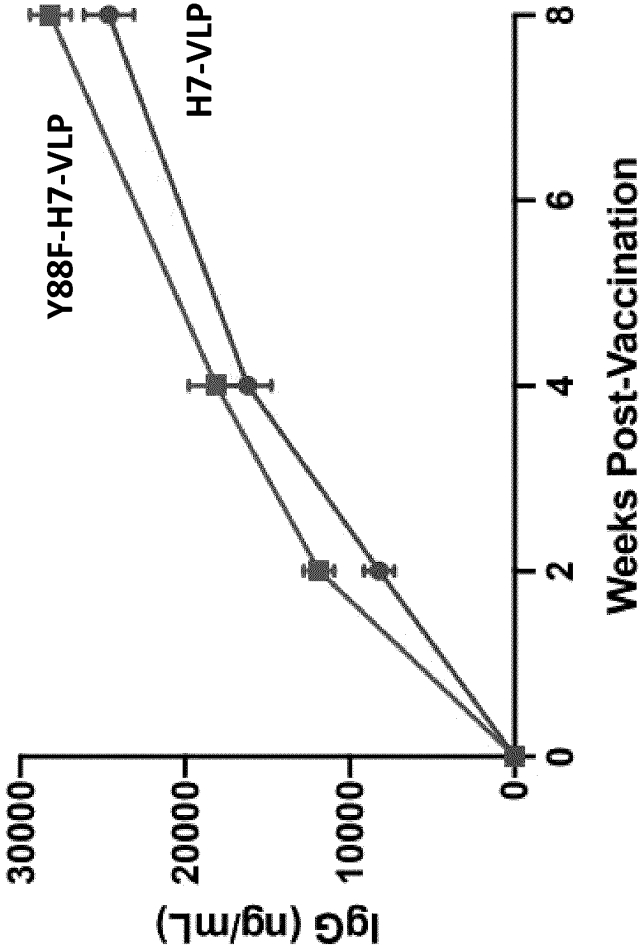


Figure 7E

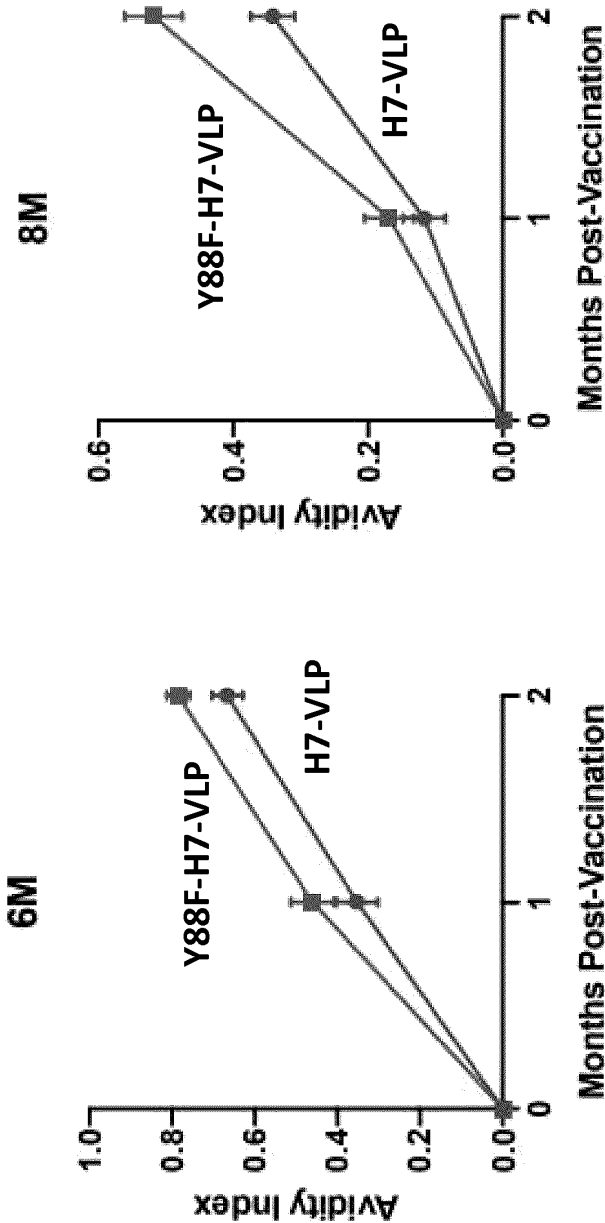
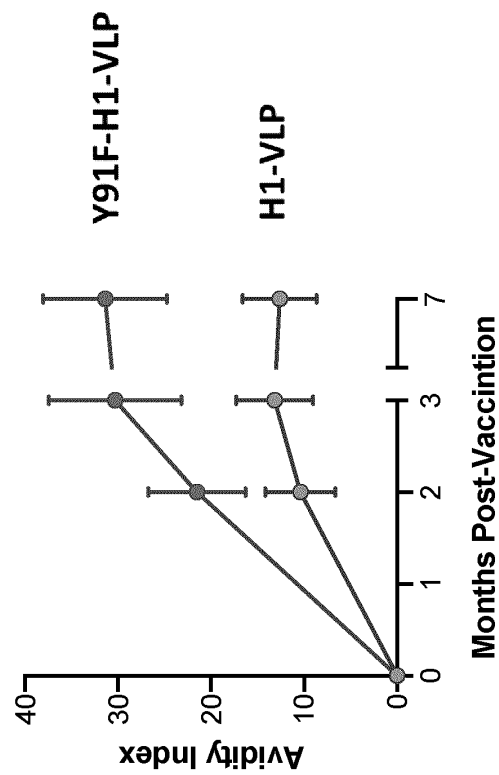


Figure 7F



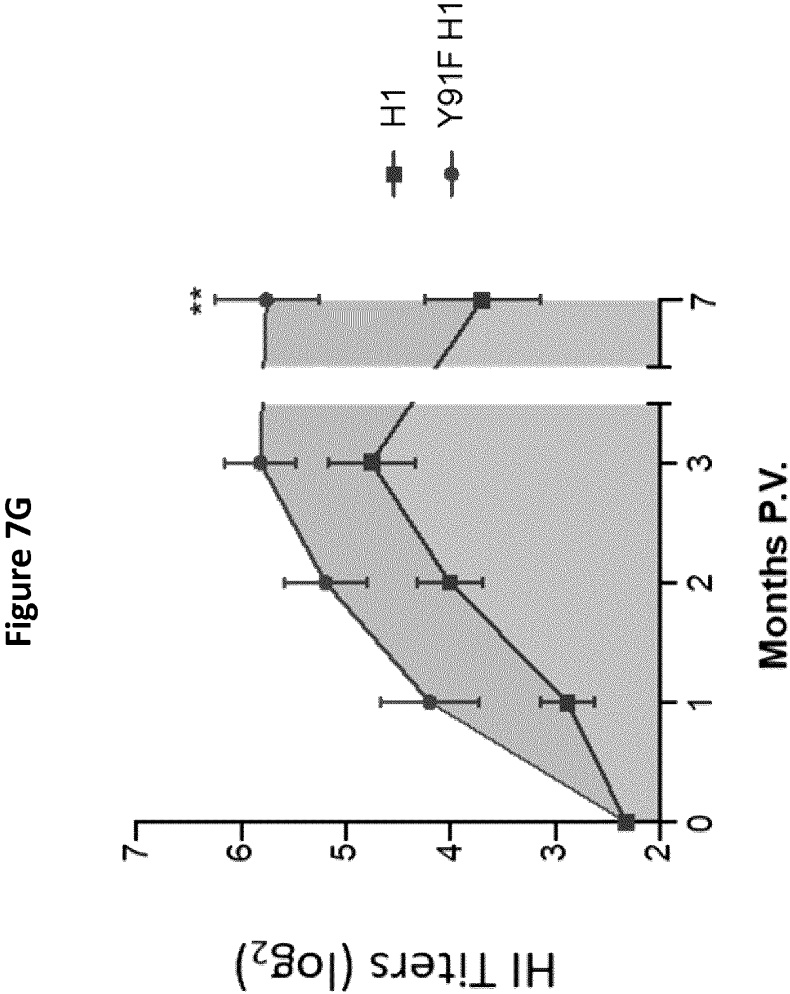


Figure 7H

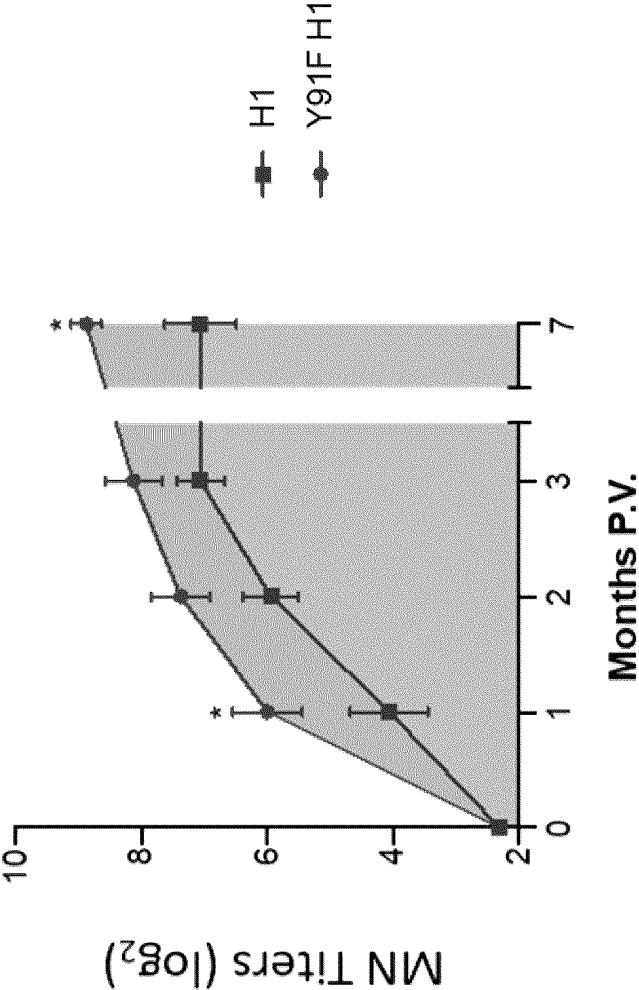


Figure 7I
H1 A/Idaho/07/2018

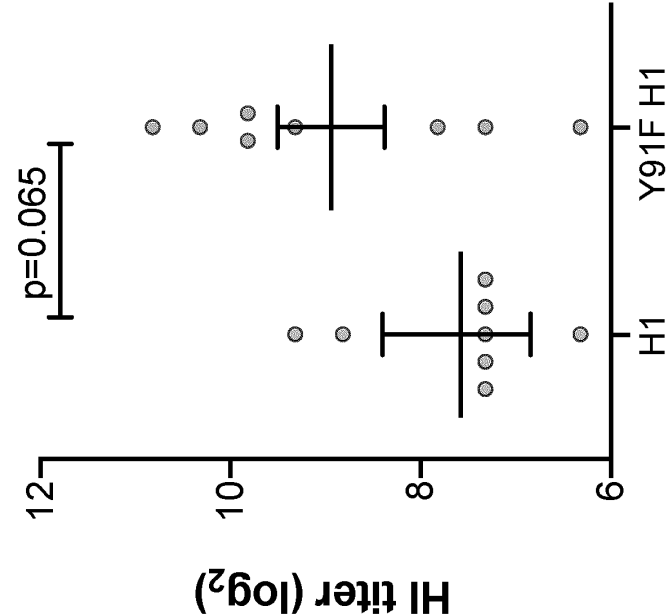


Figure 7J
H1 A/Idaho/07/2018

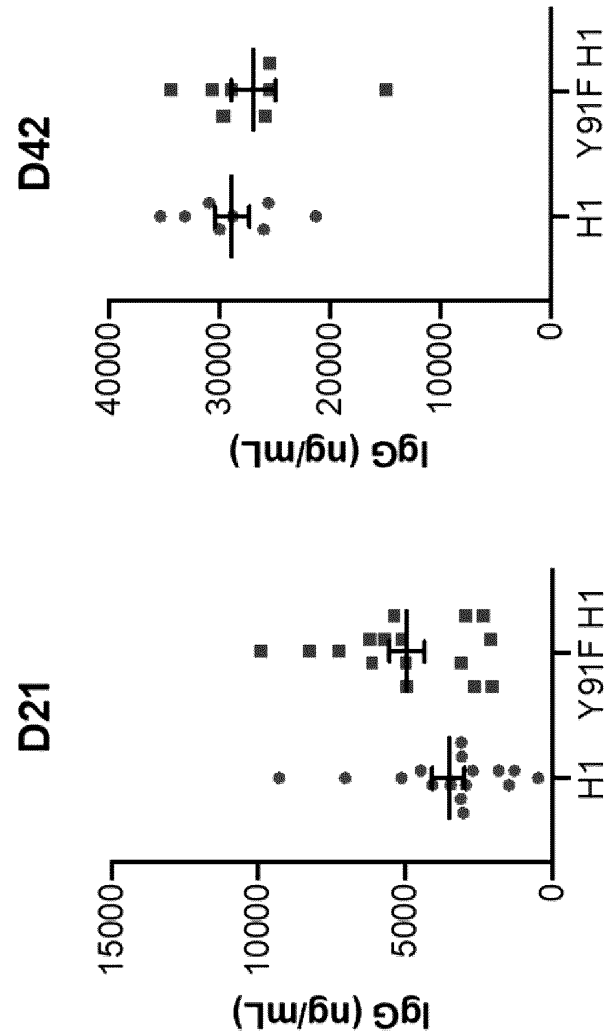


Figure 7K
A/Brisbane/02/2018

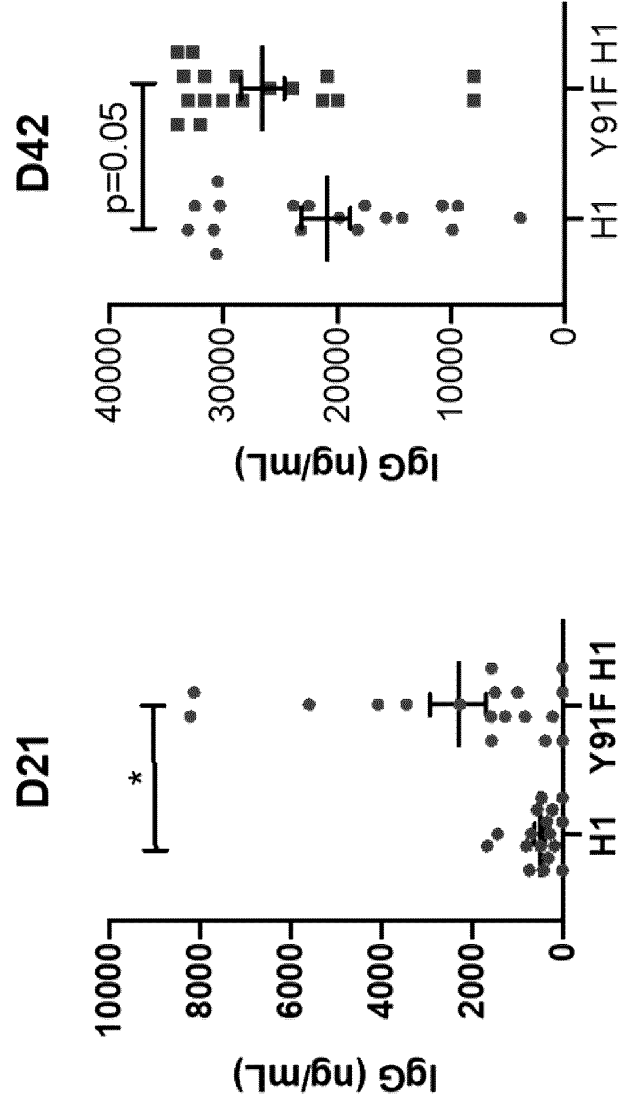


Figure 7L
A/Brisbane/02/2018

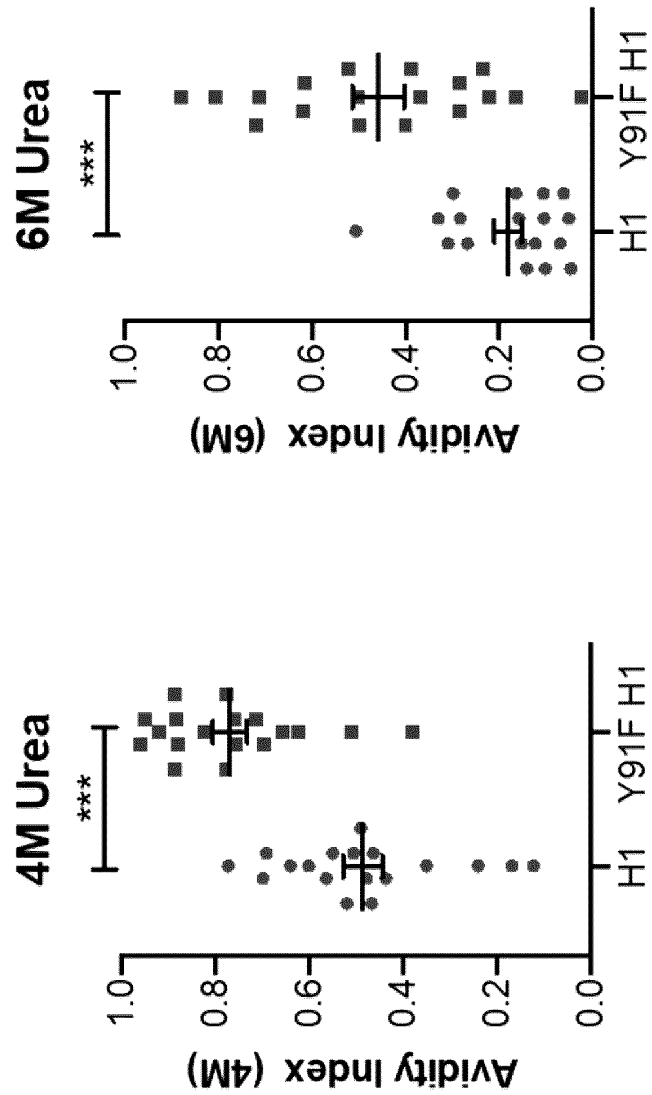
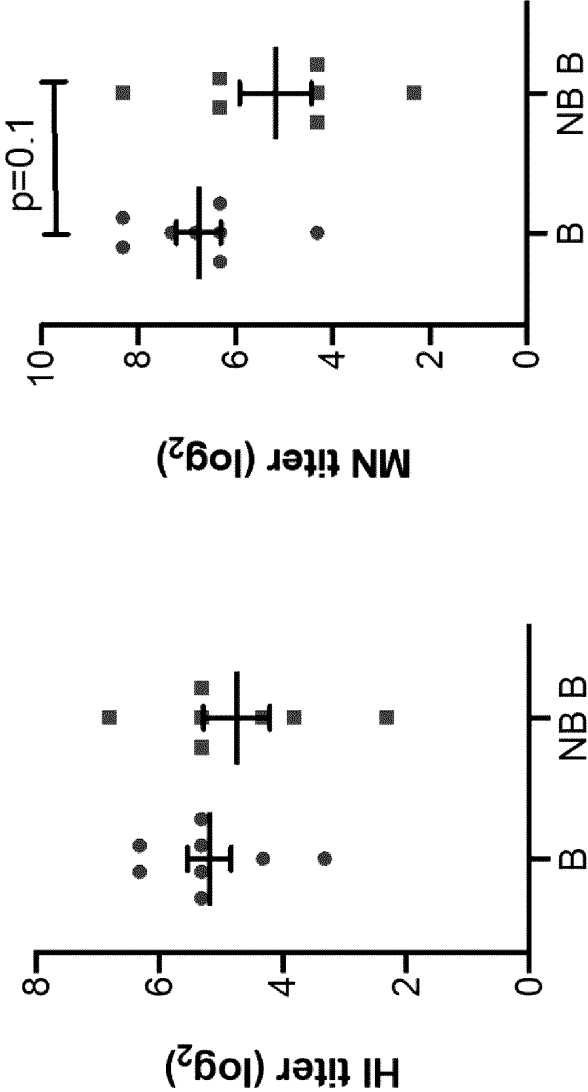


Figure 7M
B/Phuket/3073/2013



D21

Y-axis: IgG (ng/mL) (0 to 20000)

X-axis: B, NB B

Group	IgG (ng/mL) (Individual Points)	Mean (ng/mL)	SD (ng/mL)
B	1800, 7000, 7500, 7800, 8000, 8200, 8500, 8800, 9000, 9200, 9500, 9800, 10000, 10200, 10500, 10800, 11000, 11200, 11500, 11800, 12000, 12200, 12500, 12800, 13000, 13200, 13500, 13800, 14000, 14200, 14500, 14800, 15000, 15200, 15500, 15800, 16000, 16200, 16500, 16800, 17000, 17200, 17500, 17800, 18000, 18200, 18500, 18800, 19000, 19200, 19500, 19800, 20000	~10000	~2000
NB B	1800, 1850, 1900, 1950, 2000, 2050, 2100, 2150, 2200, 2250, 2300, 2350, 2400, 2450, 2500, 2550, 2600, 2650, 2700, 2750, 2800, 2850, 2900, 2950, 3000, 3050, 3100, 3150, 3200, 3250, 3300, 3350, 3400, 3450, 3500, 3550, 3600, 3650, 3700, 3750, 3800, 3850, 3900, 3950, 4000, 4050, 4100, 4150, 4200, 4250, 4300, 4350, 4400, 4450, 4500, 4550, 4600, 4650, 4700, 4750, 4800, 4850, 4900, 4950, 5000, 5050, 5100, 5150, 5200, 5250, 5300, 5350, 5400, 5450, 5500, 5550, 5600, 5650, 5700, 5750, 5800, 5850, 5900, 5950, 6000, 6050, 6100, 6150, 6200, 6250, 6300, 6350, 6400, 6450, 6500, 6550, 6600, 6650, 6700, 6750, 6800, 6850, 6900, 6950, 7000, 7050, 7100, 7150, 7200, 7250, 7300, 7350, 7400, 7450, 7500, 7550, 7600, 7650, 7700, 7750, 7800, 7850, 7900, 7950, 8000, 8050, 8100, 8150, 8200, 8250, 8300, 8350, 8400, 8450, 8500, 8550, 8600, 8650, 8700, 8750, 8800, 8850, 8900, 8950, 9000, 9050, 9100, 9150, 9200, 9250, 9300, 9350, 9400, 9450, 9500, 9550, 9600, 9650, 9700, 9750, 9800, 9850, 9900, 9950, 10000, 10050, 10100, 10150, 10200, 10250, 10300, 10350, 10400, 10450, 10500, 10550, 10600, 10650, 10700, 10750, 10800, 10850, 10900, 10950, 11000, 11050, 11100, 11150, 11200, 11250, 11300, 11350, 11400, 11450, 11500, 11550, 11600, 11650, 11700, 11750, 11800, 11850, 11900, 11950, 12000, 12050, 12100, 12150, 12200, 12250, 12300, 12350, 12400, 12450, 12500, 12550, 12600, 12650, 12700, 12750, 12800, 12850, 12900, 12950, 13000, 13050, 13100, 13150, 13200, 13250, 13300, 13350, 13400, 13450, 13500, 13550, 13600, 13650, 13700, 13750, 13800, 13850, 13900, 13950, 14000, 14050, 14100, 14150, 14200, 14250, 14300, 14350, 14400, 14450, 14500, 14550, 14600, 14650, 14700, 14750, 14800, 14850, 14900, 14950, 15000, 15050, 15100, 15150, 15200, 15250, 15300, 15350, 15400, 15450, 15500, 15550, 15600, 15650, 15700, 15750, 15800, 15850, 15900, 15950, 16000, 16050, 16100, 16150, 16200, 16250, 16300, 16350, 16400, 16450, 16500, 16550, 16600, 16650, 16700, 16750, 16800, 16850, 16900, 16950, 17000, 17050, 17100, 17150, 17200, 17250, 17300, 17350, 17400, 17450, 17500, 17550, 17600, 17650, 17700, 17750, 17800, 17850, 17900, 17950, 18000, 18050, 18100, 18150, 18200, 18250, 18300, 18350, 18400, 18450, 18500, 18550, 18600, 18650, 18700, 18750, 18800, 18850, 18900, 18950, 19000, 19050, 19100, 19150, 19200, 19250, 19300, 19350, 19400, 19450, 19500, 19550, 19600, 19650, 19700, 19750, 19800, 19850, 19900, 19950, 20000	~17500	~1000

D42

Y-axis: IgG (ng/mL) (0 to 50000)

X-axis: B, NB B

Group	IgG (ng/mL) (Individual Points)	Mean (ng/mL)	SD (ng/mL)
B	1800, 1850, 1900, 1950, 2000, 2050, 2100, 2150, 2200, 2250, 2300, 2350, 2400, 2450, 2500, 2550, 2600, 2650, 2700, 2750, 2800, 2850, 2900, 2950, 3000, 3050, 3100, 3150, 3200, 3250, 3300, 3350, 3400, 3450, 3500, 3550, 3600, 3650, 3700, 3750, 3800, 3850, 3900, 3950, 4000, 4050, 4100, 4150, 4200, 4250, 4300, 4350, 4400, 4450, 4500, 4550, 4600, 4650, 4700, 4750, 4800, 4850, 4900, 4950, 5000, 5050, 5100, 5150, 5200, 5250, 5300, 5350, 5400, 5450, 5500, 5550, 5600, 5650, 5700, 5750, 5800, 5850, 5900, 5950, 6000, 6050, 6100, 6150, 6200, 6250, 6300, 6350, 6400, 6450, 6500, 6550, 6600, 6650, 6700, 6750, 6800, 6850, 6900, 6950, 7000, 7050, 7100, 7150, 7200, 7250, 7300, 7350, 7400, 7450, 7500, 7550, 7600, 7650, 7700, 7750, 7800, 7850, 7900, 7950, 8000, 8050, 8100, 8150, 8200, 8250, 8300, 8350, 8400, 8450, 8500, 8550, 8600, 8650, 8700, 8750, 8800, 8850, 8900, 8950, 9000, 9050, 9100, 9150, 9200, 9250, 9300, 9350, 9400, 9450, 95		

Figure 70
B/Phuket/3073/2013

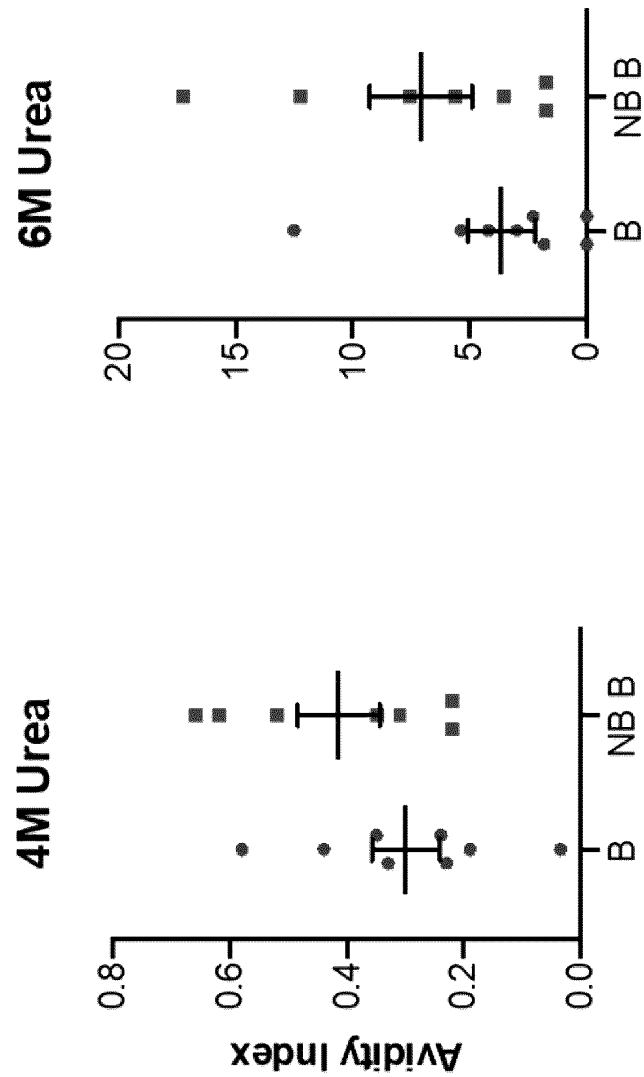


Figure 8A

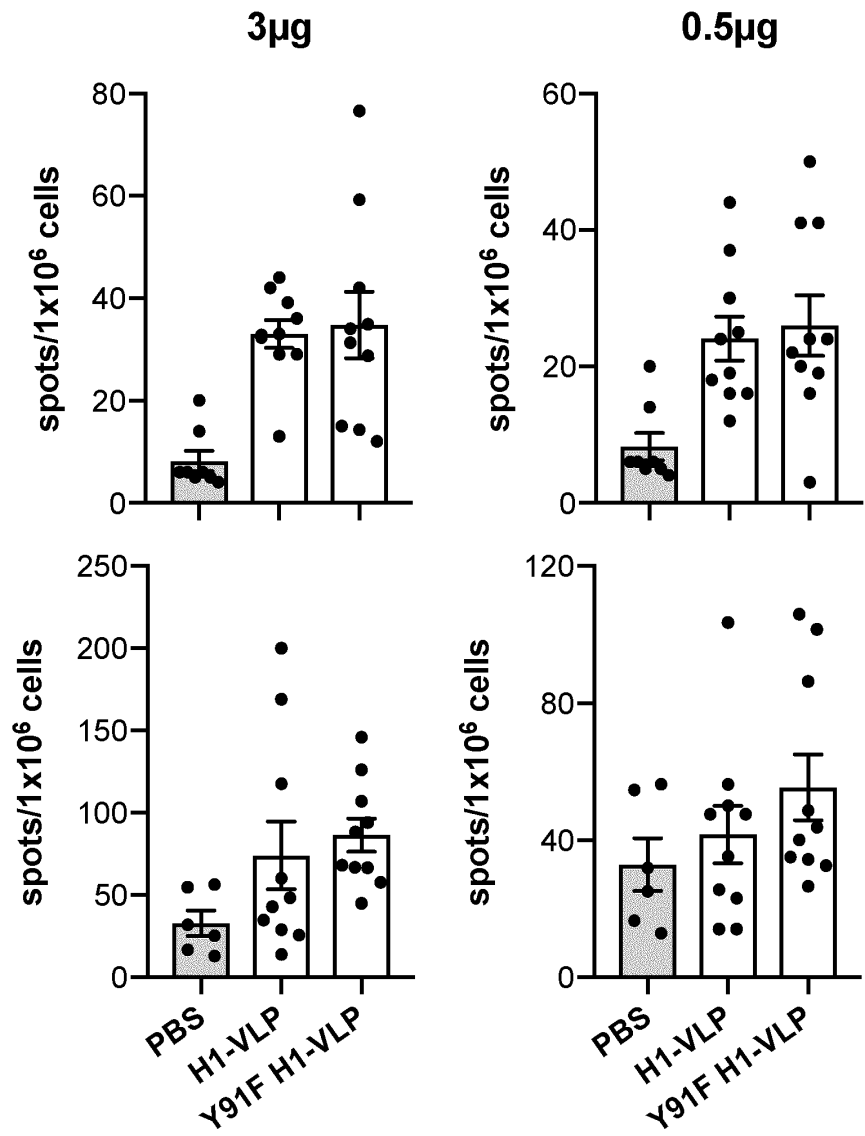


Figure 8B

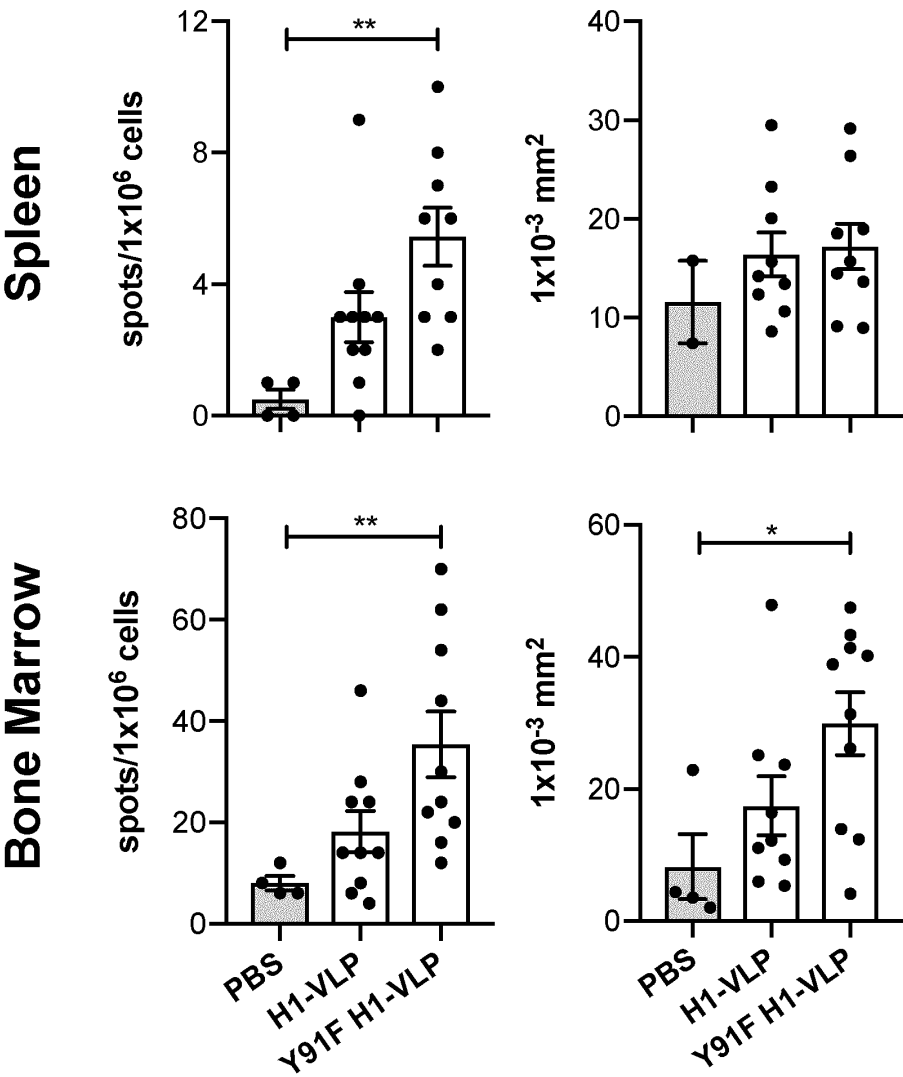


Figure 8C

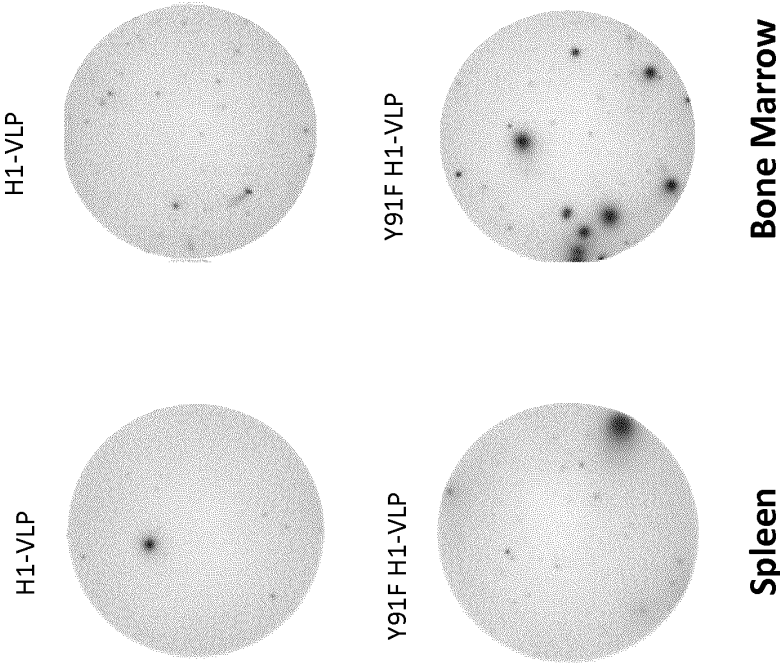
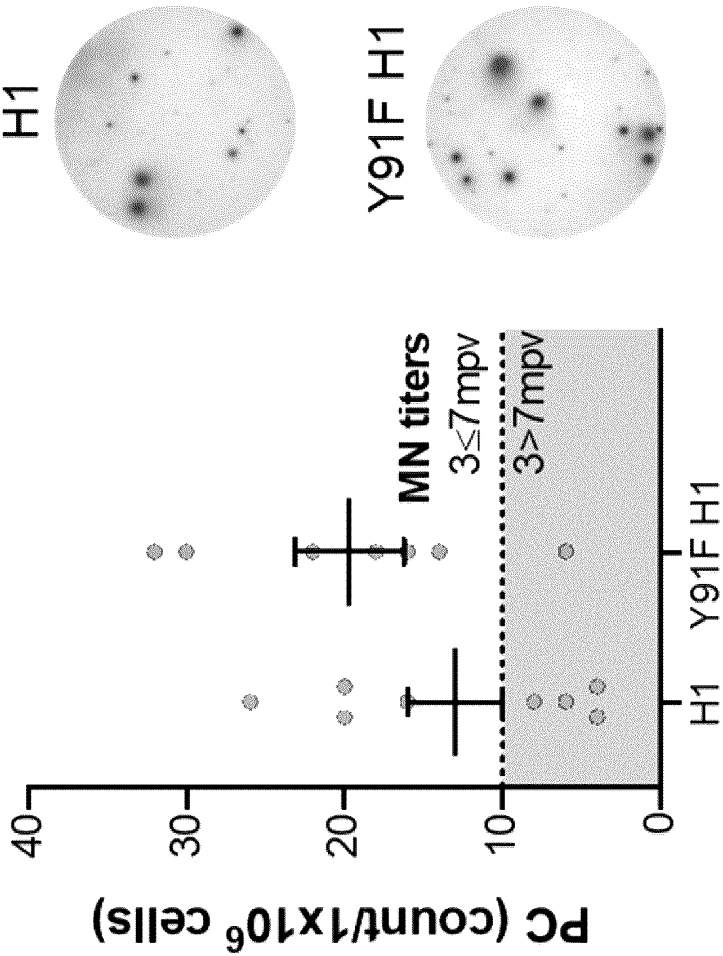


Figure 8D



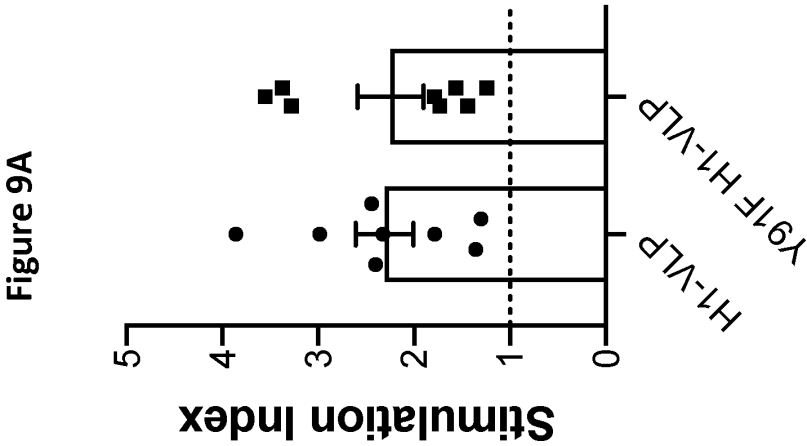


Figure 9B

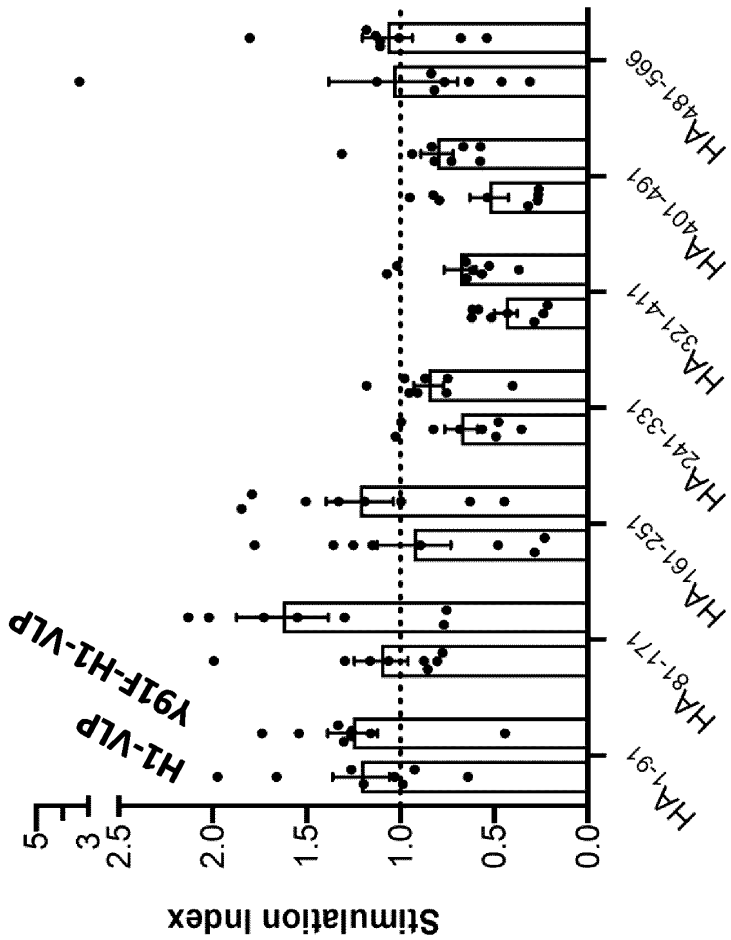


Figure 10A

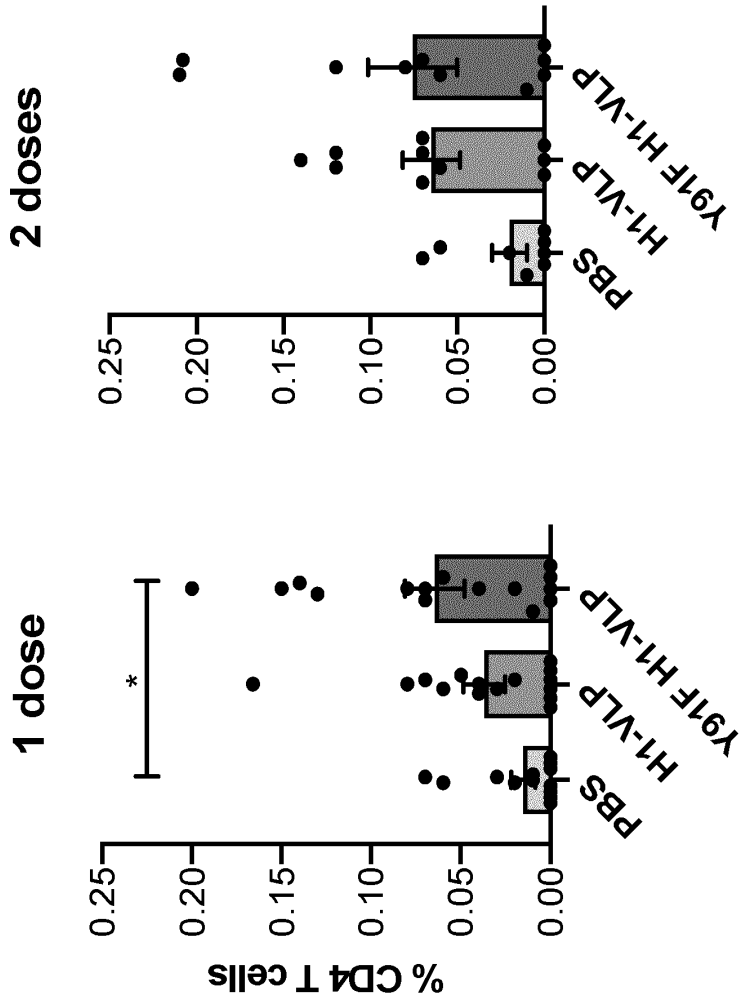


Figure 10B

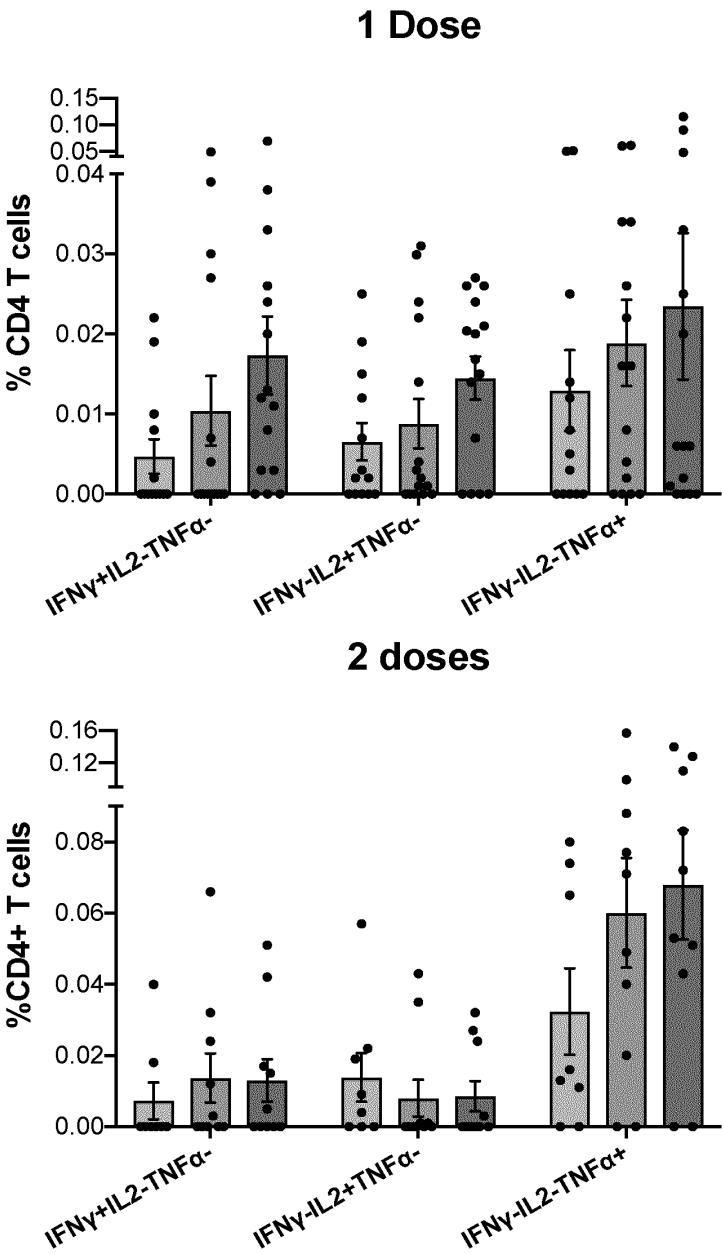


Figure 10C

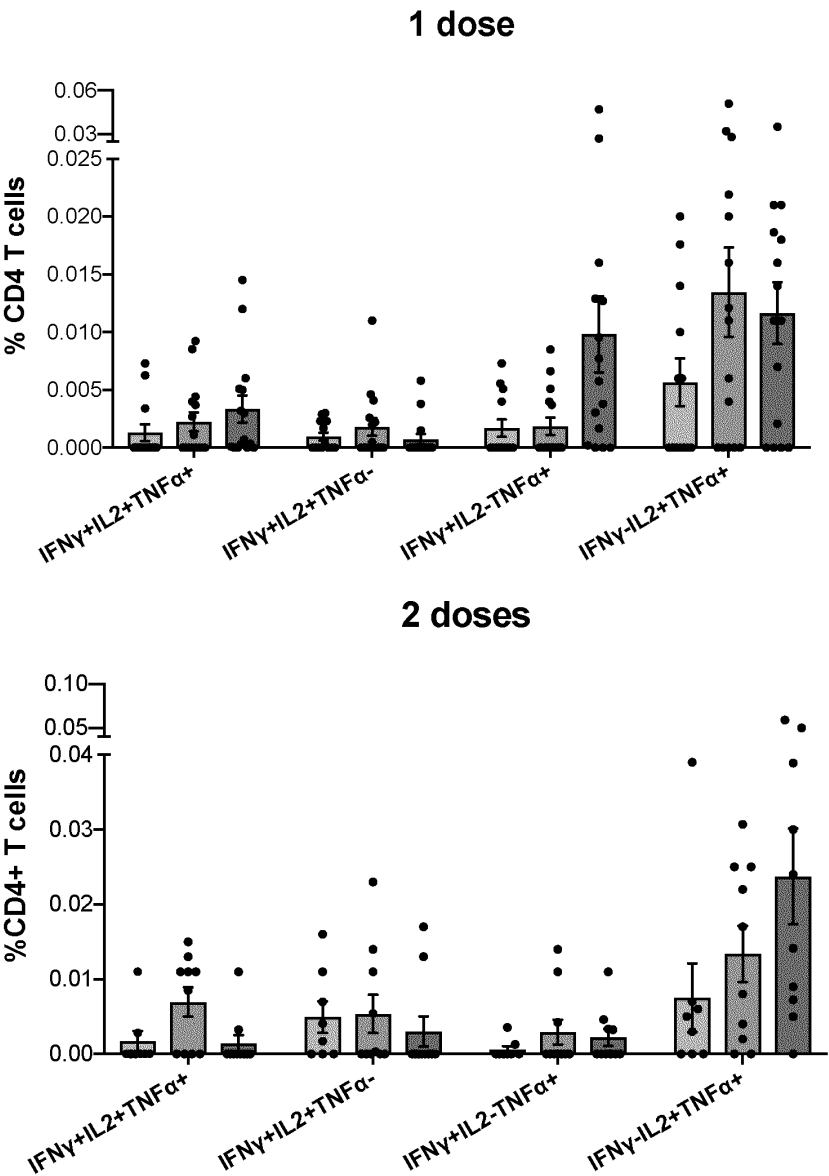


Figure 10D

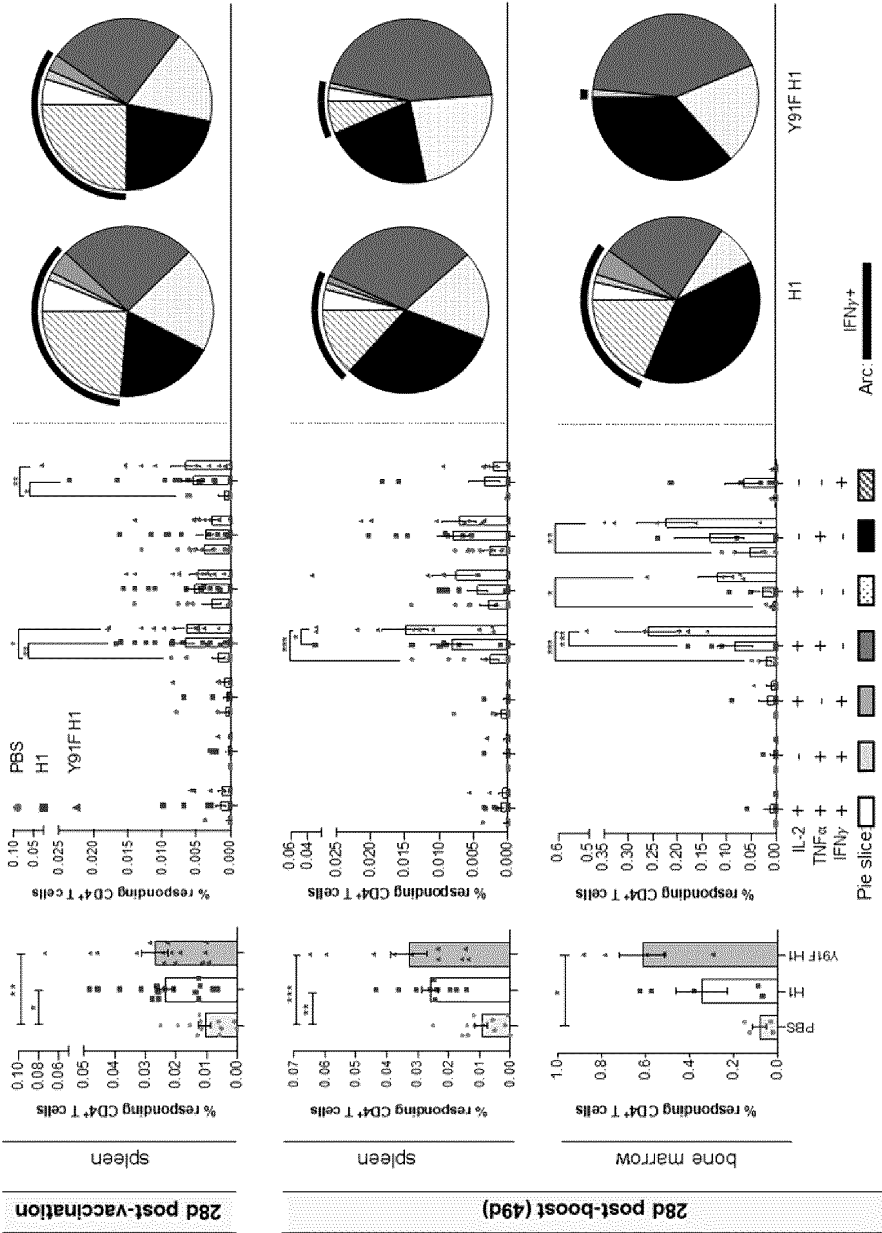


Figure 10E

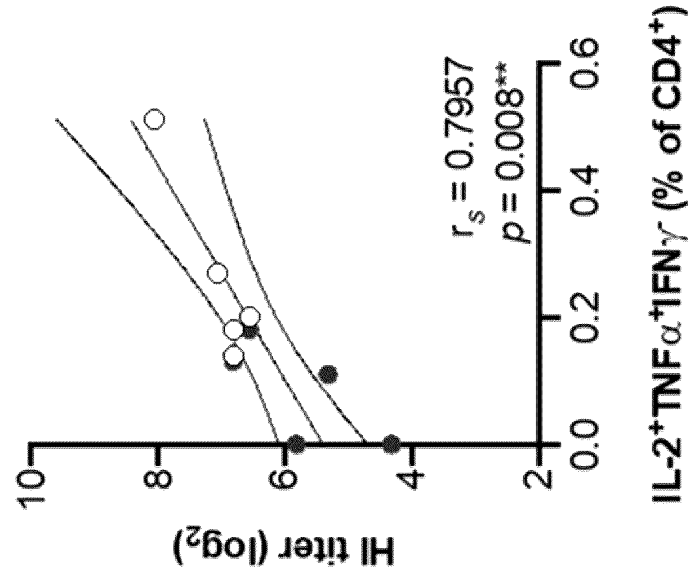


Figure 10F

Idaho

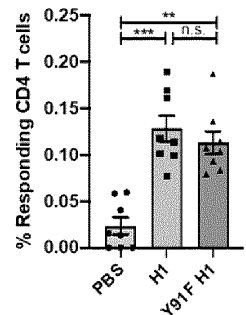


Figure 10G

Idaho

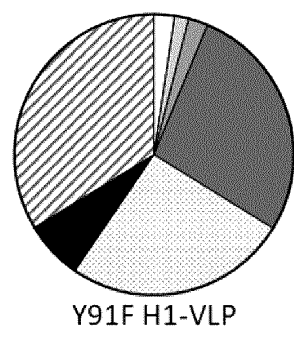
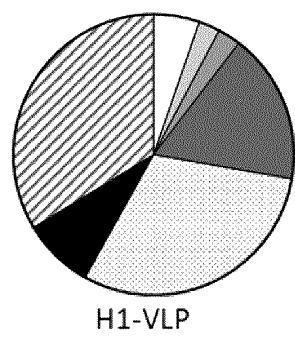
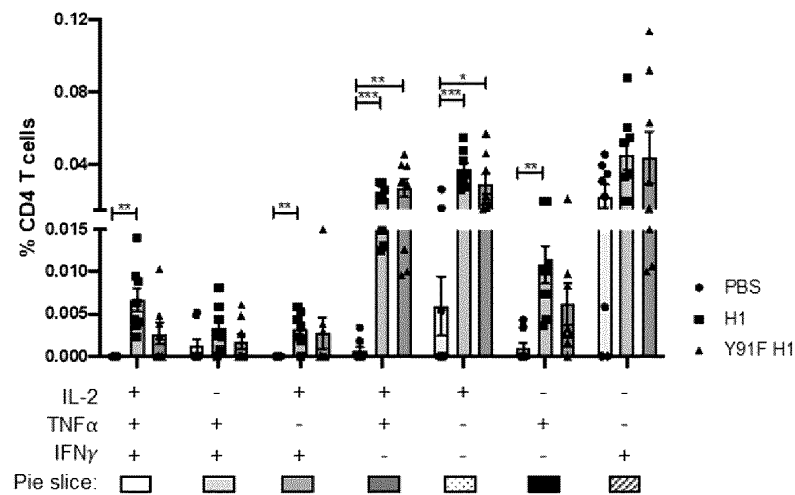


Figure 10H

Idaho

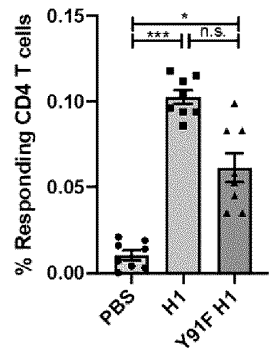
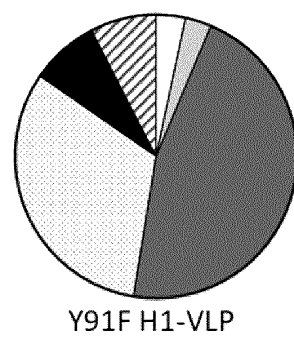
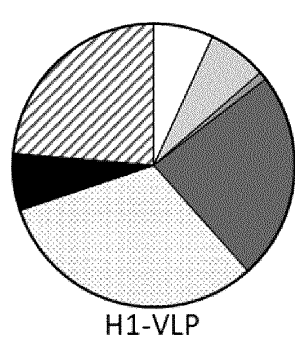
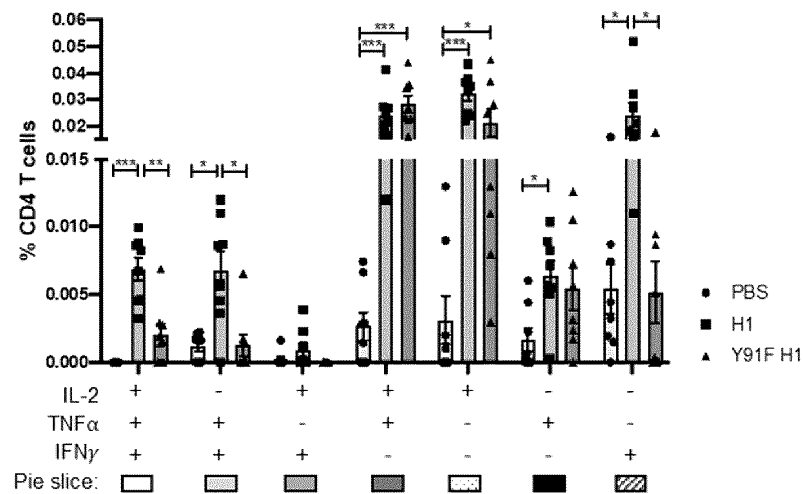


Figure 10I

Idaho



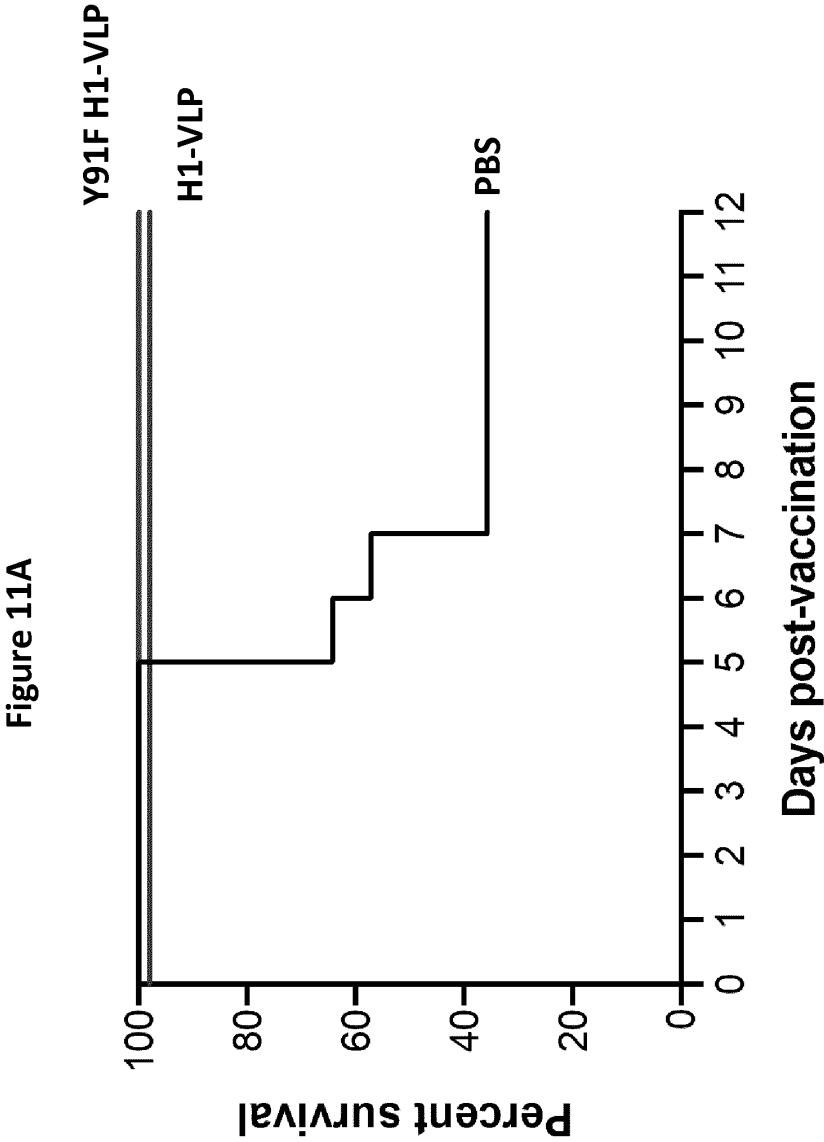


Figure 11B

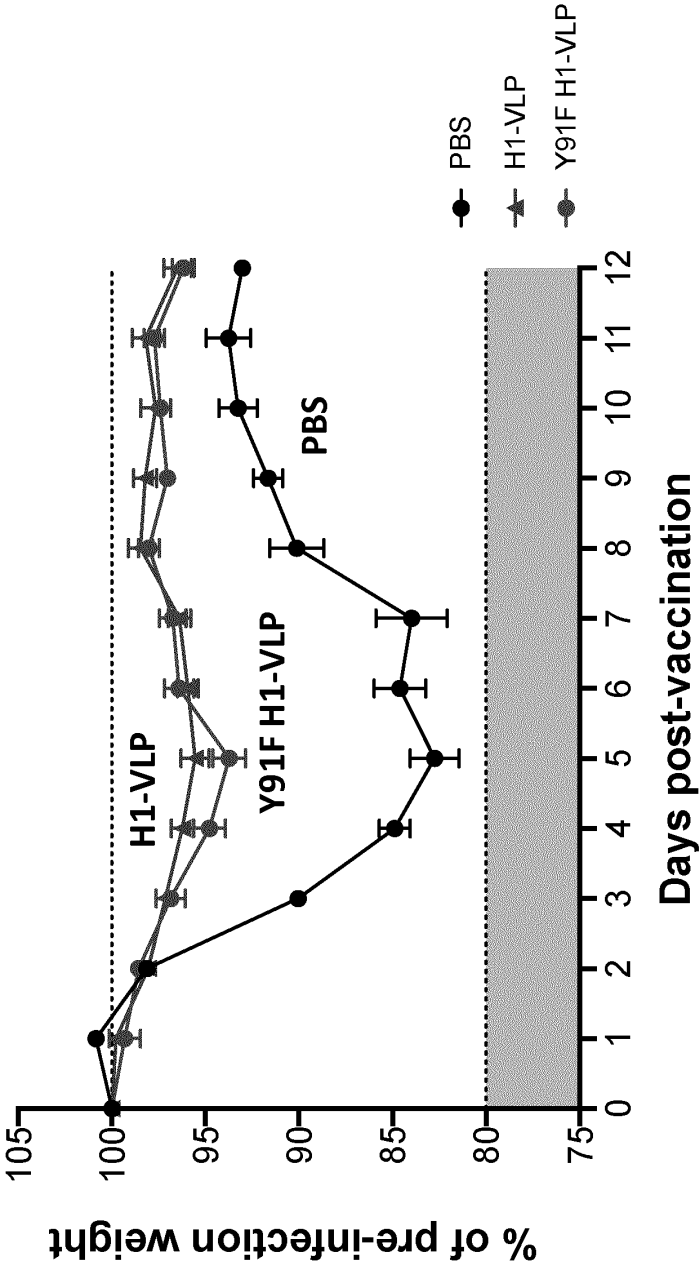


Figure 11C

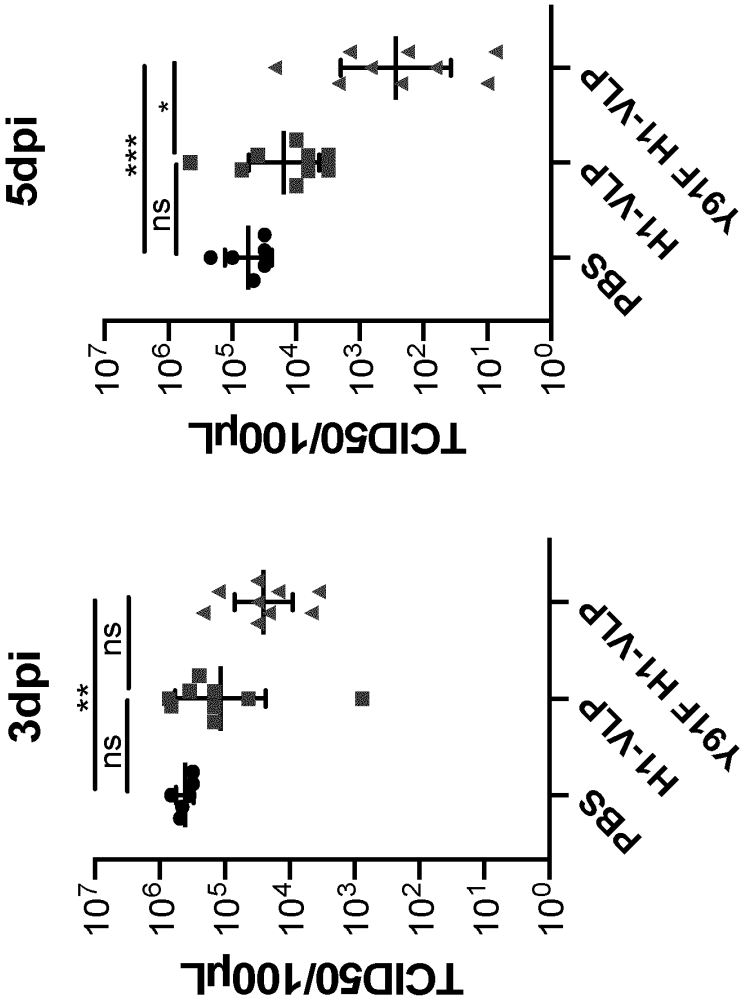
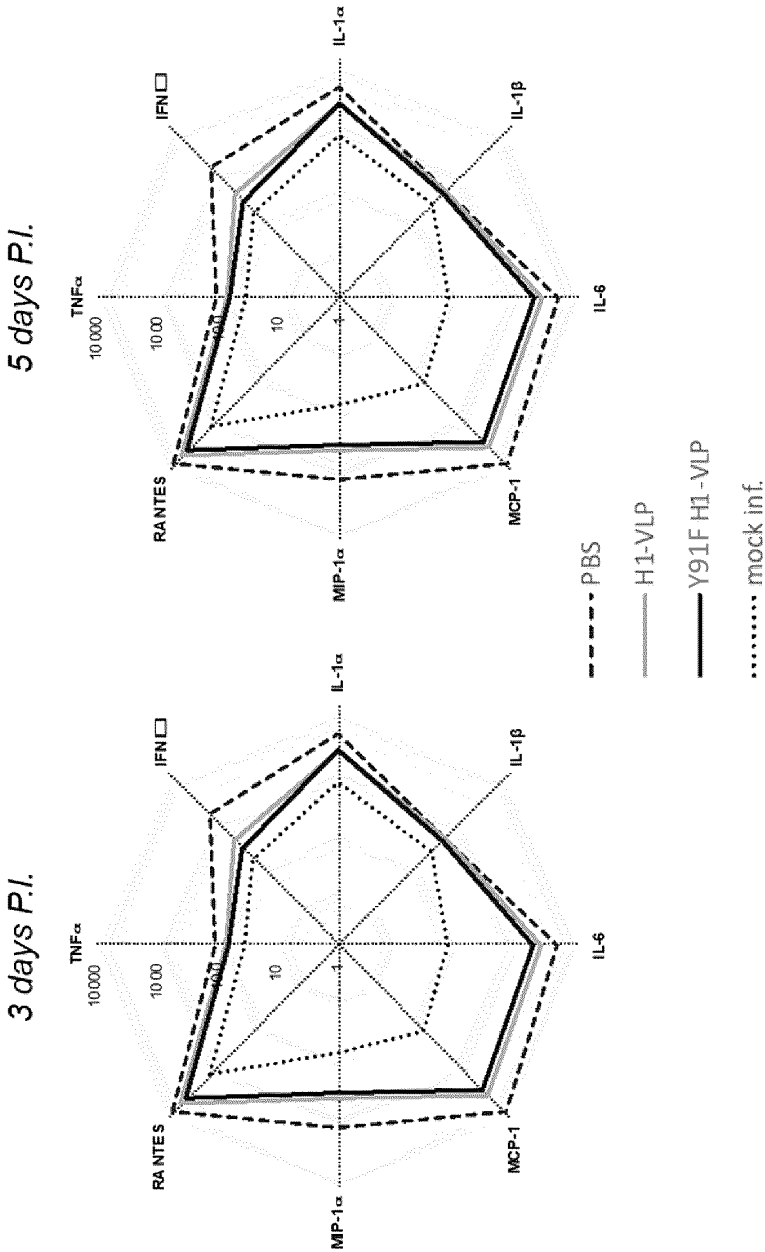
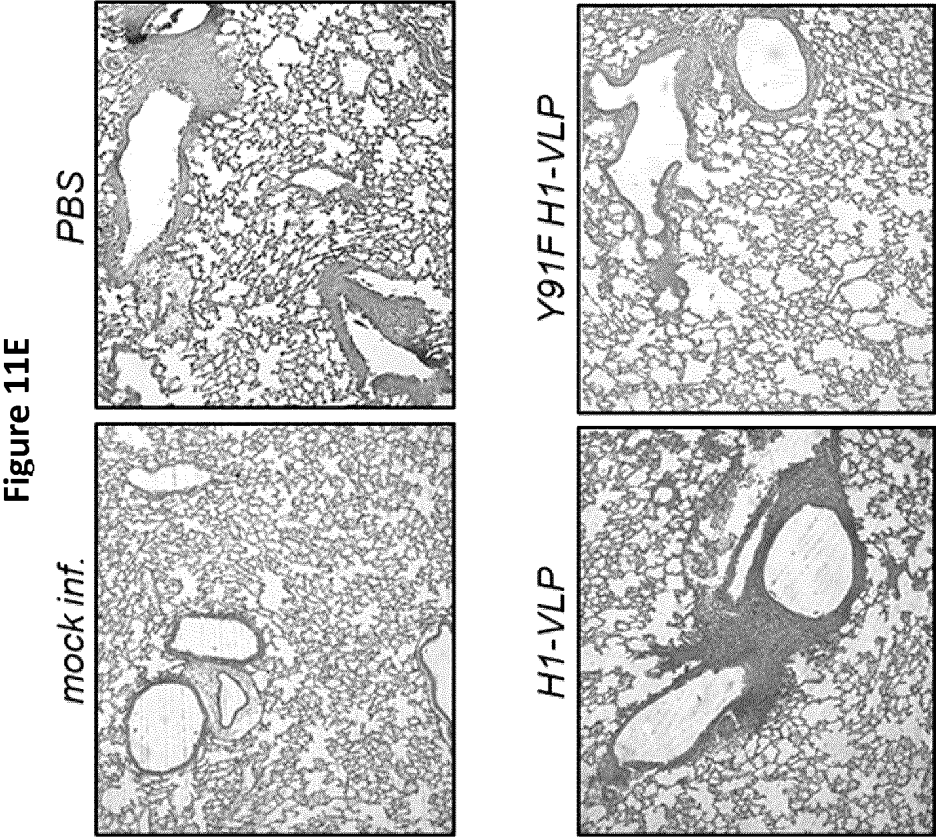
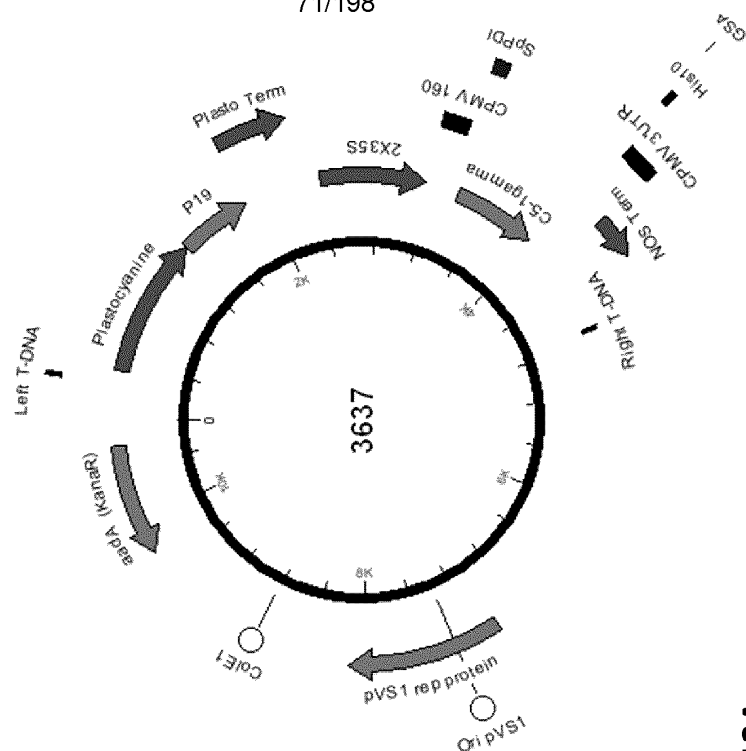


Figure 11D





Acceptor construct 3637



Acceptor construct 1190

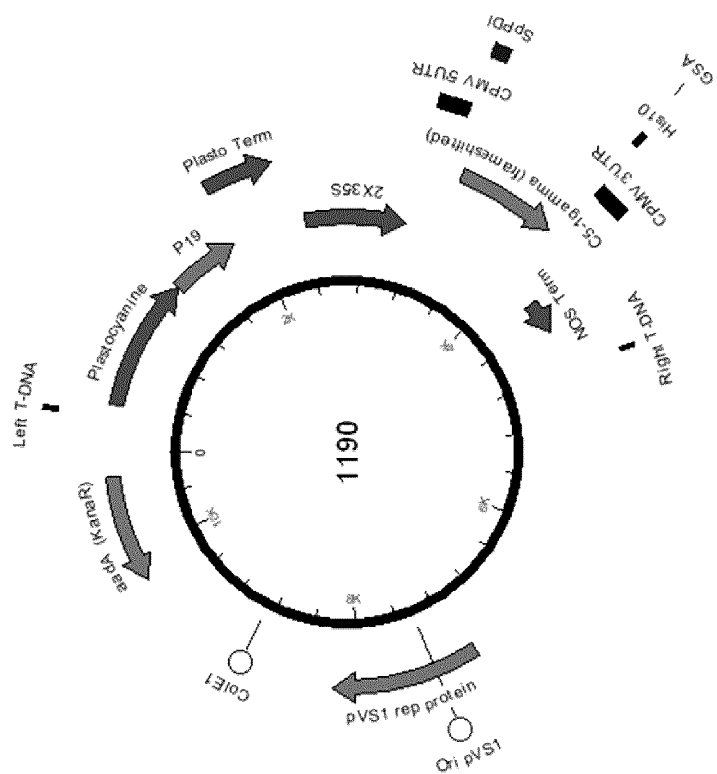
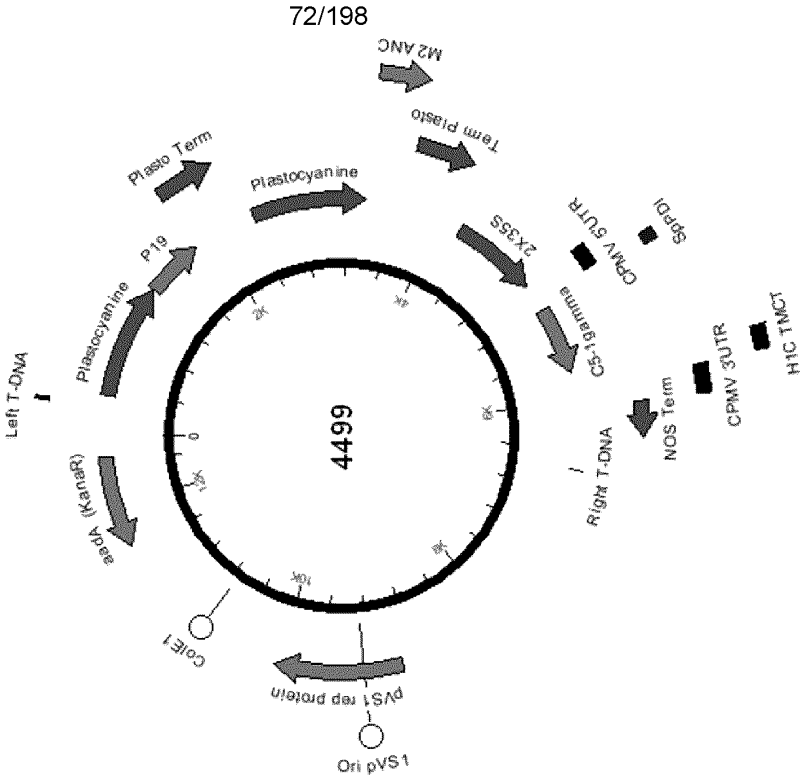


Figure 12A

Acceptor construct 4499



Acceptor construct 2530

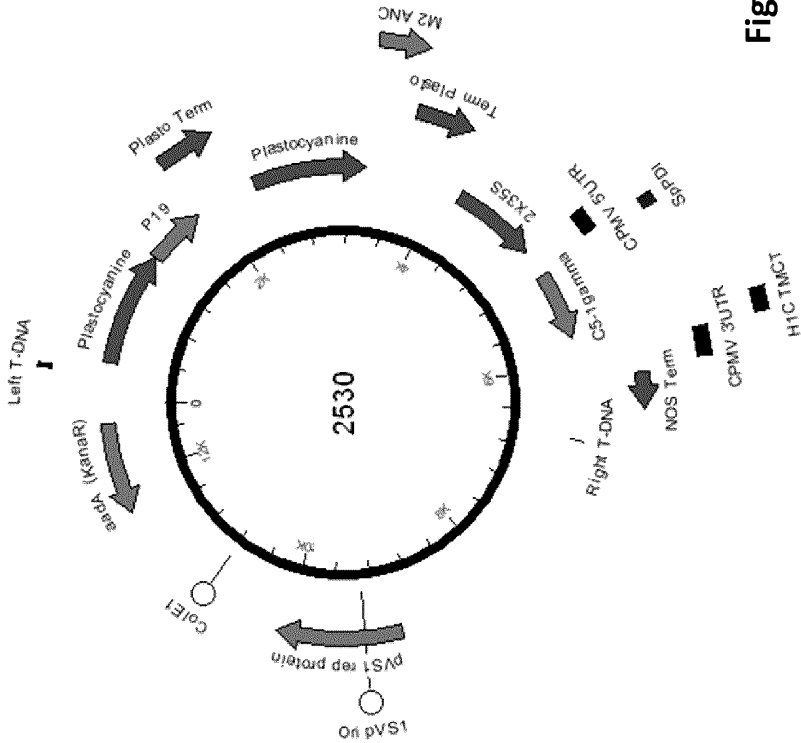


Figure 12B

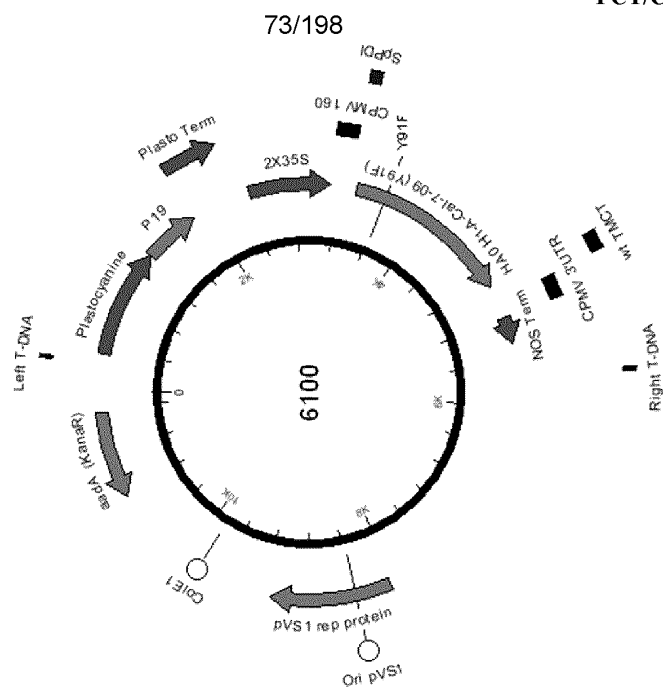
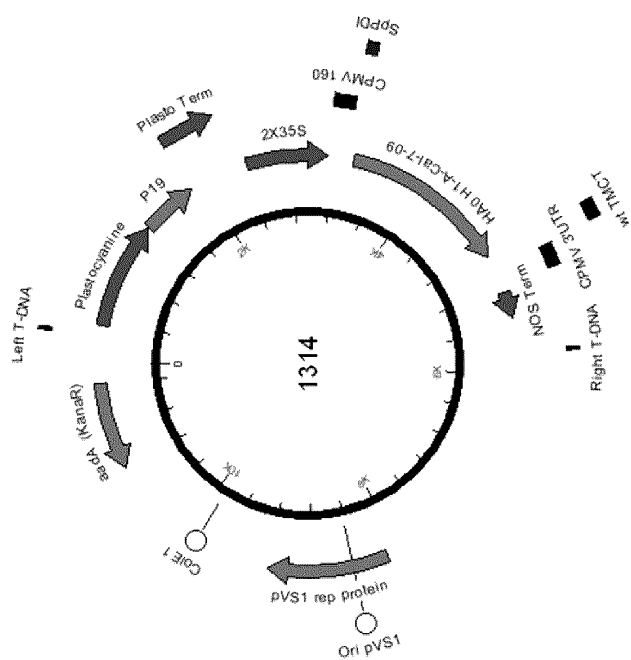


Figure 12C

H1 Cal



H1 Idaho

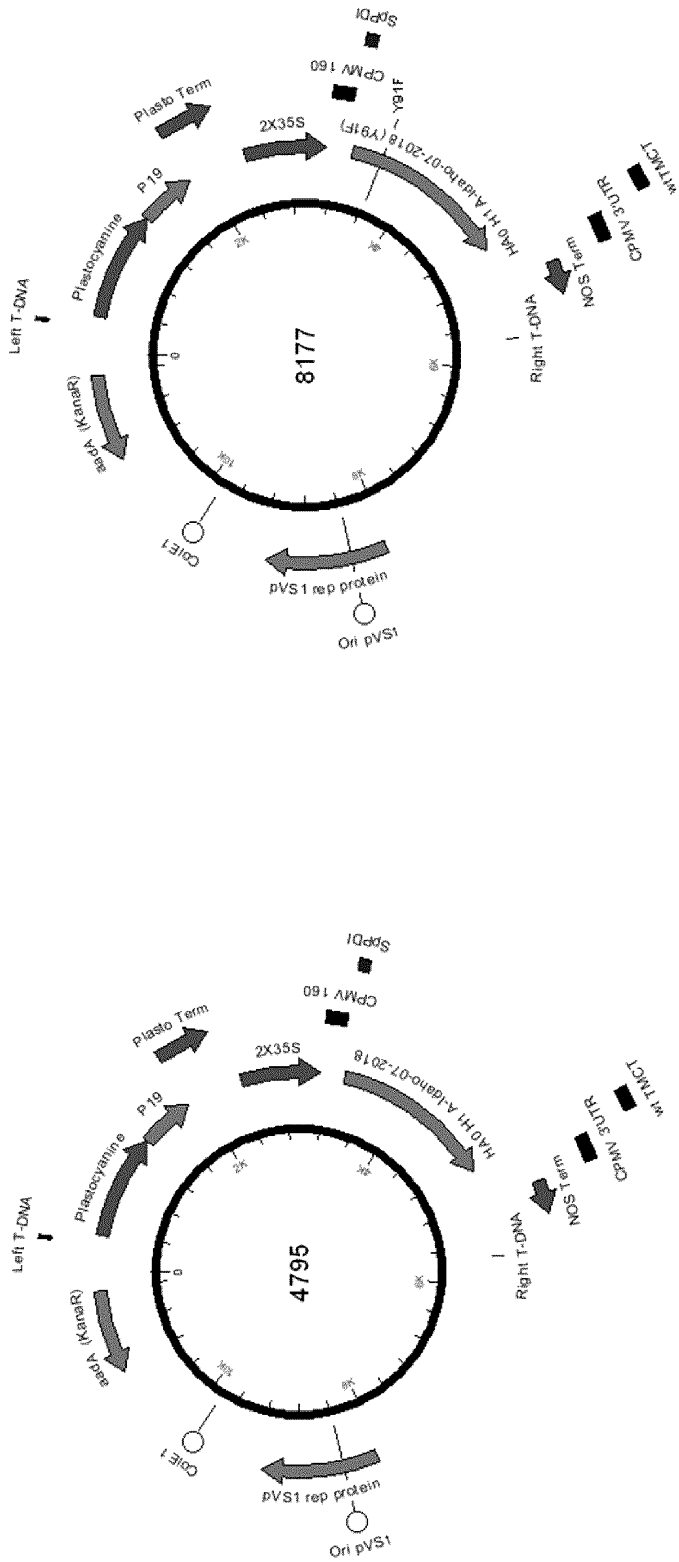


Figure 12D

H3 Kansas

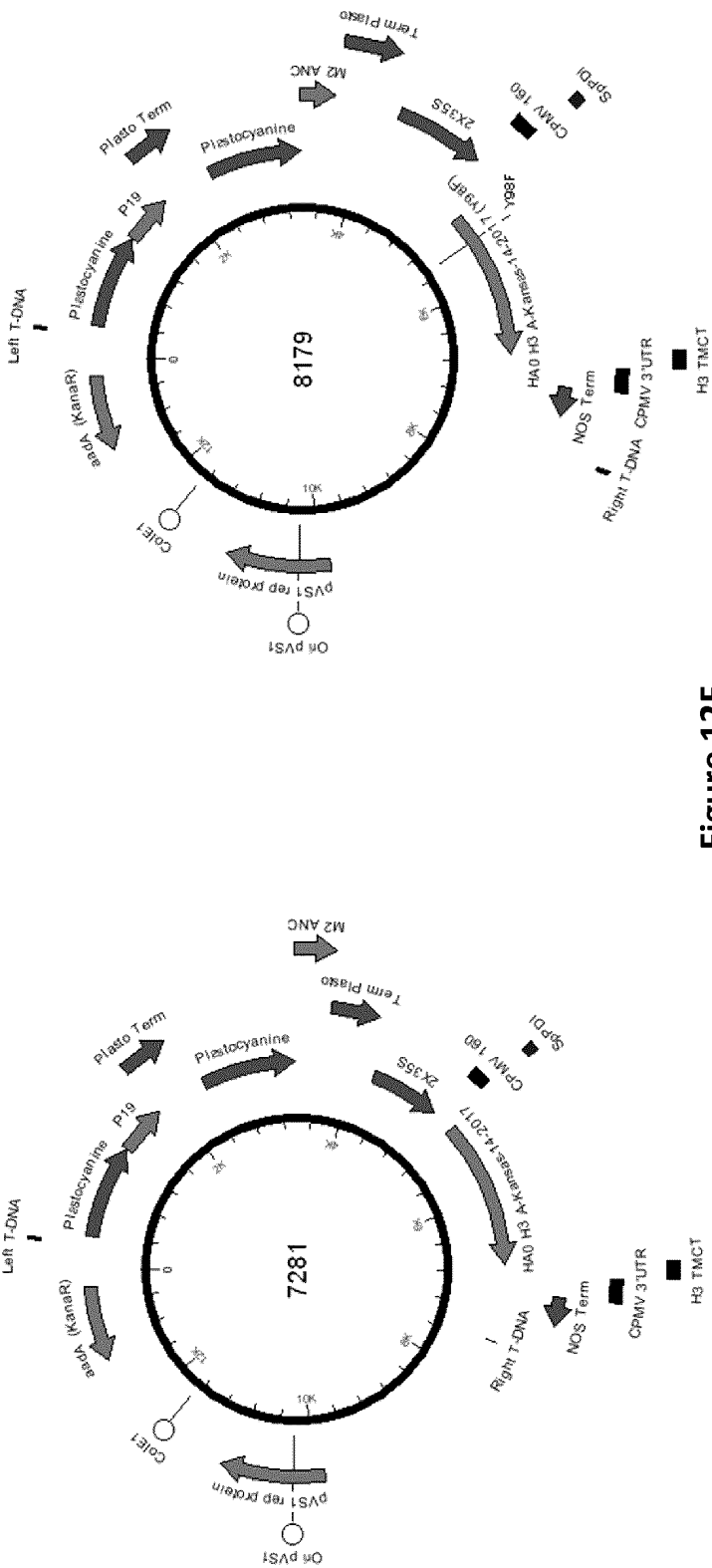


Figure 12F

H3 Kansas

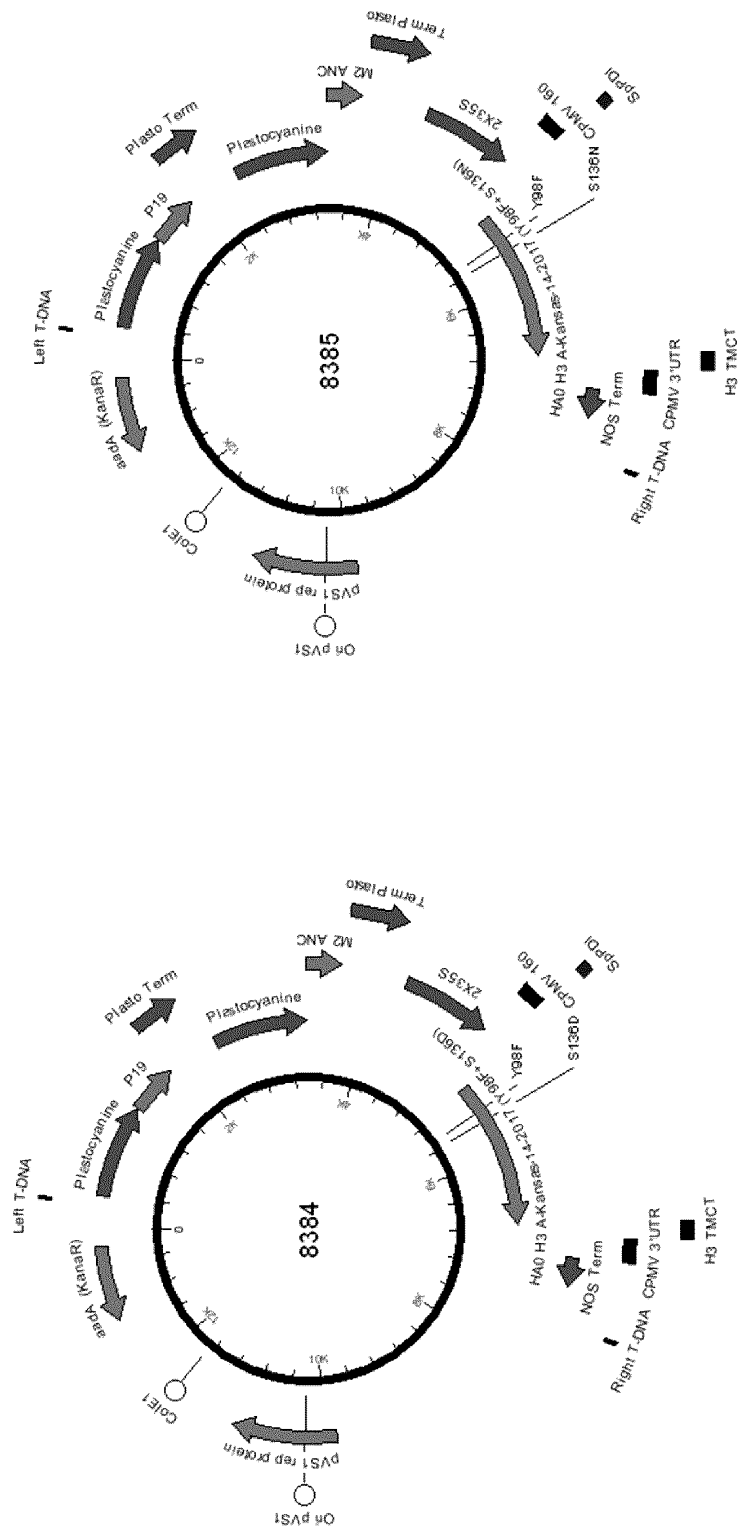


Figure 12G

H3 Kansas

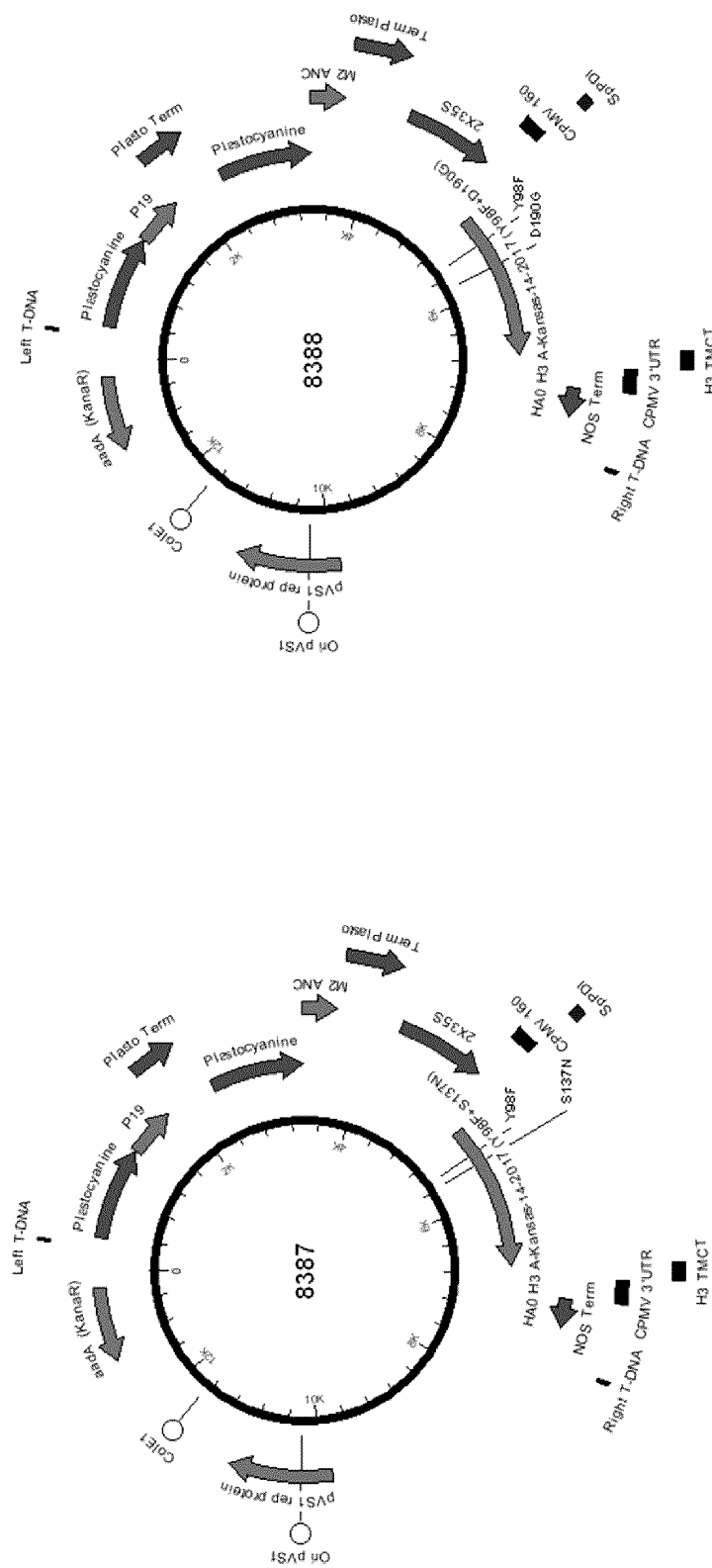


Figure 12H

H3 Kansas

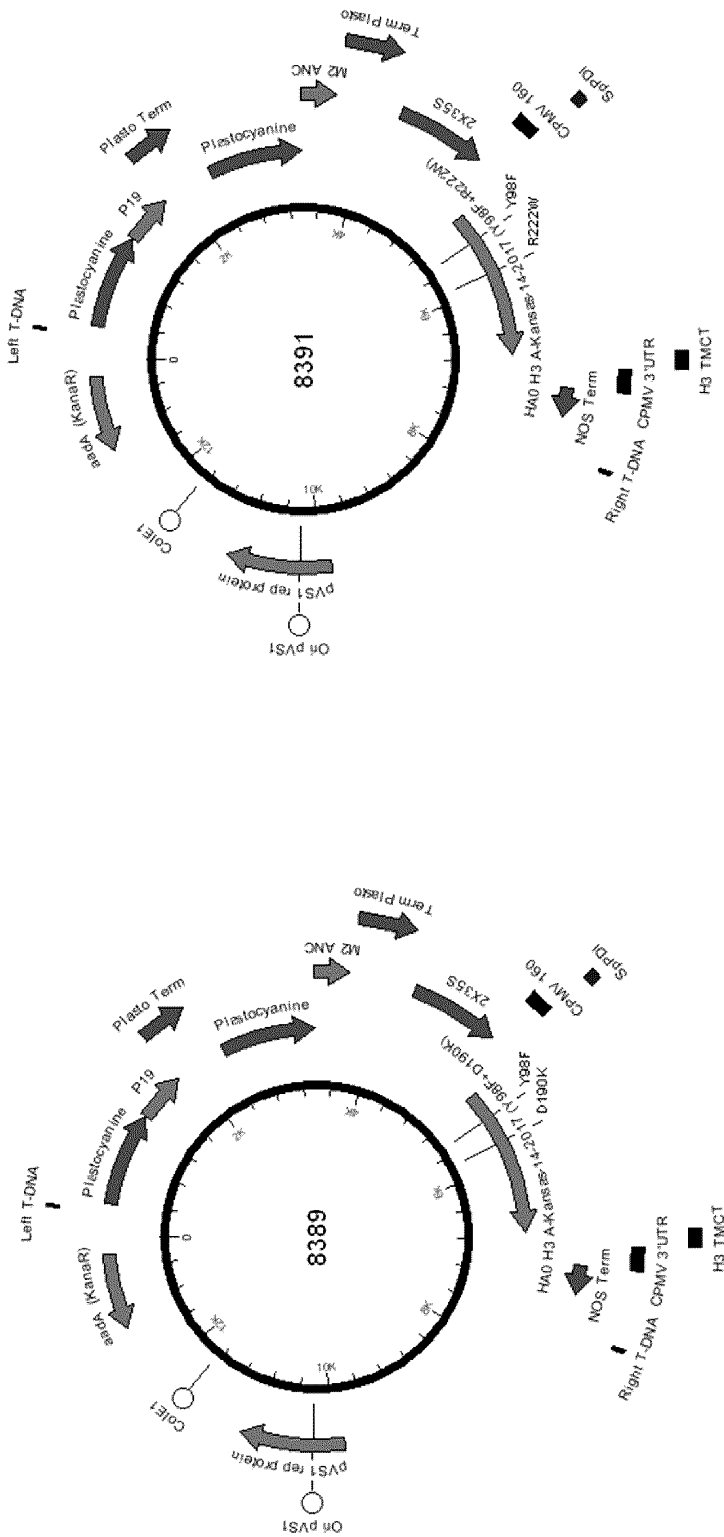


Figure 12I

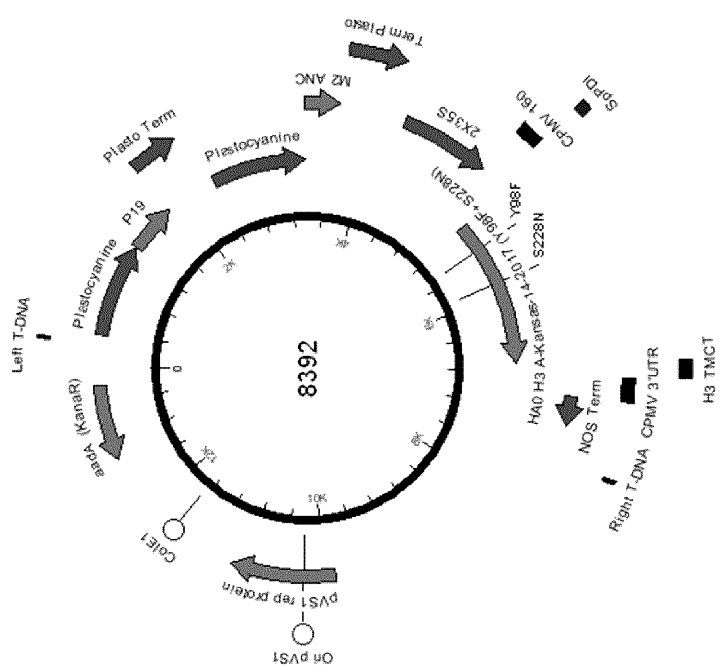
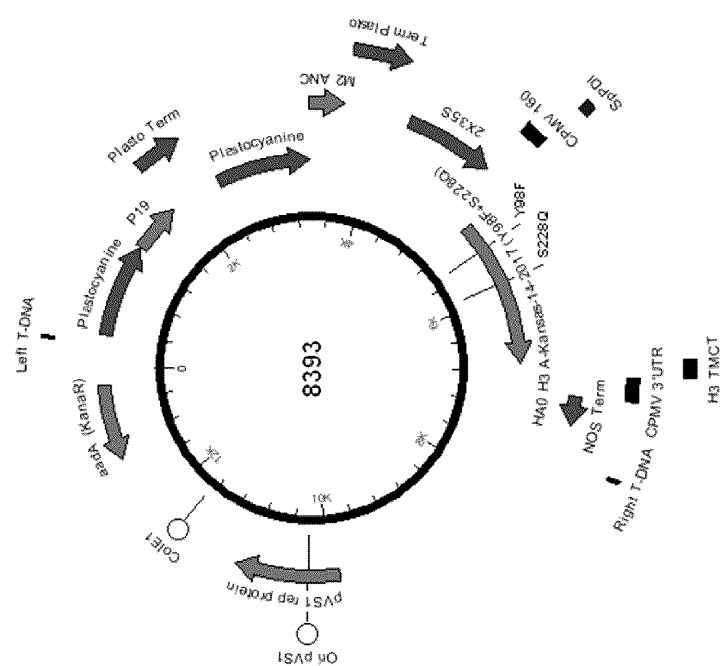


Figure 12J

H3 Kansas

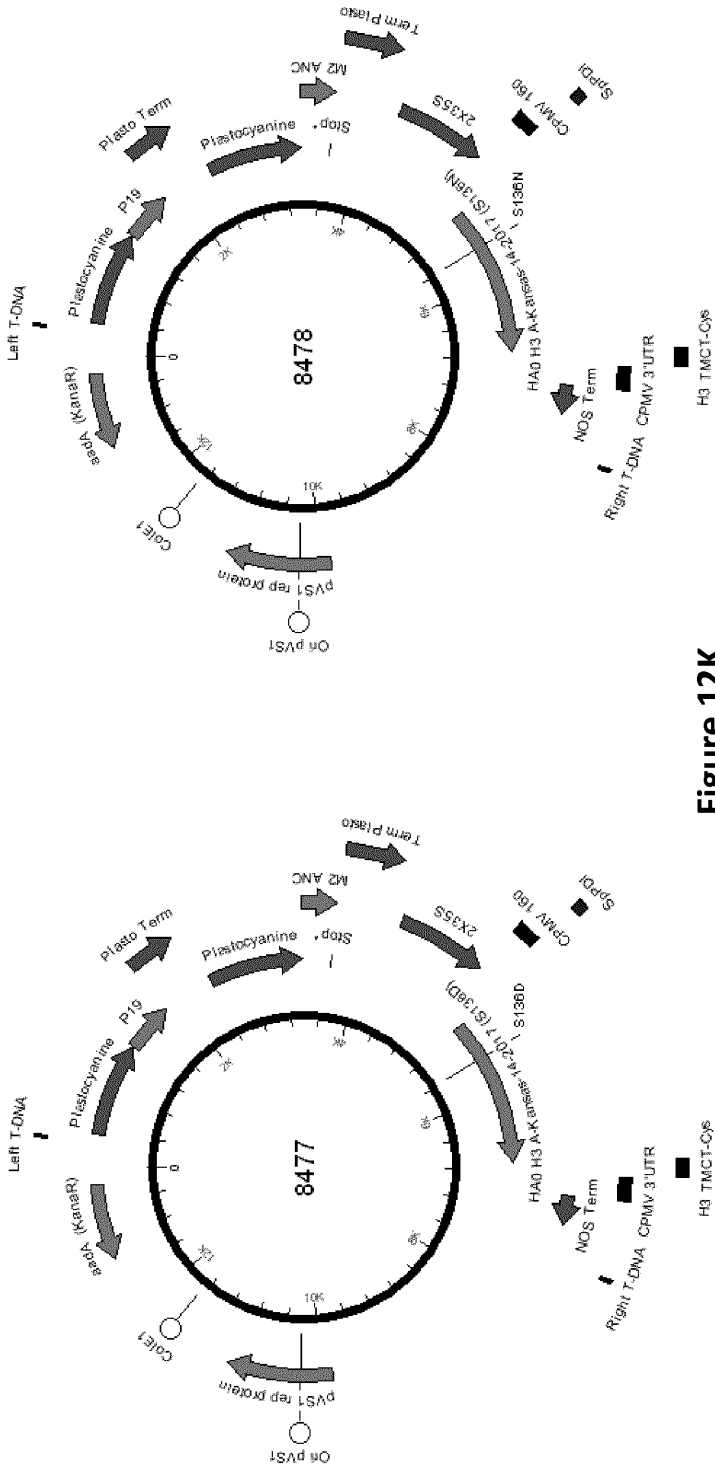
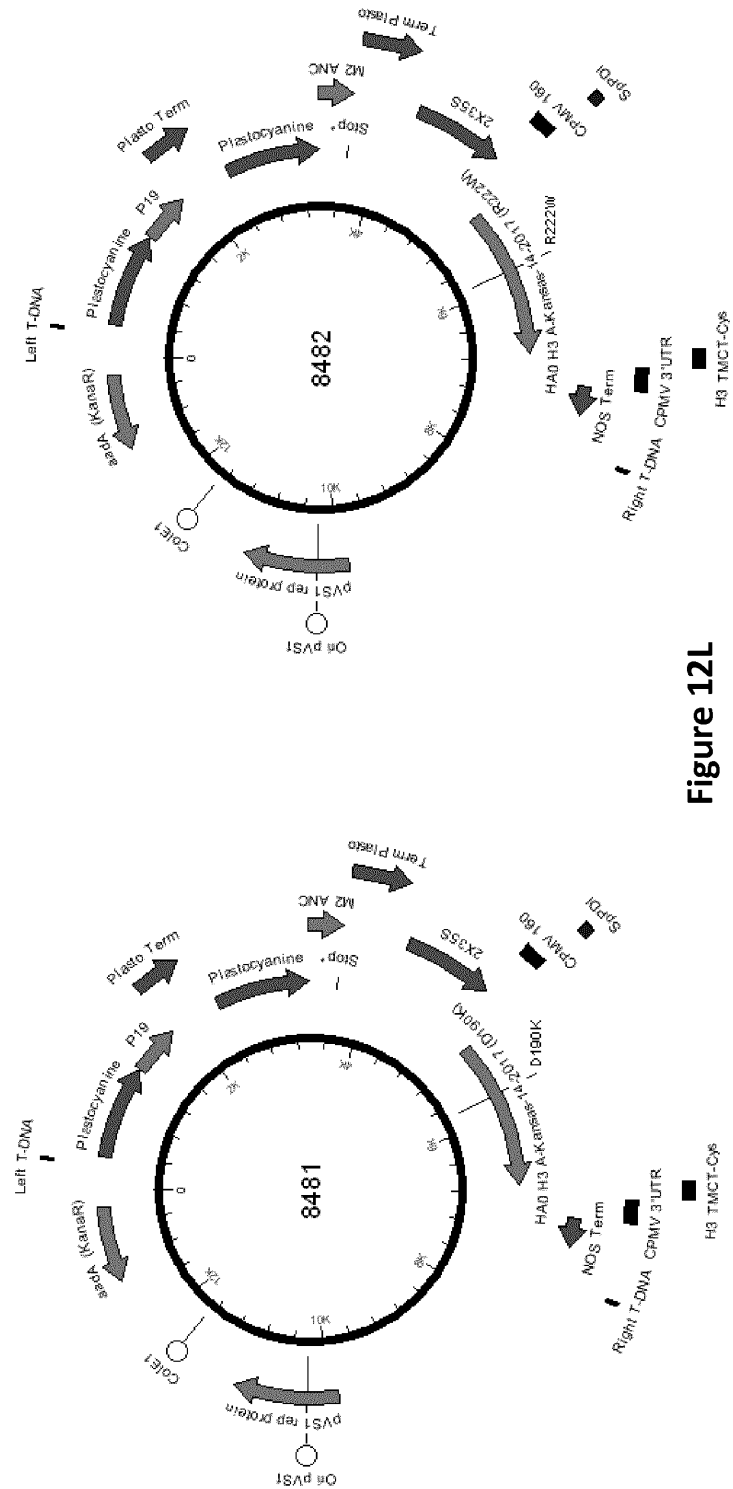


Figure 12K

H3 Kansas



H3 Kansas

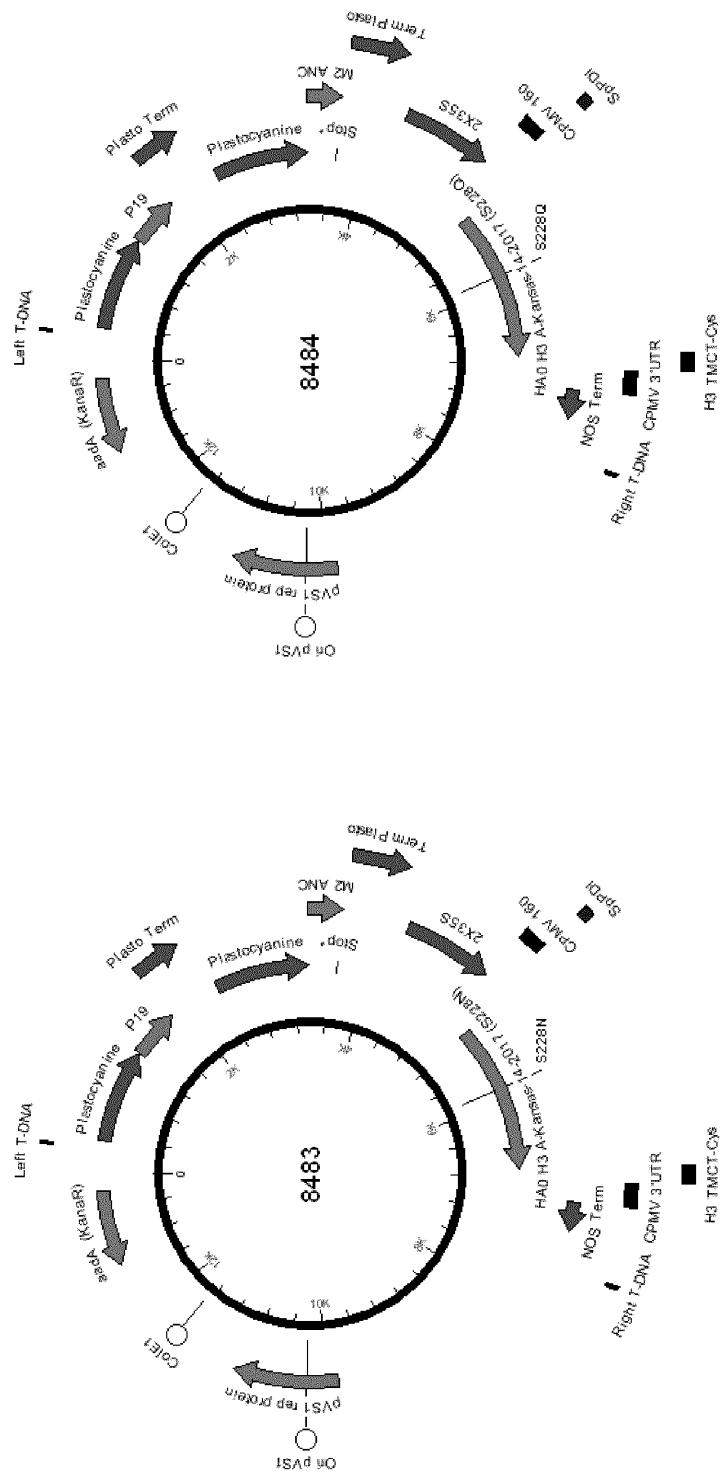


Figure 12M

H5 Indonesia

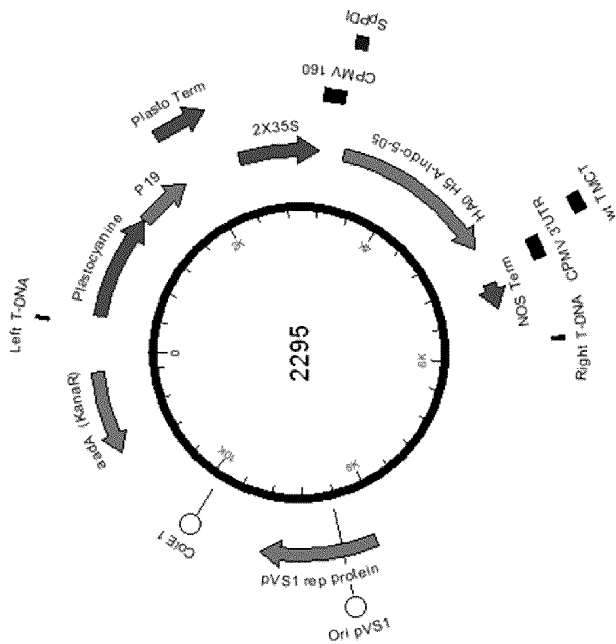
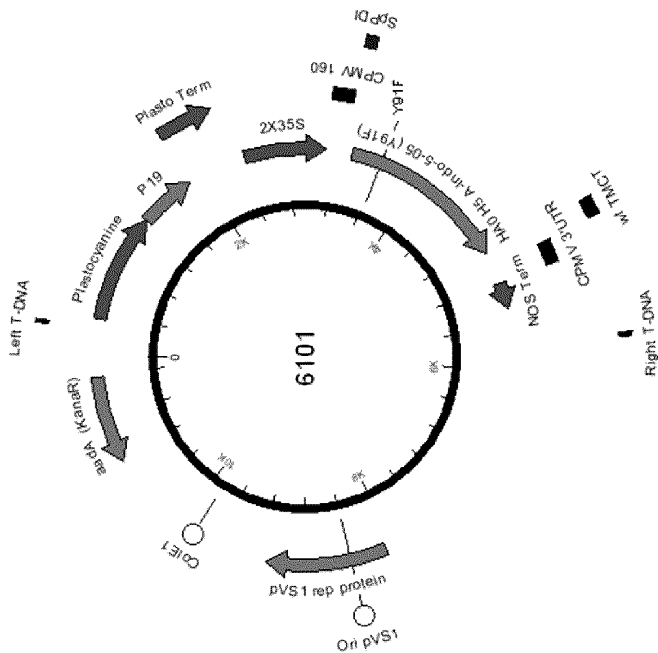


Figure 12N

H7 Shanghai

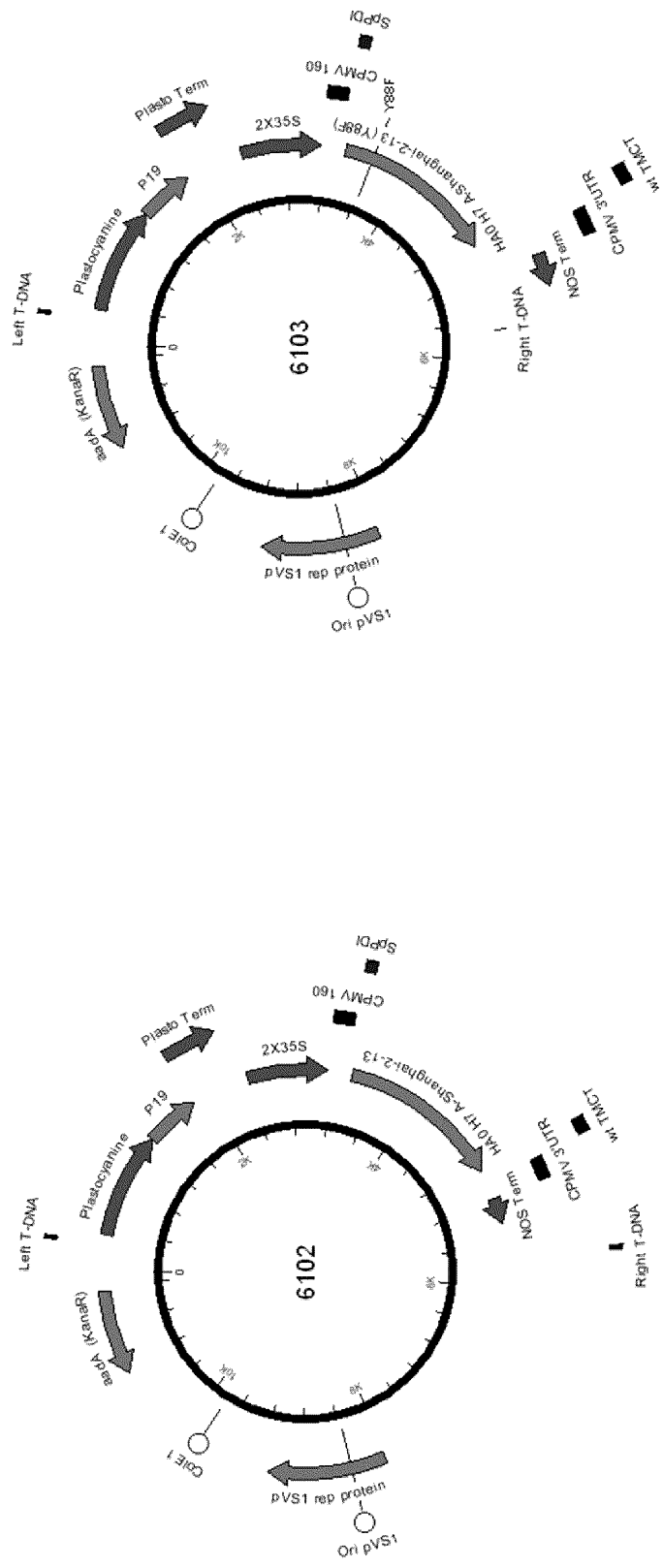


Figure 120

B Phuket

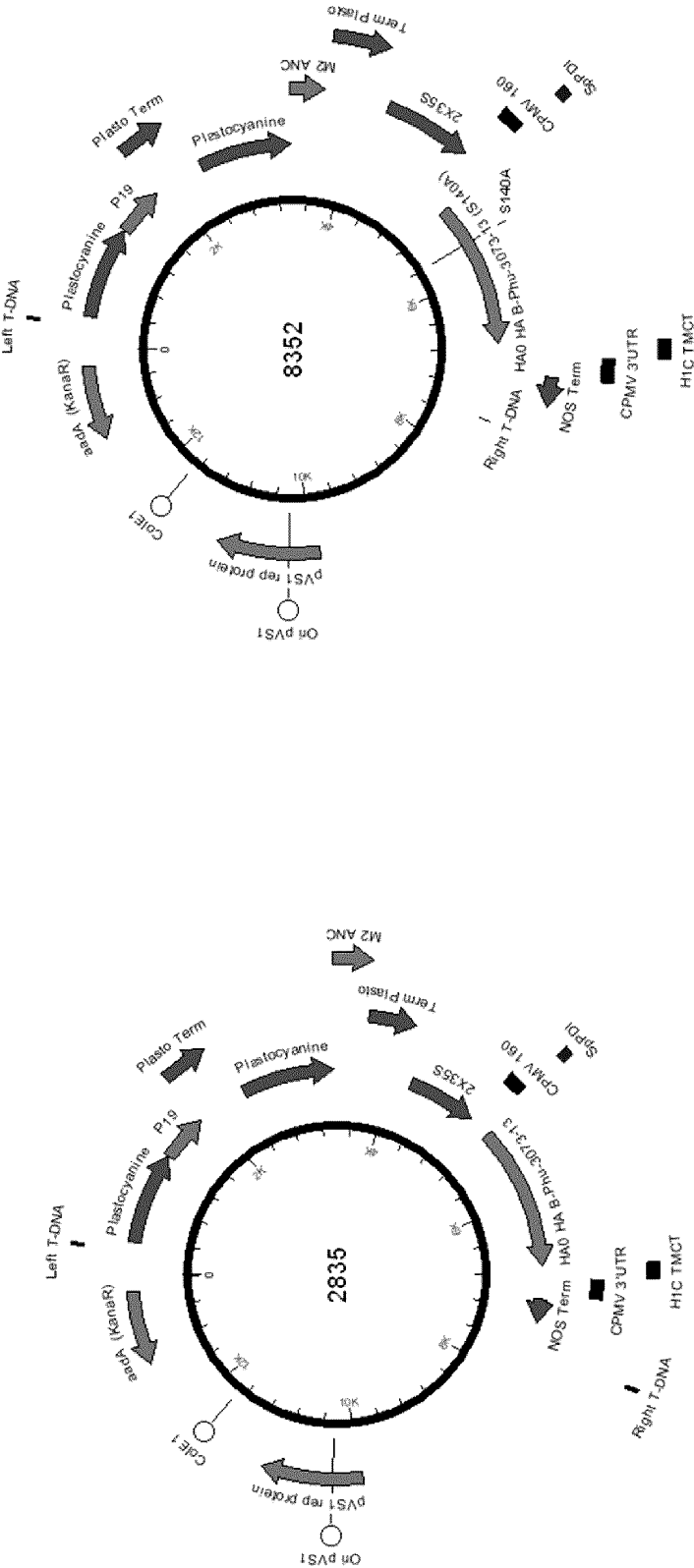


Figure 12P

B Phuket

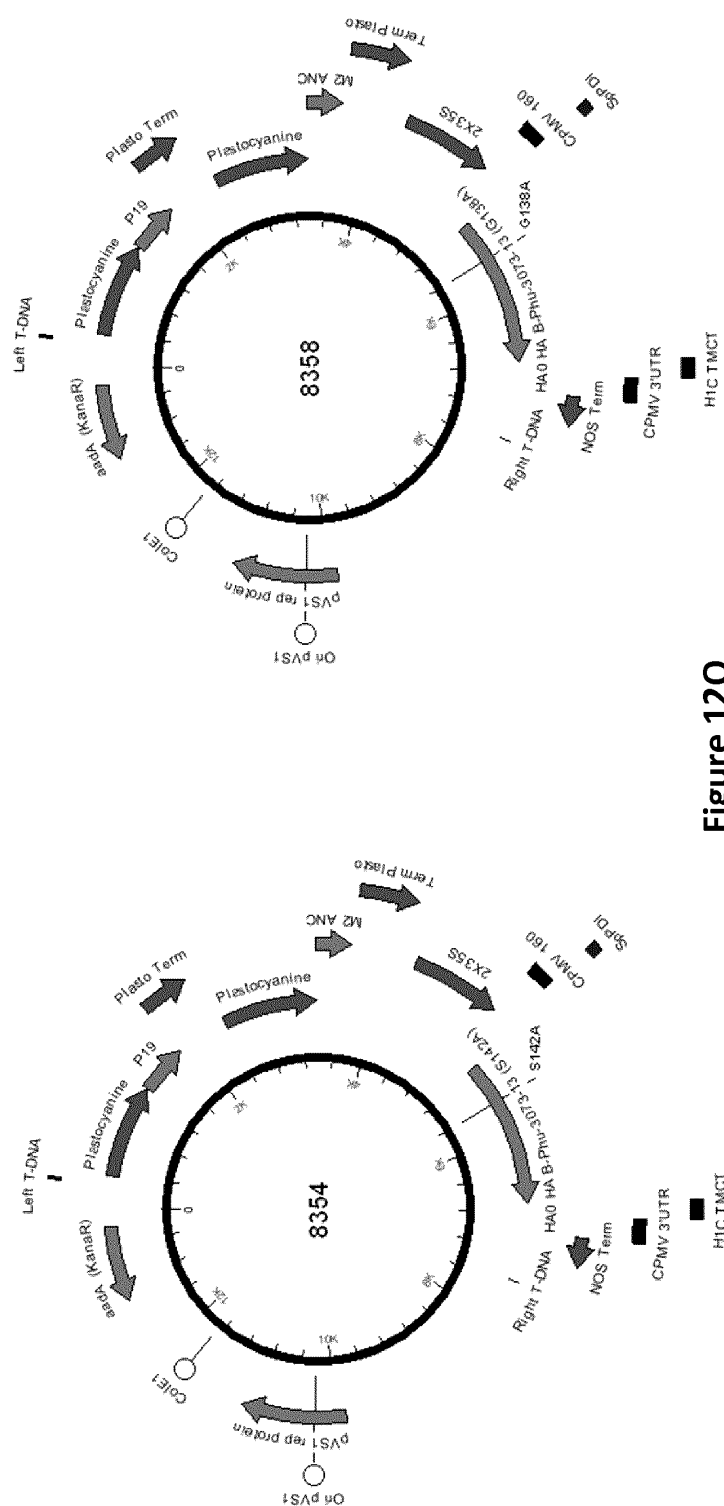


Figure 12Q

B Phuket

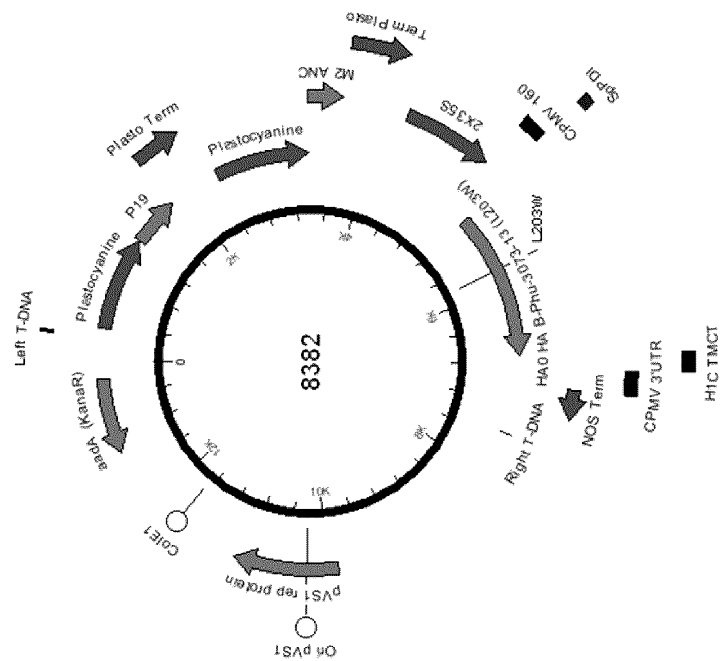


Figure 12S

B Singapore

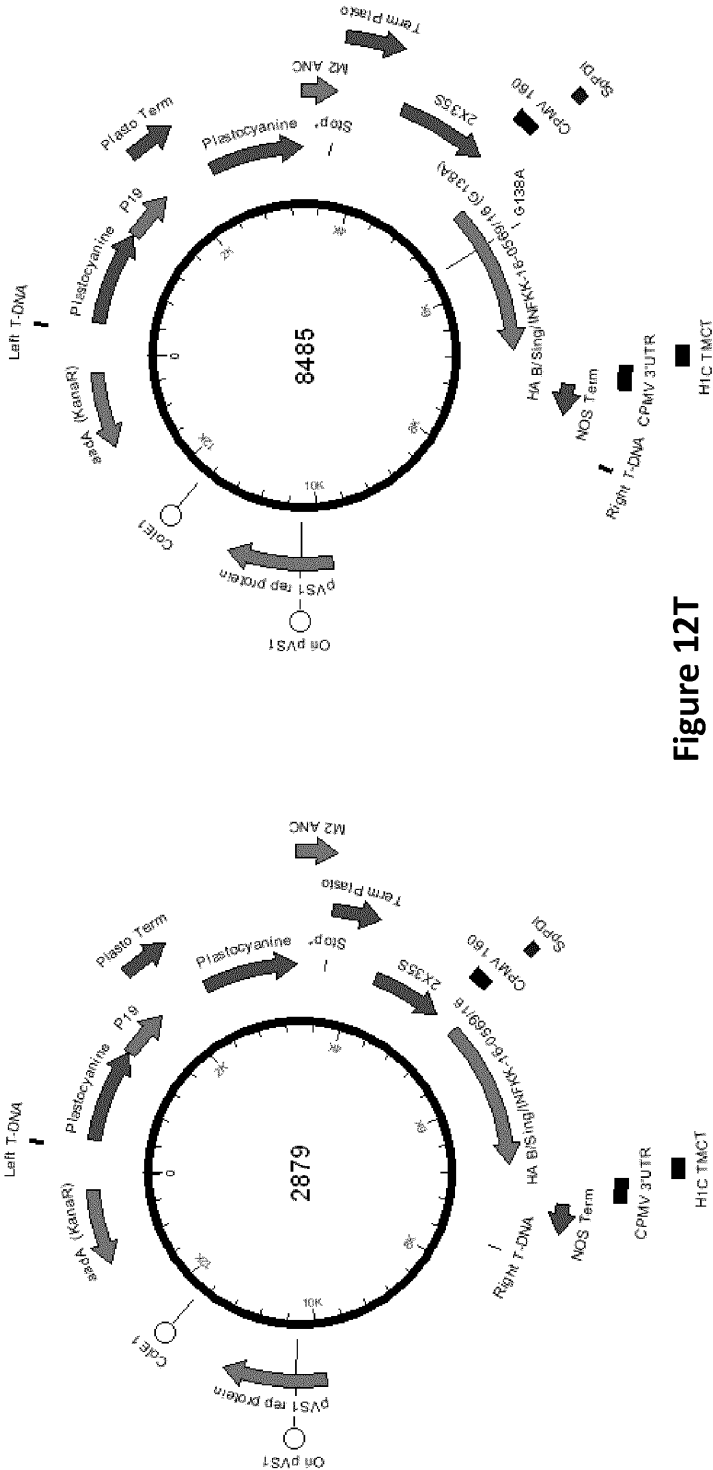


Figure 12T

B Singapore

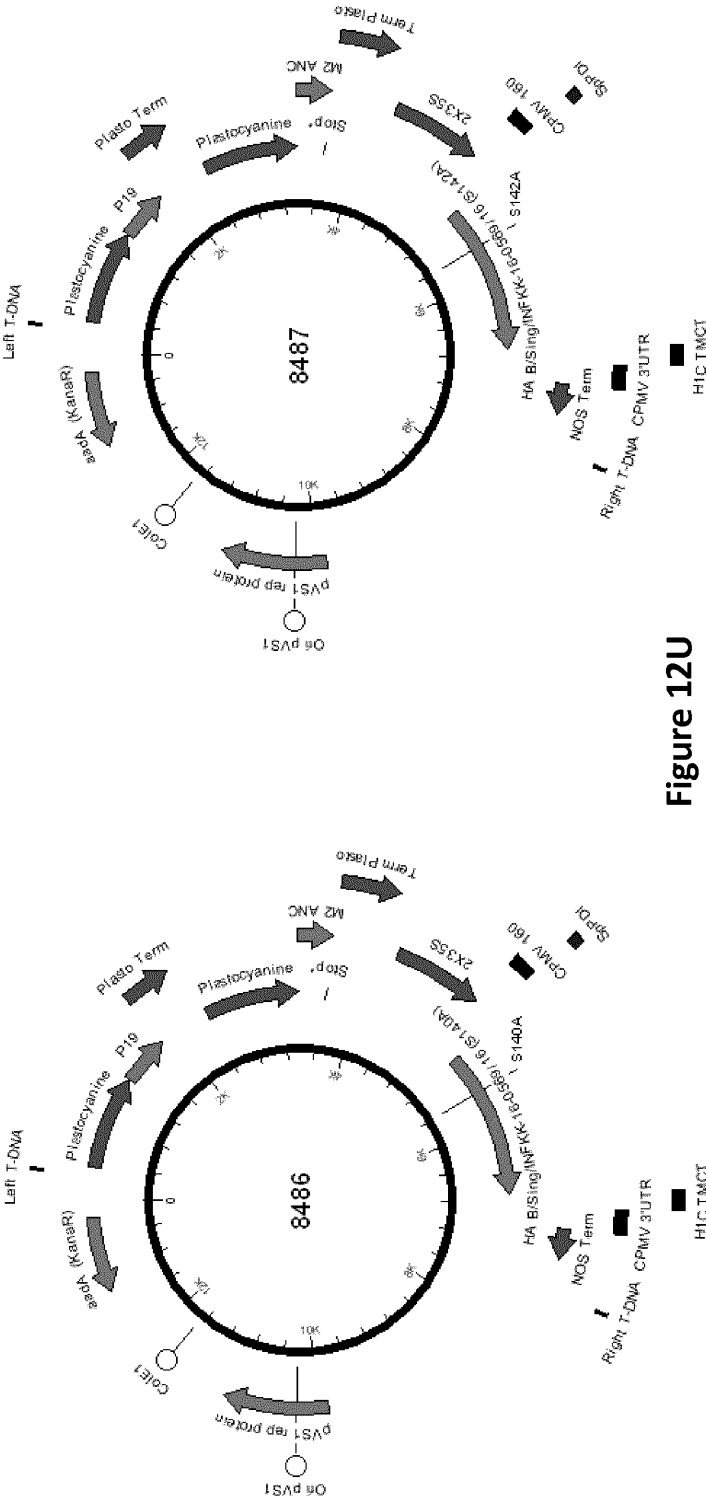


Figure 12U

B Singapore

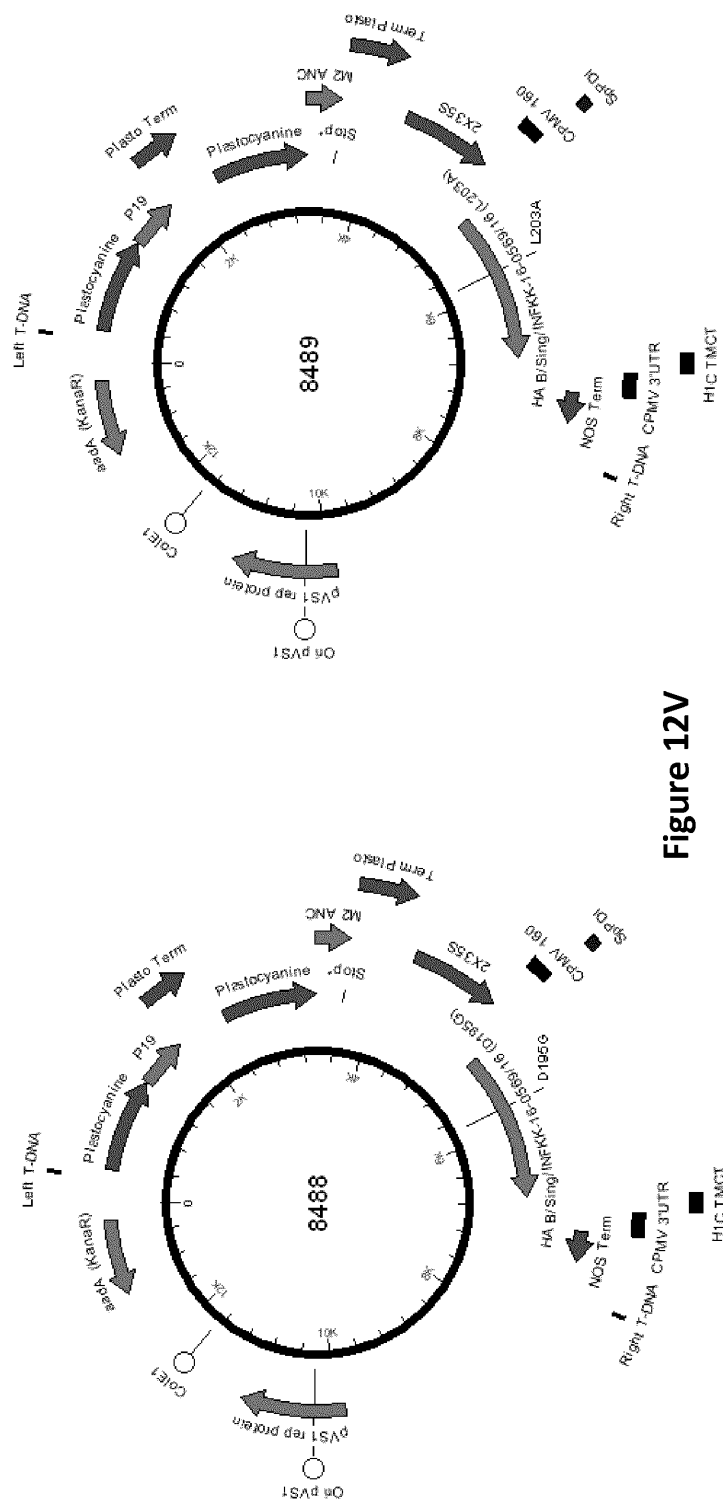


Figure 12V

B Singapore

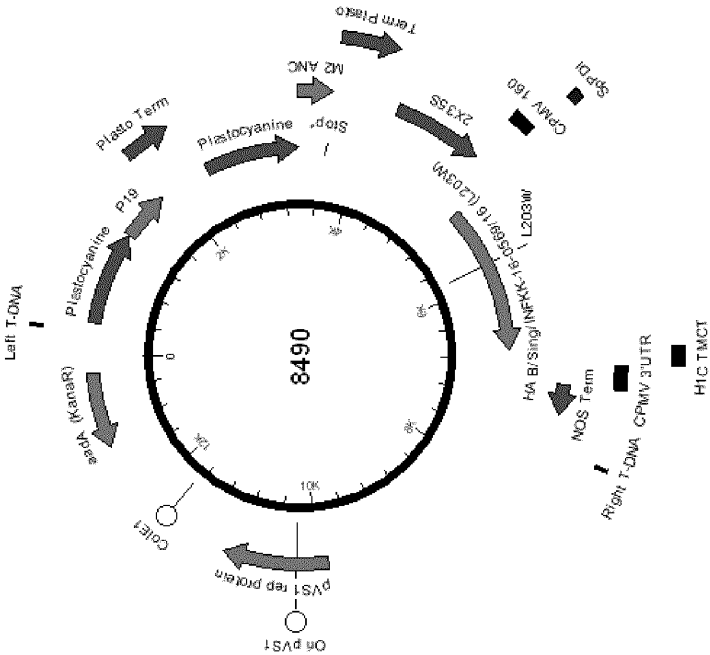


Figure 12W

B Maryland

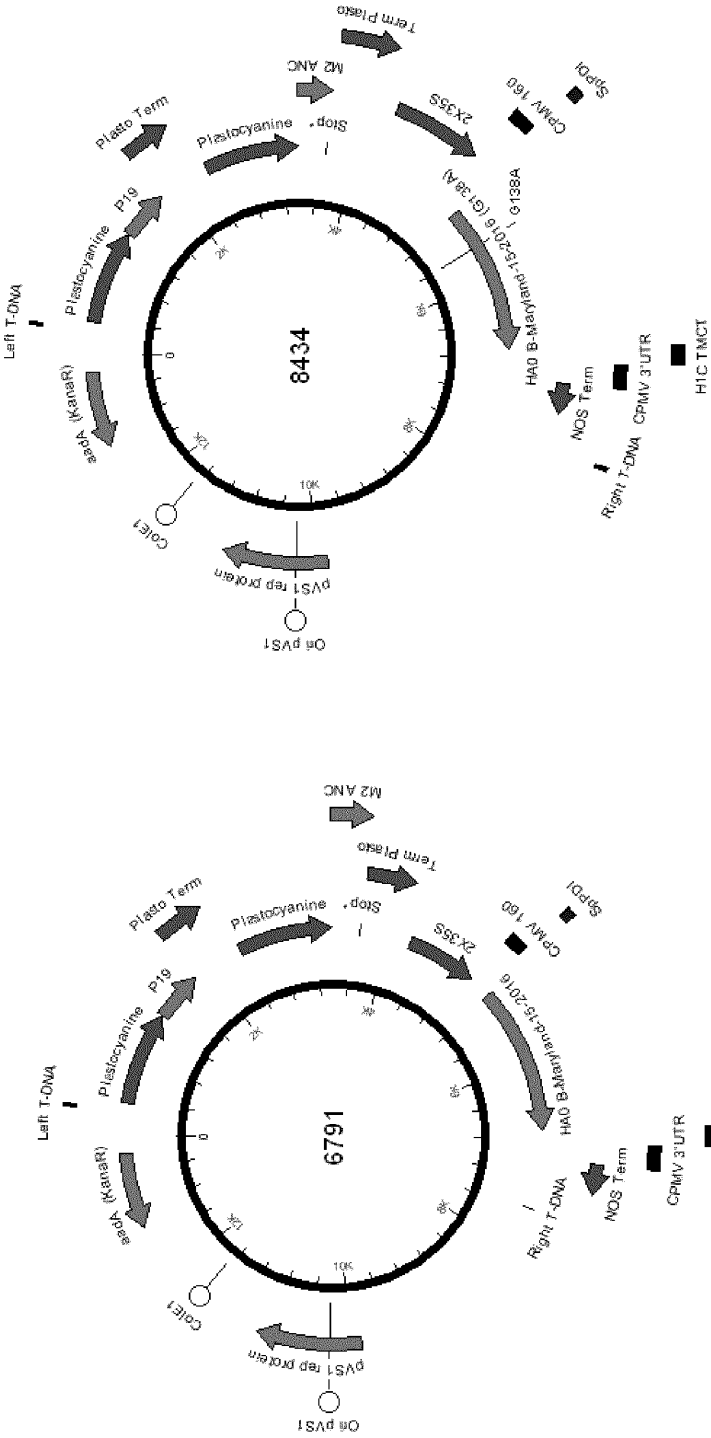
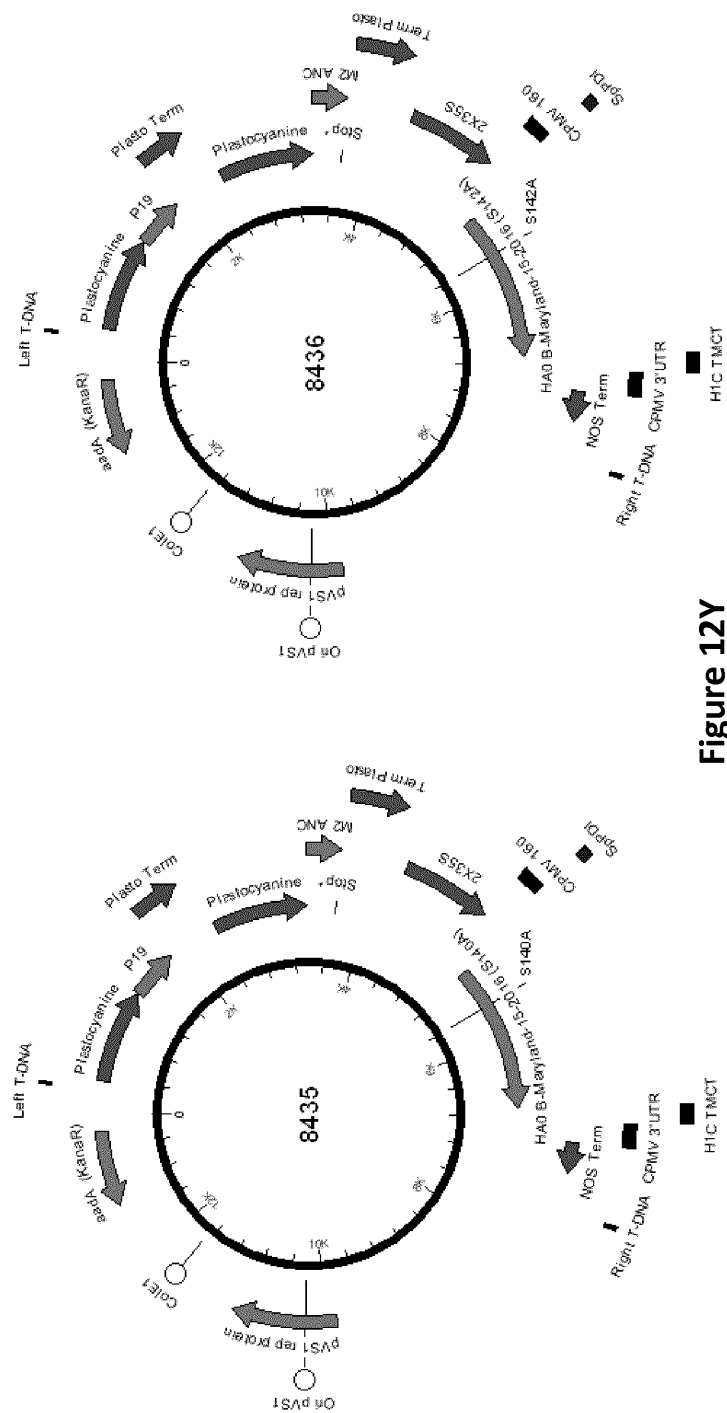


Figure 12X



B Maryland

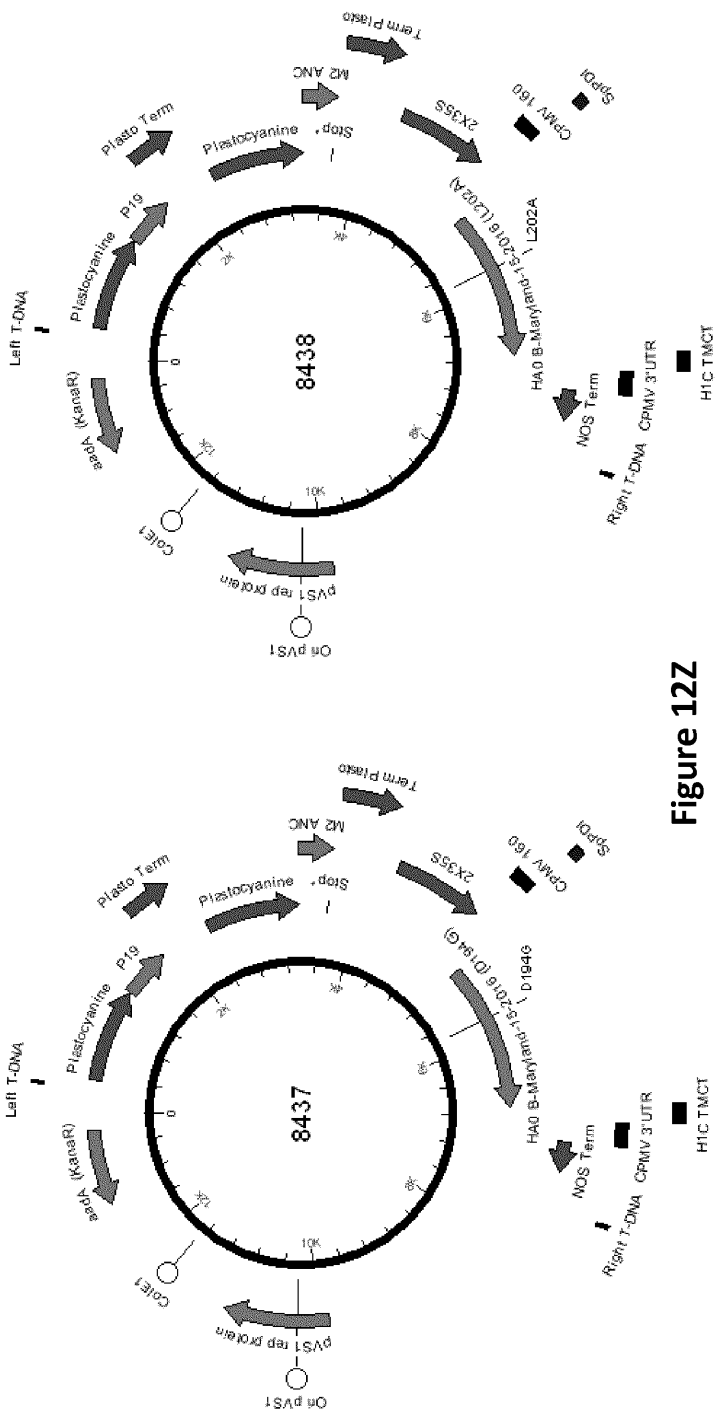


Figure 12Z

B Maryland

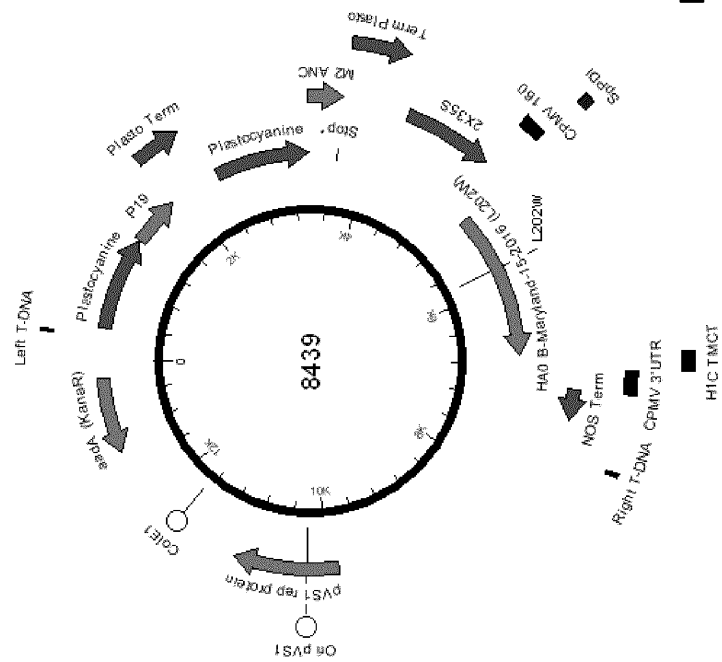


Figure 12AA

B Washington

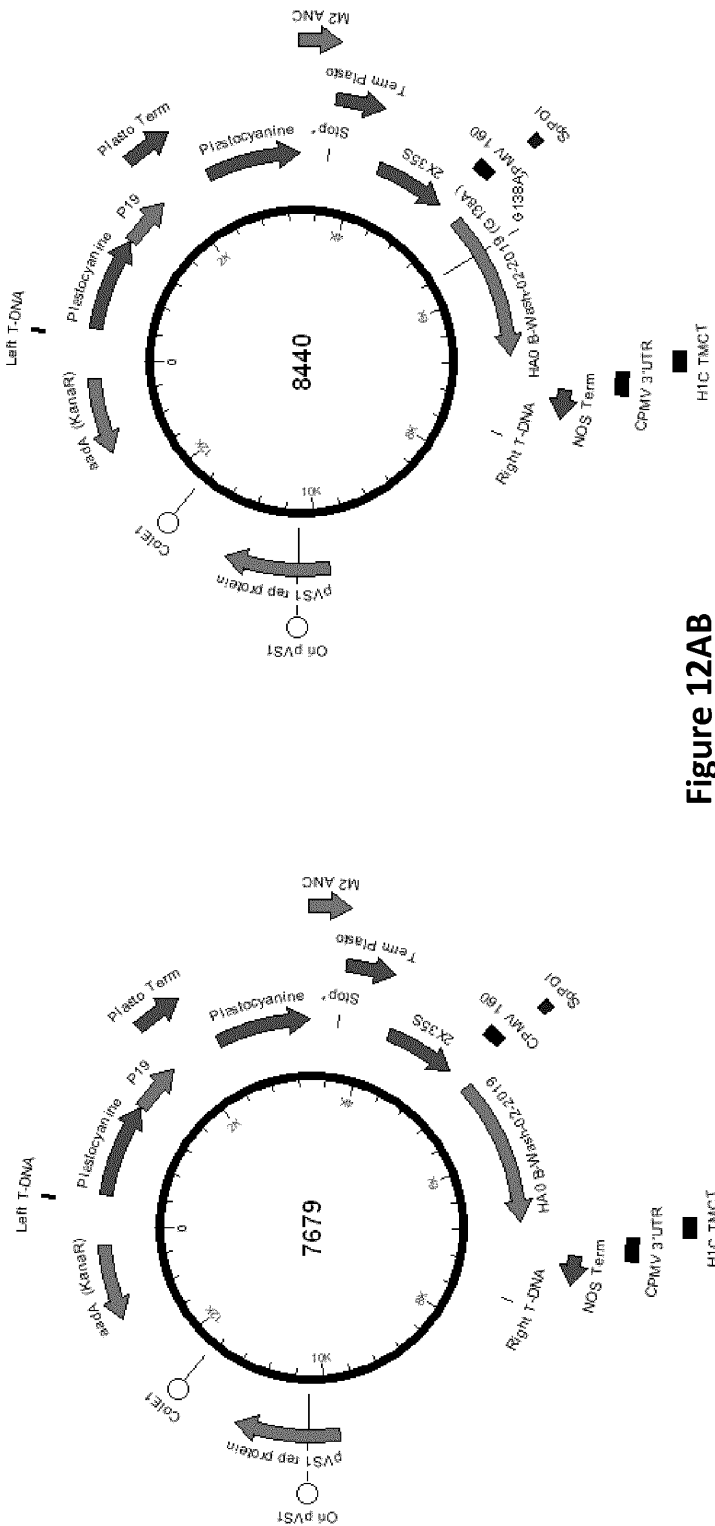


Figure 12AB

B Washington

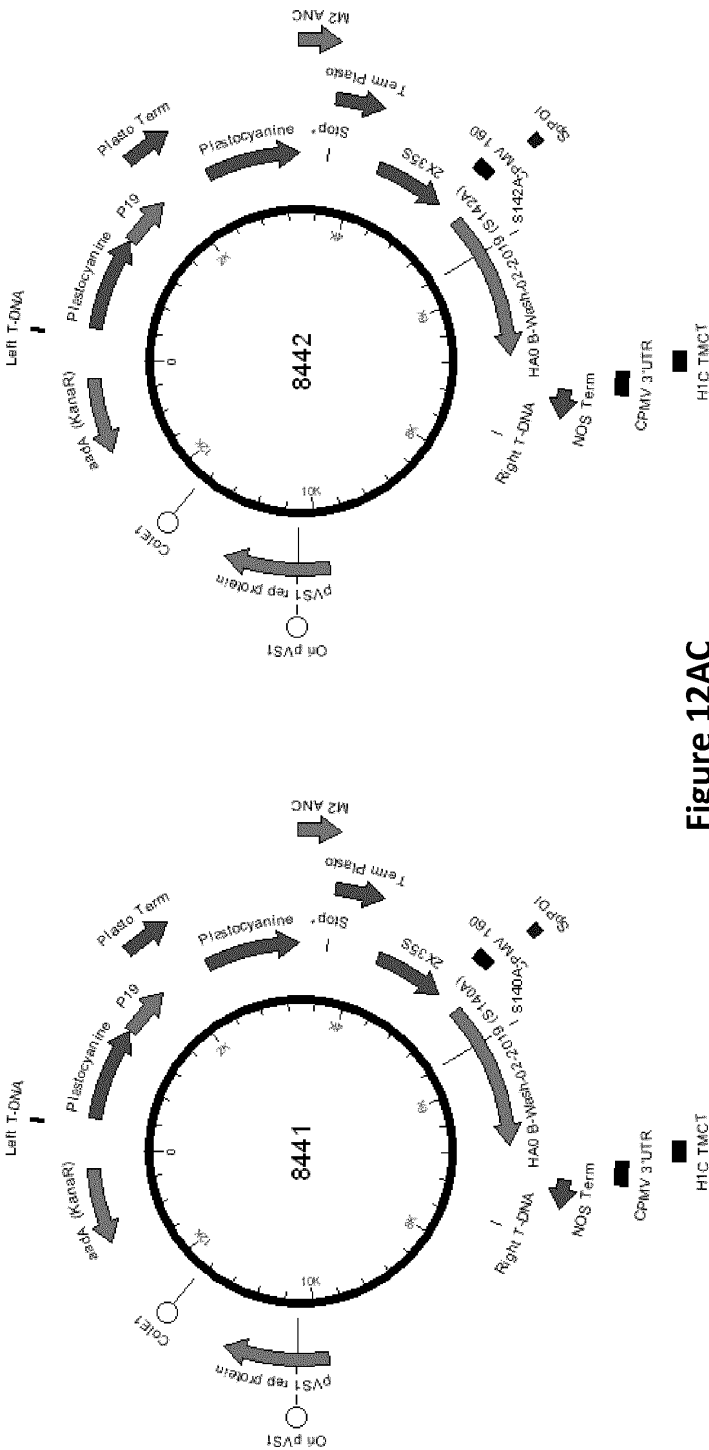
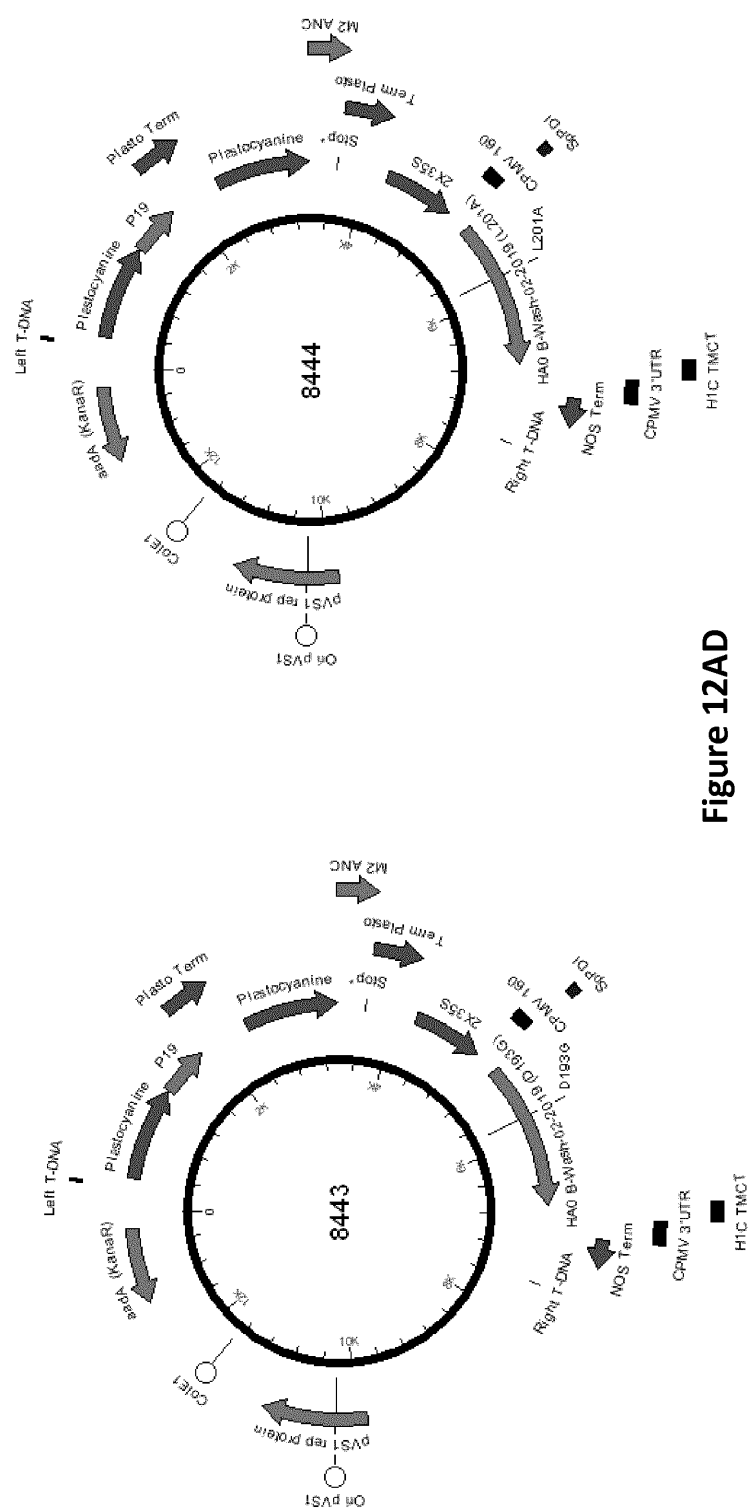


Figure 12AC



B Washington

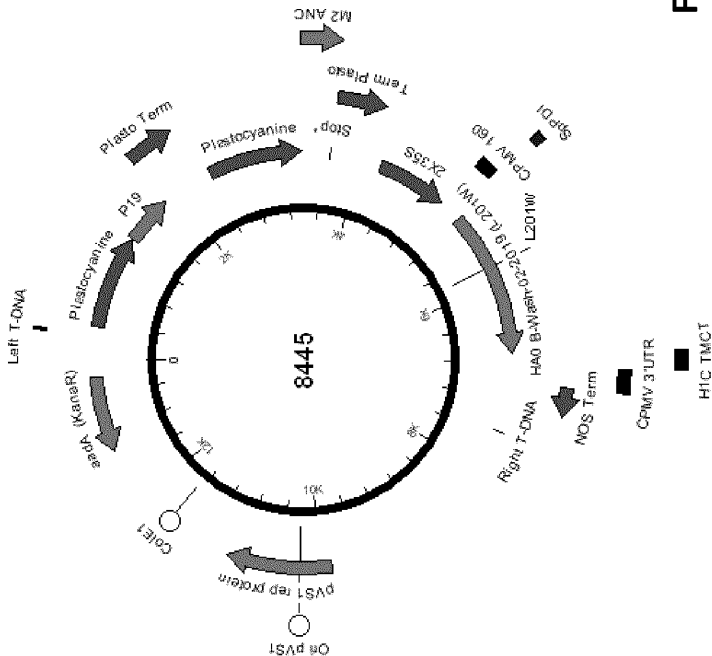
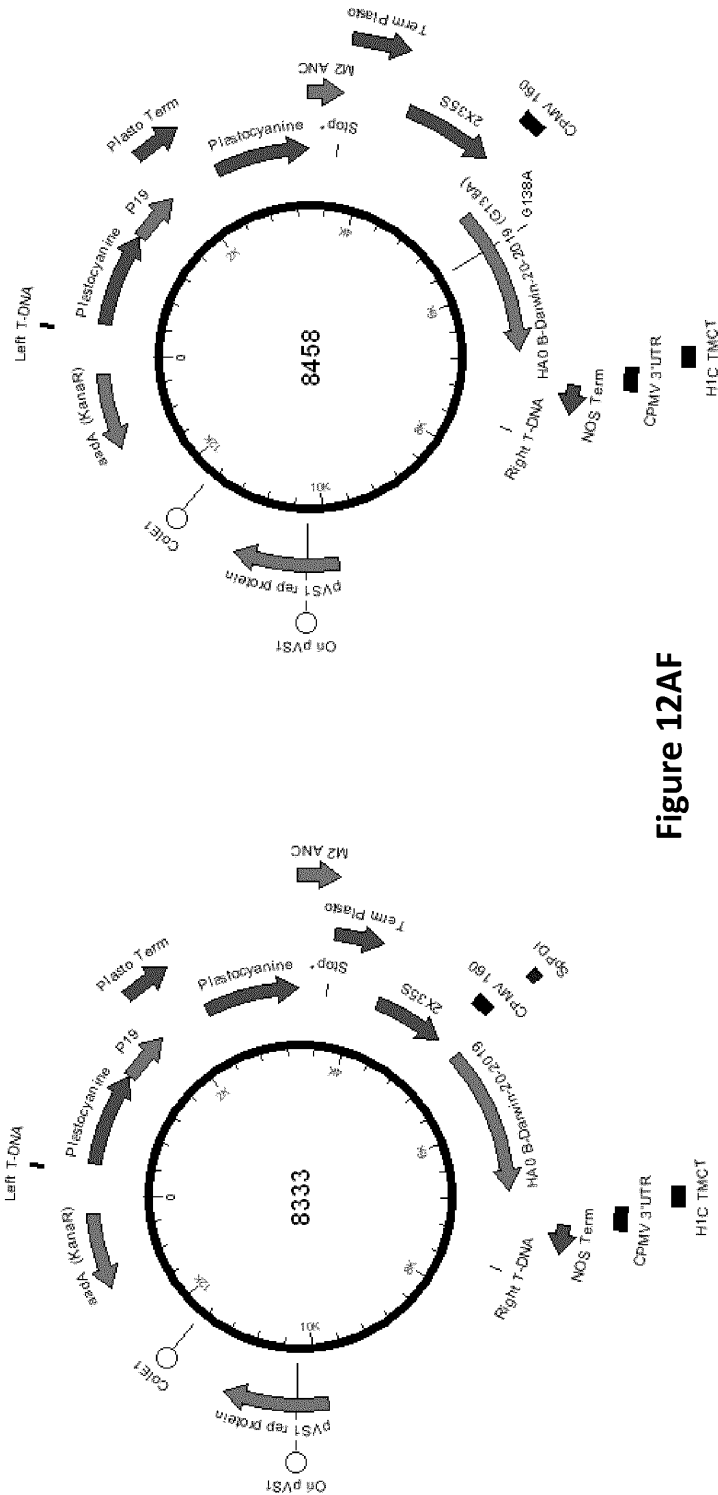
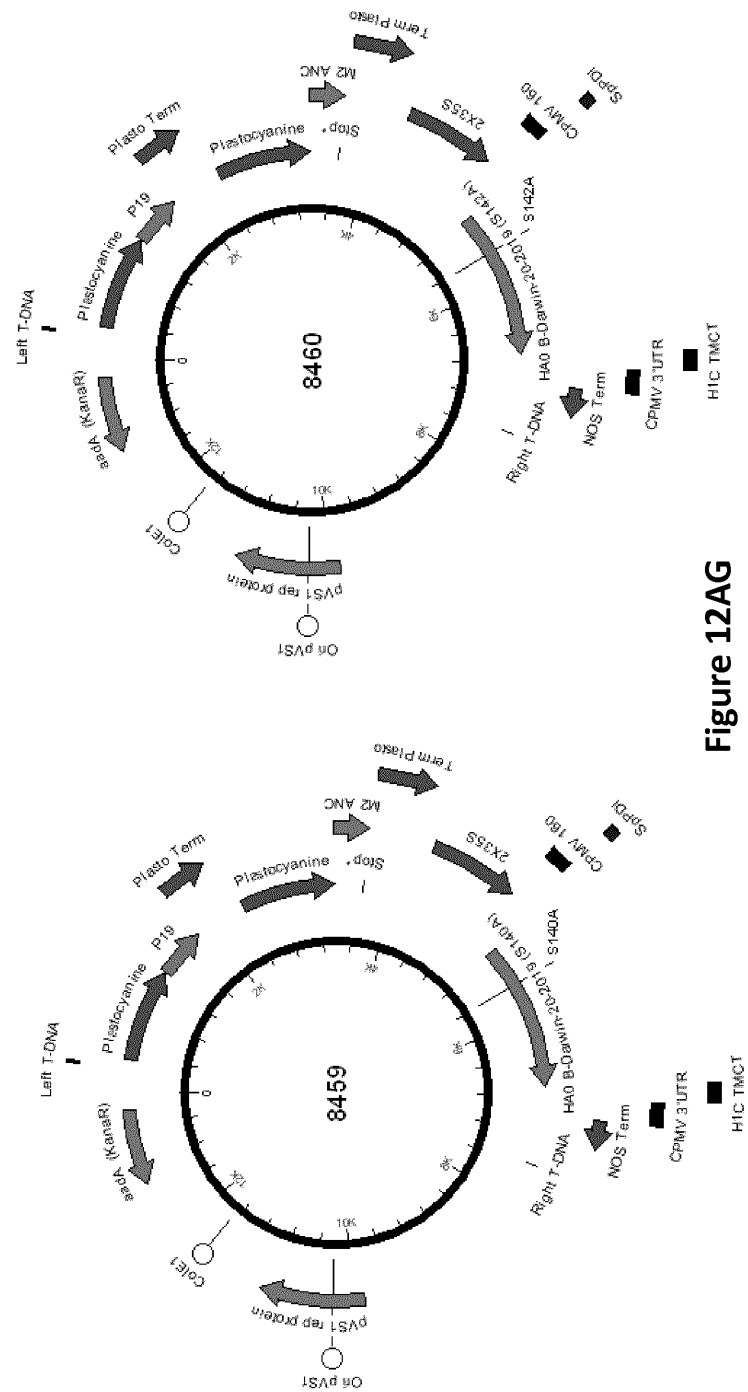


Figure 12AE

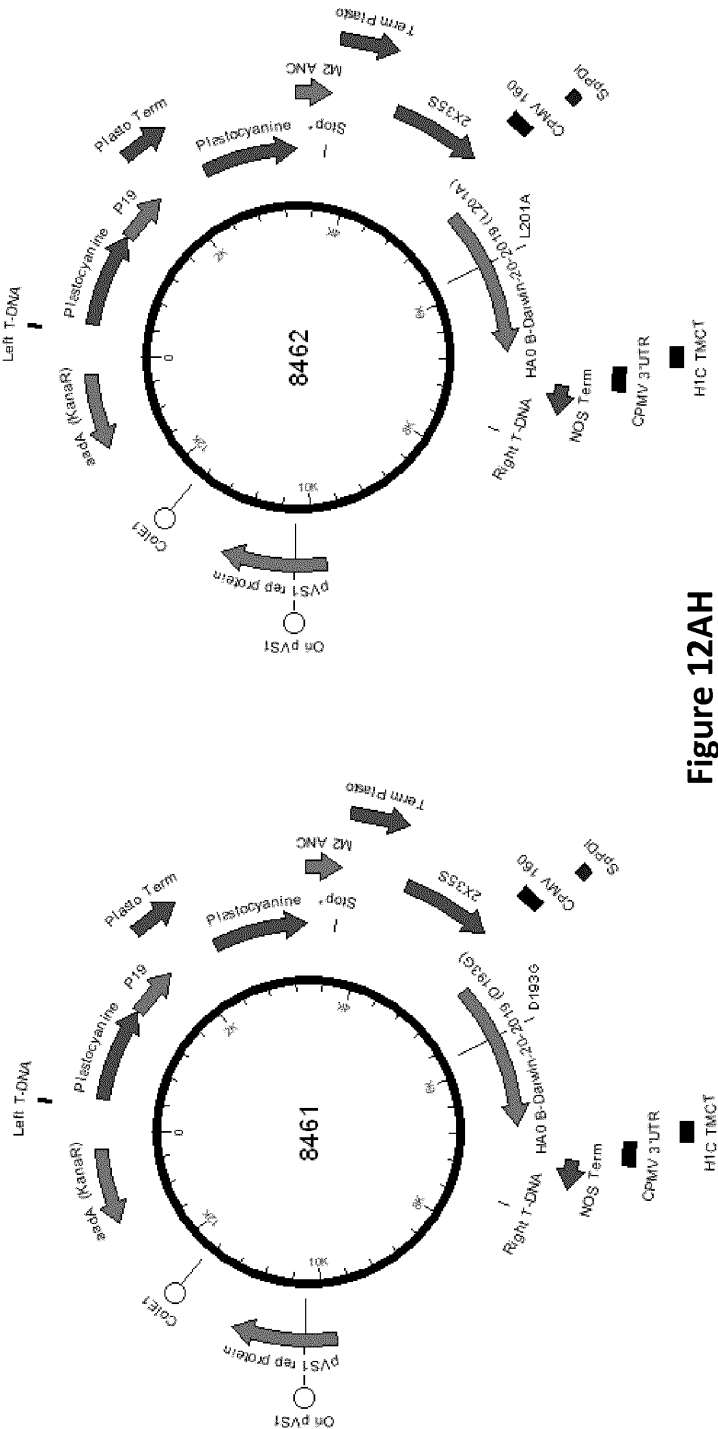
B Darwin



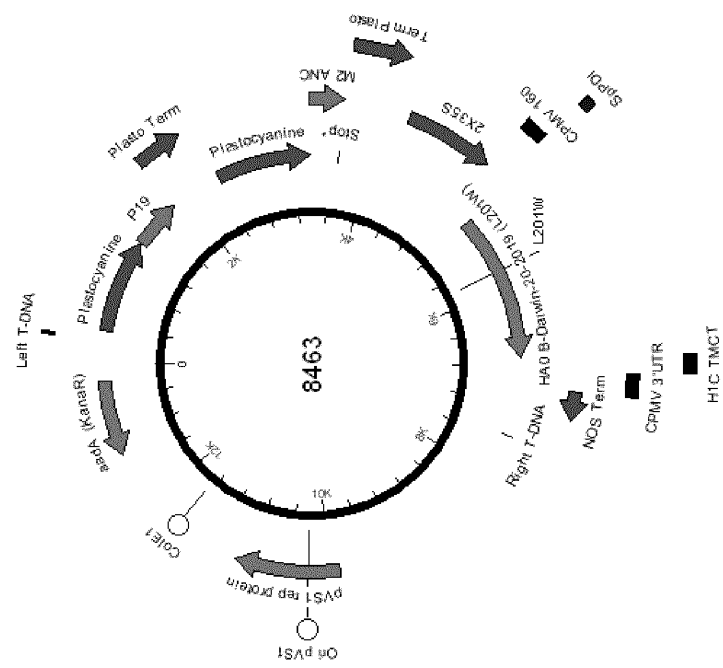
B Darwin



B Darwin



B Darwin



B Victoria

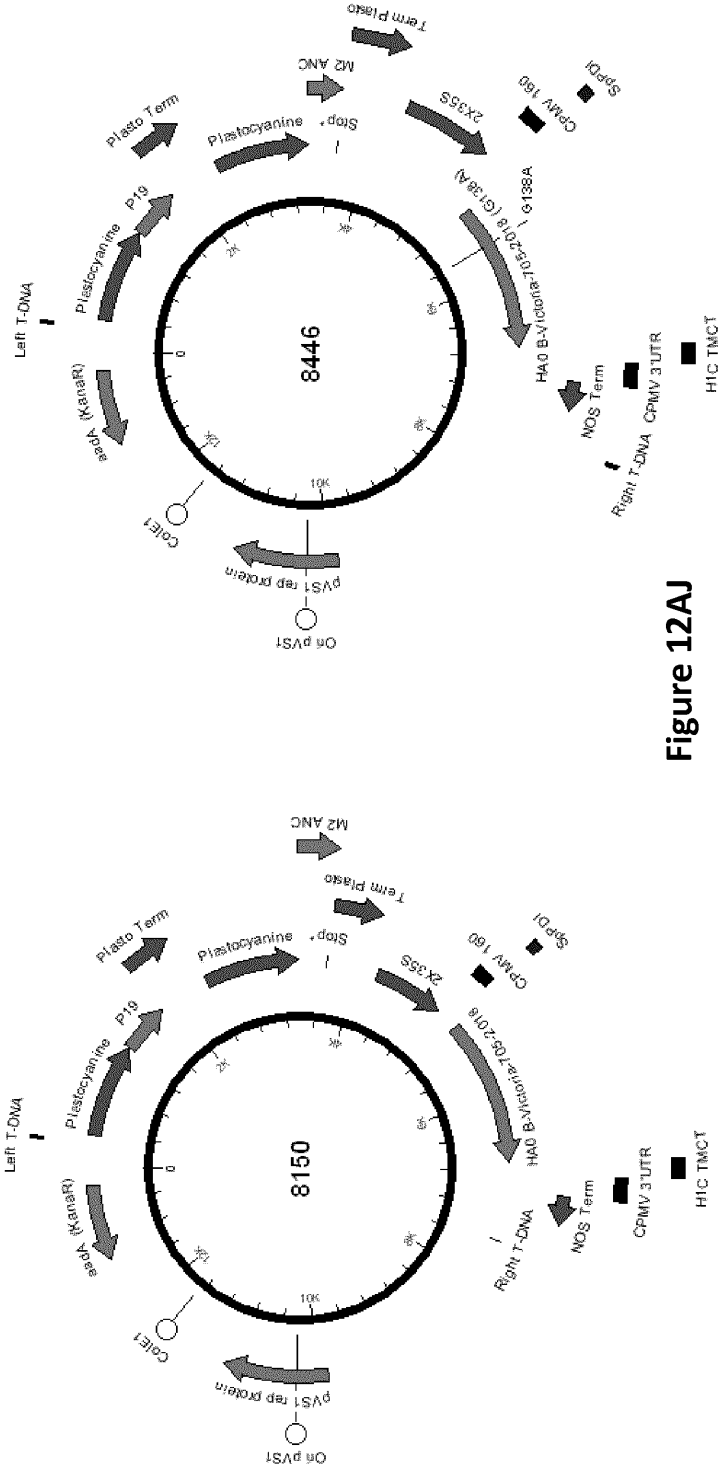


Figure 12AJ

B Victoria

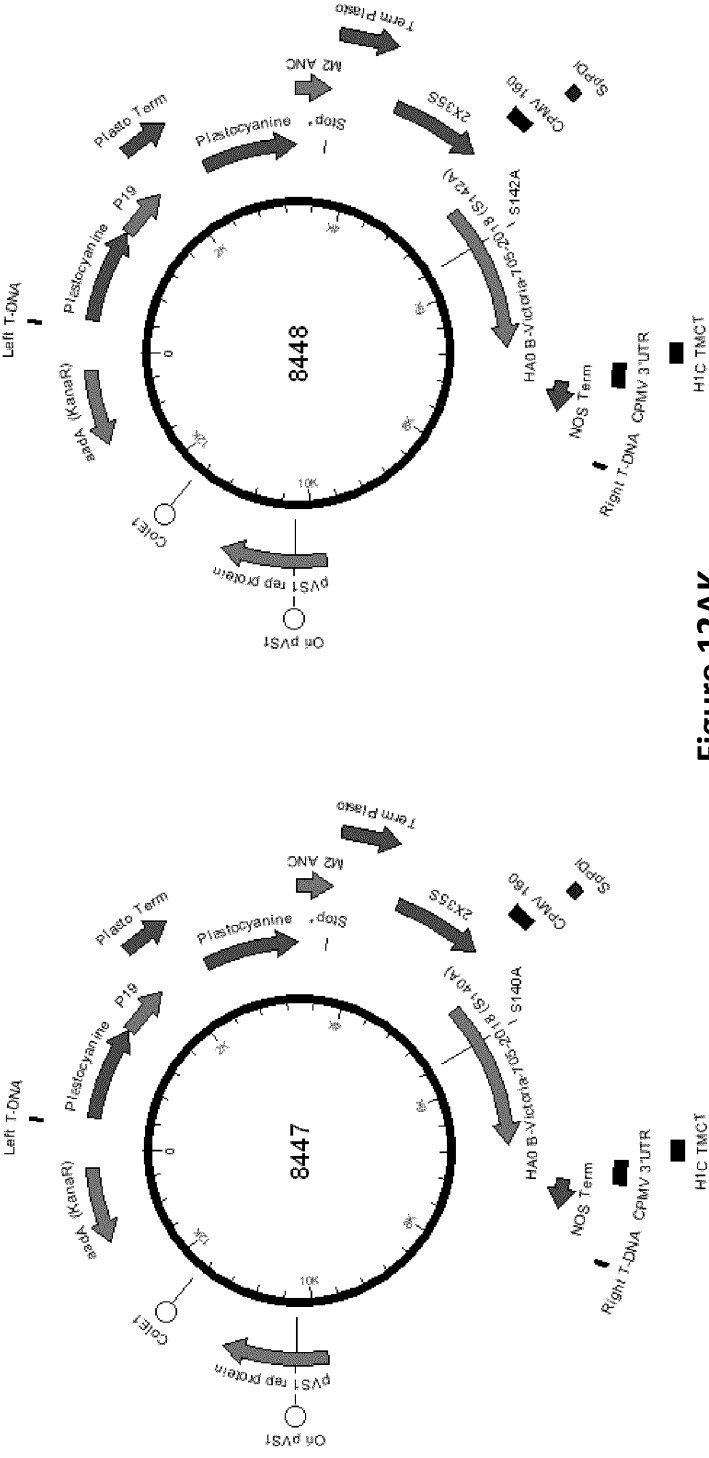


Figure 12AK

B Victoria

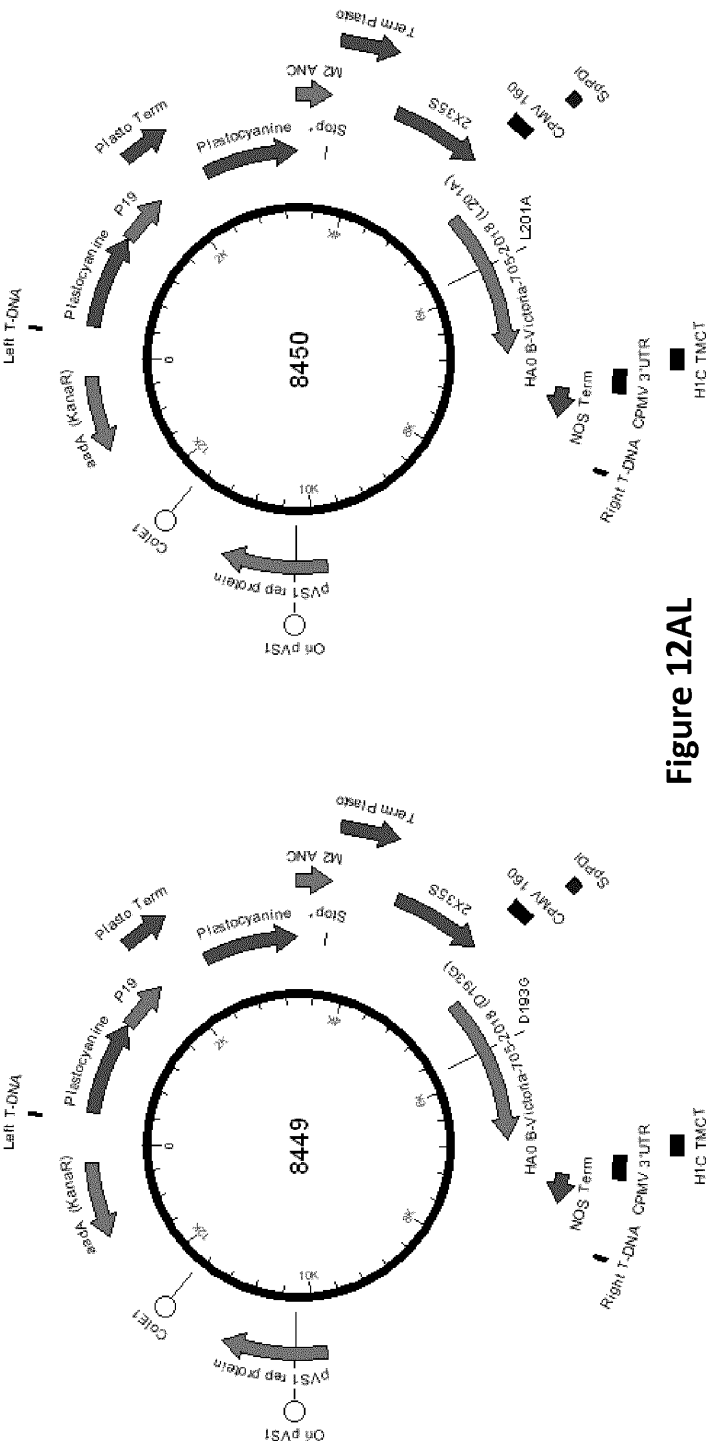


Figure 12AL

Figure 13A**PDI-H1 Cal DNA (SEQ ID NO: 1)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCTTCTCAGATCTTCG
CTGACACATTATGTATAGGTTATCATGCGAACAATTCAACAGACACTGTAGACACAGTACTAGAAAAGAA
TGTAACAGTAACACACTCTGTTAACCTTCTAGAAGACAAGCATAACGGGAAACTATGCAAACTAAGAGGG
GTAGCCCCATTGCATTTGGGTAAATGTAACATTGCTGGCTGGATCCTGGGAAATCCAGAGTGTGAATCAC
TCTCCACAGCAAGCTCATGGTCCTACATTGTGGAAACACCTAGTTCAGACAATGGAACGTGTTACCCAGG
AGATTTTCATCGATTATGAGGAGCTAAGAGAGCAATTGAGCTCAGTGTGCATCATTTGAAAGGTTTGAGATA
TTCCCCAAGACAAGTTCATGGCCCAATCATGACTCGAACAAGGTGTAACGGCAGCATGTCCTCATGCTG
GAGCAAAAAGCTTCTACAAAAATTTAATATGGCTAGTTAAAAAAGGAAATTCATACCCAAAGCTCAGCAA
ATCCTACATTAATGATAAAGGGAAAGAAGTCCTCGTGTATGGGGCATTACCATCCATCTACTAGTGCT
GACCAACAAAGTCTCTATCAGAATGCAGATGCATATGTTTTTGTGGGGTCATCAAGATACAGCAAGAAGT
TCAAGCCGGAAATAGCAATAAGACCCAAAGTGAGGGATCAAGAAGGGAGAATGAACTATTACTGGACACT
AGTAGAGCCGGGAGACAAAATAACATTCGAAGCAACTGGAAATCTAGTGGTACCGAGATATGCATTCGCA
ATGGAAAAGAAATGCTGGATCTGGTATTATCATTTTCAGATACACCAGTCCACGATTGCAATACAACCTTGTC
AAACACCCAAGGGTGCTATAAACACCAGCCTCCCATTTTCAGAATATACATCCGATCACAATTGGAAAATG
TCCAAAATATGTAAAAAGCACAAAATTGAGACTGGCCACAGGATTGAGGAATATCCCGTCTATTCAATCT
AGAGGACTATTTGGGGCCATTGCCGGTTTCATTGAAGGGGGTGGACAGGGATGGTAGATGGATGGTACG
GTTATCACCATCAAAATGAGCAGGGGTGAGGATATGCAGCCGACCTGAAGAGCACACAGAATGCCATTGA
CGAGATTACTAACAAAGTAAATTCTGTTATTGAAAAGATGAATACACAGTTCACAGCAGTAGGTAAAGAG
TTCAACCACCTGGAAAAAAGAATAGAGAATTTAAATAAAAAAGTTGATGATGGTTTCTGGACATTTGGA
CTTACAATGCCGAAGTGTGGTCTATTGGAAAATGAAAGAACTTTGGACTACCACGATTCAAATGTGAA
GAACTTATATGAAAAGGTAAGAAGCCAGCTAAAAACAATGCCAAGGAAATTTGGAAACGGCTGCTTTGAA
TTTTACCACAAATGCGATAACACGTGCATGGAAAGTGTCAAAAATGGGACTTATGACTACCCAAAATACT
CAGAGGAAGCAAAATTAAACAGAGAAGAAATAGATGGGGTAAAGCTGGAATCAACAAGGATTTACCAGAT
TTTGGCGATCTATTCAACTGTCGCCAGTTCATTGGTACTGGTAGTCTCCCTGGGGGCAATCAGTTTCTGG
ATGTGCTCTAATGGGTCTCTACAGTGTAGAATATGTATTTAA

Figure 13B**PDI-H1 Cal AA (SEQ ID NO: 2)**

MAKNVAIFGLLFSLVLVPSQIFADTLCIGYHANNSTDVDTVLEKNVTVTHSVNLLEDKHNGKLCKLRG
VAPLHLGKCNIAGWILGNPECESLSTASSWSYIVETPSSDNGTCYPGDFIDYEELREQLSSVSSFERFEI
FPKTSSWPNHDSNKGVTAAACPHAGAKSFYKNLIWLVKKGNSYPKLSKSYINDKGKEVLVLWGIHHPSTSA
DQQSLYQNADAYVFGSSRYSKKFKPEIAIRPKVRDQEGRMNYYWTLVEPGDKITFEATGNLVVPRYAF
MERNAGSGIIISDTPVHDCNTTCQTPKGAINSTLFPQNIHPITIGKCPKYVKSTKLRLATGLRNIPSIQS
RGLFGAIAGFIEGGWTGMVDGWYGYHHQNEQSGYAADLKSTQNAIDEITNKVNSVIEKMNTQFTAVGKE
FNHLEKRIENLNKKVDDGFLDIWTYNAELLVLENERLTLDYHDSNVKNLYEKVRSQKNNAKEIGNGCFE
FYHKCDNTCMESVKNGTIDYPKYSEEAKLNREEIDGVKLESTRIYQILAIYSTVASSLVLVVSLGAISFW
MCSNGSLQCRICI

Figure 13C**PDI-H1 Cal-Y91F DNA (SEQ ID NO: 11)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCTTCTCAGATCTTCG
CTGACACATTATGTATAGGTTATCATGCGAACAATTCAACAGACACTGTAGACACAGTACTAGAAAAGAA
TGTAACAGTAACACACTCTGTTAACCTTCTAGAAGACAAGCATAACGGGAAACTATGCAAACTAAGAGGG
GTAGCCCCATTGCATTTGGGTAAATGTAACATTGCTGGCTGGATCCTGGGAAATCCAGAGTGTGAATCAC
TCTCCACAGCAAGCTCATGGTCCTACATTGTGGAAACACCTAGTTCAGACAATGGAACGTGTTTCCCAGG
AGATTTTCATCGATTATGAGGAGCTAAGAGAGCAATTGAGCTCAGTGTGCATCATTTGAAAGGTTTGAGATA
TTCCCCAAGACAAGTTCATGGCCCAATCATGACTCGAACAAGGTGTAACGGCAGCATGTCCTCATGCTG
GAGCAAAAAGCTTCTACAAAAATTTAATATGGCTAGTTAAAAAAGGAAATTCATACCCAAAGCTCAGCAA
ATCCTACATTAATGATAAAGGGAAAGAAGTCCTCGTGTATGGGGCATTACCATCCATCTACTAGTGCT
GACCAACAAAGTCTCTATCAGAATGCAGATGCATATGTTTTTGTGGGGTCATCAAGATACAGCAAGAAGT
TCAAGCCGGAAATAGCAATAAGACCCAAAGTGAGGGATCAAGAAGGGAGAATGAACTATTACTGGACACT
AGTAGAGCCGGGAGACAAAATAACATTCGAAGCAACTGGAAATCTAGTGGTACCGAGATATGCATTCGCA
ATGGAAAAGAAATGCTGGATCTGGTATTATCATTTTCAGATACACCAGTCCACGATTGCAATACAACCTTGTC
AAACACCCAAGGGTGCTATAAACACCAGCCTCCCATTTCAGAATATACATCCGATCACAATTGGAAAATG
TCCAAAATATGTAAAAAGCACAAAATTGAGACTGGCCACAGGATTGAGGAATATCCCGTCTATTCAATCT
AGAGGACTATTTGGGGCCATTGCCGGTTTCATTGAAGGGGGTGGACAGGGATGGTAGATGGATGGTACG
GTTATCACCATCAAAATGAGCAGGGGTGAGGATATGCAGCCGACCTGAAGAGCACACAGAATGCCATTGA
CGAGATTACTAACAAAGTAAATTCTGTTATTGAAAAGATGAATACACAGTTCACAGCAGTAGGTAAAGAG
TTCAACCACCTGGAAAAAAGAATAGAGAATTTAAATAAAAAAGTTGATGATGGTTTCTGGACATTTGGA
CTTACAATGCCGAAGTGTGGTCTATTGGAAAATGAAAGAACTTTGGACTACCACGATTCAAATGTGAA
GAACTTATATGAAAAGGTAAGAAGCCAGCTAAAAACAATGCCAAGGAAATTGGAAACGGCTGCTTTGAA
TTTTACCACAAATGCGATAACACGTGCATGGAAAGTGTCAAAAATGGGACTTATGACTACCCAAAATACT
CAGAGGAAGCAAAATTAAACAGAGAAGAAATAGATGGGGTAAAGCTGGAATCAACAAGGATTTACCAGAT
TTTGGCGATCTATTCAACTGTCGCCAGTTCATTGGTACTGGTAGTCTCCCTGGGGGCAATCAGTTTCTGG
ATGTGCTCTAATGGGTCTCTACAGTGTAGAATATGTATTTAA

Figure 13D**PDI-H1 Cal-Y91F AA (SEQ ID NO: 12)**

MAKNVAIFGLLFSLVLVPSQIFADTLCIGYHANNSTDVDTVLEKNVTVTHSVNLLEDKHNGKLCCKLRG
VAPLHLGKCNIAGWILGNPECESLSTASSWSYIVETPSSDNGTCFPGDFIDYEELREQLSSVSSFERFEI
FPKTSSWPNHDSNKGVTAAACPHAGAKSFYKNLIWLVKKGNSYPKLSKSYINDKGKEVLVLWGIHHPSTSA
DQQSLYQNADAYVVFVGSSRYSKKFKPEIAIRPKVRDQEGRMNYYWTLVEPGDKITFEATGNLVVPRYAF
MERNAGSGIIISDTPVHDCNTTCQTPKGAINSTLSPFQNIHPITIGKCPKYVKSTKLRLATGLRNIPSIQS
RGLFGAIAGFIEGGWTGMVDGWYGYHHQNEQSGYAADLKSTQNAIDEITNKVNSVIEKMNTQFTAVGKE
FNHLEKRIENLNKKVDDGFLDIWTYNAELLVLENERTLDYHDSNVKNLYEKVRSQKNNAKEIGNGCFE
FYHKCDNTCMESVKNGTIDYPKYSEEAKLNREEIDGVKLESTRIYQILAIYSTVASSLVLVVSLGAISFW
MCSNGSLQCRICI

MAKNVAIFGLLFSLLVLVPSQIFADTLCIGYHANNSTDTVDTVLEKNVTVTHSVNLLEDKHNGLCKLRG
VAPLHLGKCNIAGWILGNPECESLSTARSWSYIVETSNSDNGTCYPGDFINYEELREQLSSVSSFERFEI
FPKTSWPNHDSNKGVTAAACPHAGAKSFYKNLIWLVKKGNSYPKLNQTYINDKGKEVLVLWGIHHPPTTA
DQQSLYQNADAYVFVGTSRYSKKFKPEIATRPKVRDQEGRMNYYWTLVEPGDKITFEATGNLVVPRYAFT
MERNAGSGIIISDTPVHDCNTTCQTPEGAINTSLPFQNVHPITIGKCPKYVKSTKLRLATGLRNVPSIQS
RGLFGAIAGFIEGGWTGMVDGWYGYHHQNEQSGYAADLKSTQNAIDKITNKVNSVIEKMNTQDТАVGKE
FNHLEKRIENLNKKVDDGFLDIWTYNAELLVLMENERTLDYHDSNVKNLYEKVRNQLKNNAKEIGNGCFE
FYHKCDNTCMESVKNGTYDYPKYSEEAKLNREKIDGVKLESTRIYQILAIYSTVASSLVLVVSLGAISFW
MCSNGSLOCRCI

Figure 13G**PDI-H1 Idaho-Y91F DNA (SEQ ID NO:104)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCTTCTCAGATCTTCG
CGGACACATTATGTATAGGTTATCATGCGAACAATTCAACAGACACTGTAGACACAGTACTAGAAAAGAA
TGTAACAGTAACACACTCTGTTAACCTTCTGGAAGACAAGCATAACGGAAAACCTATGCAAACTAAGAGGG
GTAGCCCCATTGCATTTGGGTAAATGTAACATTGCTGGCTGGATCCTGGGAAATCCAGAGTGTGAATCAC
TCTCCACAGCAAGATCATGGTCCTACATTGTGGAACATCTAATTGAGACAATGGAACGTGTTTCCCAGG
AGATTTTCATCAATTATGAGGAGCTAAGAGAGCAATTGAGCTCAGTGTGCATCATTTGAAAGGTTTGAGATA
TTCCCCAAGACAAGTTCATGGCCCAATCATGACTCGAACAAGGTGTAACGGCAGCATGTCCTCACGCTG
GAGCAAAAAGCTTCTACAAAACTTGATATGGCTAGTTAAAAAAGGAAATTCATACCCAAAGCTTAACCA
AACCTACATTAATGATAAAGGGAAAGAAGTCCTCGTGTGTGGGGCATTACCATCCACCCACTACTGCT
GACCAACAAAGTCTCTATCAGAATGCAGATGCATATGTTTTTGTGGGGACATCAAGATACAGCAAGAAGT
TCAAGCCGGAAATAGCAACAAGACCCAAAGTGAGGGATCAAGAAGGGAGAATGAACTATTACTGGACACT
AGTAGAGCCGGGAGACAAAATAACATTCGAAGCAACTGGAAATCTAGTGGTACCGAGATATGCATTCACA
ATGGAAAAGAAATGCTGGATCTGGTATTATCATTTTCAGATACACCAAGTCCACGATTGCAATACAACCTTGT
AGACACCCGAGGGTGTATATAAACACCAGCCTCCCATTTTCAGAATGTGCATCCGATCACAATTGGAATG
TCCAAAGTATGTAAAAAGCACAAAATTGAGACTGGCCACAGGATTGAGGAATGTTCCGTCTATTCAATCT
AGAGGCCTATTTCGGGGCCATTGCCGGCTTCATTGAAGGGGGGTGGACAGGGATGGTAGATGGATGGTACG
GTTATCACCATCAAAATGAGCAGGGGTGAGGATATGCAGCCGACCTGAAGAGCACACAAAATGCCATTGA
CAAGATTACTAACAAAGTAAATTCGTGTTATTGAAAAGATGAATACACAGGACACAGCAGTGGGTAAAGAG
TTCAACCACCTGGAAAAAAGAATAGAGAATCTAAATAAAAAAGTTGATGATGGTTTCTGGACATTTGGA
CTTACAATGCCGAAGTGTGGTTCTAATGGAAAATGAAAGAACTTTGGACTATCACGATTCAAATGTGAA
GAACTTGTATGAAAAAGTAAGAAACCAGTTAAAAACAATGCCAAGGAAATTGGAAACGGCTGCTTTGAA
TTTTACCACAAATGCGATAACACGTGCATGGAAAGTGTCAAAAATGGGACTTATGACTACCCAAAATACT
CAGAGGAAGCAAAATTAAACAGAGAAAAAATAGATGGGGTAAAGCTGGAATCAACAAGGATTTACCAGAT
TTTGGCGATCTATTCAACTGTCGCCAGTTCATTGGTACTGGTAGTCTCCCTGGGGGCAATCAGCTTCTGG
ATGTGCTCTAATGGGTCTCTACAGTGTAGAATATGTATTTAA

Figure 13H**PDI-H1 Idaho-Y91F AA (SEQ ID NO: 105)**

MAKNVAIFGLLFSLVLVPSQIFADTLCIGYHANNSTDVDTVLEKNVTVTHSVNLLEDKHNGKLCKLRG
VAPLHLGKCNIAGWILGNPECESLSTARSWSYIVETSNSDNGTCFPGDFINYEELREQLSSVSSFERFEI
FPKTSSWPNHDSNKGVTAAACPHAGAKSFYKNLIWLVKKGNSYPKLNQTYINDKGKEVLVLWGIHHPPTTA
DQQSLYQNADAYVFGVTSRYSKKFKPEIATRPKVRDQEGRMNYWTLVEPGDKITFEATGNLVVPRYAFT
MERNAGSGIIISDTPVHDCNTTCQTPEGAINSTLSPFQNVHPITIGKCPKYVKSTKLRLATGLRNVPSIQS
RGLFGAIAGFIEGGWTGMVDGWYGYHHQNEQSGSYAADLKSTQNAIDKITNKVNSVIEKMNTQDTAVGKE
FNHLEKRIENLNKKVDDGFLDIWTYNAELLVLMENERTLDYHDSNVKNLYEKVRNQLKNNAKEIGNGCFE
FYHKCDNTCMESVKNGTIDYPKYSEEAKLNREKIDGVKLESTRIYQILAIYSTVASSLVLVVSLGAISFW
MCSNGSLQCRICI

Figure 13I**PDI-H1 Brisbane DNA (SEQ ID NO: 194)**

atggcgaaaaacggttgcgattttcggccttattgttttctcttcttggttggttccttctcagatcttcg
cggacacattatgtataggttatcatgcgaacaattcaacagacactgtagacacagtactagaaaagaa
tgtaacagtaacacactctgttaaccttctggaagacaagcataacggaaaactatgcaaactaggcggg
gtagccccattgcatttgggttaaattgaacattgctggctggatcctgggaaatccagagtgtgaatcac
tctccacagcaagatcatggtcctacattgtggaacatctaattcagacaatggaacgtgttaccagg
agatttcatcaattatgaggagctaagagagcaattgagctcagtgatcatcatttgaaaggttgagata
ttccccaagacaagttcatggccaatcatgactcgaacaaaggtgtaacggcagcatgtcctcacgctg
gagcaaaaagcttctacaaaaacttgatatggctagttaaaaaaggaaattcatacccaaagcttaacca
aacctacattaatgataaagggaaagaagtcctcgtgctgtggggcattcaccatccaccactactgct
gaccaacaaagtctctatcagaatgcagatgcatatgttttgtggggacatcaagatacagcaagaagt
tcaagccggaaatagcaacaagacccaaagtggagggatcaagaaggagaaatgaactattactggacact
agtagagccgggagacaaaaataacattcgaagcaactggaaatctagtggtagcagagatatgcattcaca
atggaaagaaatgctggatctggtattatcatttcagatacaccagtccacgattgcaatacaacttgct
agacagccgaggggtgctataaacaccagcctcccatctcagaatgtgcatccggtgacaattggaaaatg
tccaaagtatgtaaaaagcacaaaattgagactggccacaggattgaggaatgttccgtctattcaatct
agaggcctattcggggccattgccggcttcattgaaggggggtggacagggatggtagatggatggtagc
gttatcaccatcaaaatgagcaggggtcaggatagcagccgacctgaagagcacacaaaatgccattga
caagattactaacaagtaaatctctgttattgaaaagatgaatacacaggacacagcagtgggtaaagag
ttcaaccacctggaaaaaagaatagagaatctaaataaaaaagttgatgatggtttcttgacatttgga
cttacaatgccgaactgttggttctaattgaaaatgaaagaactttggactatcacgattcaaatgtgaa
gaacttgatgaaaaagtaagaaaccagttaaaaaacaatgccaaaggaaattggaaacggctgctttgaa
ttttaccacaaatgcgataacacgtgcatggaaagtgtcaaaaatgggacttatgactacccaaaatact
cagaggaagcaaaattaaacagagaaaaaatagatggggtaaagctggaatcaacaaggatttaccagat
tttggcgatctattcaactgtcgccagttcattgggtactggtagtctccctgggggcaatcagcttctgg
atgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 13J**PDI-H1 Brisbane AA (SEQ ID NO: 195)**

MAKNVAIFGLLFSLVLVPSQIFADTLCIGYHANNSTDVDTVLEKNVTVTHSVNLLLEDKHNGKLCKLGG
VAPLHLGKCNIAGWILGNPECESLSTARSWSYIVETSNSDNGTCYPGDFINYEELREQLSSVSSFERFEI
FPKTSSWPNHDSNKGVTAAACPHAGAKSFYKNLIWLVKKGNSYPKLNQTYINDKGKEVLVLWGIHHPPTTA
DQQSLYQNADAYVFGTSRYSKKFKPEIATRPKVRDQEGRMNYWTLVEPGDKITFEATGNLVVPRYAFT
MERNAGSGIIISDTPVHDCNTTCQTAEGAINSTLFPQNVHPVTIGKCPKYVKSTKLRLATGLRNVPSIQS
RGLFGAIAGFIEGGWTGMVDGWYGYHHQNEQSGYAADLKSTQNAIDKITNKVNSVIEKMNTQDTAVGKE
FNHLEKRIENLNKKVDDGFLDIWTYNAELLVLMENERTLDYHDSNVKNLYEKVRNQLKNNAKEIGNGCFE
FYHKCDNTCMESVKNGTIDYPKYSEEAKLNREKIDGVKLESTRIYQILAIYSTVASSLVLVVSLGAISFW
MCSNGSLQCRICI

Figure 13K**PDI-H1 Brisbane Y98F DNA (SEQ ID NO: 196)**

atggcgaaaaacggttgcgattttcggccttattgttttctcttctgtgttggttccttctcagatcttcg
cggacacattatgtataggttatcatgcgaacaattcaacagacactgtagacacagtactagaaaagaa
tgtaacagtaacacactctgttaaccttctggaagacaagcataacggaaaactatgcaaactaggcggg
gtagccccattgcatttgggttaaattgaacattgctggctggatcctgggaaatccagagtgtgaatcac
tctccacagcaagatcatggtcctacattgtggaacatctaattcagacaatggaacgtgtttccagg
agatttcatcaattatgaggagctaagagagcaattgagctcagtgatcatcatttgaaaggttgagata
ttccccaagacaagttcatggccaatcatgactcgaacaaaggtgtaacggcagcatgtcctcacgctg
gagcaaaaagcttctacaaaaacttgatatggctagttaaaaaaggaaattcatacccaaagcttaacca
aacctacattaatgataaagggaaagaagtcctcgtgctgtggggcattcaccatccaccactactgct
gaccaacaaagtctctatcagaatgcagatgcatatgttttgtggggacatcaagatacagcaagaagt
tcaagccggaaatagcaacaagacccaaagtggagggatcaagaaggagaaatgaactattactggacact
agtagagccgggagacaaaaataacattcgaagcaactggaaatctagtggtagcgagatatgcattcaca
atggaaagaaatgctggatctggtattatcatttcagatacaccagtcacgattgcaatacaacttgct
agacagccgaggggtgctataaacaccagcctcccatctcagaatgtgcatccggtgacaattggaaaatg
tccaaagtatgtaaaaagcacaaaattgagactggccacaggattgaggaatgttccgtctattcaatct
agaggcctattcggggccattgccggcttcattgaaggggggtggacagggatggtagatggatggtagc
gttatcaccatcaaaatgagcaggggtcaggatgtagccgacctgaagagcacacaaaatgccattga
caagattactaacaaagtaaatctgttattgaaaagatgaatacacaggacacagcagtgggtaaagag
ttcaaccacctggaaaaaagaatagagaatctaaataaaaaagttgatgatggtttcttgacatttgga
cttacaatgccgaactgttggttctaattgaaaatgaaagaactttggactatcacgattcaaatgtgaa
gaacttgatgaaaaagtaagaaaccagttaaaaaacaatgccaaaggaaattggaaacggctgctttgaa
ttttaccacaaatgcgataacacgtgcatggaaagtgtcaaaaatgggacttatgactacccaaaatact
cagaggaagcaaaattaaacagagaaaaaatagatggggtaaagctggaatcaacaaggatttaccagat
tttggcgatctattcaactgtcgccagttcattgggtactggtagtctccctgggggcaatcagcttctgg
atgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 13L**PDI-H1 Brisbane Y98F AA (SEQ ID NO: 197)**

MAKNVAIFGLLFSLVLVPSQIFADTLCIGYHANNSTDVDTVLEKNVTVTHSVNLLEDKHNGKLCKLGG
VAPLHLGKCNIAGWILGNPECESLSTARSWSYIVETSNSDNGTCFPGDFINYEELREQLSSVSSFERFEI
FPKTSSWPNHDSNKGVTAAACPHAGAKSFYKNLIWLVKKGNSYPKLNQTYINDKGKEVLVLWGIHHPPTTA
DQQSLYQNADAYVFGVTSRYSKKFKPEIATRPKVRDQEGRMNYWTLVEPGDKITFEATGNLVVPYRFT
MERNAGSGIIISDTPVHDCNTTCQTAEGAINSTLFPQNVHPVTIGKCPKYVKSTKLRLATGLRNVPSIQS
RGLFGAIAGFIEGGWTGMVDGWYGYHHQNEQSGYAADLKSTQNAIDKITNKVNSVIEKMNTQDITAVGKE
FNHLEKRIENLNKKVDDGFLDIWTYNAELLVLMENERTLDYHDSNVKNLYEKVRNQLKNNAKEIGNGCFE
FYHKCDNTCMESVKNGTYDYPKYSEEAKLNREKIDGVKLESTRIYQILAIYSTVASSLVLVSLGAISFW
MCSNGSLQCRICI

Figure 14A**PDI-H3 Kan DNA (SEQ ID NO:60)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCCTTCTCAGATCTTCG
CGCAAAAAATCCCTGGAAATGACAATAGCACGGCAACGCTGTGCCTTGGGCACCATGCAGTACCAAACGG
AACGATAGTGAAAACAATCACGAATGACCGAATTGAAGTTACTAATGCTACTGAGCTGGTTTCAGAATTCC
TCAATAGGTGAAATATGCGACAGTCCTCATCAGATCCTTGATGGAGAAAACCTGCACACTAATAGATGCTC
TATTGGGAGACCCTCAGTGTGATGGCTTTCAAAATAAGAAATGGGACCTTTTGTGTTGAACGAAACAAAGC
CTACAGCAACTGTTACCCTTATGATGTGCCGGATTATGCCTCCCTTAGGTCAGTGTGCCTCATCCGGC
ACACTGGAGTTTAAACAATGAAAGCTTCAATTGGGCTGGAGTCACTCAAAACGGAACAAGTTCTTCTTGCA
TAAGGGGATCTAAGAGTAGTTTCTTTAGTAGATTAAATTGGTTGACCCACTTAAACTCCAAATACCCAGC
ATTAAACGTGACTATGCCAAACAATGAACAATTTGACAAATTGTACATTTGGGGGGTTCACCACCCGGGT
ACGGACAAGGACCAAATCAGCCTGTATGCACAATCATCAGGAAGAATCACAGTATCTACCAAAGAAGCC
AACCAAGCTGTAATCCCGAATATCGGATCTAGACCCAGAATAAGGGATATCCCTAGCAGAATAAGCATCTA
TTGGACAATAGTAAAACCGGGAGACATACTTTTGATTAAACAGCACAGGGAATCTAATTGCTCCTAGGGGT
TACTTCAAAAATACGAAGTGGGAAAAGCTCAATAATGAGATCAGATGCACCCATTGGCAAATGCAAGTCTG
AATGCATCACTCCAAATGGAAGCATTCCCAATGACAAACCATTCCAAAATGTAAACAGGATCACATACGG
GGCCTGTCCCAGATATGTTAAGCAAAGCACTCTGAAATTGGCAACAGGAATGCGAAATGTACCAGAGAGA
CAAACCTAGAGGCATATTTGGCGCAATAGCGGGTTTCATAGAAAATGGTTGGGAGGGAATGGTGGATGGTT
GGTACGGCTTCAGGCATCAAAATCTGAGGGAAGAGGACAAGCAGCAGATCTCAAAGCACTCAAGCAGC
AATCGATCAAAATCAATGGGAAGCTGGCTCGAGTTATCGGGAAAACCAACGAGAAATTCCATCAGATTGAA
AAAGAATTCTCAGAAGTAGAAGGGAGAATTGAGGACCTTGAGAAATATGTTGAGGACACAAAATAGATC
TCTGGTCATACAACGCGGAGCTTCTTGTGTCCTGGAGAACCAACATACAATTGATCTAACTGACTCAGA
AATGAACAACTGTTTGAAAAACAAAGAAGCAACTGAGGGAAAATGCTGAGGATATGGGCAATGGTTGT
TTCAAAATATACCACAAATGTGACAATGCCTGCATGGGATCAATCAGAAATGGAAGTTATGACCACAACG
TATACAGGGATGAAGCATTAACAACCGGTTCCAGATCAAGGGAGTTGAGCTGAAGTCAGGGTACAAAGA
TTGGATCCTATGGATTTCTTTGCCATATCATCCCTGTACTGTTAGTTGCTTTGTTGGGGTTTCATCATG
TGGGCCTGCCAAAAGGGCAACATTAGGTGCAACATTTGCATTTGA

Figure 14B**PDI-H3 Kan AA (SEQ ID NO: 61)**

MAKNVAIFGLLFSLVLVPSQIFAQKIPGNDNSTATLCLGHHAVPNGTIVKTTITNDRIEVTNATELVQNS
SIGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERNKAYSNCYPYDVPDYASLRSLVASSG
TLEFNNEFNVAGVTQNGTSSSCIRGSKSSFFSRLNLWTHLNSKYPALNVTMPNNEQFDKLYIWGVHHPG
TDKDQISLYAQSSGRITVSTKRSQQAVIPNIGSRPRIRDIPSRSISYWTIVKPGDILLINSTGNLIAPRG
YFKIRSGKSSIMRSDAPIGKCKSECITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPER
QTRGIFGAIAGFIENGWEGMVDGWYGFRHQNSEGRQAADLKSTQAAIDQINGKLARVIGKTNEKFHQIE
KEFSEVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSEMKNLFKTKKQLRENAEDMGNGC
FKIYHKCDNACMGSIIRNGTYDHNVYRDEALNNRFQIKGVELKSGYKDWILWISFAISSLVLLVALLGFIM
WACQKGNIRCNICI

Figure 14C**PDI-H3 Kan-Y98F DNA (SEQ ID NO: 64)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCCTTCTCAGATCTTCG
CGCAAAAAATCCCTGGAAATGACAATAGCACGGCAACGCTGTGCCTTGGGCACCATGCAGTACCAAACGG
AACGATAGTGAAAACAATCACGAATGACCGAATTGAAGTTACTAATGCTACTGAGCTGGTTTCAGAATTCC
TCAATAGGTGAAATATGCGACAGTCCTCATCAGATCCTTGATGGAGAAAACCTGCACACTAATAGATGCTC
TATTGGGAGACCCTCAGTGTGATGGCTTTCAAAATAAGAAATGGGACCTTTTGTGTTGAACGAAACAAAGC
CTACAGCAACTGTTTCCCTTATGATGTGCCGGATTATGCCTCCCTTAGGTCAGTGTGCCTCATCCGGC
ACACTGGAGTTTAAACAATGAAAGCTTCAATTGGGCTGGAGTCACTCAAAACGGAACAAGTTCTTCTTGCA
TAAGGGGATCTAAGAGTAGTTTCTTTAGTAGATTAAATTTGGTTGACCCACTTAAACTCCAAATACCCAGC
ATTAAACGTGACTATGCCAAACAATGAACAATTTGACAAATTGTACATTTGGGGGGTTCCACCACCCGGGT
ACGGACAAGGACCAAATCAGCCTGTATGCACAATCATCAGGAAGAATCACAGTATCTACCAAAGAAGCC
AACCAAGCTGTAATCCCGAATATCGGATCTAGACCCAGAATAAGGGATATCCCTAGCAGAATAAGCATCTA
TTGGACAATAGTAAAACCGGGAGACATACTTTTGATTAAACAGCACAGGGAATCTAATTGCTCCTAGGGGT
TACTTCAAAAATACGAAGTGGGAAAAGCTCAATAATGAGATCAGATGCACCCATTGGCAAATGCAAGTCTG
AATGCATCACTCCAAATGGAAGCATTCCCAATGACAAACCATTCCAAAATGTAAACAGGATCACATACGG
GGCCTGTCCCAGATATGTTAAGCAAAGCACTCTGAAATTTGGCAACAGGAATGCGAAATGTACCAGAGAGA
CAAACCTAGAGGCATATTTGGCGCAATAGCGGGTTTCATAGAAAATGGTTGGGAGGGAATGGTGGATGGTT
GGTACGGCTTCAGGCATCAAAATCTGAGGGAAGAGGACAAGCAGCAGATCTCAAAGCACTCAAGCAGC
AATCGATCAAAATCAATGGGAAGCTGGCTCGAGTTATCGGGAAAACCAACGAGAAATTCATCAGATTGAA
AAAGAATTCTCAGAAGTAGAAGGGAGAATTGAGGACCTTGAGAAATATGTTGAGGACACAAAATAGATC
TCTGGTCATACAACGCGGAGCTTCTTGTGTCCTGGAGAACCAACATACAATTGATCTAACTGACTCAGA
AATGAACAACTGTTTGAAGAAAACAAAGAAGCAACTGAGGGAAAATGCTGAGGATATGGGCAATGGTTGT
TTCAAAATATACCACAAATGTGACAATGCCTGCATGGGATCAATCAGAAATGGAAGTTATGACCACAACG
TATACAGGGATGAAGCATTAACAACCGGTTCCAGATCAAGGGAGTTGAGCTGAAGTCAGGGTACAAAGA
TTGGATCCTATGGATTTCTTTGCCATATCATCCCTGTACTGTTAGTTGCTTTGTTGGGGTTTCATCATG
TGGGCCTGCCAAAAGGGCAACATTAGGTGCAACATTTGCATTTGA

Figure 14D**PDI-H3 Kan-Y98F AA (SEQ ID NO: 65)**

MAKNVAIFGLLFSLVLVPSQIFAQKIPGNDNSTATLCLGHHAVPNGTIVKTTITNDRIEVTNATELVQNS
SIGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERNKAYSNCFPYDVPDYASLRSLVASSG
TLEFNNEFNVAGVTQNGTSSSCIRGSKSSFFSRLNLWTHLNSKYPALNVTMPNNEQFDKLYIWGVHHPG
TDKDQISLYAQSSGRITVSTKRSQQAVIPNIGSRPRIRDIPSRSISYWTIVKPGDILLINSTGNLIAPRG
YFKIRSGKSSIMRSDAPIGKCKSECITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPER
QTRGIFGAIAGFIENGWEGMVDGWYGFRHQNSEGRQAADLKSTQAAIDQINGKLARVIGKTNEKFHQIE
KEFSEVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSEMKNLFKTKKQLRENAEDMGNGC
FKIYHKCDNACMGSIRNGTYDHNVYRDEALNNRFQIKGVELKSGYKDWILWISFAISSLVLLVALLGFIM
WACQKGNIRCNICI

Figure 14E**PDI-H3 Kan-Y98F, S136D DNA (SEQ ID NO: 68)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCCTTCTCAGATCTTCG
CGCAAAAAATCCCTGGAAATGACAATAGCACGGCAACGCTGTGCCTTGGGCACCATGCAGTACCAAACGG
AACGATAGTGAAAACAATCACGAATGACCGAATTGAAGTTACTAATGCTACTGAGCTGGTTTCAGAATTCC
TCAATAGGTGAAATATGCGACAGTCCTCATCAGATCCTTGATGGAGAAAACCTGCACACTAATAGATGCTC
TATTGGGAGACCCTCAGTGTGATGGCTTTCAAAATAAGAAATGGGACCTTTTGTGTTGAACGAAACAAAGC
CTACAGCAACTGTTTCCCTTATGATGTGCCGGATTATGCCTCCCTTAGGTCAGTGTGCCTCATCCGGC
ACACTGGAGTTTAAACAATGAAAGCTTCAATTGGGCTGGAGTCACTCAAAACGGAACAGACTCTTCTTGCA
TAAGGGGATCTAAGAGTAGTTTCTTTAGTAGATTAAATTGGTTGACCCACTTAAACTCCAAATACCCAGC
ATTAAACGTGACTATGCCAAACAATGAACAATTTGACAAATTGTACATTTGGGGGGTTCACCACCCGGGT
ACGGACAAGGACCAAATCAGCCTGTATGCACAATCATCAGGAAGAATCACAGTATCTACCAAAGAAGCC
AACCAAGCTGTAATCCCGAATATCGGATCTAGACCCAGAATAAGGGATATCCCTAGCAGAATAAGCATCTA
TTGGACAATAGTAAAACCGGGAGACATACTTTTGATTAAACAGCACAGGGAATCTAATTGCTCCTAGGGGT
TACTTCAAAAATACGAAGTGGGAAAAGCTCAATAATGAGATCAGATGCACCCATTGGCAAATGCAAGTCTG
AATGCATCACTCCAAATGGAAGCATTCCCAATGACAAACCATTCCAAAATGTAAACAGGATCACATACGG
GGCCTGTCCCAGATATGTTAAGCAAAGCACTCTGAAATTGGCAACAGGAATGCGAAATGTACCAGAGAGA
CAAACCTAGAGGCATATTTGGCGCAATAGCGGGTTTCATAGAAAATGGTTGGGAGGGAATGGTGGATGGTT
GGTACGGCTTCAGGCATCAAAATTCTGAGGGAAGAGGACAAGCAGCAGATCTCAAAGCACTCAAGCAGC
AATCGATCAAAATCAATGGGAAGCTGGCTCGAGTTATCGGGAAAACCAACGAGAAATTCCATCAGATTGAA
AAAGAATTCTCAGAAGTAGAAGGGAGAATTGAGGACCTTGAGAAATATGTTGAGGACACAAAATAGATC
TCTGGTCATACAACGCGGAGCTTCTTGTGTCCTGGAGAACCAACATACAATTGATCTAACTGACTCAGA
AATGAACAACTGTTTGAAAAACAAAGAAGCAACTGAGGGAAAATGCTGAGGATATGGGCAATGGTTGT
TTCAAAATATACCACAAATGTGACAATGCCTGCATGGGATCAATCAGAAATGGAAGTTATGACCACAACG
TATACAGGGATGAAGCATTAACAACCGGTTCCAGATCAAGGGAGTTGAGCTGAAGTCAGGGTACAAAGA
TTGGATCCTATGGATTTCTTTGCCATATCATCCCTGTACTGTTAGTTGCTTTGTTGGGGTTTCATCATG
TGGGCCTGCCAAAAGGGCAACATTAGGTGCAACATTTGCATTTGA

Figure 14F**PDI-H3 Kan- Y98F, S136D AA (SEQ ID NO: 69)**

MAKNVAIFGLLFSLVLVPSQIFAQKIPGNDNSTATLCLGHHAVPNGTIVKTTITNDRIEVTNATELVQNS
SIGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERNKAYSNCFPYDVPDYASLRSLVASSG
TLEFNNEFNVAGVTQNGTDSSCIRGSKSSFFSRLNWLTHLSKYPALNVTMPNNEQFDKLYIWGVHHPG
TDKDQISLYAQSSGRITVSTKRSQQAVIPNIGSRPRIRDIPSRSISYWTIVKPGDILLINSTGNLIAPRG
YFKIRSGKSSIMRSDAPIGKCKSECITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPER
QTRGIFGAIAGFIENGWEGMVDGWYGFRHQNSEGRQAADLKSTQAAIDQINGKLARVIGKTNEKFHQIE
KEFSEVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSEMKNLFKTKKQLRENAEDMGNGC
FKIYHKCDNACMGSIRNGTYDHNVYRDEALNNRFQIKGVELKSGYKDWILWISFAISSLVLLVALLGFIM
WACQKGNIRCNICI

Figure 14G**PDI-H3 Kan- Y98F, S136N DNA (SEQ ID NO: 72)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTTCCTTCTCAGATCTTCG
CGCAAAAAATCCCTGGAAATGACAATAGCACGGCAACGCTGTGCCTTGGGCACCATGCAGTACCAAACGG
AACGATAGTGAAAACAATCACGAATGACCGAATTGAAGTTACTAATGCTACTGAGCTGGTTTCAGAATTCC
TCAATAGGTGAAATATGCGACAGTCCTCATCAGATCCTTGATGGAGAAAACCTGCACACTAATAGATGCTC
TATTGGGAGACCCTCAGTGTGATGGCTTTCAAAATAAGAAATGGGACCTTTTTGTTGAACGAAACAAAGC
CTACAGCAACTGTTTTCCCTTATGATGTGCCGGATTATGCCTCCCTTAGGTCAGTGTGCCTCATCCGGC
ACACTGGAGTTTAAACAATGAAAGCTTCAATTGGGCTGGAGTCACTCAAAACGGAACAAACTCTTCTTGCA
TAAGGGGATCTAAGAGTAGTTTCTTTAGTAGATTAAATTGGTTGACCCACTTAAACTCCAAATACCCAGC
ATTAAACGTGACTATGCCAAACAATGAACAATTTGACAAATTGTACATTTGGGGGGTTCACCACCCGGGT
ACGGACAAGGACCAAATCAGCCTGTATGCACAATCATCAGGAAGAATCACAGTATCTACCAAAGAAGCC
AACCAAGCTGTAATCCCGAATATCGGATCTAGACCCAGAATAAGGGATATCCCTAGCAGAATAAGCATCTA
TTGGACAATAGTAAAACCGGGAGACATACTTTTGATTAAACAGCACAGGGAATCTAATTGCTCCTAGGGGT
TACTTCAAAAATACGAAGTGGGAAAAGCTCAATAATGAGATCAGATGCACCCATTGGCAAATGCAAGTCTG
AATGCATCACTCCAAATGGAAGCATTCCCAATGACAAACCATTCCAAAATGTAAACAGGATCACATACGG
GGCCTGTCCCAGATATGTTAAGCAAAGCACTCTGAAATTGGCAACAGGAATGCGAAATGTACCAGAGAGA
CAAACCTAGAGGCATATTTGGCGCAATAGCGGGTTTCATAGAAAATGGTTGGGAGGGAATGGTGGATGGTT
GGTACGGCTTCAGGCATCAAAATCTGAGGGAAGAGGACAAGCAGCAGATCTCAAAGCACTCAAGCAGC
AATCGATCAAAATCAATGGGAAGCTGGCTCGAGTTATCGGGAAAACCAACGAGAAATTCCATCAGATTGAA
AAAGAATTCTCAGAAGTAGAAGGGAGAATTGAGGACCTTGAGAAATATGTTGAGGACACAAAATAGATC
TCTGGTCATACAACGCGGAGCTTCTTGTGGCCCTGGAGAACCAACATACAATTGATCTAACTGACTCAGA
AATGAACAAACTGTTTGAAAAACAAAGAAGCAACTGAGGGAAAATGCTGAGGATATGGGCAATGGTTGT
TTCAAAATATACCACAAATGTGACAATGCCTGCATGGGATCAATCAGAAATGGAAGTTATGACCACAACG
TATACAGGGATGAAGCATTAACAACCGGTTCCAGATCAAGGGAGTTGAGCTGAAGTCAGGGTACAAAGA
TTGGATCCTATGGATTTCTTTGCCATATCATCCCTGTACTGTTAGTTGCTTTGTTGGGGTTTCATCATG
TGGGCCTGCCAAAAGGGCAACATTAGGTGCAACATTTGCATTTGA

Figure 14H**PDI-H3 Kan- Y98F, S136N AA (SEQ ID NO: 73)**

MAKNVAIFGLLFSLVLVPSQIFAQKIPGNDNSTATLCLGHHAVPNGTIVKTTITNDRIEVTNATELVQNS
SIGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERNKAYSNCFPYDVPDYASLRSLVASSG
TLEFNNEFNVAGVTQNGTNSSCIRGSKSSFFSRLNLWLTHLSKYPALNVTMPNNEQFDKLYIWGVHHPG
TDKDQISLYAQSSGRITVSTKRSQQAVIPNIGSRPRIRDIPSRSISYWTIVKPGDILLINSTGNLIAPRG
YFKIRSGKSSIMRSDAPIGKCKSECITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPER
QTRGIFGAIAGFIENGWEGMVDGWYGFRHQNSEGRQAADLKSTQAAIDQINGKLARVIGKTNEKFHQIE
KEFSEVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSEMKNLFKTKKQLRENAEDMGNGC
FKIYHKCDNACMGSIIRNGTYDHNVYRDEALNNRFQIKGVELKSGYKDWILWISFAISSLVLLVALLGFIM
WACQKGNIRCNICI

Figure 14I**PDI-H3 Kan- Y98F, S137N DNA (SEQ ID NO: 76)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCCTTCTCAGATCTTCG
CGCAAAAAATCCCTGGAAATGACAATAGCACGGCAACGCTGTGCCTTGGGCACCATGCAGTACCAAACGG
AACGATAGTGAAAACAATCACGAATGACCGAATTGAAGTTACTAATGCTACTGAGCTGGTTTCAGAATTCC
TCAATAGGTGAAATATGCGACAGTCCTCATCAGATCCTTGATGGAGAAAACCTGCACACTAATAGATGCTC
TATTGGGAGACCCTCAGTGTGATGGCTTTCAAAATAAGAAATGGGACCTTTTTGTTGAACGAAACAAAGC
CTACAGCAACTGTTTTCCCTTATGATGTGCCGGATTATGCCTCCCTTAGGTCAGTGTGCCTCATCCGGC
ACACTGGAGTTTAAACAATGAAAGCTTCAATTGGGCTGGAGTCACTCAAAACGGAACAAGTAAGTACTCTTGCA
TAAGGGGATCTAAGAGTAGTTTCTTTAGTAGATTAAATTTGGTTGACCCACTTAAACTCCAAATACCCAGC
ATTAAACGTGACTATGCCAAACAATGAACAATTTGACAAATTGTACATTTGGGGGGTTCACCACCCGGGT
ACGGACAAGGACCAAATCAGCCTGTATGCACAATCATCAGGAAGAATCACAGTATCTACCAAAGAAGCC
AACCAAGCTGTAATCCCGAATATCGGATCTAGACCCAGAATAAGGGATATCCCTAGCAGAATAAGCATCTA
TTGGACAATAGTAAAACCGGGAGACATACTTTTGATTAAACAGCACAGGGAATCTAATTGCTCCTAGGGGT
TACTTCAAAAATACGAAGTGGGAAAAGCTCAATAATGAGATCAGATGCACCCATTGGCAAATGCAAGTCTG
AATGCATCACTCCAAATGGAAGCATTCCCAATGACAAACCATTCCAAAATGTAAACAGGATCACATACGG
GGCCTGTCCCAGATATGTTAAGCAAAGCACTCTGAAATTGGCAACAGGAATGCGAAATGTACCAGAGAGA
CAAACCTAGAGGCATATTTGGCGCAATAGCGGGTTTCATAGAAAATGGTTGGGAGGGAATGGTGGATGGTT
GGTACGGCTTCAGGCATCAAAATCTGAGGGAAGAGGACAAGCAGCAGATCTCAAAGCACTCAAGCAGC
AATCGATCAAAATCAATGGGAAGCTGGCTCGAGTTATCGGGAAAACCAACGAGAAATTCCATCAGATTGAA
AAAGAATTCTCAGAAGTAGAAGGGAGAATTGAGGACCTTGAGAAATATGTTGAGGACACAAAATAGATC
TCTGGTCATACAACGCGGAGCTTCTTGTGGCCCTGGAGAACCAACATACAATTGATCTAACTGACTCAGA
AATGAACAACTGTTTGAAAAACAAAGAAGCAACTGAGGGAAAATGCTGAGGATATGGGCAATGGTTGT
TTCAAAATATACCACAAATGTGACAATGCCTGCATGGGATCAATCAGAAATGGAAGTATGACCACAACG
TATACAGGGATGAAGCATTAACAACCGGTTCCAGATCAAGGGAGTTGAGCTGAAGTCAGGGTACAAAGA
TTGGATCCTATGGATTTCTTTGCCATATCATCCCTGTACTGTTAGTTGCTTTGTTGGGGTTTCATCATG
TGGGCCTGCCAAAAGGGCAACATTAGGTGCAACATTTGCATTTGA

Figure 14J**PDI-H3 Kan- Y98F, S137N AA (SEQ ID NO: 77)**

MAKNVAIFGLLFSLVLVPSQIFAQKIPGNDNSTATLCLGHHAVPNGTIVKTTITNDRIEVTNATELVQNS
SIGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERNKAYSNCFPYDVPDYASLRSLVASSG
TLEFNNEFNVAGVTQNGTSNSCIRGSKSSFFSRLNLWLTHLSKYPALNVTMPNNEQFDKLYIWGVHHPG
TDKDQISLYAQSSGRITVSTKRSQQAVIPNIGSRPRIRDIPSRSISYWTIVKPGDILLINSTGNLIAPRG
YFKIRSGKSSIMRSDAPIGKCKSECITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPER
QTRGIFGAIAGFIENGWEGMVDGWYGFRHQNSEGRQAADLKSTQAAIDQINGKLARVIGKTNEKFHQIE
KEFSEVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSEMKNLFEKTKKQLRENAEDMGNGC
FKIYHKCDNACMGSIIRNGTYDHNVYRDEALNNRFQIKGVELKSGYKDWILWISFAISSLVLLVALLGFIM
WACQKGNIRCNICI

Figure 14K**PDI-H3 Kan- Y98F, D190G DNA (SEQ ID NO: 80)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCCTTCTCAGATCTTCG
CGCAAAAAATCCCTGGAAATGACAATAGCACGGCAACGCTGTGCCTTGGGCACCATGCAGTACCAAACGG
AACGATAGTGAAAACAATCACGAATGACCGAATTGAAGTTACTAATGCTACTGAGCTGGTTTCAGAATTCC
TCAATAGGTGAAATATGCGACAGTCCATCAGATCCTTGATGGAGAAAACCTGCACACTAATAGATGCTC
TATTGGGAGACCCTCAGTGTGATGGCTTTCAAAATAAGAAATGGGACCTTTTGTGTTGAACGAAACAAAGC
CTACAGCAACTGTTTCCCTTATGATGTGCCGGATTATGCCTCCCTTAGGTCAGTGTGCCTCATCCGGC
ACACTGGAGTTTAACAATGAAAGCTTCAATTGGGCTGGAGTCACTCAAAACGGAACAAGTTCTTCTTGCA
TAAGGGGATCTAAGAGTAGTTTCTTTAGTAGATTAAATGGTTGACCCACTTAAACTCCAAATACCCAGC
ATTAAACGTGACTATGCCAAACAATGAACAATTTGACAAATTGTACATTTGGGGGGTTCCACCACCCGGGT
ACGGACAAGGGCCAAATCAGCCTGTATGCACAATCATCAGGAAGAATCACAGTATCTACCAAAGAAGCC
AACCAAGCTGTAATCCCGAATATCGGATCTAGACCCAGAATAAGGGATATCCCTAGCAGAATAAGCATCTA
TTGGACAATAGTAAAACCGGGAGACATACTTTTGATTAAACAGCACAGGGAATCTAATTGCTCCTAGGGGT
TACTTCAAAAATACGAAGTGGGAAAAGCTCAATAATGAGATCAGATGCACCCATTGGCAAATGCAAGTCTG
AATGCATCACTCCAAATGGAAGCATTCCCAATGACAAACCATTCCAAAATGTAAACAGGATCACATACGG
GGCCTGTCCCAGATATGTTAAGCAAAGCACTCTGAAATTGGCAACAGGAATGCGAAATGTACCAGAGAGA
CAAACCTAGAGGCATATTTGGCGCAATAGCGGGTTTCATAGAAAATGGTTGGGAGGGAATGGTGGATGGTT
GGTACGGCTTCAGGCATCAAAATTCTGAGGGAAGAGGACAAGCAGCAGATCTCAAAGCACTCAAGCAGC
AATCGATCAAAATCAATGGGAAGCTGGCTCGAGTTATCGGGAAAACCAACGAGAAATTCCATCAGATTGAA
AAAGAATTCTCAGAAGTAGAAGGGAGAATTGAGGACCTTGAGAAATATGTTGAGGACACAAAATAGATC
TCTGGTCATACAACGCGGAGCTTCTTGTGGCCCTGGAGAACCAACATACAATTGATCTAACTGACTCAGA
AATGAACAACTGTTTGAAAAACAAAGAAGCAACTGAGGGAAAAATGCTGAGGATATGGGCAATGGTTGT
TTCAAAATATACCACAAATGTGACAATGCCTGCATGGGATCAATCAGAAATGGAAGTTATGACCACAACG
TATACAGGGATGAAGCATTAACAACCGGTTCCAGATCAAGGGAGTTGAGCTGAAGTCAGGGTACAAAGA
TTGGATCCTATGGATTTCTTTGCCATATCATCCCTGTACTGTTAGTTGCTTTGTTGGGGTTTCATCATG
TGGGCCTGCCAAAAGGGCAACATTAGGTGCAACATTTGCATTTGA

Figure 14L**PDI-H3 Kan- Y98F, D190G AA (SEQ ID NO: 81)**

MAKNVAIFGLLFSLVLVPSQIFAQKIPGNDNSTATLCLGHHAVPNGTIVKTIITNDRIEVTNATELVQNS
SIGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERNKAYSNCFPYDVPDYASLRSLVASSG
TLEFNNEFNVAGVTQNGTSSSCIRGSKSSFFSRLNLWLTHLSKYPALNVTMPNNEQFDKLYIWGVHHPG
TDKGQISLYAQSSGRITVSTKRSQQAVIPNIGSRPRIRDIPSRSISYWTIVKPGDILLINSTGNLIAPRG
YFKIRSGKSSIMRSDAPIGKCKSECITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPER
QTRGIFGAIAGFIENGWEGMVDGWYGFRHQNSEGRQAADLKSTQAAIDQINGKLARVIGKTNEKFHQIE
KEFSEVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSEMKNLFKTKKQLRENAEDMGNGC
FKIYHKCDNACMGSIRNGTYDHNVYRDEALNNRFQIKGVELKSGYKDWILWISFAISSLVLLVALLGFIM
WACQKGNIRCNICI

Figure 14M**PDI-H3 Kan- Y98F, D190K DNA (SEQ ID NO: 84)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTTCCTTCTCAGATCTTCG
CGCAAAAAATCCCTGGAAATGACAATAGCACGGCAACGCTGTGCCTTGGGCACCATGCAGTACCAAACGG
AACGATAGTGAAAACAATCACGAATGACCGAATTGAAGTTACTAATGCTACTGAGCTGGTTTCAGAATTCC
TCAATAGGTGAAATATGCGACAGTCCTCATCAGATCCTTGATGGAGAAAACCTGCACACTAATAGATGCTC
TATTGGGAGACCCTCAGTGTGATGGCTTTCAAAATAAGAAATGGGACCTTTTGTGTTGAACGAAACAAAGC
CTACAGCAACTGTTTCCCTTATGATGTGCCGGATTATGCCTCCCTTAGGTCAGTGTGCCTCATCCGGC
ACACTGGAGTTTAAACAATGAAAGCTTCAATTGGGCTGGAGTCACTCAAAACGGAACAAGTTCTTCTTGCA
TAAGGGGATCTAAGAGTAGTTTCTTTAGTAGATTAAATTGGTTGACCCACTTAAACTCCAAATACCCAGC
ATTAAACGTGACTATGCCAAACAATGAACAATTTGACAAATTGTACATTTGGGGGGTTCACCACCCGGGT
ACGGACAAGAAGCAAATCAGCCTGTATGCACAATCATCAGGAAGAATCACAGTATCTACCAAAGAAGCC
AACCAAGCTGTAATCCCGAATATCGGATCTAGACCCAGAATAAGGGATATCCCTAGCAGAATAAGCATCTA
TTGGACAATAGTAAAACCGGGAGACATACTTTTGATTAAACAGCACAGGGAATCTAATTGCTCCTAGGGGT
TACTTCAAAAATACGAAGTGGGAAAAGCTCAATAATGAGATCAGATGCACCCATTGGCAAATGCAAGTCTG
AATGCATCACTCCAAATGGAAGCATTCCCAATGACAAACCATTCCAAAATGTAAACAGGATCACATACGG
GGCCTGTCCCAGATATGTTAAGCAAAGCACTCTGAAATTGGCAACAGGAATGCGAAATGTACCAGAGAGA
CAAACCTAGAGGCATATTTGGCGCAATAGCGGGTTTCATAGAAAATGGTTGGGAGGGAATGGTGGATGGTT
GGTACGGCTTCAGGCATCAAAATTCTGAGGGAAGAGGACAAGCAGCAGATCTCAAAGCACTCAAGCAGC
AATCGATCAAAATCAATGGGAAGCTGGCTCGAGTTATCGGGAAAACCAACGAGAAATTCCATCAGATTGAA
AAAGAATTCTCAGAAGTAGAAGGGAGAATTGAGGACCTTGAGAAATATGTTGAGGACACAAAATAGATC
TCTGGTCATACAACGCGGAGCTTCTTGTGCCCCTGGAGAACCAACATACAATTGATCTAACTGACTCAGA
AATGAACAACTGTTTGAAAAACAAAGAAGCAACTGAGGGAAAAATGCTGAGGATATGGGCAATGGTTGT
TTCAAAATATACCACAAATGTGACAATGCCTGCATGGGATCAATCAGAAATGGAAGTTATGACCACAACG
TATACAGGGATGAAGCATTAACAACCGGTTCCAGATCAAGGGAGTTGAGCTGAAGTCAGGGTACAAAGA
TTGGATCCTATGGATTTCTTTGCCATATCATCCCTGTACTGTTAGTTGCTTTGTTGGGGTTTCATCATG
TGGGCCTGCCAAAAGGGCAACATTAGGTGCAACATTTGCATTTGA

Figure 14N**PDI-H3 Kan- Y98F, D190K AA (SEQ ID NO: 85)**

MAKNVAIFGLLFSLVLVPSQIFAQKIPGNDNSTATLCLGHHAVPNGTIVKTTITNDRIEVTNATELVQNS
SIGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERNKAYSNCFPYDVPDYASLRSLVASSG
TLEFNNEFNVAGVTQNGTSSSCIRGSKSSFFSRLNLWLTHLSKYPALNVTMPNNEQFDKLYIWGVHHPG
TDKKQISLYAQSSGRITVSTKRSQQAVIPNIGSRPRIRDIPSRSISYWTIVKPGDILLINSTGNLIAPRG
YFKIRSGKSSIMRSDAPIGKCKSECITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPER
QTRGIFGAIAGFIENGWEGMVDGWYGFRHQNSEGRQAADLKSTQAAIDQINGKLARVIGKTNEKFHQIE
KEFSEVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSEMKNLFKTKKQLRENAEDMGNGC
FKIYHKCDNACMGSIIRNGTYDHNVYRDEALNNRFQIKGVELKSGYKDWILWISFAISSLVLLVALLGFIM
WACQKGNIRCNICI

Figure 14O**PDI-H3 Kan- Y98F, R222W DNA (SEQ ID NO: 88)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCCTTCTCAGATCTTCG
CGCAAAAAATCCCTGGAAATGACAATAGCACGGCAACGCTGTGCCTTGGGCACCATGCAGTACCAAACGG
AACGATAGTGAAAACAATCACGAATGACCGAATTGAAGTTACTAATGCTACTGAGCTGGTTTCAGAATTCC
TCAATAGGTGAAATATGCGACAGTCCATCAGATCCTTGATGGAGAAAACCTGCACACTAATAGATGCTC
TATTGGGAGACCCTCAGTGTGATGGCTTTCAAAATAAGAAATGGGACCTTTTGTGTTGAACGAAACAAAGC
CTACAGCAACTGTTTCCCTTATGATGTGCCGGATTATGCCTCCCTTAGGTCAGTGTGCCTCATCCGGC
ACACTGGAGTTTAAACAATGAAAGCTTCAATTGGGCTGGAGTCACTCAAAACGGAACAAGTTCTTCTTGCA
TAAGGGGATCTAAGAGTAGTTTCTTTAGTAGATTAAATTGGTTGACCCACTTAAACTCCAAATACCCAGC
ATTAAACGTGACTATGCCAAACAATGAACAATTTGACAAATTGTACATTTGGGGGGTTCACCACCCGGGT
ACGGACAAGGACCAAATCAGCCTGTATGCACAATCATCAGGAAGAATCACAGTATCTACCAAAGAAGCC
AACCAAGCTGTAATCCCGAATATCGGATCTAGACCCTGGATAAGGGATATCCCTAGCAGAATAAGCATCTA
TTGGACAATAGTAAAACCGGGAGACATACTTTTGATTAAACAGCACAGGGAATCTAATTGCTCCTAGGGGT
TACTTCAAAAATACGAAGTGGGAAAAGCTCAATAATGAGATCAGATGCACCCATTGGCAAATGCAAGTCTG
AATGCATCACTCCAAATGGAAGCATTCCCAATGACAAACCATTCCAAAATGTAAACAGGATCACATACGG
GGCCTGTCCCAGATATGTTAAGCAAAGCACTCTGAAATTGGCAACAGGAATGCGAAATGTACCAGAGAGA
CAAACCTAGAGGCATATTTGGCGCAATAGCGGGTTTCATAGAAAATGGTTGGGAGGGAATGGTGGATGGTT
GGTACGGCTTCAGGCATCAAAATTCTGAGGGAAGAGGACAAGCAGCAGATCTCAAAGCACTCAAGCAGC
AATCGATCAAAATCAATGGGAAGCTGGCTCGAGTTATCGGGAAAACCAACGAGAAATTCCATCAGATTGAA
AAAGAATTCTCAGAAGTAGAAGGGAGAATTGAGGACCTTGAGAAATATGTTGAGGACACAAAATAGATC
TCTGGTCATACAACGCGGAGCTTCTTGTGGCCCTGGAGAACCAACATACAATTGATCTAAGTACTCAGA
AATGAACAACTGTTTGAAGAAAACAAAGAAGCAACTGAGGGAAAATGCTGAGGATATGGGCAATGGTTGT
TTCAAAATATACCACAAATGTGACAATGCCTGCATGGGATCAATCAGAAATGGAAGTTATGACCACAACG
TATACAGGGATGAAGCATTAACAACCGGTTCCAGATCAAGGGAGTTGAGCTGAAGTCAGGGTACAAAGA
TTGGATCCTATGGATTTCTTTGCCATATCATCCCTGTACTGTTAGTTGCTTTGTTGGGGTTTCATCATG
TGGGCCTGCCAAAAGGGCAACATTAGGTGCAACATTTGCATTTGA

Figure 14P**PDI-H3 Kan- Y98F, R222W AA (SEQ ID NO: 89)**

MAKNVAIFGLLFSLVLVPSQIFAQKIPGNDNSTATLCLGHHAVPNGTIVKTTITNDRIEVTNATELVQNS
SIGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERNKAYSNCFPYDVPDYASLRSLVASSG
TLEFNNEFNVAGVTQNGTSSSCIRGSKSSFFSRLNWLTHLNSKYPALNVTMPNNEQFDKLYIWGVHHPG
TDKDQISLYAQSSGRITVSTKRSQQAVIPNIGSRPWIRDIPSRSISYWTIVKPGDILLINSTGNLIAPRG
YFKIRSGKSSIMRSDAPIGKCKSECITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPER
QTRGIFGAIAGFIENGWEGMVDGWYGFRHQNSEGRQAADLKSTQAAIDQINGKLARVIGKTNEKFHQIE
KEFSEVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSEMKNLFKTKKQLRENAEDMGNGC
FKIYHKCDNACMGSIIRNGTYDHNVYRDEALNNRFQIKGVELKSGYKDWILWISFAISSLVLLVALLGFIM
WACQKGNIRCNICI

Figure 14Q**PDI-H3 Kan- Y98F, S228N DNA (SEQ ID NO: 92)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCCTTCTCAGATCTTCG
CGCAAAAAATCCCTGGAAATGACAATAGCACGGCAACGCTGTGCCTTGGGCACCATGCAGTACCAAACGG
AACGATAGTGAAAACAATCACGAATGACCGAATTGAAGTTACTAATGCTACTGAGCTGGTTTCAGAATTCC
TCAATAGGTGAAATATGCGACAGTCCTCATCAGATCCTTGATGGAGAAAACCTGCACACTAATAGATGCTC
TATTGGGAGACCCTCAGTGTGATGGCTTTCAAAATAAGAAATGGGACCTTTTGTGTTGAACGAAACAAAGC
CTACAGCAACTGTTTCCCTTATGATGTGCCGGATTATGCCTCCCTTAGGTCAGTGTGCCTCATCCGGC
ACACTGGAGTTTAAACAATGAAAGCTTCAATTGGGCTGGAGTCACTCAAAACGGAACAAGTTCTTCTTGCA
TAAGGGGATCTAAGAGTAGTTTCTTTAGTAGATTAAATTTGGTTGACCCACTTAAACTCCAAATACCCAGC
ATTAAACGTGACTATGCCAAACAATGAACAATTTGACAAATTGTACATTTGGGGGGTTCCACCACCCGGGT
ACGGACAAGGACCAAATCAGCCTGTATGCACAATCATCAGGAAGAATCACAGTATCTACCAAAGAAGCC
AACCAAGCTGTAATCCCGAATATCGGATCTAGACCCAGAATAAGGGATATCCCTAACAGAATAAGCATCTA
TTGGACAATAGTAAAACCGGGAGACATACTTTTGATTAAACAGCACAGGGAATCTAATTGCTCCTAGGGGT
TACTTCAAAAATACGAAGTGGGAAAAGCTCAATAATGAGATCAGATGCACCCATTGGCAAATGCAAGTCTG
AATGCATCACTCCAAATGGAAGCATTCCCAATGACAAACCATTCCAAAATGTAAACAGGATCACATACGG
GGCCTGTCCCAGATATGTTAAGCAAAGCACTCTGAAATTGGCAACAGGAATGCGAAATGTACCAGAGAGA
CAAACCTAGAGGCATATTTGGCGCAATAGCGGGTTTCATAGAAAATGGTTGGGAGGGAATGGTGGATGGTT
GGTACGGCTTCAGGCATCAAAATTCTGAGGGAAGAGGACAAGCAGCAGATCTCAAAGCACTCAAGCAGC
AATCGATCAAAATCAATGGGAAGCTGGCTCGAGTTATCGGGAAAACCAACGAGAAATTCCATCAGATTGAA
AAAGAATTCTCAGAAGTAGAAGGGAGAATTGAGGACCTTGAGAAATATGTTGAGGACACAAAATAGATC
TCTGGTCATACAACGCGGAGCTTCTTGTGGCCCTGGAGAACCAACATACAATTGATCTAACTGACTCAGA
AATGAACAACTGTTTGAAAAAACAAAGAAGCAACTGAGGGAAAAATGCTGAGGATATGGGCAATGGTTGT
TTCAAAATATACCACAAATGTGACAATGCCTGCATGGGATCAATCAGAAATGGAAGTTATGACCACAACG
TATACAGGGATGAAGCATTAACAACCGGTTCCAGATCAAGGGAGTTGAGCTGAAGTCAGGGTACAAAGA
TTGGATCCTATGGATTTCTTTGCCATATCATCCCTGTACTGTTAGTTGCTTTGTTGGGGTTTCATCATG
TGGGCCTGCCAAAAGGGCAACATTAGGTGCAACATTTGCATTTGA

Figure 14R**PDI-H3 Kan- Y98F, S228N AA (SEQ ID NO: 93)**

MAKNVAIFGLLFSLVLVPSQIFAQKIPGNDNSTATLCLGHHAVPNGTIVKTTITNDRIEVTNATELVQNS
SIGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERNKAYSNCFPYDVPDYASLRSLVASSG
TLEFNNEFNVAGVTQNGTSSSCIRGSKSSFFSRLNLWLTHLSKYPALNVTMPNNEQFDKLYIWGVHHPG
TDKDQISLYAQSSGRITVSTKRSQQAVIPNIGSRPRIRDIPNRISYWTIVKPGDILLINSTGNLIAPRG
YFKIRSGKSSIMRSDAPIGKCKSECITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPER
QTRGIFGAIAGFIENGWEGMVDGWYGFRHQNSEGRQAADLKSTQAAIDQINGKLARVIGKTNEKFHQIE
KEFSEVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSEMKNLFKTKKQLRENAEDMGNGC
FKIYHKCDNACMGSIRNGTYDHNVYRDEALNNRFQIKGVELKSGYKDWILWISFAISSLVLLVALLGFIM
WACQKGNIRCNICI

Figure 14S**PDI-H3 Kan- Y98F, S228Q DNA (SEQ ID NO: 96)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCCTTCTCAGATCTTCG
CGCAAAAAATCCCTGGAAATGACAATAGCACGGCAACGCTGTGCCTTGGGCACCATGCAGTACCAAACGG
AACGATAGTGAAAACAATCACGAATGACCGAATTGAAGTTACTAATGCTACTGAGCTGGTTTCAGAATTCC
TCAATAGGTGAAATATGCGACAGTCCTCATCAGATCCTTGATGGAGAAAACCTGCACACTAATAGATGCTC
TATTGGGAGACCCTCAGTGTGATGGCTTTCAAAATAAGAAATGGGACCTTTTGTGTTGAACGAAACAAAGC
CTACAGCAACTGTTTCCCTTATGATGTGCCGGATTATGCCTCCCTTAGGTCAGTGTGCCTCATCCGGC
ACACTGGAGTTTAAACAATGAAAGCTTCAATTGGGCTGGAGTCACTCAAAACGGAACAAGTTCTTCTTGCA
TAAGGGGATCTAAGAGTAGTTTCTTTAGTAGATTAAATGGTTGACCCACTTAAACTCCAAATACCCAGC
ATTAAACGTGACTATGCCAAACAATGAACAATTTGACAAATTGTACATTTGGGGGGTTCCACCACCCGGGT
ACGGACAAGGACCAAATCAGCCTGTATGCACAATCATCAGGAAGAATCACAGTATCTACCAAAGAAGCC
AACCAAGCTGTAATCCCGAATATCGGATCTAGACCCAGAATAAGGGATATCCCTCAGAGAATAAGCATCTA
TTGGACAATAGTAAAACCGGGAGACATACTTTTGATTAAACAGCACAGGGAATCTAATTGCTCCTAGGGGT
TACTTCAAAAATACGAAGTGGGAAAAGCTCAATAATGAGATCAGATGCACCCATTGGCAAATGCAAGTCTG
AATGCATCACTCCAAATGGAAGCATTCCCAATGACAAACCATTCCAAAATGTAAACAGGATCACATACGG
GGCCTGTCCCAGATATGTTAAGCAAAGCACTCTGAAATTGGCAACAGGAATGCGAAATGTACCAGAGAGA
CAAACCTAGAGGCATATTTGGCGCAATAGCGGGTTTCATAGAAAATGGTTGGGAGGGAATGGTGGATGGTT
GGTACGGCTTCAGGCATCAAAATTCTGAGGGAAGAGGACAAGCAGCAGATCTCAAAGCACTCAAGCAGC
AATCGATCAAAATCAATGGGAAGCTGGCTCGAGTTATCGGGAAAACCAACGAGAAATTCCATCAGATTGAA
AAAGAATTCTCAGAAGTAGAAGGGAGAATTGAGGACCTTGAGAAATATGTTGAGGACACAAAATAGATC
TCTGGTCATACAACGCGGAGCTTCTTGTGCCCCTGGAGAACCAACATACAATTGATCTAAGTACTCAGA
AATGAACAACTGTTTGAAGAAAACAAAGAAGCAACTGAGGGAAAATGCTGAGGATATGGGCAATGGTTGT
TTCAAAATATACCACAAATGTGACAATGCCTGCATGGGATCAATCAGAAATGGAAGTTATGACCACAACG
TATACAGGGATGAAGCATTAACAACCGGTTCCAGATCAAGGGAGTTGAGCTGAAGTCAGGGTACAAAGA
TTGGATCCTATGGATTTCTTTGCCATATCATCCCTGTACTGTTAGTTGCTTTGTTGGGGTTTCATCATG
TGGGCCTGCCAAAAGGGCAACATTAGGTGCAACATTTGCATTTGA

Figure 14T**PDI-H3 Kan- Y98F, S228Q AA (SEQ ID NO: 97)**

MAKNVAIFGLLFSLVLVPSQIFAQKIPGNDNSTATLCLGHHAVPNGTIVKTTITNDRIEVTNATELVQNS
SIGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERNKAYSNCFPYDVPDYASLRSLVASSG
TLEFNNEFNVAGVTQNGTSSSCIRGSKSSFFSRLNLWLTHLSKYPALNVTMPNNEQFDKLYIWGVHHPG
TDKDQISLYAQSSGRITVSTKRSQQAVIPNIGSRPRIRDIPQRISYWTIVKPGDILLINSTGNLIAPRG
YFKIRSGKSSIMRSDAPIGKCKSECITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPER
QTRGIFGAIAGFIENGWEGMVDGWYGFRHQNSEGRQAADLKSTQAAIDQINGKLARVIGKTNEKFHQIE
KEFSEVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSMNKLFEKTKKQLRENAEDMGNGC
FKIYHKCDNACMGSIIRNGTYDHNVYRDEALNNRFQIKGVELKSGYKDWILWISFAISSLVLLVALLGFIM
WACQKGNIRCNICI

Figure 14U**PDI-H3 Kan-S136D DNA (SEQ ID NO: 111)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttggttggttccttctcagatcttcg
cgcaaaaaatccctggaaatgacaatagcacggcaacgctgtgccttgggcaccatgcagtaccaaagg
aacgatagtgaacaatcacgaatgaccgaattgaagttactaatgctactgagctgggttcagaattcc
tcaataggtgaaatatgcgacagtcctcatcagatccttgatggagaaaactgcacactaatagatgctc
tattgggagaccctcagtgatggcctttcaaaataagaaatgggacctttttgttgaacgaaacaaagc
ctacagcaactgttacccttatgatgtgccgattatgcctcccttaggtcactagttgcctcatccggc
acactggagtttaacaatgaaagcttcaattgggctggagtcactcaaaacggaacagactcttcttgca
taaggggatctaagagtagtttcttttagtagattaaattgggttgaccacttaaactccaaataccagc
attaaacgtgactatgccaaacaatgaacaatttgacaaattgtacatttgggggggttcaccacccgggt
acggacaaggaccaaatacagcctgtatgcacaatcatcaggaagaatcacagtatctacaaaaagaagcc
aacaagctgtaatcccgaatatcggatctagaccagaataagggatatccctagcagaataagcatcta
ttggacaatagtaaaacggggagacatacttttgattaacagcacagggaatctaattgctcctaggggt
tacttcaaaatacgaagtgggaaaagctcaataatgagatcagatgcacccattggcaaatgcaagtctg
aatgcatcactccaaatggaagcattcccaatgacaaaccattccaaaatgtaaacaggatcacatacgg
ggcctgtcccagatatgttaagcaaagcactctgaaattggcaacaggaatgcgaaatgtaccagagaga
caaactagaggcatatttggcgcaatagcgggtttcatagaaaatgggtgggaggaatggtggatggtt
ggtacggcttcaggcatcaaaattctgagggagaggacaagcagcagatctcaaaagcactcaagcagc
aatcgatcaaatcaatgggaagctggctcgagttatcgggaaaaccaacgagaaaattccatcagattgaa
aaagaattctcagaagtagaaggagaaattcaggaccttgagaaaatatgttgaggacacaaaaatagatc
tctggtcatacaacgcggagcttcttgttgccctggagaaccaacatacaattgatctaactgactcaga
aatgaacaaactgtttgaaaaaacaagaagcaactgagggaaaatgctgaggatatgggcaatggtgtg
ttcaaaatataccacaaatgtgacaatgcctgcatgggatcaatcagaaatggaacttatgaccacaacg
tatacagggatgaagcattaaacaaccggttccagatcaaggaggttgagctgaagtcagggtacaaaga
ttggatcctatggatttctttgccatatcatccctgtactgttagttgctttgttgggggttcacatg
tgggcctgccaaaagggaacattaggtgcaacatttgcatttga

Figure 14V**PDI-H3 Kan-S136D AA (SEQ ID NO: 112)**

MAKNVAIFGLLFSLLVLPVSIFAQKIPGNDNSTATLCLGHHAVPNGTIVKTIITNDRIEVTNATELVQNS
SIGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERNKAYSNCYPYDVPDYASLRSLVASSG
TLEFNNEFNVAGVTQNGTDSSCIRGSKSSFFSRLNWLTHLNSKYPALNVTMPNNEQFDKLYIWGVHHPG
TDKDQISLYAQSSGRITVSTKRSQQAVIPNIGSRPRIRDIPSRISYWTIVKPGDILLINSTGNLIAPRG
YFKIRSGKSSIMRSDAPIGKCKSECITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPER
QTRGIFGAIAGFIENGWEGMVDGWYGFRHQNSEGRGQAADLKSTQAAIDQINGKLARVIGKTNEKFHQIE
KEFSEVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSEMKNLFEKTKKQLRENAEDMGNGC
FKIYHKCDNACMGSIIRNGTYDHNVYRDEALNNRFQIKGVELKSGYKDWILWISFAISSLVLLVALLGFIM
WACQKGNIRCNICI

Figure 14W**PDI-H3 Kan-S136N DNA (SEQ ID NO: 113)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttggttggttccttctcagatcttcg
cgcaaaaaatccctggaaatgacaatagcacggcaacgctgtgccttgggcaccatgcagtaccaaagg
aacgatagtgaacaacatcacgaatgaccgaattgaagttactaatgctactgagctgggttcagaattcc
tcaataggtgaaatatgcgacagtcctcatcagatccttgatggagaaaactgcacactaatagatgctc
tattgggagaccctcagtgatggcctttcaaaataagaaatgggacctttttgttgaacgaaacaaagc
ctacagcaactgttacccttatgatgtgccgattatgcctcccttaggtcactagttgcctcatccggc
acactggagtttaacaatgaaagcttcaattgggctggagtcactcaaacggaacaaactcttcttgca
taaggggatctaagagtagtttcttttagtagattaaattgggttgacccttaaactccaaataccagc
attaaacgtgactatgccaaacaatgaacaatttgacaaattgtacatttgggggggttcaccacccgggt
acggacaaggaccaaatacagcctgtatgcacaatcatcaggaagaatcacagtatctacaaaaagaagcc
aacaagctgtaatcccgaatatcggatctagaccagaataaagggatatccctagcagaataagcatcta
ttggacaatagtaaaacggggagacatacttttgattaacagcacagggaatctaattgctcctaggggt
tacttcaaaatacgaagtgggaaaagctcaataatgagatcagatgcacccattggcaaatgcaagtctg
aatgcatcactccaaatggaagcattcccaatgacaaaccattccaaaatgtaaacaggatcacatacgg
ggcctgtcccagatatgttaagcaaagcactctgaaattggcaacaggaatgcgaaatgtaccagagaga
caaactagaggcatatttggcgcaatagcgggtttcatagaaaatgggtgggaggaatggtggatggtt
ggtacggcttcaggcatcaaaattctgagggagaggacaagcagcagatctcaaaagcactcaagcagc
aatcgatcaaatcaatgggaagctggctcgagttatcgggaaaaccaacgagaaaattccatcagattgaa
aaagaattctcagaagtagaagggagaattcaggaccttgagaaaatatgttgaggacacaaaaatagatc
tctggtcatacaacgcggagcttcttgttgccctggagaaccaacatacaattgatctaactgactcaga
aatgaacaaactgtttgaaaaaacaagaagcaactgagggaaaatgctgaggatatgggcaatggtgtg
ttcaaaatataccacaaatgtgacaatgcctgcatgggatcaatcagaaatggaacttatgaccacaacg
tatacagggatgaagcattaaacaaccggttccagatcaaggaggttgagctgaagtcagggtacaaaga
ttggatcctatggatttctttgccatatcatccctgtactggttagttgctttgttgggggttcacatg
tgggcctgccaaaagggaacattaggtgcaacatttgcatattga

Figure 14X**PDI-H3 Kan-S136N AA (SEQ ID NO: 114)**

MAKNVAIFGLLFSLLVLPVSQIFAQKIPGNDNSTATLCLGHHAVPNGTIVKTI TNDRIEVTNATELVQNS
SIGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERNKAYSNCYPYDVPDYASLRSLVASSG
TLEFNNEFNFAGVTQNGTNSSCIRGSKSSFFSRLNWLTHLNSKYPALNVTMPNNEQFDKLYIWGVHHPG
TDKDQISLYAQSSGRITVSTKRSQQAVIPNIGSRPRIRDIPSRI SIYWTIVKPGDILLINSTGNLIAPRG
YFKIRSGKSSIMRSDAPIGKCKSECITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPER
QTRGIFGAIAGFIENGWEGMVDGWYGFRHQNSEGRGQAADLKSTQAAIDQINGKLARVIGKTNEKFHQIE
KEFSEVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSEMKNLFEKTKKQLRENAEDMGNGC
FKIYHKCDNACMGSI RNGTYDHNVYRDEALNNRFQIKGVELKSGYKDWILWISFAISSLVLLVALLGFIM
WACQKGNIRCNICI

Figure 14Y**PDI-H3 Kan-D190K DNA (SEQ ID NO: 115)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttggttggttccttctcagatcttcg
cgcaaaaaatccctggaaatgacaatagcacggcaacgctgtgccttgggcaccatgcagtaccaaagg
aacgatagtgaacaatcacgaatgaccgaattgaagtactaatgctactgagctgggttcagaattcc
tcaataggtgaaatatgcgacagtcctcatcagatccttgatggagaaaactgcacactaatagatgctc
tattgggagaccctcagtgatggcctttcaaaataagaaatgggacctttttgttgaaacgaaacaaagc
ctacagcaactgttacccttatgatgtgccggattatgcctcccttaggtcactagttgcctcatccggc
acactggagtttaacaatgaaagcttcaattgggctggagtcactcaaaacggaacaagttcttcttgca
taaggggatctaagagtagtttcttttagtagattaaattgggttgacccttaaactccaaataccagc
attaaacgtgactatgccaaacaatgaacaatttgacaaattgtacatttgggggggttcaccacccgggt
acggacaagaagcaaatcagcctgtatgcacaatcatcaggaagaatcacagtatctacaaaaagaagcc
aacaagctgtaatcccgaatatcggatctagaccagaataaagggatatccctagcagaataagcatcta
ttggacaatagtaaaacggggagacatacttttgattaacagcacagggaatctaattgctcctaggggt
tacttcaaaatacgaagtgggaaaagctcaataatgagatcagatgcaccattggcaaatgcaagtctg
aatgcatcactccaaatggaagcattcccaatgacaaaccattccaaaatgtaaacaggatcacatacgg
ggcctgtcccagatatgttaagcaaagcactctgaaattggcaacaggaatgcgaaatgtaccagagaga
caaactagaggcatatttggcgcaatagcgggtttcatagaaaatgggtgggaggaatggtggatggtt
ggtacggcttcaggcatcaaaattctgagggagaggacaagcagcagatctcaaaagcactcaagcagc
aatcgatcaaatcaatgggaagctggctcgagttatcgggaaaaccaacgagaaaattccatcagattgaa
aaagaattctcagaagtagaagggagaattcaggaccttgagaaaatggttgaggacacaaaaatagatc
tctggtcatacaacgcggagcttcttgttgccctggagaaccaacatacaattgatctaactgactcaga
aatgaacaaactgtttgaaaaaacaagaagcaactgagggaaaatgctgagggatatgggcaatggtgtg
ttcaaaatataccacaaatgtgacaatgcctgcatgggatcaatcagaaatggaacttatgaccacaacg
tatacagggatgaagcattaaacaaccggttccagatcaaggaggttgagctgaagtcagggtacaaaga
ttggatcctatggatttctttgccatatcatccctgtactgtagttgctttgttgggggttcacatg
tgggcctgccaaaagggaacattaggtgcaacatttgcatattga

Figure 14Z**PDI-H3 Kan-D190K AA (SEQ ID NO: 116)**

MAKNVAIFGLLFSLLVLPVSIFAQKIPGNDNSTATLCLGHHAVPNGTIVKTI TNDRIEVTNATELVQNS
SIGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERNKAYSNCYPYDVPDYASLRSLVASSG
TLEFNNEFNFAGVTQNGTSSSCIRGSKSSFFSRLNWLTHLNSKYPALNVTMPNNEQFDKLYIWGVHHPG
TDKKQISLYAQSSGRITVSTKRSQQAVIPNIGSRPRIRDIPSRI SIYWTIVKPGDILLINSTGNLIAPRG
YFKIRSGKSSIMRSDAPIGKCKSECITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPER
QTRGIFGAIAGFIENGWEGMVDGWYGRHQNSEGRGQAADLKSTQAAIDQINGKLARVIGKTNEKFHQIE
KEFSEVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSEMKNLFEKTKKQLRENAEDMGNGC
FKIYHKCDNACMGSI RNGTYDHNVYRDEALNNRFQIKGVELKSGYKDWILWISFAISSLVLLVALLGFIM
WACQKGNIRCNICI

Figure 14AA**PDI-H3 Kan-R222W DNA (SEQ ID NO: 117)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttggttggttccttctcagatcttcg
cgcaaaaaatccctggaaatgacaatagcacggcaacgctgtgccttgggcaccatgcagtaccaaagg
aacgatagtgaacaacatcacgaatgaccgaattgaagtactaatgctactgagctgggttcagaattcc
tcaataggtgaaatatgcgacagtcctcatcagatccttgatggagaaaactgcacactaatagatgctc
tattgggagaccctcagtgatggcctttcaaaataagaaatgggacctttttgttgaaacgaaacaaagc
ctacagcaactgttacccttatgatgtgccgattatgcctcccttaggtcactagttgcctcatccggc
acactggagtttaacaatgaaagcttcaattgggctggagtcactcaaaacggaacaagttcttcttgca
taaggggatctaagagtagtttcttttagtagattaaattgggttgacccttaaactccaaataccagc
attaaacgtgactatgccaaacaatgaacaatttgacaaattgtacatttgggggggttcaccacccgggt
acggacaaggaccaaatacagcctgtatgcacaatcatcaggaagaatcacagtatctacaaaaagaagcc
aacaagctgtaatcccgaatatcggatctagaccctggataaagggatatccctagcagaataagcatcta
ttggacaatagtaaaacggggagacatacttttgattaacagcacagggaatctaattgctcctaggggt
tacttcaaaatacgaagtgggaaaagctcaataatgagatcagatgcaccattggcaaatgcaagtctg
aatgcatcactccaaatggaagcattcccaatgacaaaccattccaaaatgtaaacaggatcacatacgg
ggcctgtcccagatatgttaagcaaagcactctgaaattggcaacaggaatgcgaaatgtaccagagaga
caaactagaggcatatttggcgcaatagcgggtttcatagaaaatgggtgggaggaatggtggatggtt
ggtacggcttcaggcatcaaaattctgagggagaggacaagcagcagatctcaaaagcactcaagcagc
aatcgatcaaatcaatgggaagctggctcgagttatcgggaaaaccaacgagaaaattccatcagattgaa
aaagaattctcagaagtagaagggagaattcaggaccttgagaaaatggttgaggacacaaaaatagatc
tctggtcatacaacgcggagcttcttgttgccctggagaaccaacatacaattgatctaactgactcaga
aatgaacaaactgtttgaaaaaacaagaagcaactgagggaaaatgctgaggatatgggcaatggtgtg
ttcaaaatataccacaaatgtgacaatgcctgcatgggatcaatcagaaatggaacttatgaccacaacg
tatacagggatgaagcattaaacaaccggttccagatcaaggaggttgagctgaagtcagggtacaaaga
ttggatcctatggatttctttgccatatcatccctgtactggttagttgctttgttgggggttcacatg
tgggcctgccaaaagggaacattaggtgcaacatttgcatattga

Figure 14AB**PDI-H3 Kan-R222W AA (SEQ ID NO: 118)**

MAKNVAIFGLLFSLVLVPSQIFAQKIPGNDNSTATLCLGHHAVPNGTIVKTI TNDRIEVTNATELVQNS
SIGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERNKAYSNCYPYDVPDYASLRSLVASSG
TLEFNNEFNFAGVTQNGTSSSCIRGSKSSFFSRLNWLTHLNSKYPALNVTMPNNEQFDKLYIWGVHHPG
TDKDQISLYAQSSGRITVSTKRSQQAVIPNIGSRPWIRDIPSRISYWTIVKPGDILLINSTGNLIAPRG
YFKIRSGKSSIMRSDAFIGKCKSECITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPER
QTRGIFGAIAGFIENGWEGMVDGWYGFRHQNSEGRGQAADLKSTQAAIDQINGKLARVIGKTNEKFHQIE
KEFSEVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSEMKNLFEKTKKQLRENAEDMGNGC
FKIYHKCDNACMGSI RN GTYDHN VYRDEALNNRFQIKGVELKSGYKDWILWISFAISSLVLLVALLGFIM
WACQKGNIRCNICI

Figure 14AC**PDI-H3 Kan-S228N DNA (SEQ ID NO: 119)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttggttggttccttctcagatcttcg
cgcaaaaaatccctggaaatgacaatagcacggcaacgctgtgccttgggcaccatgcagtaccaaagg
aacgatagtgaacaatcacgaatgaccgaattgaagtactaatgctactgagctgggttcagaattcc
tcaataggtgaaatatgcgacagtcctcatcagatccttgatggagaaaactgcacactaatagatgctc
tattgggagaccctcagtgatggcctttcaaaataagaaatgggacctttttgttgaaacgaaacaaagc
ctacagcaactgttacccttatgatgtgccggattatgcctcccttaggtcactagttgcctcatccggc
acactggagtttaacaatgaaagcttcaattgggctggagtcactcaaaacggaacaagttcttcttgca
taaggggatctaagagtagtttcttttagtagattaaattgggttgacccttaaactccaaataccagc
attaaacgtgactatgccaaacaatgaacaatttgacaaattgtacatttgggggggttcaccacccgggt
acggacaaggaccaaatacagcctgtatgcacaatcatcaggaagaatcacagtatctacaaaaagaagcc
aacaagctgtaatcccgaatatcggatctagaccagaataaagggatatccctaacagaataagcatcta
ttggacaatagtaaaacggggagacatacttttgattaacagcacagggaatctaattgctcctaggggt
tacttcaaaatacgaagtgggaaaagctcaataatgagatcagatgcaccattggcaaatgcaagtctg
aatgcatcactccaaatggaagcattcccaatgacaaaccattccaaaatgtaaacaggatcacatacgg
ggcctgtcccagatatgttaagcaaagcactctgaaattggcaacaggaatgcgaaatgtaccagagaga
caaactagaggcatatttggcgcaatagcgggtttcatagaaaatgggtgggaggaatggtggatggtt
ggtacggcttcaggcatcaaaattctgagggagaggacaagcagcagatctcaaaagcactcaagcagc
aatcgatcaaatcaatgggaagctggctcgagttatcgggaaaaccaacgagaaaattccatcagattgaa
aaagaattctcagaagtagaaggagaaattcaggaccttgagaaaatggttgaggacacaaaaatagatc
tctggtcatacaacgcggagcttcttgttgccctggagaaccaacatacaattgatctaactgactcaga
aatgaacaaactgtttgaaaaaacaagaagcaactgagggaaaatgctgaggatattgggcaatggtgtg
ttcaaaatataccacaaatgtgacaatgcctgcatgggatcaatcagaaatggaacttatgaccacaacg
tatacagggatgaagcattaaacaaccggttccagatcaaggaggttgagctgaagtcagggtacaaaga
ttggatcctatggatttctttgccatatcatccctgtactggttagttgctttgttgggggttcacatg
tgggcctgccaaaagggaacattaggtgcaacatttgcatattga

Figure 14AD**PDI-H3 Kan-S228N AA (SEQ ID NO: 120)**

MAKNVAIFGLLFSLLVLPVSIFAQKIPGNDNSTATLCLGHHAVPNGTIVKTI TNDRIEVTNATELVQNS
SIGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERNKAYSNCYPYDVPDYASLRSLVASSG
TLEFNNEFNVAGVTQNGTSSSCIRGSKSSFFSRLNWLTHLNSKYPALNVTMPNNEQFDKLYIWGVHHPG
TDKDQISLYAQSSGRITVSTKRSQQAVIPNIGSRPRIRDIPNRISYWTIVKPGDILLINSTGNLIAPRG
YFKIRSGKSSIMRSDAPIGKCKSECITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPER
QTRGIFGAIAGFIENGWEGMVDGWYGFRHQNSEGRGQAADLKSTQAAIDQINGKLARVIGKTNEKFHQIE
KEFSEVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSEMKNLFEKTKKQLRENAEDMGNGC
FKIYHKCDNACMGSI RNGTYDHNVYRDEALNNRFQIKGVELKSGYKDWILWISFAISSLVLLVALLGFIM
WACQKGNIRCNICI

Figure 14AE**PDI-H3 Kan-S228Q DNA (SEQ ID NO: 121)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttggttggttccttctcagatcttcg
cgcaaaaaatccctggaaatgacaatagcacggcaacgctgtgccttgggcaccatgcagtaccaaagg
aacgatagtgaacaacatcacgaatgaccgaattgaagttactaatgctactgagctgggttcagaattcc
tcaataggtgaaatatgcgacagtcctcatcagatccttgatggagaaaactgcacactaatagatgctc
tattgggagaccctcagtgatggcctttcaaaataagaaatgggacctttttgttgaacgaaacaaagc
ctacagcaactgttacccttatgatgtgccgattatgcctcccttaggtcactagttgcctcatccggc
acactggagtttaacaatgaaagcttcaattgggctggagtcactcaaacggaacaagttcttcttgca
taaggggatctaagagtagtttcttttagtagattaaattgggttgacccttaaactccaaataccagc
attaaacgtgactatgccaaacaatgaacaatttgacaaattgtacatttgggggggttcaccacccgggt
acggacaaggaccaaatacagcctgtatgcacaatcatcaggaagaatcacagtatctacaaaaagaagcc
aacaagctgtaatcccgaatatcggatctagaccagaaataagggatatccctcagagaataagcatcta
ttggacaatagtaaaacggggagacatacttttgattaacagcacagggaatctaattgctcctaggggt
tacttcaaaatacgaagtgggaaaagctcaataatgagatcagatgcaccattggcaaatgcaagtctg
aatgcatcactccaaatggaagcattcccaatgacaaaccattccaaaatgtaaacaggatcacatacgg
ggcctgtcccagatatgttaagcaaagcactctgaaattggcaacaggaatgcgaaatgtaccagagaga
caaactagaggcatatttggcgcaatagcgggtttcatagaaaatgggtgggaggaatggtggatggtt
ggtacggcttcaggcatcaaaattctgagggagaggacaagcagcagatctcaaaagcactcaagcagc
aatcgatcaaatcaatgggaagctggctcgagttatcgggaaaaccaacgagaaaattccatcagattgaa
aaagaattctcagaagtagaaggagaaattcaggaccttgagaaaatatgttgaggacacaaaaatagatc
tctggtcatacaacgcggagcttcttgttgccctggagaaccaacatacaattgatctaactgactcaga
aatgaacaaactgtttgaaaaaacaagaagcaactgagggaaaatgctgaggatatgggcaatggtgtg
ttcaaaatataccacaaatgtgacaatgcctgcatgggatcaatcagaaatggaacttatgaccacaacg
tatacagggatgaagcattaaacaaccggttccagatcaaggaggttgagctgaagtcagggtacaaaga
ttggatcctatggatttctttgccatatcatccctgtactgttagttgctttgttgggggttcacatg
tgggcctgccaaaagggaacattaggtgcaacatttgcatattga

Figure 14AF**PDI-H3 Kan-S228Q AA (SEQ ID NO: 122)**

MAKNVAIFGLLFSLVLVPSQIFAQKIPGNDNSTATLCLGHHAVPNGTIVKTI TNDRIEVTNATELVQNS
SIGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERNKAYSNCYPYDVPDYASLRSLVASSG
TLEFNNEFNFAGVTQNGTSSSCIRGSKSSFFSRLNWLTHLNSKYPALNVTMPNNEQFDKLYIWGVHHPG
TDKDQISLYAQSSGRITVSTKRSQQAVIPNIGSRPRIRDIPQRISYWTIVKPGDILLINSTGNLIAPRG
YFKIRSGKSSIMRSDAPIGKCKSECITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPER
QTRGIFGAIAGFIENGWEGMVDGWYGFRHQNSEGRGQAADLKSTQAAIDQINGKLARVIGKTNEKFHQIE
KEFSEVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSEMKNLFEKTKKQLRENAEDMGNGC
FKIYHKCDNACMGSI RNGTYDHNVYRDEALNNRFQIKGVELKSGYKDWILWISFAISSLVLLVALLGFIM
WACQKGNIRCNICI

Figure 15A**PDI-H7 Shan DNA (SEQ ID NO: 20)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTGTGTTGGTTCCTTCTCAGATCTTCG
CGGACAAAATCTGCCTCGGACATCATGCCGTGTCAAACGGAACCAAAGTAAACACATTAAGTAAAGAGG
AGTGGAAGTCGTCAATGCAACTGAAACAGTGGACGAACAAACATCCCCAGGATCTGCTCAAAGGGAAA
AGGACAGTTGACCTCGGTCAATGTGGACTCCTGGGGACAATCACTGGACCACCTCAATGTGACCAATTCC
TAGAATTTTCAGCCGATTTAATTATTGAGAGGCGAGAAGGAAGTGATGTCTGTTATCCTGGGAAATTCGT
GAATGAAGAAGCTCTGAGGCAAAATTCAGAGAATCAGGCGGAATTGACAAGGAAGCAATGGGATTACACA
TACAGTGGGAATAAGAATAATGGAGCAACCAGTGCATGTAGGAGATCAGGATCTTCATTCTATGCAGAAA
TGAAATGGCTCCTGTCAAACACAGATAATGCTGCATTCCCGCAGATGACTAAGTCATATAAAAAATACAAG
AAAAAGCCCAGCTCTAATAGTATGGGGGATCCATCATTCGGTATCAACTGCAGAGCAAACCAAGCTATAT
GGGAGTGGAAACAAACTGGTGACAGTTGGGAGTTCTAATTATCAACAATCTTTTGTACCGAGTCCAGGAG
CGAGACCACAAGTTAATGGTCTGTCTGGAAGAATTGACTTTCATTGGCTAATGCTAAATCCCAATGATAC
AGTCACTTTTCAGTTTCAATGGGGCTTTCATAGCTCCAGACCGTGCAAGCTTCCTGAGAGGAAAATCTATG
GGAATCCAGAGTGGAGTACAGTTGATGCCAATTGTGAAGGGGACTGCTATCATAGTGGAGGGACAATAA
TAAGTAAGTTGCCATTTTCAGAACATAGATAGCAGGGCAGTTGGAAAATGTCCGAGATATGTTAAGCAAAG
GAGTCTGCTGCTAGCAACAGGGATGAAGAATGTTCCCTGAGATTCCAAAGGGAAGAGGCCTATTTGGTGCT
ATAGCGGGTTTTATTGAAAATGGATGGGAAGGCCTAATTGATGGTTGGTATGGTTTTAGACACCAGAATG
CACAGGGAGAGGGAACCTGCTGCAGATTACAAAAGCACTCAATCGGCAATTGATCAAATAACAGGAAAATT
AAACCGGCTTATAGAAAAAACCAACCAACAATTTGAGTTGATCGACAATGAATTCATGAGGTAGAGAAG
CAAATCGGTAATGTGATAAATTGGACCAGAGATTCTATAACAGAAGTGTGGTCATACAATGCTGAACCTCT
TGGTAGCAATGGAGAACCAGCATAACAATTGATCTGGCTGATTCAGAAAATGGACAAACTGTACGAACGAGT
GAAAAGACAGCTGAGAGAGAATGCTGAAGAAGATGGCACTGGTTGCTTTGAAATATTTTACAAGTGTGAT
GATGACTGTATGGCCAGTATTAGAAATAACACCTATGATCACAGCAAATACAGGGAAGAGGCAATGCAAA
ATAGAATACAGATTGACCCAGTCAAACTAAGCAGCGGCTACAAAAGATGTGATACTTTGGTTTTAGCTTCGG
GGCATCATGTTTCATACTTCTAGCCATTGTAATGGGCCTTGCTTTCATATGTGTAAAGAATGGAAACATG
CGGTGCACTATTTGTATATAA

Figure 15B**PDI-H7 Shan AA (SEQ ID NO: 21)**

MAKNVAIFGLLFSLLVLPVSI FADKICLGHHAVSNGTKVNTLTERGVEVVNATETVERTNIPRICSKGK
RTVDLGQCGLLGITITGPPQCDQFLEFSADLI IERREGSDVCYPGKFVNNEALRQILRESGGIDKEAMGFT
YSGIRTNGATSACRRSGSSFYAEMKWLLSNTDNAAFQMTKSYKNTRKSPALIVWGIHHSVSTAEQTKLY
GSGNKLVTVGSSNYQQSFVPSPGARPVNGLSGRIDFHWLMLNPNDTVTFSENGAFIAPDRASFLRGKSM
GIQSGVQVDANCEGDCYHSGGTIIISNLPFQNI DSRAVGKCPRYVKQRSLLLATGMKNVPEIPKGRGLFGA
IAGFIENGWEGLIDGWYGFRHQNAQGEFTAADYKSTQSAIDQITGKLNRLIEKTNQQFELIDNEFNEVEK
QIGNVINWTRDSITEVWSYNAELLVAMENQHTIDLADSEMDKLYERVKRQLRENAEEDGTGCFEIFHKCD
DDCMASIRNNTYDHSKYREEAMQNRIQIDPVKLSSGYKDVLWFSFGASCFILLAIVMGLVFICVKNNGM
RCTICI

Figure 15C**PDI-H7 Shan-Y88F DNA (SEQ ID NO: 25)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCCTTCTCAGATCTTCG
CGGACAAAATCTGCCTCGGACATCATGCCGTGTCAAACGGAACCAAAGTAAACACATTAAGTAAAGAGG
AGTGGAAGTCGTCAATGCAACTGAAACAGTGGAACGAACAAACATCCCCAGGATCTGCTCAAAGGGAAA
AGGACAGTTGACCTCGGTCAATGTGGACTCCTGGGGACAATCACTGGACCACCTCAATGTGACCAATTCC
TAGAATTTTCAGCCGATTTAATTATTGAGAGGCGAGAAGGAAGTGATGTCTGTTTCCCTGGGAAATTTCGT
GAATGAAGAAGCTCTGAGGCAAATTCCTCAGAGAATCAGGCGGAATTGACAAGGAAGCAATGGGATTTCACA
TACAGTGGAATAAGAACTAATGGAGCAACCAGTGCATGTAGGAGATCAGGATCTTCATTCTATGCAGAAA
TGAAATGGCTCCTGTCAAACACAGATAATGCTGCATTCCCGCAGATGACTAAGTCATATAAAAAATACAAG
AAAAAGCCCAGCTCTAATAGTATGGGGGATCCATCATTCCTGATCAACTGCAGAGCAAACCAAGCTATAT
GGGAGTGGAACAAACTGGTGACAGTTGGGAGTTCTAATTATCAACAATCTTTTGTACCGAGTCCAGGAG
CGAGACCACAAGTTAATGGTCTGTCTGGAAGAATTGACTTTCATTGGCTAATGCTAAATCCCAATGATAC
AGTCACTTTTCAGTTTCAATGGGGCTTTTCATAGCTCCAGACCGTGCAAGCTTCCTGAGAGGAAAATCTATG
GGAATCCAGAGTGAGTACAGGTTGATGCCAATTGTGAAGGGGACTGCTATCATAGTGGAGGGACAATAA
TAAGTAACTTGCCATTTTCAGAACATAGATAGCAGGGCAGTTGGAAAAATGTCCGAGATATGTTAAGCAAAG
GAGTCTGCTGCTAGCAACAGGGATGAAGAATGTTCCCTGAGATTCCAAAGGGAAGAGGCCTATTTGGTGCT
ATAGCGGGTTTTCATTGAAAATGGATGGGAAGGCCTAATTGATGGTTGGTATGGTTTTCAGACACCAGAATG
CACAGGGAGAGGGAACCTGCTGCAGATTACAAAAGCACTCAATCGGCAATTGATCAAATAACAGGAAAATT
AAACCGGCTTATAGAAAAAACCAACCAACAATTTGAGTTGATCGACAATGAATTCATGAGGTAGAGAAG
CAAATCGGTAATGTGATAAATTGGACCAGAGATTCTATAACAGAAGTGTGGTCATACAATGCTGAACTCT
TGGTAGCAATGGAGAACCAGCATACAATTGATCTGGCTGATTGAGAAATGGACAAACTGTACGAACGAGT
GAAAAGACAGCTGAGAGAGAATGCTGAAGAAGATGGCACTGGTTGCTTTGAAATATTTTACAAGTGTGAT
GATGACTGTATGGCCAGTATTAGAAATAACACCTATGATCACAGCAAATACAGGGAAGAGGCAATGCAA
ATAGAATACAGATTGACCCAGTCAAACCTAAGCAGCGGTACAAAGATGTGATACTTTGGTTTAGCTTCGG
GGCATCATGTTTCATACTTCTAGCCATTGTAATGGGCTTGTCTTCATATGTGTAAAGAATGGAAACATG
CGGTGCACTATTTGTATATAA

Figure 15D**PDI-H7 Shan-Y88F AA (SEQ ID NO: 26)**

MAKNVAIFGLLFSLLVLVPSQIFADKICLGHHAVSNGTKVNTLTERGVEVVNATETVERTNIPRICSKGK
RTVDLGQCGLLGTITGPPQCDQFLEFSADLIIERREGSDVCFPKGKFNNEALRQILRESGGIDKEAMGFT
YSGIRTNGATSACRRSGSSFYAEMKWLLSNTDNAAFPQMTKSYKNTRKSPALIVWGIHHSVSTAEQTKLY
GSGNKLVTVGSSNYQQSFVPSPGARPVNGLSGRIDFHWLMLNPNDTVTFNFNGAFIAPDRASFLRGKSM
GIQSGVQVDANCEGDCYHSGGTIIISNLPFQNIDSRAVGKCPRYVKQRSLLLATGMKNVPEIPKGRGLFGA
IAGFIENGWEGLIDGWYGFRHQNAQGEFTAADYKSTQSAIDQITGKLNRLIEKTNQQFELIDNEFNEVEK
QIGNVINWTRDSITEVWSYNAELLVAMENQHTIDLADSEMDKLYERVKRQLRENAEEDGTGCFEIFHKCD
DDCMASIRNNTYDHISKYREEAMQNRIQIDPVKLSSGYKDVLWFSFGASCFILLAIVMGLVFICVKNNGM
RCTICI

Figure 15E**PDI-H5 Indo DNA (SEQ ID NO: 198)**

atggcgaaaaacggttgcgattttcggccttattgttttctcttcttggttggttccttctcagatcttcg
ccgatcagattttgcattgggttaccatgcaaacaattcaacagagcaggttgacacaatcatggaaaagaa
cgttactgttacacatgcccaagacatactggaaaagacacacaacgggaagctctgcgatctagatgga
gtgaagcctctaatttttaagagattgtagttagctggatggctcctcggaacccaatgtgtgacgaat
tcatcaatgtaccggaatggctttacatagtggaagggccaatccaaccaatgacctctgttaccagg
gagtttcaacgactatgaagaactgaaacacctattgagcagaataaaccattttgagaaaattcaaatc
atccccaaaagttcttgggtccgatcatgaagcctcatcaggagtttagctcagcatgtccatacctgggaa
gtccctccttttttagaaatgtggtatggcttatcaaaaagaacagtacataccaacaataaagaaaag
ctacaataataccaaccaagaggatcttttggtagtgtgggaattcaccatcctaataatgatgcggcagag
cagacaaggctatatcaaaacccaaccacctatattccattgggacatcaacactaaaccagagattgg
taccaaaaatagctactagatccaaagtaaacgggcaaagtgggaaggatggagttcttctggacaatttt
aaaacctaataatgatgcaatcaacttcgagagtaatggaaatttcattgctccagaatatgcatacaaaatt
gtcaagaaaggggactcagcaattatgaaaagtgaattggaatatggtaactgcaacaccaagtgtcaaa
ctccaatgggggagataaactctagtagtccattccacaacatacacccctctcaccatcgggggaatgcc
caaataatgtgaaatcaaacagatttagtccttgcaacagggtcagaaatagccctcaaagagagagcaga
agaaaaaagagaggactatttggagctatagcaggttttatagagggaggatggcaggggaatggtagatg
gttggtatgggtaccaccatagcaatgagcaggggagtgggtacgctgcagacaaagaatccactcaaaa
ggcaatagatggagtcaccaataaggtcaactcaatcattgacaaaatgaacactcagtttgaggccgtt
ggaagggaatttaataacttagaaaggagaatagagaatttaacaagaagatggaagacgggtttctag
atgtctggacttataatgccgaacttctggttctcatggaaaatgagagaactctagactttcatgactc
aaatgttaagaacctctacgacaaggtccgactacagcttagggataatgcaaaggagctgggtaacggt
tgtttcgagttctatcacaaatgtgataatgaatgtatggaaagtataagaaacggaacgtacaactatc
cgcagtatccagaagaagcaagattaaaaagagaggaaataagtggggtaaaattggaatcaataggaac
ttaccaataactgtcaattttattcaacagtggcgagttccctagcactggcaatcatgatggctggtcta
tctttatggatgtgctccaatggatcggttacaatgcagaatttgcatttaa

Figure 15F**PDI-H5 Indo AA (SEQ ID NO: 199)**

MAKNVAIFGLLFSLVLVPSQIFADQICIGYHANNSTEQVDTIMEKNVTVTTHAQDILEKTHNGKLCDLG
VKPLILRDCSVAGWLLGNPMCEFINVPEWSYIVEKANPTNDLCYPGSFNDYEELKHLLSRINHFEKIQI
IPKSSWSDHEASSGVSSACPYLGSFPRNVVWLIKKNSTYPTIKKSYNNNTNQEDLLVLWGIHHPNDAAE
QTRLYQNPTTYISIGTSTLNQRLVPKIATRISKVNGQSGRMEFFWTILKPNDAINFESNGNFIAPEYAYKI
VKKGDSAIMKSELEYGNCNTKCQTPMGAINSSMPFHNHPLTIGECPKYVKSRLVLATGLRNSPQRESR
RKKRGLFGAIAGFIEGGWQGMVDGWYGYHHSNEQSGYAADKESTQKAIDGVTNKVNSIIDKMNTQFEAV
GREFNNLERRIENLNKKMEDGFLDVWTYNAELLVMENERTLDFHDSNVKNLYDKVRLQLRDNAKELNG
CFEFYHKCDNECMESIRNGTYNYPQYSEEARLKREEISGVKLESIGTYQILSIYSTVASSLALAIMMAGL
SLWMCSNGLQCRICI

Figure 15G**IF-H5ITMCT.s1-4r (SEQ ID NO: 200)**

actaaagaaaataggcctttaaatgcaaattctgcattgtaacgatccat

Figure 15H**PDI-H5 Indo-Y91F DNA (SEQ ID NO: 201)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttggttggttccttctcagatcttcg
ccgatcagatttgcattgggttaccatgcaaacaattcaacagagcaggttgacacaatcatggaaaagaa
cgttactgttacacatgcccaagacatactggaaaagacacacaacgggaagctctgcgatctagatgga
gtgaagcctctaatttttaagagattgtagttagctggatggctcctcggaacccaatgtgtgacgaat
tcatcaatgtaccggaatggctttacatagtggaagggccaatccaaccaatgacctctgtttccagg
gagtttcaacgactatgaagaactgaaacacctattgagcagaataaaccattttgagaaaattcaaatc
atccccaaaagttcttgggtccgatcatgaagcctcatcaggagttagctcagcatgtccatacctgggaa
gtccctccttttttagaaatgtggtatggccttatcaaaaagaacagtacataccaacaataaagaaaag
ctacaataataccaaccaagaggatcttttggtagtgtgggaattcaccatcctaataatgatgcggcagag
cagacaaggctatatcaaaacccaaccacctatatattccattgggacatcaacactaaaccagagattgg
taccaaaaatagctactagatccaaagtaaaccgggcaaagtgggaaggatggagttcttctggacaatttt
aaaacctaataatgatgcaatcaacttcgagagtaatggaaatttcattgctccagaatatgcatacaaaatt
gtcaagaaaggggactcagcaattatgaaaagtgaattggaatatggtaactgcaacaccaagtgtcaaa
ctccaatgggggagataaactctagtagtccattccacaacatacacccctctcaccatcggggaatgcc
caaatatgtgaaatcaaacagatttagtccttgcaacagggtcagaaatagccctcaaagagagagcaga
agaaaaaagagaggactatgttgagctatagcaggttttatagagggaggatggcaggggaatggtagatg
gttggtatgggtaccaccatagcaatgagcaggggagtggttacgctgcagacaaagaatccactcaaaa
ggcaatagatggagtcaccaataaggtcaactcaatcattgacaaaatgaacactcagtttgaggccgtt
ggaagggaatttaataaacttagaaaggagaatagagaatttaacaagaagatggaagacgggtttctag
atgtctggacttataatgccgaacttctggttctcatggaaaatgagagaactctagactttcatgactc
aaatgttaagaacctctacgacaaggtccgactacagcttagggataatgcaaaggagctgggtaacggt
tgtttcgagttctatcacaaatgtgataatgaatgtatggaaagtataagaaacggaacgtacaactatc
cgcagtatccagaagaagcaagattaaaaagagaggaaataagtggggtaaaattggaatcaataggaac
ttaccaataactgtcaattttattcaacagtggcgagttccctagcactggcaatcatgatggctggtcta
tctttatggatgtgctccaatggatcggttacaatgcagaatttgcatttaa

Figure 15I**PDI-H5 Indo-Y91F AA (SEQ ID NO: 202)**

MAKNVAIFGLLFSLLVLPVPSQIFADQICIGYHANNSTEQVDTIMEKNVTVTTHAQDILEKTHNGKLCDLG
VKPLILRDCSVAGWLLGNPMCDFINVPESYIVEKANPTNDLCFPGSFNDYEELKHLLSRINHFEKIQI
IPKSSWSDHEASSGVSSACPYLGSFSFRNVVWLIKKNSTYPTIKKSYNNNTNQEDLLVLWGIHHPNDAAE
QTRLYQNPTTYISIGTSTLNQRLVPKIATRISKVNGQSGRMEFFWTILKPNDAINFESNGNFIAPEYAYKI
VKKGDSAIMKSELEYGNCNTKCQTPMGAINSSMPFHNHPLTIGECPKYVKSRLVLATGLRNSPQRESR
RKKRGLFGAIAGFIEGGWQGMVDGWYGYHHSNEQSGYAADKESTQKAIDGVTNKVNSIIDKMNTQFEAV
GREFNNLERRIENLNKKMEDGFLDVWTYNAELLVMENERTLDFHDSNVKNLYDKVRLQLRDNAKELNG
CFEFYHKCDNECMESIRNGTYNYPQYSEEARLKREEISGVKLESIGTYQILSIYSTVASSLALAIMMAGL
SLWMCNSGSLQCRICI

Figure 16A**PDI-B Phu (Prl-) DNA (SEQ ID NO: 27)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCCTTCTCAGATCTTCG
CGGATCGAATCTGCACTGGGATAACATCTTCAAACCTCACCTCATGTGGTCAAACAGCTACTCAAGGGGA
GGTCAATGTGACTGGCGTGATACCACTGACAACAACCAACAAAATCTTATTTTGCAAATCTCAAAGGA
ACAAGGACCAGAGGGAACTATGCCCGGACTGTCTCAACTGTACAGATCTGGATGTGGCCTTGGGCAGGC
CAATGTGTGTGGGGACCACACCTTCTGCTAAAGCTTCAATACTCCATGAGGTCAGACCTGTTACATCCGG
GTGCTTTTCTATAATGCACGACAGAACAAAATCAGGCAACTACCCAATCTTCTCAGAGGATATGAAAAG
ATCAGGTTATCAACCCAAAACGTTATCGATGCAGAAAAAGCACCAGGAGGACCCTACAGACTTGGAACCT
CAGGATCTTGCCCTAACGCTACCAGTAAAATCGGATTTTTTGAACAATGGCTTGGGCTGTCCCAAAGGA
CAACTACAAAATGCAACGAACCCACTAACAGTGGAAGTACCATACATTTGTACAGAAGGGGAAGACCAA
ATTACTGTTTGGGGGTTCCATTCCGATAACAAAACCCAAATGAAGAGCCTCTATGGAGACTCAAATCCTC
AAAAGTTCACCTCATCTGCTAATGGAGTAACCACGCATTATGTTTCTCAGATTGGCGACTTCCCAGATCA
AACAGAAGACGGGAGGACTACCACAAAGCGGCAGAATTGTTGTTGATTACATGATGCAAAAACCTGGGAAA
ACAGGAACAATTGTCTATCAAAGGGGTGTTTTGTTGCCTCAAAAAGGTGTGGTGCGCAGTGGCAGGAGCA
AAGTAATAAAGGGTCATTGCCTTTAATTGGTGAAGCAGATTGCCTTCATGAAGAATACGGTGGATTAAA
CAAAAGCAAGCCTTACTACACAGGAAAACATGCAAAAGCCATAGGAAATTGCCCAATATGGGTAAAAACA
CCTTTGAAGCTTGCCAATGGAACCAATATAGACCTCCTGGTGGAGGATGGGAAGGAATGATTGCAGGTT
GGCACGGATACACATCTCACGGAGCACATGGAGTGGCAGTGGCGGCAGACCTTAAGAGTACACAAGAAGC
TATAAATAAGATAACAAAAAATCTCAATTCCTTGAAGTAACTAGAAAGTAAAGAACCTTCAAAGACTAAGT
GGTGCCATGGATGAACTCCACAACGAAATACTCGAGCTGGATGAAAAAGTGGATGATCTCAGAGCTGACA
CTATAAGCTCACAAATAGAACTTGCAGTCTTGCTTTCCAACGAAGGAATAATAAACAGTGAAGACGAGCA
TCTATTGGCACTTGAGAGAAAATAAGAAAATGCTGGGTCCCTCTGCTGTAGACATAGGAAACGGATGC
TTCGAAACCAAAACACAAATGCAACCAGACCTGCTTAGACAGGATAGCTGCTGGCACCTTTAATGCAGGAG
AATTTTCTCTCCCCACTTTTGATTCAATGAACATTACTGCTGCATCTTTAAATGATGATGGATTGGATAA
CTACCAGATTTTGGCGATCTATTCAACTGTCGCCAGTTCATTGGTACTGGTAGTCTCCCTGGGGGCAATC
AGTTTCTGGATGTGCTCTAATGGGTCTCTACAGTGTAGAATATGTATTTAA

Figure 16B**PDI-B Phu (Prl-) AA (SEQ ID NO: 28)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKTATQGEVNVTVGIPLTTTPTKSYFANLKG
TRTRGKLCPCDCLNCTDLVALGRPMC VGTTPSAKASILHEVRPVTSGCFPIIMHRTKIRQLPNLLRGY EK
IRLSTQNVIDAEKAPGGPYRLGTSGSCPNATSKIGFFATMAWAVPKDNYKNATNPLTVEVPYICTEGEDQ
ITVWGFHSDNKTQMSLYGDSNPQKFTSSANGVTTHYVSQIGDFPDQTEDGGLPQSGRIVVDYMMQKPGK
TGTIVYQRGVLLPQKVCASGRSKVIKSLPLIGEADCLHEEYGGLNLSKPYTGKHAKAIGNCPIWVK
PLKLANGTKYRPPGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLS
GAMDELHNEILELDEKVDDL RADTISSQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVDIGNGC
FETKHKCNQTCLDRIAAGTFNAGEFSLPTFDSL NITAAASLNDGLDNYQILAIYSTVASSLVLVSLGAI
SFWMCSNGSLQCRICI

Figure 16C**PDI-B Phu (S140A, Pri-) DNA (SEQ ID NO: 32)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCCTTCTCAGATCTTCG
CGGATCGAATCTGCACTGGGATAACATCTTCAAACCTCACCTCATGTGGTCAAACAGCTACTCAAGGGGA
GGTCAATGTGACTGGCGTGATACCACTGACAACAACCAACAAAATCTTATTTTGCAAATCTCAAAGGA
ACAAGGACCAGAGGGAACTATGCCCGGACTGTCTCAACTGTACAGATCTGGATGTGGCCTTGGGCAGGC
CAATGTGTGTGGGGACCACACCTTCTGCTAAAGCTTCAATACTCCATGAGGTCAGACCTGTTACATCCGG
GTGCTTTTCTATAATGCACGACAGAACAAAATCAGGCAACTACCCAATCTTCTCAGAGGATATGAAAAG
ATCAGGTTATCAACCCAAAACGTTATCGATGCAGAAAAAGCACCAGGAGGACCCTACAGACTTGAACCG
CCGGATCTTGCCCTAACGCTACCACTAAAATCGGATTTTTTGAACAATGGCTTGGGCTGTCCCAAAGGA
CAACTACAAAATGCAACGAACCCACTAACAGTGGAAGTACCATACATTTGTACAGAAGGGGAAGACCAA
ATTACTGTTTGGGGGTTCCATTCCGATAACAAAACCCAAATGAAGAGCCTCTATGGAGACTCAAATCCTC
AAAAGTTCACCTCATCTGCTAATGGAGTAACCACGCATTATGTTTCTCAGATTGGCGACTTCCCAGATCA
AACAGAAGACGGGAGGACTACCACAAAGCGGCAGAATTGTTGTTGATTACATGATGCAAAAACCTGGGAAA
ACAGGAACAATTGTCTATCAAAGGGGTGTTTTGTTGCCTCAAAAAGGTGTGGTGCGCAGTGGCAGGAGCA
AAGTAATAAAAGGGTCATTGCCTTTAATTGGTGAAGCAGATTGCCTTCATGAAGAATACGGTGGATTAAA
CAAAAGCAAGCCTTACTACACAGGAAAACATGCAAAAGCCATAGGAAATTGCCCAATATGGGTAAAAACA
CCTTTGAAGCTTGCCAATGGAACCAATATAGACCTCCTGGTGGAGGATGGGAAGGAATGATTGCAGGTT
GGCACGGATACACATCTCACGGAGCACATGGAGTGGCAGTGGCGGCAGACCTTAAGAGTACACAAGAAGC
TATAAATAAGATAACAAAAATCTCAATTCCTTGAGTGAAGTAAAGAACCTTCAAAGACTAAGT
GGTGCCATGGATGAACTCCACAACGAAATACTCGAGCTGGATGAAAAAGTGGATGATCTCAGAGCTGACA
CTATAAGCTCACAAATAGAACTTGCAGTCTTGCTTTCCAACGAAGGAATAATAAACAGTGAAGACGAGCA
TCTATTGGCACTTGAGAGAAAATAAGAAAATGCTGGGTCCCTCTGCTGTAGACATAGGAAACGGATGC
TTCGAAACCAAAACACAAATGCAACCAGACCTGCTTAGACAGGATAGCTGCTGGCACCTTTAATGCAGGAG
AATTTTCTCTCCCCACTTTTGATTCAATGAACATTACTGCTGCATCTTTAAATGATGATGGATTGGATAA
CTACCAGATTTTGGCGATCTATTCAACTGTCGCCAGTTCATTGGTACTGGTAGTCTCCCTGGGGGCAATC
AGTTTCTGGATGTGCTCTAATGGGTCTCTACAGTGTAGAATATGTATTTAA

Figure 16D**PDI-B Phu (S140A, Pri-) AA (SEQ ID NO: 33)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSYFANLKG
TRTRGKLCPCDCLNCTDLVALGRPMC VGTTPSAKASILHEVRPVTSGCFPIIMHRTKIRQLPNLLRGY EK
IRLSTQNVIDAEKAPGGPYRLGTAGSCPNATSKIGFFATMAWAVPKDNYKNATNPLTVEVPYICTEGEDQ
ITVWGFHSDNKTQMSLYGDSNPQKFTSSANGVTTHYVSQIGDFPDQTEDGGLPQSGRIVVDYMMQKPGK
TGTIVYQRGVLLPQKVCASGRSKVIKSLPLIGEADCLHEEYGGLNLSKPYTGKHAKAIGNCPIWVK
PLKLANGTKYRPPGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLSLSELEVKNLQRLS
GAMDELHNEILELDEKVDDLADTISSQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVDIGNGC
FETKHKCNQTCLDRIAAGTFNAGEFSLPTFDSL NITAAASLNDGLDNYQILAIYSTVASSLVLVSLGAI
SFWMCSNGSLQCRICI

Figure 16E**PDI-B Phu (S142A, Pri-) DNA (SEQ ID NO: 36)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCCTTCTCAGATCTTCG
CGGATCGAATCTGCACTGGGATAACATCTTCAAACCTCACCTCATGTGGTCAAACAGCTACTCAAGGGGA
GGTCAATGTGACTGGCGTGATACCACTGACAACAACCAACAAAATCTTATTTTGCAAATCTCAAAGGA
ACAAGGACCAGAGGGAAACTATGCCCGGACTGTCTCAACTGTACAGATCTGGATGTGGCCTTGGGCAGGC
CAATGTGTGTGGGGACCACACCTTCTGCTAAAGCTTCAATACTCCATGAGGTCAGACCTGTTACATCCGG
GTGCTTTTCTATAATGCACGACAGAACAAAATCAGGCAACTACCCAATCTTCTCAGAGGATATGAAAAG
ATCAGGTTATCAACCCAAAACGTTATCGATGCAGAAAAAGCACCAGGAGGACCCTACAGACTTGGAACCT
CAGGAGCCTGCCCTAACGCTACCAGTAAAATCGGATTTTTTTCGAACAATGGCTTGGGCTGTCCCAAAGGA
CAACTACAAAATGCAACGAACCCACTAACAGTGGAAGTACCATACATTTGTACAGAAGGGGAAGACCAA
ATTACTGTTTGGGGGTTCCATTCCGATAACAAAACCCAAATGAAGAGCCTCTATGGAGACTCAAATCCTC
AAAAGTTCACCTCATCTGCTAATGGAGTAACCACGCATTATGTTTTCTCAGATTGGCGACTTCCCAGATCA
AACAGAAGACGGGAGGACTACCACAAAGCGGCAGAATTGTTGTTGATTACATGATGCAAAAACCTGGGAAA
ACAGGAACAATTGTCTATCAAAGGGGTGTTTTGTTGCCTCAAAAAGGTGTGGTGCGCAGTGGCAGGAGCA
AAGTAATAAAAGGGTCATTGCCTTTAATTGGTGAAGCAGATTGCCTTCATGAAGAATACGGTGGATTAAA
CAAAAGCAAGCCTTACTACACAGGAAAACATGCAAAAGCCATAGGAAATTGCCCAATATGGGTAAAAACA
CCTTTGAAGCTTGCCAATGGAACCAATATAGACCTCCTGGTGGAGGATGGGAAGGAATGATTGCAGGTT
GGCACGGATACACATCTCACGGAGCACATGGAGTGGCAGTGGCGGCAGACCTTAAGAGTACACAAGAAGC
TATAAATAAGATAACAAAAATCTCAATTCCTTGAGTGAAGTAAAGAACCTTCAAAGACTAAGT
GGTGCCATGGATGAACTCCACAACGAAATACTCGAGCTGGATGAAAAAGTGGATGATCTCAGAGCTGACA
CTATAAGCTCACAAATAGAACTTGCAGTCTTGCTTTCCAACGAAGGAATAATAAACAGTGAAGACGAGCA
TCTATTGGCACTTGAGAGAAAATAAGAAAATGCTGGGTCCCTCTGCTGTAGACATAGGAAACGGATGC
TTCGAAACCAAAACACAAATGCAACCAGACCTGCTTAGACAGGATAGCTGCTGGCACCTTTAATGCAGGAG
AATTTTCTCTCCCCACTTTTGATTCAATGAACATTACTGCTGCATCTTTAAATGATGATGGATTGGATAA
CTACCAGATTTTGGCGATCTATTCAACTGTCGCCAGTTCATTGGTACTGGTAGTCTCCCTGGGGGCAATC
AGTTTCTGGATGTGCTCTAATGGGTCTCTACAGTGTAGAATATGTATTTAA

Figure 16F**PDI-B Phu (S142A, Pri-) AA (SEQ ID NO: 37)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSYFANLKG
TRTRGKLCPCDCLNCTDLVALGRPMC VGTTPSAKASILHEVRPVTSGCFPIIMHRTKIRQLPNLLRGY EK
IRLSTQNVIDAEKAPGGPYRLGTSGACPNATSKIGFFATMAWAVPKDNYKNATNPLTVEVPYICTEGEDQ
ITVWGFHSDNKTQMSLYGDSNPQKFTSSANGVTTHYVSQIGDFPDQTEDGGLPQSGRIVVDYMMQKPGK
TGTIVYQRGVLLPQKVCASGRSKVIKSLPLIGEADCLHEEYGGLNLSKPYTGKHAKAIGNCPIWVK
PLKLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLS
GAMDELHNEILELDEKVDDL RADTISSQIELAVLLSNEGIINSEDEHLLALERKLLKMLGPSAVDIGNGC
FETKHKCNQTCLDRIAAGTFNAGEFSLPTFDSL NITAAASLNDGLDNYQILAIYSTVASSLVLVSLGAI
SFWMCSNGSLQCRICI

Figure 16G**PDI-B Phu (G138A, PrI-) DNA (SEQ ID NO: 40)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCCTTCTCAGATCTTCG
CGGATCGAATCTGCACTGGGATAACATCTTCAAACCTCACCTCATGTGGTCAAAACAGCTACTCAAGGGGA
GGTCAATGTGACTGGCGTGATACCACTGACAACAACCAACAAAATCTTATTTTGCAAATCTCAAAGGA
ACAAGGACCAGAGGGAACTATGCCCGGACTGTCTCAACTGTACAGATCTGGATGTGGCCTTGGGCAGGC
CAATGTGTGTGGGGACCACACCTTCTGCTAAAGCTTCAATACTCCATGAGGTCAGACCTGTTACATCCGG
GTGCTTTTCTATAATGCACGACAGAACAAAATCAGGCAACTACCCAATCTTCTCAGAGGATATGAAAAG
ATCAGGTTATCAACCCAAAACGTTATCGATGCAGAAAAAGCACCAGGAGGACCCTACAGACTTGCCACCT
CAGGATCTTGCCCTAACGCTACCAGTAAAATCGGATTTTTTGAACAATGGCTTGGGCTGTCCCAAAGGA
CAACTACAAAATGCAACGAACCCACTAACAGTGGAAGTACCATACATTTGTACAGAAGGGGAAGACCAA
ATTACTGTTTGGGGGTTCCATTCCGATAACAAAACCCAAATGAAGAGCCTCTATGGAGACTCAAATCCTC
AAAAGTTCACCTCATCTGCTAATGGAGTAACCACGCATTATGTTTCTCAGATTGGCGACTTCCCAGATCA
AACAGAAGACGGGAGGACTACCACAAAGCGGCAGAATTGTTGTTGATTACATGATGCAAAAACCTGGGAAA
ACAGGAACAATTGTCTATCAAAGGGGTGTTTTGTTGCCTCAAAAAGGTGTGGTGCGCAGTGGCAGGAGCA
AAGTAATAAAAGGGTCATTGCCTTTAATTGGTGAAGCAGATTGCCTTCATGAAGAATACGGTGGATTAAA
CAAAAGCAAGCCTTACTACACAGGAAAACATGCAAAAGCCATAGGAAATTGCCCAATATGGGTAAAAACA
CCTTTGAAGCTTGCCAATGGAACCAATATAGACCTCCTGGTGGAGGATGGGAAGGAATGATTGCAGGTT
GGCACGGATACACATCTCACGGAGCACATGGAGTGGCAGTGGCGGCAGACCTTAAGAGTACACAAGAAGC
TATAAATAAGATAACAAAAAATCTCAATTCCTTGAAGTAACTAGAAAGTAAAGAACCTTCAAAGACTAAGT
GGTGCCATGGATGAACTCCACAACGAAATACTCGAGCTGGATGAAAAAGTGGATGATCTCAGAGCTGACA
CTATAAGCTCACAAATAGAACTTGCAGTCTTGCTTTCCAACGAAGGAATAATAAACAGTGAAGACGAGCA
TCTATTGGCACTTGAGAGAAAATAAGAAAATGCTGGGTCCCTCTGCTGTAGACATAGGAAACGGATGC
TTCGAAACCAAAACACAAATGCAACCAGACCTGCTTAGACAGGATAGCTGCTGGCACCTTTAATGCAGGAG
AATTTTCTCTCCCCACTTTTGATTCAATGAACATTACTGCTGCATCTTTAAATGATGATGGATTGGATAA
CTACCAGATTTTGGCGATCTATTCAACTGTCGCCAGTTCATTGGTACTGGTAGTCTCCCTGGGGGCAATC
AGTTTCTGGATGTGCTCTAATGGGTCTCTACAGTGTAGAATATGTATTTAA

Figure 16H**PDI-B Phu (G138A, PrI-) AA (SEQ ID NO: 41)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKTATQGEVNVTVGIPLTTTPTKSYFANLKG
TRTRGKLCPDCLNCTDLVALGRPMC VGTTPSAKASILHEVRPVTSGCFPIIMHRTKIRQLPNLLRGY EK
IRLSTQNVIDAEKAPGGPYRLATSGSCPNATSKIGFFATMAWAVPKDNYKNATNPLTVEVPYICTEGEDQ
ITVWGFHSDNKTQMSLYGDSNPQKFTSSANGVTTHYVSQIGDFPDQTEDGGLPQSGRIVVDYMMQKPGK
TGTIVYQRGVLLPQKVWCASGRSKVIKSLPLIGEADCLHEEYGGLNLSKPYTGKHAKAIGNCPIWVKT
PLKLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLS
GAMDELHNEILELDEKVDDL RADTISSQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVDIGNGC
FETKHKCNQTCLDRIAAGTFNAGEFSLPTFDSL NITAASLNDGLDNYQILAIYSTVASSLVLVSLGAI
SFWMCSNGSLQCRICI

Figure 16I**PDI-B Phu (L203A, PrI-) DNA (SEQ ID NO: 44)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCTTCTCAGATCTTCG
CGGATCGAATCTGCACTGGGATAACATCTTCAAACCTCACCTCATGTGGTCAAAACAGCTACTCAAGGGGA
GGTCAATGTGACTGGCGTGATACCACTGACAACAACACCAACAAAATCTTATTTTGCAAATCTCAAAGGA
ACAAGGACCAGAGGGAACTATGCCCGGACTGTCTCAACTGTACAGATCTGGATGTGGCCTTGGGCAGGC
CAATGTGTGTGGGGACCACACCTTCTGCTAAAGCTTCAATACTCCATGAGGTCAGACCTGTTACATCCGG
GTGCTTTCTATAATGCACGACAGAACAATAATCAGGCACTACCCAATCTTCTCAGAGGATATGAAAAG
ATCAGGTTATCAACCCAAAACGTTATCGATGCAGAAAAAGCACCAGGAGGACCCTACAGACTTGGAACCT
CAGGATCTTGCCCTAACGCTACCAGTAAATCGGATTTTTTGCAACAATGGCTTGGGCTGTCCCAAAGGA
CAACTACAAAAATGCAACGAACCCACTAACAGTGGAAGTACCATACATTTGTACAGAAGGGGAAGACCAA
ATTACTGTTTTGGGGGTTCCATTTCGGATAACAAAACCCAAATGAAGAGCGCCTATGGAGACTCAAATCCTC
AAAAGTTCACCTCATCTGCTAATGGAGTAACCACGCATTATGTTTCTCAGATTGGCGACTTCCAGATCA
AACAGAAGACGGAGGACTACCACAAAGCGGCAGAATTGTTGTTGATTACATGATGCAAAAACCTGGGAAA
ACAGGAACAATTGTCTATCAAAGGGGTGTTTTGTTGCCTCAAAAAGGTGTGGTGCGCGAGTGGCAGGAGCA
AAGTAATAAAAGGGTCATTGCCTTTAATTGGTGAAGCAGATTGCCTTCATGAAGAATACGGTGGATTAAA
CAAAAGCAAGCCTTACTACACAGGAAAACATGCAAAAGCCATAGGAAATTGCCCAATATGGGTAAAAACA
CCTTTGAAGCTTGCCAATGGAACCAAATATAGACCTCCTGGTGGAGGATGGGAAGGAATGATTGCAGGTT
GGCACGGATACACATCTCACGGAGCACATGGAGTGGCAGTGGCGGCAGACCTTAAGAGTACACAAGAAGC
TATAAATAAGATAACAAAAATCTCAATTCCTTGTAGTGAAGTAAAGAACCTTCAAAGACTAAGT
GGTGCCATGGATGAAGTCCACAACGAAATACTCGAGCTGGATGAAAAAGTGGATGATCTCAGAGCTGACA
CTATAAGCTCACAAATAGAAGTTCAGTCTTGTCTTCCAACGAAGGAATAATAAACAGTGAAGACGAGCA
TCTATTGGCACTTGAGAGAAAAGTAAAGAAAATGCTGGGTCCCTCTGCTGTAGACATAGGAAACGGATGC
TTCGAAACCAAAACACAAATGCAACCAGACCTGCTTAGACAGGATAGCTGCTGGCACCTTTAATGCAGGAG
AATTTTCTCTCCCCACTTTTGATTCAATGAACATTACTGCTGCATCTTTAAATGATGATGGATTGGATAA
CTACCAGATTTTGGCGATCTATTCAACTGTCGCCAGTTCATTGGTACTGGTAGTCTCCCTGGGGGCAATC
AGTTTCTGGATGTGCTCTAATGGGTCTCTACAGTGTAGAATATGTATTTAA

Figure 16J**PDI-B Phu (L203A, PrI-) AA (SEQ ID NO: 45)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKTATQGEVNVTVGIPLTTTPTKSYFANLKG
TRTRGKLCPCDCLNCTDLVALGRPMC VGTPSAKASILHEVRPVTSGCFPIIMHDKIRQLPNLLRGYEK
IRLSTQNVIDAEKAPGGPYRLGTSGSCPNATSKIGFFATMAWAVPKDNYKNATNPLTVEVPYICTEGEDQ
ITVWGFHSDNKTQMKSAYGDSNPQKFTSSANGVTTHYVSQIGDFPDQTEDGGLPQSGRIVVDDYMMQKPGK
TGTIVYQRGVLLPQKVWCASGRSKVIKGSPLIGEADCLHEEYGGLNKSKPYTGTGKHAKAIGNCPIWVKT
PLKLANGTKYRPPGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLS
GAMDELHNEILELDEKVDDLADTISQIELAVLLSNEGIINSEDEHLLALERKLLKMLGPSAVDIGNGC
FETKHKCNQTCLDRIAAGTFNAGEFSLPTFDSLNTAASLNDGLDNYQILAIYSTVASSLVLVSLGAI
SFWMCSNGLQCRICI

Figure 16K**PDI-B Phu (D195G, PrI-) DNA (SEQ ID NO: 48)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCCTTCTCAGATCTTCG
CGGATCGAATCTGCACTGGGATAACATCTTCAAACCTCACCTCATGTGGTCAAACAGCTACTCAAGGGGA
GGTCAATGTGACTGGCGTGATACCACTGACAACAACCAACAAAATCTTATTTTGCAAATCTCAAAGGA
ACAAGGACCAGAGGGAACTATGCCCGGACTGTCTCAACTGTACAGATCTGGATGTGGCCTTGGGCAGGC
CAATGTGTGTGGGGACCACACCTTCTGCTAAAGCTTCAATACTCCATGAGGTCAGACCTGTTACATCCGG
GTGCTTTCTCTATAATGCACGACAGAACAAAATCAGGCAACTACCCAATCTTCTCAGAGGATATGAAAAG
ATCAGGTTATCAACCCAAAACGTTATCGATGCAGAAAAAGCACCAGGAGGACCCTACAGACTTGGAACCT
CAGGATCTTGCCCTAACGCTACCAGTAAAATCGGATTTTTTTCGAACAATGGCTTGGGCTGTCCCAAAGGA
CAACTACAAAATGCAACGAACCCACTAACAGTGGAAGTACCATACATTTGTACAGAAGGGGAAGACCAA
ATTACTGTTTGGGGGTTCCATTTCGGGCAACAAAACCCAAATGAAGAGCCTCTATGGAGACTCAAATCCTC
AAAAGTTCACCTCATCTGCTAATGGAGTAACCACGCATTATGTTTCTCAGATTGGCGACTTCCCAGATCA
AACAGAAGACGGGAGGACTACCACAAAGCGGCAGAATTGTTGTTGATTACATGATGCAAAAACCTGGGAAA
ACAGGAACAATTGTCTATCAAAGGGGTGTTTTGTTGCCTCAAAAAGGTGTGGTGCGCAGTGGCAGGAGCA
AAGTAATAAAAGGGTCATTGCCTTTAATTGGTGAAGCAGATTGCCTTCATGAAGAATACGGTGGATTAAA
CAAAAGCAAGCCTTACTACACAGGAAAACATGCAAAAGCCATAGGAAATTGCCCAATATGGGTAAAAACA
CCTTTGAAGCTTGCCAATGGAACCAAATATAGACCTCCTGGTGGAGGATGGGAAGGAATGATTGCAGGTT
GGCACGGATACACATCTCACGGAGCACATGGAGTGGCAGTGGCGGCAGACCTTAAGAGTACACAAGAAGC
TATAAATAAGATAACAAAAAATCTCAATTCCTTGTAGTGAAGTAAAGAACCTTCAAAGACTAAGT
GGTGCCATGGATGAACTCCACAACGAAATACTCGAGCTGGATGAAAAAGTGGATGATCTCAGAGCTGACA
CTATAAGCTCACAAATAGAACTTGCAGTCTTGCTTTCCAACGAAGGAATAATAAACAGTGAAGACGAGCA
TCTATTGGCACTTGAGAGAAAATAAGAAAATGCTGGGTCCCTCTGCTGTAGACATAGGAAACGGATGC
TTCGAAACCAAACACAAATGCAACCAGACCTGCTTAGACAGGATAGCTGCTGGCACCTTTAATGCAGGAG
AATTTTCTCTCCCCACTTTTGATTCAATTGAACATTACTGCTGCATCTTTAAATGATGATGGATTGGATAA
CTACCAGATTTTGGCGATCTATTCAACTGTCGCCAGTTCATTGGTACTGGTAGTCTCCCTGGGGGCAATC
AGTTTCTGGATGTGCTCTAATGGGTCTCTACAGTGTAGAATATGTATTTAA

Figure 16L**PDI-B Phu (D195G, PrI-) AA (SEQ ID NO: 49)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKTATQGEVNVTVGIPLTTTPTKSYFANLKG
TRTRGKLCPCDCLNCTDLVALGRPMC VGTTPSAKASILHEVRPVTSGCFPIIMHRTKIRQLPNLLRGY EK
IRLSTQNVIDAEKAPGGPYRLGTSGSCPNATSKIGFFATMAWAVPKDNYKNATNPLTVEVPYICTEGEDQ
ITVWGFHSGNKTQMKSLYGDSNPQKFTSSANGVTTHYVSQIGDFPDQTEDGGLPQSGRIVVDYMMQKPGK
TGTIVYQRGVLLPQKVCASGRSKVIKSLPLIGEADCLHEEYGGLNLSKPYTGKHAKAIGNCPIWVK
PLKLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLS
GAMDELHNEILELDEKVDDLADTISSQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVDIGNGC
FETKHKCNQTCLDRIAAGTFNAGEFSLPTFDSL NITAAASLNDGLDNYQILAIYSTVASSLVLVSLGAI
SFWMCSNGSLQCRICI

Figure 16M**PDI-B Phu (L203W, Prl-) DNA (SEQ ID NO: 52)**

ATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTCCCTTCTCAGATCTTCG
CGGATCGAATCTGCACTGGGATAACATCTTCAAACCTCACCTCATGTGGTCAAAACAGCTACTCAAGGGGA
GGTCAATGTGACTGGCGTGATACCACTGACAACAACCAACAAAATCTTATTTTGCAAATCTCAAAGGA
ACAAGGACCAGAGGGAACTATGCCCGGACTGTCTCAACTGTACAGATCTGGATGTGGCCTTGGGCAGGC
CAATGTGTGTGGGGACCACACCTTCTGCTAAAGCTTCAATACTCCATGAGGTCAGACCTGTTACATCCGG
GTGCTTTTCTATAATGCACGACAGAACAAAATCAGGCAACTACCCAATCTTCTCAGAGGATATGAAAAG
ATCAGGTTATCAACCCAAAACGTTATCGATGCAGAAAAAGCACCAGGAGGACCCTACAGACTTGGAACCT
CAGGATCTTGCCCTAACGCTACCACTAAAATCGGATTTTTTGAACAATGGCTTGGGCTGTCCCAAAGGA
CAACTACAAAATGCAACGAACCCACTAACAGTGGAAGTACCATACATTTGTACAGAAGGGGAAGACCAA
ATTACTGTTTGGGGGTTCCATTCCGATAACAAAACCCAAATGAAGAGCTGGTATGGGAGCTCAAATCCTC
AAAAGTTCACCTCATCTGCTAATGGAGTAACCACGCATTATGTTTCTCAGATTGGCGACTTCCCAGATCA
AACAGAAGACGGGAGGACTACCACAAAGCGGCAGAATTGTTGTTGATTACATGATGCAAAAACCTGGGAAA
ACAGGAACAATTGTCTATCAAAGGGGTGTTTTGTTGCCTCAAAAAGGTGTGGTGCGCAGTGGCAGGAGCA
AAGTAATAAAAGGGTCATTGCCTTTAATTGGTGAAGCAGATTGCCTTCATGAAGAATACGGTGGATTAAA
CAAAAGCAAGCCTTACTACACAGGAAAACATGCAAAAGCCATAGGAAATTGCCCAATATGGGTAAAAACA
CCTTTGAAGCTTGCCAATGGAACCAATATAGACCTCCTGGTGGAGGATGGGAAGGAATGATTGCAGGTT
GGCACGGATACACATCTCACGGAGCACATGGAGTGGCAGTGGCGGCAGACCTTAAGAGTACACAAGAAGC
TATAAATAAGATAACAAAAATCTCAATTCCTTGAAGTAACTAGAAAGTAAAGAACCTTCAAAGACTAAGT
GGTGCCATGGATGAACTCCACAACGAAATACTCGAGCTGGATGAAAAAGTGGATGATCTCAGAGCTGACA
CTATAAGCTCACAAATAGAACTTGCAGTCTTGCTTTCCAACGAAGGAATAATAAACAGTGAAGACGAGCA
TCTATTGGCACTTGAGAGAAAATAAGAAAATGCTGGGTCCCTCTGCTGTAGACATAGGAAACGGATGC
TTCGAAACCAAACACAAATGCAACCAGACCTGCTTAGACAGGATAGCTGCTGGCACCTTTAATGCAGGAG
AATTTTCTCTCCCCACTTTTGATTCAATGAACATTACTGCTGCATCTTTAAATGATGATGGATTGGATAA
CTACCAGATTTTGGCGATCTATTCAACTGTCGCCAGTTCATTGGTACTGGTAGTCTCCCTGGGGGCAATC
AGTTTCTGGATGTGCTCTAATGGGTCTCTACAGTGTAGAATATGTATTTAA

Figure 16N**PDI-B Phu (L203W, Prl-) AA (SEQ ID NO: 53)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKTATQGEVNVTVGIPLTTTPTKSYFANLKG
TRTRGKLCPCDCLNCTDLVALGRPMC VGTTPSAKASILHEVRPVTSGCFPIIMHRTKIRQLPNLLRGY EK
IRLSTQNVIDAEKAPGGPYRLGTSGSCPNATSKIGFFATMAWAVPKDNYKNATNPLTVEVPYICTEGEDQ
ITVWGFHSDNKTQMKSWYGDSNPQKFTSSANGVTTHYVSQIGDFPDQTEDGGLPQSGRIVVDYMMQKPGK
TGTIVYQRGVLLPQKVCASGRSKVIKSLPLIGEADCLHEEYGGLNLSKPYTGKHAKAIGNCPIWVK
PLKLANGTKYRPPGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLSLSELEVKNLQRLS
GAMDELHNEILELDEKVDDL RADTISSQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVDIGNGC
FETKHKCNQTCLDRIAAGTFNAGEFSLPTFDSL NITAASLNDGLDNYQILAIYSTVASSLVLVSLGAI
SFWMCSNGSLQCRICI

Figure 16O**PDI-B Sing (PrI-) DNA (SEQ ID NO:123)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttggttggttccttctcagatcttcg
cgcaaaaaatccctggaaatgacaatagcacggcaacgctgtgccttgggcaccatgcagtaccaaagg
aacgatagtgaacaatcacgaatgaccgaattgaagtactaatgctactgagctgggttcagaattcc
tcaataggtgaaatatgacgacagtcctcatcagatccttgatggagaaaactgcacactaatagatgctc
tattgggagaccctcagtgatggcctttcaaaataagaaatgggacctttttgttgaaacgaaacaaagc
ctacagcaactgttacccttatgatgtgccggattatgcctcccttaggtcactagttgcctcatccggc
acactggagtttaacaatgaaagcttcaattgggctggagtcactcaaaacggaacagactcttcttgca
taaggggatctaagagtagtttcttttagtagattaaattgggttgaccacttaaactccaaataccagc
attaaacgtgactatgccaaacaatgaacaatttgacaaattgtacatttgggggggttcaccacccgggt
acggacaaggaccaaatacagcctgtatgcacaatcatcaggaagaatcacagtatctacaaaaagaagcc
aacaagctgtaatcccgaatatcggatctagaccagaataaagggatatccctagcagaataagcatcta
ttggacaatagtaaaacggggagacatacttttgattaacagcacagggaatctaattgctcctaggggt
tacttcaaaatacgaagtgggaaaagctcaataatgagatcagatgcaccattggcaaatgcaagtctg
aatgcatcactccaaatggaagcattcccaatgacaaaccattccaaaatgtaaacaggatcacatacgg
ggcctgtcccagatatgttaagcaaagcactctgaaattggcaacaggaatgcgaaatgtaccagagaga
caaactagaggcatatttggcgcaatagcgggtttcatagaaaatgggtgggaggaatggtggatggtt
ggtacggcttcaggcatcaaaattctgaggaagaggacaagcagcagatctcaaaagcactcaagcagc
aatcgatcaaatcaatgggaagctggctcgagttatcgggaaaaccaacgagaaaattccatcagattgaa
aaagaattctcagaagtagaagggaattcaggaccttgagaaaatggttgaggacacaaaaatagatc
tctggtcatacaacgcggagcttcttgttgccctggagaaccaacatacaattgatctaactgactcaga
aatgaacaaactgtttgaaaaaacaagaagcaactgagggaaaatgctgaggatatgggcaatggtgtg
ttcaaaatataccacaaatgtgacaatgcctgcatgggatcaatcagaaatggaacttatgaccacaacg
tatacagggatgaagcattaaacaaccggttccagatcaaggaggttgagctgaagtacgggtacaaaga
ttggatcctatggatttcctttgccatatcatccctgtactgttagttgctttgttgggggttcacatg
tgggcctgccaaaagggaacattaggtgcaacatttgcatttga

Figure 16P**PDI-B Sing (PrI-) AA (SEQ ID NO:124)**

MAKNVAIFGLLFSLLVLPISQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSYFANLKG
TRTRGKLCPCDCLNCTDLVALGRPMC VGTPSAKASILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGY EK
IRLSTQNVIDAEKAPGGPYRLGTSGSCPNATSKIGFFATMAWAVPKDNYKNATNPQTVEVPYICTEGEDQ
ITVWGFHSDNKTQMSLYGDSNPQKFTSSANGVTTHYVSQIGDFPDQTEDGGLPQSGRI VVDYMQKPGK
TGTIVYQRGVLLPQKVWCASGRSKVIKGSPLIGEADCLHEEYGGLNKS KPYTGKHAKAIGNCPIWVKT
PLKLANGTKYRPPGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLS
GAMDELHNEILELDEKVDDL RADTISSQIELAVLLSNEGIINSEDEHLLALERKLLKMLGPSAVDIGNC
FETKHKCNQTCLDRIAAGTFNAGEFSLPTFDSL NITAASLNDDGLDNYQILAIYSTVASSLVLVSLGAI
SFWMCSNGSLQCRICI

Figure 16Q**PDI-B Sing-G138A (Pri-) DNA (SEQ ID NO:125)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcttcaaactcacctcatgtggtcaaaacagctactcaagggga
ggtcaatgtgactggcgtgataccactgacaacaacaccaaaaaatcttattttgcaaatctcaaagga
acaaggaccagaggggaaactatgcccgactgtctcaactgtacagatctggatgtggccttgggcaggc
caatgtgtgtggggaccacaccttctgctaaagcttcaatactccatgaggtcagacctgttacatccgg
gtgctttcctataatgcacgacagaacaaaaatcaggcaactacccaatcttctcagaggatatgaaaag
atcaggttatcaacccaaaacgttatcgtatgcagaaaaagcaccaggaggacctacagacttgccacct
caggatcttgccctaacgctaccagtaaaatcggattttttgcaacaatggcttgggctgtcccaaagga
caactacaaaaatgcaacgaacccacaaacagtgggaagtaccatacatttgtacagaaggggaagaccaa
attactgtttgggggttccattcggataacaaaacccaaatgaagagcctctatggagactcaaatcctc
aaaagttcacctcatctgctaattggagtaaccacgcattatgtttctcagattggcgacttccagatca
aacagaagacggaggactaccacaaagcggcagaattgttgttgattacatggtgcaaaaaacctgggaaa
acaggaacaattgtctatcaaaggggtgttttgttgctcaaaaaggtgtggtgcgcgagtggcaggagca
aagtaataaaaggggtcattgcctttaattgggtgaagcagattgccttcatgaagaatacgggtggattaa
caaaagcaagccttactacacaggaaaacatgcaaaagccataggaaattgcccaatatgggtaaaaaca
cctttgaagcttgccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggtt
ggcacggatacacatctcacggagcacatggagtggcagtgccggcagaccttaagagtacacaagaagc
tataaataagataacaaaaaatctcaattccttgagtgaactagaagtaagaaccttcaaagactaagt
ggtgccatggatgaactccacaacgaaatactcgagctggatgaaaaagtggtgatctcagagctgaca
ctataagctcacaatatagaacttgcagtccttgctttccaacgaaggaataataaacagtgaagacgagca
tctattggcacttgagagaaaaactaaagaaaatgctgggtccctctgctgtagacataggaaaaggatgc
ttcgaaccaaacaacaaaatgcaaccagacctgcttagacaggatagctgctggcacctttaatgcaggag
aattttctctccccacttttgattcattgaacattactgctgcatctttaaataatgatgatggattggataa
ctaccagattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctggggggaatc
agtttctggtgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16R**PDI-B Sing-G138A (Pri-) AA (SEQ ID NO:126)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSYFANLKG
TRTRGKLCPCDLNCTDLVALGRPMC VGTPSAKASILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGY EK
IRLSTQNVIDA EKAPGGPYRLATSGSCPNATSKIGFFATMAWAVPKDNYKNATNPQTVEVPYICTEGEDQ
ITVWGFHSDNKTQMKSLYGDSNPQKFTSSANGVTTHYVSQIGDFPDQTEDGGLPQSGRIVVDYMVQKPGK
TGTIVYQRGVLLPQKVWCASGRSKVIKGSPLIGEADCLHEEYGGLNKS KPYYTGKHAKAIGNCPIWVKT
PLKLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLS
GAMDELHNEILELDEKVDDL RADTISSQIELAVLLSNEGIINSEDEHLLALERKLLKMLGPSAVDIGNGC
FETKHKCNQTCLDRIAAGTFNAGEFSLPTFDSL NITAASLND DGLDNYQILAIYSTVASSLVLVSLGAI
SFWMCSNGLQCRICI

Figure 16S**PDI-B Sing-S140A (Prl-) DNA (SEQ ID NO:127)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcttcaaactcacctcatgtggtcaaaacagctactcaagggga
ggtcaatgtgactggcgtgataccactgacaacaacaccaaaaaatcttattttgcaaatctcaaagga
acaaggaccagaggggaaactatgcccgactgtctcaactgtacagatctggatgtggccttgggcaggc
caatgtgtgtggggaccacaccttctgctaaagcttcaatactccatgaggtcagacctgttacatccgg
gtgctttcctataatgcacgacagaacaaaaatcaggcaactacccaatcttctcagaggatatgaaaag
atcaggttatcaacccaaaacgttatcgaatgcagaaaaagcaccaggaggacctacagacttggaaccg
ccggatcttgccctaacgctaccagtaaaatcggattttttgcaacaatggcttgggctgtcccaaagga
caactacaaaaatgcaacgaacccacaaacagtgggaagtaccatacatttgtacagaaggggaagaccaa
attactgtttgggggttccattcggataacaaaacccaaatgaagagcctctatggagactcaaatcctc
aaaagttcacctcatctgctaattggagtaaccacgcattatgtttctcagattggcgacttccagatca
aacagaagacggaggactaccacaaagcggcagaattgttgttgattacatggtgcaaaaaacctgggaaa
acaggaacaattgtctatcaaaggggtgttttgttgctcaaaaaggtgtggtgcgcgagtggcaggagca
aagtaataaaaggggtcattgcctttaattgggtgaagcagattgccttcatgaagaatacgggtggattaa
caaaagcaagccttactacacaggaaaacatgcaaaagccataggaaattgcccaatatgggtaaaaaca
cctttgaagcttgccaatggaaccaaataatagacctcctgggtggaggatgggaaggaatgattgcaggtt
ggcacggatacacatctcacggagcacatggagtggcagtgccggcagaccttaagagtacacaagaagc
tataaataagataacaaaaaatctcaattccttgagtgaactagaagtaagaaccttcaaagactaagt
ggtgccatggatgaactccacaacgaaatactcgagctggatgaaaaagtggtgatctcagagctgaca
ctataagctcacaatatagaacttgcagtccttgctttccaacgaaggaataataaacagtgaagacgagca
tctattggcacttgagagaaaaactaaagaaaatgctgggtccctctgctgtagacataggaaaaggatgc
ttcgaaccaaacaacaaaatgcaaccagacctgcttagacaggatagctgctggcacctttaatgcaggag
aatcttctctccccacttttgattcattgaacattactgctgcatctttaaataatgatgatggattggataa
ctaccagattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctggggggaatc
agtttctggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16T**PDI-B Sing-S140A (Prl-) AA (SEQ ID NO:128)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSYFANLKG
TRTRGKLCPCDLNCTDLVALGRPMC VGTPSAKASILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGY EK
IRLSTQNVIDA EKAPGGPYRLGTAGSCPNATSKIGFFATMAWAVPKDNYKNATNPQTVEVPYICTEGEDQ
ITVWGFHSDNKTQMKSLYGDSNPQKFTSSANGVTTHYVSQIGDFPDQTEDGGLPQSGRIVVDYMVQKPGK
TGTIVYQRGVLLPQKVWCASGRSKVIKGSPLIGEADCLHEEYGGLNKS KPYTGHAKAIGNCPIWVK T
PLKLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLS
GAMDELHNEILELDEKVDDL RADTISSQIELAVLLSNEGIINSEDEHLLALERK LKMLGPSAVDIGNC
FETKHKCNQTCLDRIAAGTFNAGEFSLPTFDSL NITAASLND DGLDNYQILAIYSTVASSLVLVSLGAI
SFWMCSNGLQCRICI

Figure 16U**PDI-B Sing-S142A (Prl-) DNA (SEQ ID NO:129)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcttcaaactcacctcatgtggtcaaaacagctactcaagggga
ggtcaatgtgactggcgtgataccactgacaacaacaccaaaaaatcttattttgcaaatctcaaagga
acaaggaccagaggggaaactatgcccggactgtctcaactgtacagatctggatgtggccttgggcaggc
caatgtgtgtggggaccacaccttctgctaaagcttcaatactccatgaggtcagacctgttacatccgg
gtgctttcctataatgcacgacagaacaaaaatcaggcaactacccaatcttctcagaggatatgaaaag
atcaggttatcaacccaaaacgttatcgtatgcagaaaaagcaccaggaggacctacagacttggaacct
caggagcctgcctaacgtaccagtaaaatcggaattttttgcaacaatggcttgggctgtcccaaagga
caactacaaaaatgcaacgaacccacaaacagtgggaagtaccatacatttgtacagaaggggaagaccaa
attactgtttgggggttcattcggataacaaaacccaaatgaagagcctctatggagactcaaatcctc
aaaagttcacctcatctgctaattggagtaaccacgcattatgtttctcagattggcgacttccagatca
aacagaagacggaggactaccacaaagcggcagaattgttgttgattacatggtgcaaaaaacctgggaaa
acaggaacaattgtctatcaaaggggtgttttgttgctcaaaaaggtgtggtgcgcgagtggcaggagca
aagtaataaaaggggtcattgcctttaattgggtgaagcagattgccttcatgaagaatacgggtggattaa
caaaagcaagccttactacacaggaaaacatgcaaaagccataggaaattgcccaatatgggtaaaaaca
cctttgaagcttgccaatggaaccaaataatagacctcctgggtggaggatgggaaggaatgattgcaggtt
ggcacggatacacatctcacggagcacatggagtggcagtgccggcagaccttaagagtacacaagaagc
tataaataagataacaaaaaatctcaattccttgagtgaactagaagtaagaaccttcaaagactaagt
ggtgccatggatgaactccacaacgaaatactcgagctggatgaaaaagtggtgatctcagagctgaca
ctataagctcacaatatagaacttgcagtccttgctttccaacgaaggaataataaacagtgaagacgagca
tctattggcacttgagagaaaaactaaagaaaatgctgggtccctctgctgtagacataggaaaaggatgc
ttcgaaaccaaacacaaatgcaaccagacctgcttagacaggatagctgctggcacctttaatgcaggag
aatcttctctccccacttttgattcattgaacattactgctgcatctttaaataatgatgatggattggataa
ctaccagattttggcgatctattcaactgtcgccagttcattggtactggtagtctccttggggggaatc
agtttctggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16V**PDI-B Sing-S142A (Prl-) AA (SEQ ID NO:130)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSYFANLKG
TRTRGKLCPCDLNCTDLVALGRPMC VGTPSAKASILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGY EK
IRLSTQNVIDA EKAPGGPYRLGTSGACPNATSKIGFFATMAWAVPKDNYKNATNPQTVEVPYICTEGEDQ
ITVWGFHSDNKTQMKSLYGDSNPQKFTSSANGVTTHYVSQIGDFPDQTEDGGLPQSGRIVVDYMVQKPGK
TGTIVYQRGVLLPQKVWCASGRSKVIKGSPLIGEADCLHEEYGGLNKS KPYTGGKHA KAIGNCPIWVKT
PLKLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLS
GAMDELHNEILELDEKVDDL RADTISSQIELAVLLSNEGIINSEDEHLLALERK LKMLGPSAVDIGNGC
FETKHKCNQTCLDRIAAGTFNAGEFSLPTFDSL NITAASLND DGLDNYQILAIYSTVASSLVLVSLGAI
SFWMCSNGLQCRICI

Figure 16W**PDI-B Sing-D195G (Pri-) DNA (SEQ ID NO:131)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcttcaaactcacctcatgtggtcaaaacagctactcaagggga
ggtcaatgtgactggcgtgataccactgacaacaacaccaaaaaatcttattttgcaaatctcaaagga
acaaggaccagaggggaaactatgcccggactgtctcaactgtacagatctggatgtggccttgggcaggc
caatgtgtgtggggaccacaccttctgctaaagcttcaatactccatgaggtcagacctgttacatccgg
gtgctttcctataatgcacgacagaacaaaaatcaggcaactacccaatcttctcagaggatatgaaaag
atcaggttatcaacccaaaacgttatcgtatgcagaaaaagcaccaggaggacctacagacttggaacct
caggatcttgccctaacgctaccagtaaaatcggattttttgcaacaatggcttgggctgtcccaaagga
caactacaaaaatgcaacgaacccacaaacagtgggaagtaccatacatttgtacagaaggggaagaccaa
attactgtttgggggttcattcgggcaacaaaacccaaatgaagagcctctatggagactcaaatcctc
aaaagttcacctcatctgctaattggagtaaccacgcattatgtttctcagattggcgacttccagatca
aacagaagacggaggactaccacaaagcggcagaattgttgttgattacatggtgcaaaaaacctgggaaa
acaggaacaattgtctatcaaaggggtgttttgttgctcaaaaaggtgtggtgcgcgagtggcaggagca
aagtaataaaaggggtcattgcctttaattgggtgaagcagattgccttcatgaagaatacgggtggattaa
caaaagcaagccttactacacaggaaaacatgcaaaagccataggaaaattgcccaatatgggtaaaaaca
cctttgaagcttgccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggtt
ggcacggatacacatctcacggagcacatggagtggcagtgccggcagaccttaagagtacacaagaagc
tataaataagataacaaaaaatctcaattccttgagtgaactagaagtaagaaccttcaaagactaagt
ggtgccatggatgaactccacaacgaaatactcgagctggatgaaaaagtggtgatctcagagctgaca
ctataagctcacaatatagaacttgacgtcttgctttccaacgaaggaataataaacagtgaagacgagca
tctattggcacttgagagaaaaactaaagaaaatgctgggtccctctgctgtagacataggaaaaggatgc
ttcgaaccaaacaacaaaatgcaaccagacctgcttagacaggatagctgctggcacctttaatgcaggag
aattttctctccccacttttgattcattgaacattactgctgcatctttaaataatgatgatggattggataa
ctaccagattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctggggggcaatc
agtttctggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16X**PDI-B Sing-D195G (Pri-) AA (SEQ ID NO:132)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSYFANLKG
TRTRGKLCPCDLNCTDLVALGRPMC VGTPSAKASILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGY EK
IRLSTQNVIDA EKAPGGPYRLGTSGSCPNATSKIGFFATMAWAVPKDNYKNATNPQTVEVPYICTEGEDQ
ITVWGFHSGNKTQMKSLYGDSNPQKFTSSANGVTTHYVSQIGDFPDQTEDGGLPQSGRIVVDYMVQKPGK
TGTIVYQRGVLLPQKVWCASGRSKVIKGSPLIGEADCLHEEYGGLNKS KPYYTGKHAKAIGNCPIWVK T
PLKLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLS
GAMDELHNEILELDEKVDDL RADTISSQIELAVLLSNEGIINSEDEHLLALERKLLKMLGPSAVDIGNGC
FETKHKCNQTCLDRIAAGTFNAGEFSLPTFDSL NITAASLND DGLDNYQILAIYSTVASSLVLVSLGAI
SFWMCSNGLQCRICI

Figure 16Y**PDI-B Sing-L203A (Pri-) DNA (SEQ ID NO:133)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcttcaaactcacctcatgtggtcaaaacagctactcaagggga
ggtcaatgtgactggcgtgataccactgacaacaacaccaaaaaatcttattttgcaaatctcaaagga
acaaggaccagaggggaaactatgcccgactgtctcaactgtacagatctggatgtggccttgggcaggc
caatgtgtgtggggaccacaccttctgctaaagcttcaatactccatgaggtcagacctgttacatccgg
gtgctttcctataatgcacgacagaacaaaaatcaggcaactacccaatcttctcagaggatatgaaaag
atcaggttatcaacccaaaacgttatcgatgcagaaaaagcaccaggaggacctacagacttggaacct
caggatcttgccctaacgctaccagtaaaatcgattttttgcaacaatggcttgggctgtcccaaagga
caactacaaaaatgcaacgaacccacaaacagtgggaagtaccatacatttgtacagaaggggaagaccaa
attactgtttgggggttccattcggataacaaaacccaaatgaagagcgcctatggagactcaaatcctc
aaaagttcacctcatctgctaattggagtaaccacgcattatgtttctcagattggcgacttccagatca
aacagaagacggaggactaccacaaagcggcagaattgttgttgattacatggtgcaaaaaacctgggaaa
acaggaacaattgtctatcaaaggggtgttttgttgctcaaaaaggtgtggtgcgcgagtggcaggagca
aagtaataaaaggggtcattgcctttaattgggtgaagcagattgccttcatgaagaatacgggtggattaa
caaaagcaagccttactacacaggaaaacatgcaaaagccataggaaaattgcccaatatgggtaaaaaca
cctttgaagcttgccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggtt
ggcacggatacacatctcacggagcacatggagtggcagtgccggcagaccttaagagtacacaagaagc
tataaataagataacaaaaaatctcaattccttgagtgaactagaagtaagaaccttcaaagactaagt
ggtgccatggatgaactccacaacgaaatactcgagctggatgaaaaagtggtgatctcagagctgaca
ctataagctcacaatatagaacttgcagtccttgctttccaacgaaggaataataaacagtgaagacgagca
tctattggcacttgagagaaaaactaaagaaaatgctgggtccctctgctgtagacataggaaaaggatgc
ttcgaaaccaaacacaaatgcaaccagacctgcttagacaggatagctgctggcacctttaatgcaggag
aatcttctctccccacttttgattcattgaacattactgctgcatctttaaataatgatgatggattggataa
ctaccagattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctggggggaatc
agtttctggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16Z**PDI-B Sing-L203A (Pri-) AA (SEQ ID NO:134)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSYFANLKG
TRTRGKLCPCDLNCTDLVALGRPMC VGTPSAKASILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGY EK
IRLSTQNVIDA EKAPGGPYRLGTSGSCPNATSKIGFFATMAWAVPKDNYKNATNPQTVEVPYICTEGEDQ
ITVWGFHSDNKTQMK SAYGDSNPQKFTSSANGVTTHYVSQIGDFPDQTEDGGLPQSGRIVVDYMVQKPGK
TGTIVYQRGVLLPQKVWCASGRSKVIKGSPLIGEADCLHEEYGG LNKSKPYT GKHAKAIGNCPIWVK T
PLKLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLS
GAMDELHNEILELDEKVDDL RADTISSQIELAVLLSNEGIINSEDEHLLALERK LKMLGPSAVDIGNC
FETKHKCNQTCLDRIAAGTFNAGEFSLPTFDSL NITAASLND DGLDNYQILAIYSTVASSLVLVSLGAI
SFWMCSNGLQCRICI

Figure 16AA**PDI-B Sing-L203W (Pri-) DNA (SEQ ID NO:135)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcttcaaactcacctcatgtggtcaaaacagctactcaagggga
ggtcaatgtgactggcgtgataccactgacaacaacaccaaaaaatcttattttgcaaatctcaaagga
acaaggaccagaggggaaactatgcccgactgtctcaactgtacagatctggatgtggccttgggcaggc
caatgtgtgtggggaccacaccttctgctaaagcttcaatactccatgaggtcagacctgttacatccgg
gtgctttcctataatgcacgacagaacaaaaatcaggcaactacccaatcttctcagaggatatgaaaag
atcaggttatcaacccaaaacggttatcgatgcagaaaaagcaccaggaggacctacagacttggaacct
caggatcttgccctaacgctaccagtaaaatcggttttttgcaacaatggcttgggctgtcccaaagga
caactacaaaaatgcaacgaacccacaaacagtgggaagtaccatacatttgtagagaaggggaagaccaa
attactgtttgggggttccattcggataacaaaacccaaatgaagagctggatggagactcaaatcctc
aaaagttcacctcatctgctaattggagtaaccacgcattatgtttctcagattggcgacttccagatca
aacagaagacggaggactaccacaaagcggcagaattgttgttgattacatggtgcaaaaaacctgggaaa
acaggaacaattgtctatcaaaggggtgttttgttgctcaaaaaggtgtggtgcgcgagtggcaggagca
aagtaataaaaggggtcattgcctttaattgggtgaagcagattgccttcatgaagaatacgggtggattaa
caaaagcaagccttactacacaggaaaacatgcaaaagccataggaaattgcccaatatgggtaaaaaca
cctttgaagcttgccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggtt
ggcacggatacacatctcacggagcacatggagtggcagtgccggcagaccttaagagtacacaagaagc
tataaataagataacaaaaaatctcaattccttgagtgaactagaagtaagaaccttcaaagactaagt
ggtgccatggatgaactccacaacgaaatactcgagctggatgaaaaagtggtgatctcagagctgaca
ctataagctcacaatatagaacttgacgtcttgccttccaacgaaggaataataaacagtgaagacgagca
tctattggcacttgagagaaaaactaaagaaaatgctgggtccctctgctgtagacataggaaaaggatgc
ttcgaaccaaacaacaaaatgcaaccagacctgcttagacaggatagctgctggcacctttaatgcaggag
aatcttctctccccacttttgattcattgaacattactgctgcatctttaaataatgatgatggattggataa
ctaccagattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctggggggaatc
agtttctggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16AB**PDI-B Sing-L203W (Pri-) AA (SEQ ID NO:136)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSYFANLKG
TRTRGKLCPCDLNCTDLVALGRPMC VGTPSAKASILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGY EK
IRLSTQNVIDA EKAPGGPYRLGTSGSCPNATSKIGFFATMAWAVPKDNYKNATNPQTVEVPYICTEGEDQ
ITVWGFHSDNKTQMKSWYGDSNPQKFTSSANGVTTHYVSQIGDFPDQTEDGGLPQSGRIVVDYMVQKPGK
TGTIVYQRGVLLPQKVWCASGRSKVIKGSPLIGEADCLHEEYGGLNKS KPYYTGKHAKAIGNCPIWVKT
PLKLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLS
GAMDELHNEILELDEKVDDL RADTISSQIELAVLLSNEGIINSEDEHLLALERKLLKMLGPSAVDIGNGC
FETKHKCNQTCLDRIAAGTFNAGEFSLPTFDSL NITAASLND DGLDNYQILAIYSTVASSLVLVSLGAI
SFWMCSNGLQCRICI

Figure 16AC**PDI-B Mary (PrI-) DNA (SEQ ID NO:137)**

atggcgaaaaacgttgcgattttcggcttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccggtgtaataccactgacaacaacacccaccaaactctcattttgcaaactctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgggcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaattagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagacgcaccaggaggacctacaaaattggaacct
caggggtcttgccctaactaccattacgaatggaacggattcttcgcaacaatggcttggggccgtcccagacaa
aaacaaaacagcaacaaatccattaacaatagaagtaccatacgtgtgtacagaaggagaagaccaaatt
accgttttgggggttccactctgacaacgagacccaaatggcaagctctatggggactcaaagccccaga
agttcacctcatctgccaacggagtaccacacattacgtttcacagattgggtggcttcccaaatcaaac
agaagacggaggactaccacaaagtggcagaattgttgttgattacatgggtgcaaaaatctggaaaaaca
ggaacaattacctatcaaagaggtattttattgcctcaaaaggtgtggtgctgcaagtggcaggagcaagg
taataaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaaacaa
aagcaagccttactacacaggggaacatgcaaggccataggaaattgcccaatatgggtgaaaaacaccc
ttgaagctggccaatggaaccaaataatagacctcctggtggaggatgggaagggaatgattgcaggttggc
acggatacacatcccattggggcacatggagtgcgtggcagcagaccttaagagcactcaagaggccat
aaacaagataacaaaaaatctcaactctttgagtgcgtgggaagtaagaatcttcaaagactaagcgggt
gccatggatgaactccacaacgaaatactagaactagatgagaaagtggatgatctcagagctgatacaa
taagctcacaaatagaactgcagtcctgctttccaatgaaggaataataaacagtggaagatgaacatct
cttggcgcttgaaagaaagctgaagaaaatgctggggccctctgctgtagagatagggaatggatgcttt
gaaaccaaacacaagtgaaccagacctgtctcgacaagatagctgctggtacctttgatgcaggagaat
tttctctccccacctttgattcactgaatattactgctgcacatctttaaatacagatggattggataatta
ccagattttggcgatctattcaactgtcgccagttcattggtagtctccctggggggcaatcagt
ttctggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16AD**PDI-B Mary (PrI-) AA (SEQ ID NO:138)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGVIPLTTTPTKSHFANLKG
TETRGKLCPKCLNCTDLVALGRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGGPYKIGTSGSCPNIITNGNGFFATMAWAVPDKNKTATNPLTIEVPYVCTEGEDQI
TVWGFHSDNETQMAKLYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKT
GTITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKSHPYYTGEHAKAIGNCPIWVKTP
LKLANTKYRPPGGGWEGMIAGWHGYTSHGAHVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLSG
AMDELHNEILELDEKVDDLADTISSQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVEIGNGCF
ETKHKCNQTCLDKIAAGTFDAGEFSLPTFDSLNTAASLNDDGLDNYQILAIYSTVASSLVLVVSLGAIS
FWMCSNGLQCRICI

Figure 16AE**IF-B-Bris(nat).c**

tctcagatcttcgcggatcgaatctgcactgggataacatcgtaaaactc

Figure 16AF**PDI-B Mary-G138A (Pri-) DNA (SEQ ID NO:140)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgctcaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgggcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaatttagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagacgcaccaggaggacctacaaaattgccacct
caggggtcttgccctaacattaccaatggaaacggattcttcgcaacaatggcttggggccgtcccagacaa
aaacaaaacagcaacaaatccattaacaatagaagtaccatacgtgtgtacagaaggagaagaccaaatt
accgtttgggggttccactctgacaacgagacccaaatggcaaagctctatggggactcaaagccccaga
agttcacctcatctgccaacggagtgaccacacattacgtttcacagattgggtggcttcccaaatcaaac
agaagacggaggactaccacaaagtggcagaattgttgttgattacatgggtgcaaaaatctggaaaaaca
ggaacaattacctatcaaagaggtattttattgcctcaaaaggtgtggtgcgcaagtggcaggagcaagg
taataaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaaacaa
aagcaagccttactacacaggggaacatgcaaaggccataggaaattgcccaatatgggtgaaaaacaccc
ttgaagctggccaatggaaccaaataatagacctcctggtggaggatgggaagggaatgattgcaggttggc
acggatacacatcccattggggcacatggagttagcgtggcagcagaccttaagagcactcaagaggccat
aaacaagataacaaaaaatctcaactctttgagttagctggaaagtaagaatcttcaaagactaagcgggt
gccatggatgaactccacaacgaaatactagaactagatgagaaaagtgatgatctcagagctgatacaa
taagctcacaaatagaactcgcagtcctgctttccaatgaaggaataataaacagtgaaagatgaacatct
cttggcgcttgaaagaaagctgaagaaaatgctggggccctctgctgtagagatagggaatggatgcttt
gaaaccaaacacaagtgaaccagacctgtctcgacaagatagctgctggtacctttgatgcaggagaat
tttctctccccacctttgattcactgaatattactgctgcatctttaaataacgatggattggataatta
ccagattttggcgatctattcaactgtcgccagttcattggtagtctccttgggggcaatcagt
ttctggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16AG**PDI-B Mary-G138A (Pri-) AA (SEQ ID NO:141)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSHFANLKG
TETRGKLCPKCLNCTDLVALGRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGGPYKIATSGSCPNI TNNGFFATMAWAVPDKNKTATNPLTIEVPYVCTEGEDQI
TVWGFHSDNETQMAKLYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKT
GTITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKS KPYTGEHAKAIGNCPIWVKTP
LKLANTKYRPPGGGWEGMIAGWHGYTSHGAHVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLSG
AMDELHNEILELDEKVDDLADTISSQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVEIGNGCF
ETKHKCNQTCLDKIAAGTFDAGEFSLPTFDSL NITAASLNDDGLDNYQILAIYSTVASSLVLVSVLGAIS
FWMCSNGLQCRICI

Figure 16AH**PDI-B Mary-S140A (PrI-) DNA (SEQ ID NO:142)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttggttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgctcaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgggcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaatttagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagacgcaccaggaggacctacaaaattggaaccg
ccgggtcttgccctaacattaccaatggaacggattcttcgcaacaatggcttggggccgtcccagacaa
aaacaaaacagcaacaaatccattaacaatagaagtaccatacgtgtgtacagaaggagaagaccaaatt
accgtttgggggttccactctgacaacgagacccaaatggcaagctctatggggactcaaagccccaga
agttcacctcatctgccaacggagtgaccacacattacgtttcacagattgggtggcttcccaaatcaaac
agaagacggaggactaccacaaagtggcagaattgttgttgattacatgggtgcaaaaatctggaaaaaca
ggaacaattacctatcaaagaggtattttattgcctcaaaaggtgtggtgcgcaagtggcaggagcaagg
taataaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaaacaa
aagcaagccttactacacaggggaacatgcaaggccataggaaattgcccaatatgggtgaaaaacaccc
ttgaagctggccaatggaaccaaataatagacctcctggtggaggatgggaagggaatgattgcaggttggc
acggatacacatcccattggggcacatggagtgcgtggcagcagaccttaagagcactcaagaggccat
aaacaagataacaaaaaatctcaactctttgagtgcgtgggaagtaagaatcttcaaagactaagcgggt
gccatggatgaactccacaacgaaatactagaactagatgagaaaagtggtgatctcagagctgatacaa
taagctcacaaatagaactgcagtcctgctttccaatgaaggaataataaacagtggaagatgaacatct
cttggcgcttgaaagaaagctgaagaaaatgctggggccctctgctgtagagatagggaatggatgcttt
gaaaccaaacacaagtgaaccagacctgtctcgacaagatagctgctggtacctttgatgcaggagaat
tttctctccccacctttgattcactgaatattactgctgcacatctttaaataacgatggattggataatta
ccagattttggcgatctattcaactgtcgccagttcattggtagtctccctggggggcaatcagt
ttctggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16AI**PDI-B Mary-S140A (PrI-) AA (SEQ ID NO:143)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSHFANLKG
TETRGKLCPKCLNCTDLVALGRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGGPYKIGTAGSCPNITNGNGFFATMAWAVPDKNKTATNPLTIEVPYVCTEGEDQI
TVWGFHSDNETQMAKLYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKT
GTITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKSXPYYTGEHAKAIGNCPIWVKTP
LKLANTKYRPPGGGWEGMIAGWHGYTSHGAHVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLSG
AMDELHNEILELDEKVDDLADTISSQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVEIGNGCF
ETKHKCNQTCCLKIAAGTFDAGEFSLPTFDSLNITAASLNDDGLDNYQILAIYSTVASSLVLVSVLGAIS
FWMCSNGLQCRICI

Figure 16AJ**PDI-B Mary-S142A (PrI-) DNA (SEQ ID NO:144)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttggttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgctcaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgggcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaatttagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagacgcaccaggaggacctacaaaattggaacct
caggggcctgcctaactaccattaccaaagcgaatctctcgcaacaatggcttggggccgtcccagacaa
aaacaaaacagcaacaatccattaacaatagaagtaccatacgtgtgtacagaaggagaagaccaaatt
accgtttgggggttccactctgacaacgagacccaaatggcaaagctctatggggactcaaagccccaga
agttcacctcatctgccaacggagtaccacacattacgtttcacagattgggtggcttcccaaatcaaac
agaagacggaggactaccacaaagtggcagaattgttgttgattacatgggtgcaaaaatctggaaaaaca
ggaacaattacctatcaaagaggtattttattgcctcaaaaggtgtggtgctgcaagtggcaggagcaagg
taataaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaaaca
aagcaagccttactacacaggggaacatgcaaaggccataggaaattgcccaatatgggtgaaaaacccc
ttgaagctggccaatggaaccaaataatagacctcctggtggaggatgggaagggaatgattgcaggttggc
acggatacacatcccattggggcacatggagtgcgtggcagcagaccttaagagcactcaagaggccat
aaacaagataacaaaaaatctcaactctttgagtgcgtgggaagtaagaatcttcaaagactaagcgggt
gccatggatgaactccacaacgaaatactagaactagatgagaaagtggatgatctcagagctgatacaa
taagctcacaaatagaactgcagtcctgctttccaatgaaggaataataaacagtgaaagatgaacatct
cttggcgcttgaaagaaagctgaagaaaatgctggggccctctgctgtagagatagggaatggatgcttt
gaaaccaaacacaagtgaaccagacctgtctcgacaagatagctgctggtacctttgatgcaggagaat
tttctctccccacctttgattcactgaatattactgctgcacatctttaaatacagatggattggataatta
ccagattttggcgatctattcaactgtcgccagttcattggtagtctccttggggggcaatcagt
ttctggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16AK**PDI-B Mary-S142A (PrI-) AA (SEQ ID NO:145)**

MAKNVAIFGLLFSLLVLPVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGVIPLTTTPTKSHFANLKG
TETRGKLCPKCLNCTDLVALGRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGGPYKIGTSGACPNITNGNGFFATMAWAVPDKNKTATNPLTIEVPYVCTEGEDQI
TVWGFHSDNETQMAKLYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKT
GTITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKSHPYYTGEHAKAIGNCPIWVKTP
LKLANTKYRPPGGGWEGMIAGWHGYTSHGAHVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLSG
AMDELHNEILELDEKVDDLADTISSQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVEIGNGCF
ETKHKCNQTCCLKIAAGTFDAGEFSLPTFDSLNTAASLNDDGLDNYQILAIYSTVASSLVLVVSLGAIS
FWMCSNGLQCRICI

Figure 16AL**PDI-B Mary-D194G (Pri-) DNA (SEQ ID NO:146)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgctcaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgggcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaatttagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagacgcaccaggaggacctacaaaattggaacct
cagggctcttgccctaactaccattaccaaaggaacggattcttcgcaacaatggcttggggccgtcccagacaa
aaacaaaacagcaacaaatccattaacaatagaagtaccatacgtgtgtacagaaggagaagaccaaatt
accgtttgggggttccactctggcaacgagacccaaatggcaagctctatggggactcaaagccccaga
agttcacctcatctgccaacggagtgaccacacattacgtttcacagattgggtggcttcccaaatcaaac
agaagacggaggactaccacaaagtggcagaattgttgttgattacatgggtgcaaaaatctggaaaaaca
ggaacaattacctatcaaagaggtattttattgcctcaaaaggtgtggtgctgcaagtggcaggagcaagg
taataaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaaacaa
aagcaagccttactacacaggggaacatgcaaggccataggaaattgcccaatatgggtgaaaaacaccc
ttgaagctggccaatggaaccaaataatagacctcctgggtggaggatgggaagggaatgattgcaggttggc
acggatacacatcccattggggcacatggagtgcgtggcagcagaccttaagagcactcaagaggccat
aaacaagataacaaaaaatctcaactctttgagtgcgtgggaagtaagaatcttcaaagactaagcgggt
gccatggatgaactccacaacgaaatactagaactagatgagaaaagtggtgatctcagagctgatacaa
taagctcacaaatagaactgcagtcctgctttccaatgaaggaataataaacagtggaagatgaacatct
cttggcgcttgaaagaaagctgaagaaaatgctggggccctctgctgtagagatagggaatggatgcttt
gaaaccaaacacaagtgaaccagacctgtctcgacaagatagctgctggtacctttgatgcaggagaat
tttctctccccacctttgattcactgaatattactgctgcacatctttaaatacagatggattggataatta
ccagattttggcgatctattcaactgtcgccagttcattggtagtctccttgggggcaatcagt
ttctggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16AM**PDI-B Mary-D194G (Pri-) AA (SEQ ID NO:147)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSHFANLKG
TETRGKLCPKCLNCTDLVALGRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGGPYKIGTSGSCPNITNGNGFFATMAWAVPDKNKTATNPLTIEVPYVCTEGEDQI
TVWGFHSGNETQMAKLYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKT
GTITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKSHPYYTGEHAKAIGNCPIWVKTP
LKLANGTKYRPPGGGWEGMIAGWHGYTSHGAHVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLSG
AMDELHNEILELDEKVDDLADTISSQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVEIGNGCF
ETKHKCNQTCCLKIAAGTFDAGEFSLPTFDSLNITAASLNDDGLDNYQILAIYSTVASSLVLVVSLGAIS
FWMCSNGLQCRICI

Figure 16AN**PDI-B Mary-L202A (PrI-) DNA (SEQ ID NO:148)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgggcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaatttagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagacgcaccaggaggacctacaaaattggaacct
caggggtcttgccctaactaccattaccaaaggaacggattcttcgcaacaatggcttggggccgtcccagacaa
aaacaaaacagcaacaaatccattaacaatagaagtaccatacgtgtgtacagaaggagaagaccaatt
accgttttgggggttccactctgacaacgagaccctaaatggcaaggcctatggggactcaaagccccaga
agttcacctcatctgccaacggagtaccacacattacgtttcacagattgggtggcttcccaaatcaaac
agaagacggaggactaccacaaagtggcagaattgttgttgattacatgggtgcaaaaatctggaaaaaca
ggaacaattacctatcaaagaggtattttattgcctcaaaagggtgtggtgcgcaagtggcaggagcaagg
taataaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaaacaa
aagcaagccttactacacaggggaacatgcaaggccataggaaattgcccaatatgggtgaaaaacaccc
ttgaagctggccaatggaaccaaataatagacctcctggtggaggatgggaagggaatgattgcaggttggc
acggatacacatcccattggggcacatggagttagcgtggcagcagaccttaagagcactcaagaggccat
aaacaagataacaaaaaatctcaactctttgagttagctgggaagtaagaatcttcaaagactaagcgggt
gccatggatgaactccacaacgaaatactagaactagatgagaaaaggatgatctcagagctgatacaa
taagctcacaaatagaactcgagtcctgctttccaatgaaggaataataaacagtgaaagatgaacatct
cttggcgcttgaaagaaagctgaagaaaatgctggggccctctgctgtagagatagggaatggatgcttt
gaaaccaaacacaagtgaaccagacctgtctcgacaagatagctgctggtacctttgatgcaggagaat
tttctctccccacctttgattcactgaatattactgctgcatctttaaataacgatggattggataatta
ccagattttggcgatctattcaactgtcgccagttcattggtagtctccctggggggcaatcagt
ttctggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16AO**PDI-B Mary-L202A (PrI-) AA (SEQ ID NO:149)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSHFANLKG
TETRGKLCPKCLNCTDLVALGRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGGPYKIGTSGSCPNI TNNGFFATMAWAVPDKNKTATNPLTIEVPYVCTEGEDQI
TVWGFHSDNETQMAKAYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKT
GTITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKS KPYTGEHAKAIGNCPIWVKTP
LKLANGTKYRPPGGGWEGMIAGWHGYTSHGAHVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLSG
AMDELHNEILELDEKVDDLADTISSQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVEIGNGCF
ETKHKCNQTCLDKIAAGTFDAGEFSLPTFDSL NITAASLNDDGLDNYQILAIYSTVASSLVLVVSLGAIS
FWMCSNGLQCRICI

Figure 16AP**PDI-B Mary-L202W (Pri-) DNA (SEQ ID NO:150)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactcatttttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgggcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaatttagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagacgcaccaggaggacctacaaaattggaacct
caggggtcttgccctaactaccattaccaaagcgaatctctcgcaacaatggcttggggccgtcccagacaa
aaacaaaacagcaacaaatccattaacaatagaagtaccatacgtgtgtacagaaggagaagaccaaatt
accgttttgggggttccactctgacaacgagacccaaatggcaaagtggatggggactcaaagccccaga
agttcacctcatctgccaacggagtgaccacacattacgtttcacagattgggtggcttcccaaatcaaac
agaagacggaggactaccacaaagtggcagaattgttgttgattacatgggtgcaaaaatctggaaaaaca
ggaacaattacctatcaaagaggtattttattgcctcaaaaggtgtggtgcgcaagtggcaggagcaagg
taataaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaaacaa
aagcaagccttactacacaggggaacatgcaaaggccataggaaattgcccaatatgggtgaaaaacccc
ttgaagctggccaatggaaccaaataatagacctcctggtggaggatgggaagggaatgattgcaggttggc
acggatacacatcccattggggcacatggagttagcgtggcagcagaccttaagagcactcaagaggccat
aaacaagataacaaaaaatctcaactctttgagttagctggaaagtaagaatcttcaaagactaagcgggt
gccatggatgaactccacaacgaaatactagaactagatgagaaaagtgatgatctcagagctgatacaa
taagctcacaaatagaactcgagtcctgctttccaatgaaggaataataaacagtgaaagatgaacatct
cttggcgcttgaaagaaagctgaagaaaatgctggggccctctgctgtagagatagggaatggatgcttt
gaaaccaaacacaagtgaaccagacctgtctcgacaagatagctgctggtacctttgatgcaggagaat
tttctctccccacctttgattcactgaatattactgctgcatctttaaataacgatggattggataatta
ccagattttggcgatctattcaactgtcgccagttcattggtagtctccctggggggcaatcagt
ttctggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16AQ**PDI-B Mary-L202W (Pri-) AA (SEQ ID NO:151)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSHFANLKG
TETRGKLCPKCLNCTDLVALGRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGGPYKIGTSGSCPNITNGNGFFATMAWAVPDKNKTATNPLTIEVPYVCTEGEDQI
TVWGFHSDNETQMAKWYGDSPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKT
GTITYQRGILLPQKVWCASGRSKVIKGSPLIGLADCLHEKYGGLNKSHPYYTGEHAKAIGNCPIWVKTP
LKLANTKYRPPGGGWEGMIAGWHGYTSHGAHVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLSG
AMDELHNEILELDEKVDDLADTISSQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVEIGNGCF
ETKHKCNQTCLDKIAAGTFDAGEFSLPTFDSL NITAAASLNDDGLDNYQILAIYSTVASSLVLVVSLGAIS
FWMCSNGLQCRICI

Figure 16AR**PDI-B Wash (Pri-) DNA (SEQ ID NO:152)**

atggcgaaaaacggttgcgattttcggcttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccagggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgggcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaattagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacggttatcaatgcagaagatgcaccaggaagacctacgagattggaacct
cagggctcttgccctaacattaccaatggaacggattcttcgcaacaatggcttggggccgtcccaaaaa
caaacagcaacaaatccattaacaatagaagtaccatacatttgtacagaaggagaagaccaaattacc
gtttgggggttccactctgacaacgagacccaaatggcaaagctctatggggactcaaagcccagaagt
tcacctcatctgccaacggagtgaccacacattacgtttcacagattggtggcttcccaaatcaaacaga
agacggaggactaccacaaagtggcagaattgttgttgattacatggtgcaaaaatctggaaaaacagga
acaattacctatcaaagaggtattttattgcctcaaaaggtgtggtgcgcaagtggcaggagcaaggtaa
taaaaggatccttgcccttaattggagaagcagattgcctccatgaaaaatacgggtggattaacaaaaag
caagccttactacacaggggaacatgcaaaggccataggaaattgcccaatatgggtgaaaacacccttg
aagctggccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggttggcacg
gatacacatcccatggggcacatggagttagcgtggcagcagaccttaagagcactcaagaggccataaa
caagataacaaaaaatctcaactctttgagttagctggaagtaagaatcttcaaagactaagcgggtgcc
atggatgaactccacaacgaaatactagaactagatgagaaagtggatgatctcagagctgatacaataa
gctcacaatatagaactcgcagtcctgctttccaatgaaggaataataaacagtgaagatgaacatctctt
ggcgcttgaaagaaagctgaagaaaatgctgggcccctctgctgtagagatagggaatggatgctttgaa
accaaacacaagtgaaccagacctgtctcgacagaatagctgctggtacctttgatgcaggagaatttt
ctctccccacctttgattcactgaatattactgctgcatctttaaatgacgatggattggataattacca
gattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctgggggcaatcagtttc
tggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16AS**PDI-B Wash (Pri-) AA (SEQ ID NO:153)**

MAKNVAIFGLLFSLLVLPVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGVIPLTTTPTKSHFANLKG
TETRGLKCPKCLNCTDLVALGRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGRPYEIGTSGSCPNI TNNGFFATMAWAVPKNKTATNPLTIEVPYICTEGEDQIT
VWGFHSDNETQMAKLYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKTG
TITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKS KPYTGEHAKAIGNCPIWVKTPL
KLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGA
MDELHNEILELDEKVDDLADTISQIELAVLLSNEGIINSEDEHLLALERKLLKMLGPSAVEIGNGCFE
TKHKCNQTCLDRIAAGTFDAGEFSLPTFDSL NITAASLNDGLDNYQILAIYSTVASSLVLVSLGAISF
WMCSNGSLQCRICI

Figure 16AT**PDI-B Wash-G138A (Pri-) DNA (SEQ ID NO:154)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgggcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaattagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagatgcaccaggaagacctacgagattgccacct
cagggctcttgccctaactaccattacgaatggaacggattcttcgcaacaatggcttggggccgtcccaaaaa
caaacagcaacaaatccattaacaatagaagtaccatacatttgtacagaaggagaagaccaaattacc
gtttgggggttccactctgacaacgagacccaaatggcaaagctctatggggactcaaagcccagaagt
tcacctcatctgccaacggagtgaccacacattacgtttcacagattggtggcttcccaaatcaaacaga
agacggaggactaccacaaagtggcagaattgttgttgattacatggtgcaaaaatctggaaaaacagga
acaattacctatcaaagaggtattttattgcctcaaaaggtgtggtgcgcaagtggcaggagcaaggtaa
taaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaacaaaaag
caagccttactacacaggggaacatgcaaaggccataggaaattgcccaatatgggtgaaaacacccttg
aagctggccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggttggcacg
gatacacatcccatggggcacatggagttagcgtggcagcagaccttaagagcactcaagaggccataaa
caagataacaaaaaatctcaactctttgagttagctggaagtaagaatcttcaaagactaagcgggtgcc
atggatgaactccacaacgaaatactagaactagatgagaaagtggatgatctcagagctgatacaataa
gctcacaatatagaactcgcagtcctgctttccaatgaaggaataataaacagtgaagatgaacatctctt
ggcgcttgaaagaaagctgaagaaaatgctgggcccctctgctgtagagatagggaaatggatgctttgaa
accaaacacaagtgaaccagacctgtctcgacagaatagctgctggtacctttgatgcaggagaatttt
ctctccccacctttgattcactgaatattactgctgcatctttaaatgacgatggattggataattacca
gattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctggggggaatcagtttc
tggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16AU**PDI-B Wash-G138A (Pri-) AA (SEQ ID NO:155)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSHFANLKG
TETRGKLCPKCLNCTDLVALGRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGRPYE IATSGSCPNI TNNGFFATMAWAVPKNKTATNPLTIEVPYICTEGEDQIT
VWGFHSDNETQMAKLYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKTG
TITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKS KPYYTGEHAKAIGNCPIWVKTPL
KLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGA
MDELHNEILELDEKVDDLADT ISSQIELAVLLSNEGI INSEDEHLLALERKLKMLGPSAVEIGNGCFE
TKHKCNQTCLDRIAAGTFDAGEFSLPTFDSL NITAASLND DGLDNYQILAIYSTVASSLVLVSLGAISF
WMCSNGLQCRICI

Figure 16AV**PDI-B Wash-S140A (Pri-) DNA (SEQ ID NO:156)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgggcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaattagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagatgcaccaggaagacctacgagattggaaccg
ccgggtcttgccctaacattaccaatggaacggattcttcgcaacaatggcttggggccgtcccaaaaaa
caaacagcaacaaatccattaacaatagaagtaccatacatttgtacagaaggagaagaccaaattacc
gtttgggggttccactctgacaacgagacccaaatggcaaagctctatggggactcaaagcccagaagt
tcacctcatctgccaacggagtgaccacacattacgtttcacagattggtggcttcccaaatcaaacaga
agacggaggactaccacaaagtggcagaattgttgttgattacatggtgcaaaaatctggaaaaacagga
acaattacctatcaaagaggtattttattgcctcaaaaggtgtggtgcgcaagtggcaggagcaaggtaa
taaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaacaaaaag
caagccttactacacaggggaacatgcaaaggccataggaaattgcccaatatgggtgaaaacacccttg
aagctggccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggttggcacg
gatacacatcccatggggcacatggagttagcgtggcagcagaccttaagagcactcaagaggccataaa
caagataacaaaaaatctcaactctttgagttagctggaagtaagaatcttcaaagactaagcgggtgcc
atggatgaactccacaacgaaatactagaactagatgagaaagtggatgatctcagagctgatacaataa
gctcacaatatagaactcgcagtcctgctttccaatgaaggaataataaacagtgaagatgaacatctctt
ggcgcttgaaagaaagctgaagaaaatgctggggccctctgctgtagagatagggaaatggatgctttgaa
accaaacacaagtgaaccagacctgtctcgacagaatagctgctggtacctttgatgcaggagaatttt
ctctccccacctttgattcactgaatattactgctgcatctttaaatgacgatggattggataattacca
gattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctggggggaatcagtttc
tggtatgtgctctaattgggtctctacagtgtagaatatgtattttaa

Figure 16AW**PDI-B Wash-S140A (Pri-) AA (SEQ ID NO:157)**

MAKNVAIFGLLFSLLVLPVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSHFANLKG
TETRGKLCPKCLNCTDLVALGRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGRPYEIGTAGSCPNI TNNGFFATMAWAVPKNKTATNPLTIEVPYICTEGEDQIT
VWGFHSDNETQMAKLYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKTG
TITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKS KPYYTGEHAKAIGNCPIWVKTPL
KLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGA
MDELHNEILELDEKVDDLADTISQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVEIGNGC FE
TKHKCNQTCLDRIAAGTFDAGEFSLPTFDSL NITAASLND DGLDNYQILAIYSTVASSLVLVSLGAISF
WMCSNGSLQCRICI

Figure 16AX**PDI-B Wash-S142A (Pri-) DNA (SEQ ID NO:158)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactcatttttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgggcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaattagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagatgcaccaggaagacctacgagattggaacct
caggggcctgcctaactaccattacgaatggaacggattcttcgcaacaatggcttggggccgtcccaaaaa
caaacagcaacaaatccattaacaatagaagtaccatacatttgtacagaaggagaagaccaaattacc
gtttgggggttccactctgacaacgagacccaaatggcaaagctctatggggactcaaagcccagaagt
tcacctcatctgccaacggagtgaccacacattacgtttcacagattggtggcttcccaaatcaaacaga
agacggaggactaccacaaagtggcagaattgttgttgattacatggtgcaaaaatctggaaaaacagga
acaattacctatcaaagaggtattttattgcctcaaaaggtgtggtgcgcaagtggcaggagcaaggtaa
taaaaggatccttgcctttaattggagaagcagattgcctccatgaaaaatacgggtggattaacaaaaag
caagccttactacacaggggaacatgcaaaggccataggaaattgcccaatatgggtgaaaacacccttg
aagctggccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggttggcacg
gatacacatcccatggggcacatggagttagcgtggcagcagaccttaagagcactcaagaggccataaa
caagataacaaaaaatctcaactctttgagttagctggaagtaagaatcttcaaagactaagcggtgcc
atggatgaactccacaacgaaatactagaactagatgagaaagtggatgatctcagagctgatacaataa
gctcacaatatagaactcgcagtcctgctttccaatgaaggaataataaacagtgaagatgaacatctctt
ggcgcttgaaagaaagctgaagaaaatgctggggccctctgctgtagagatagggaaatggatgctttgaa
accaaacacaagtgaaccagacctgtctcgacagaatagctgctggtacctttgatgcaggagaatttt
ctctccccacctttgattcactgaatattactgctgcatctttaaatgacgatggattggataattacca
gattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctggggggaatcagtttc
tggatgtgctctaattgggtctctacagtgtagaatatgtattttaa

Figure 16AY**PDI-B Wash-S142A (Pri-) AA (SEQ ID NO:159)**

MAKNVAIFGLLFSLLVLPVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSHFANLKG
TETRGLKCPKCLNCTDLVALGRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGRPYEIGTSGACPNITNGNGFFATMAWAVPKNKTATNPLTIEVPYICTEGEDQIT
VWGFHSDNETQMAKLYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKTG
TITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKSHPYYTGEHAKAIGNCPIWVKTPL
KLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGA
MDELHNEILELDEKVDDLADTISQIELAVLLSNEGIINSEDEHLLALERKLLKMLGPSAVEIGNGCFE
TKHKCNQTCLDRIAAGTFDAGEFSLPTFDSLNTAASLNDGDLNYQILAIYSTVASSLVLVSLGAISF
WMCSNGSLQCRICI

Figure 16AZ**PDI-B Wash-D193G (Pri-) DNA (SEQ ID NO:160)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgggcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaattagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagatgcaccaggaagacctacgagattggaacct
cagggctcttgccctaactaccattacgaatggaacggattcttcgcaacaatggcttggggccgtcccaaaaa
caaacagcaacaaatccattaacaatagaagtaccatacatttgtacagaaggagaagaccaaattacc
gtttgggggttccactctggcaacgagacccaaatggcaaagctctatggggactcaaagcccagaagt
tcacctcatctgccaacggagtgaccacacattacgtttcacagattggtggcttcccaaatcaaacaga
agacggaggactaccacaaagtggcagaattgttgttgattacatggtgcaaaaatctggaaaaacagga
acaattacctatcaaagaggtattttattgcctcaaaaggtgtggtgcgcaagtggcaggagcaaggtaa
taaaaggatccttgcccttaattggagaagcagattgcctccatgaaaaatacgggtggattaacaaaaag
caagccttactacacaggggaacatgcaaaggccataggaaattgcccaatatgggtgaaaacacccttg
aagctggccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggttggcacg
gatacacatcccatggggcacatggagttagcgtggcagcagaccttaagagcactcaagaggccataaa
caagataacaaaaaatctcaactctttgagttagctggaagtaagaatcttcaaagactaagcgggtgcc
atggatgaactccacaacgaaatactagaactagatgagaaagtggatgatctcagagctgatacaataa
gctcacaatatagaactcgcagtcctgctttccaatgaaggaataataaacagtgaagatgaacatctctt
ggcgcttgaaagaaagctgaagaaaatgctgggcccctctgctgtagagatagggaatggatgctttgaa
accaaacacaagtgaaccagacctgtctcgacagaatagctgctggtacctttgatgcaggagaatttt
ctctccccacctttgattcactgaatattactgctgcatctttaaatgacgatggattggataattacca
gattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctggggggaatcagtttc
tggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16BA**PDI-B Wash-D193G (Pri-) AA (SEQ ID NO:161)**

MAKNVAIFGLLFSLLVLPVSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSHFANLKG
TETRGKLCPKCLNCTDLVALGRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGRPYEIGTSGSCPNI TNNGFFATMAWAVPKNKTATNPLTIEVPYICTEGEDQIT
VWGFHSGNETQMAKLYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKTG
TITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKS KPYYTGEHAKAIGNCPIWVKTPL
KLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGA
MDELHNEILELDEKVDDLADTISQIELAVLLSNEGIINSEDEHLLALERKLLKMLGPSAVEIGNGCFE
TKHKCNQTCLDRIAAGTFDAGEFSLPTFDSL NITAASLNDGLDNYQILAIYSTVASSLVLVSLGAISF
WMCSNGSLQCRICI

Figure 16BB**PDI-B Wash-L201A (Prl-) DNA (SEQ ID NO:162)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactcatttttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgggcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaattagacagctgcctaacccttctccgaggatacgaacat
gtcaggttatcaactcacaacggttatcaatgcagaagatgcaccaggaagaccctacgagattggaacct
cagggctcttgccctaaccattaccaatggaaacggattcttcgcaacaatggcttggggccgtcccaaaaa
caaacagcaacaaatccattaacaatagaagtaccatacatttgtacagaaggagaagaccaaattacc
gtttgggggttccactctgacaacgagacccaaatggcaaaggcctatggggactcaaagcccagaagt
tcacctcatctgccaacggagtgaccacacattacgtttcacagattggtggcttcccaaatcaaacaga
agacggaggactaccacaaagtggcagaattgttgttgattacatggtgcaaaaatctggaaaaacagga
acaattacctatcaaagaggtattttattgcctcaaaagggtgtggtgcgcaagtggcaggagcaaggtaa
taaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaacaaaaag
caagccttactacacaggggaacatgcaaaggccataggaaattgcccaatatgggtgaaaacacccttg
aagctggccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggttggcacg
gatacacatcccatggggcacatggagttagcgtggcagcagaccttaagagcactcaagaggccataaa
caagataacaaaaaatctcaactctttgagttagctggaagtaagaatcttcaaagactaagcgggtgcc
atggatgaactccacaacgaaatactagaactagatgagaaagtggatgatctcagagctgatacaataa
gctcacaatatagaactcgcagtcctgctttccaatgaaggaataataaacagtgaagatgaacatctctt
ggcgcttgaaagaaagctgaagaaaatgctgggcccctctgctgtagagatagggaatggatgctttgaa
accaaacacaagtgaaccagacctgtctcgacagaatagctgctggtacctttgatgcaggagaatttt
ctctccccacctttgattcactgaatattactgctgcatctttaaatgacgatggattggataattacca
gattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctgggggcaatcagtttc
tggtatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16BC**PDI-B Wash-L201A (Prl-) AA (SEQ ID NO:163)**

MAKNVAIFGLLFSLLVLPVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGVIPLTPTTKSHFANLKG
TETRGKLCPKCLNCTDLVALGRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGRPYEIGTSGSCPNI TNNGFFATMAWAVPKNKTATNPLTIEVPYICTEGEDQIT
VWGFHSDNETQMAKAYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKTG
TITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKS KPYTGEHAKAIGNCPIWVKTPL
KLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGA
MDELHNEILELDEKVDDLADTISQIELAVLLSNEGIINSEDEHLLALERKLLKMLGPSAVEIGNGCFE
TKHKCNQTCLDRIAAGTFDAGEFSLPTFDSL NITAASLNDGLDNYQILAIYSTVASSLVLVSLGAISF
WMCSNGSLQCRICI

Figure 16BD**PDI-B Wash-L201W (Pri-) DNA (SEQ ID NO:164)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgggcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaattagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagatgcaccaggaagacctacgagattggaacct
cagggctcttgccctaactaccattacgaatggaacggattcttcgcaacaatggcttggggccgtcccaaaaa
caaacagcaacaaatccattaacaatagaagtaccatacatttgtacagaaggagaagaccaaattacc
gtttgggggttccactctgacaacgagacccaaatggcaaagtggatggggactcaaagcccagaagt
tcacctcatctgccaacggagtgaccacacattacgtttcacagattggtggcttcccaaatcaaacaga
agacggaggactaccacaaagtggcagaattgttgttgattacatggtgcaaaaatctggaaaaacagga
acaattacctatcaaagaggtattttattgcctcaaaagggtgtggtgcgcaagtggcaggagcaaggtaa
taaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaacaaaaag
caagccttactacacaggggaacatgcaaaggccataggaaattgcccaatatgggtgaaaacacccttg
aagctggccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggttggcacg
gatacacatcccatggggcacatggagttagcgtggcagcagaccttaagagcactcaagaggccataaa
caagataacaaaaaatctcaactctttgagttagctggaagtaagaatcttcaaagactaagcgggtgcc
atggatgaactccacaacgaaatactagaactagatgagaaagtggatgatctcagagctgatacaataa
gctcacaataagaactcgcagtcctgctttccaatgaaggaataataaacagtgaagatgaacatctctt
ggcgcttgaaagaaagctgaagaaaatgctgggcccctctgctgtagagatagggaatggatgctttgaa
accaaacacaagtgaaccagacctgtctcgacagaatagctgctggtacctttgatgcaggagaatttt
ctctccccacctttgattcactgaatattactgctgcatctttaaatgacgatggattggataattacca
gattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctggggggaatcagtttc
tggatgtgctctaattgggtctctacagtgtagaatatgtattttaa

Figure 16BE**PDI-B Wash-L201W (Pri-) AA (SEQ ID NO:165)**

MAKNVAIFGLLFSLLVLPVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGVIPLTTTPTKSHFANLKG
TETRGKLCPKCLNCTDLVALGRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGRPYEIGTSGSCPNI TNNGFFATMAWAVPKNKTATNPLTIEVPYICTEGEDQIT
VWGFHSDNETQMAKWYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKTG
TITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKS KPYYTGEHAKAIGNCPIWVKTPL
KLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGA
MDELHNEILELDEKVDDLADTISQIELAVLLSNEGIINSEDEHLLALERKLLKMLGPSAVEIGNGC FE
TKHKCNQTCLDRIAAGTFDAGEFSLPTFDSL NITAASLND DGLDNYQILAIYSTVASSLVLVSLGAISF
WMCSNGLQCRICI

Figure 16BF**PDI-B Vic (Prl-) DNA (SEQ ID NO:180)**

atggcgaaaaacggttgcgattttcggccttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtcaaaactcaccacatgctcgtcaaaactgctactcaagggga
ggtcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgagcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaattagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacggttatcaatgcagaagatgcaccaggaggacctacgagattggaacct
cagggctcttgccctaacattaccaatggaaacggattcttcgcaacaatggcttggggccgtcccaaaaa
caaacagcaacaaatccattaacaatagaagtaccatacatttgtacagaaggagaagaccaaattacc
gtttgggggttccactctgacaacgagacccaaatggcaaagctctatggggactcaaagcccagaagt
tcacctcatctgccaacggagtgaccacacattacgtttcacagattggtggcttcccaaatcaaacaga
agacggaggactaccacaaagtggcagaattgttgttgattacatggtgcaaaaatctggaaaaacagga
acaattacctatcaaagaggtattttattgcctcaaaaggtgtggtgcgcaagtggcaggagcaaggtaa
taaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaacaaaaag
caagccttactacacaggggaacatgcaaaggccataggaaattgcccaatatgggtgaaaacacccttg
aagctggccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggttggcacg
gatacacatcccatggggcacatggagtagcgggtggcagcagaccttaagagcactcaagaggccataaa
caagataacaaaaaatctcaactctttgagttagctggaagtaagaatcttcaaagactaagcgggtgcc
atggatgaactccacaacgaaatactagaactagatgagaaagtggatgatctcagagctgatacaataa
gctcacaatatagaactcgcagtcctgctttccaatgaaggaataataaacagtgaagatgaacatctctt
ggcgcttgaaagaaagctgaagaaaatgctgggcccctctgctgtagagatagggaaatggatgctttgaa
accaaacacaagtgaaccagacctgtctcgacagaatagctgctggtacctttgatgcaggagaatttt
ctctccccacctttgattcactgaatattactgctgcatctttaaatgacgatggattggataattacca
gattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctggggggaatcagtttc
tggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16BG**PDI-B Vic (Prl-) AA (SEQ ID NO:181)**

MAKNVAIFGLLFSLLVLPVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGVIPLTTTPTKSHFANLKG
TETRGKLCPKCLNCTDLVALSRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGGPYEIGTSGSCPNI TNNGFFATMAWAVPKNKTATNPLTIEVPYICTEGEDQIT
VWGFHSDNETQMAKLYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKTG
TITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKS KPYYTGEHAKAIGNCPIWVKTPL
KLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGA
MDELHNEILELDEKVDDLADTISQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVEIGNGCFE
TKHKCNQTCLDRIAAGTFDAGEFSLPTFDSL NITAASLNDGLDNYQILAIYSTVASSLVLVSLGAISF
WMCSNGSLQCRICI

Figure 16BH**PDI-B Vic-G138A (Pri-) DNA (SEQ ID NO:182)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgagcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaattagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagatgcaccaggaggacctacgagattgccacct
cagggctcttgccctaacattaccaatggaaacggattcttcgcaacaatggcttggggccgtcccaaaaa
caaacagcaacaaatccattaacaatagaagtaccatacatttgtacagaaggagaagaccaaattacc
gtttgggggttccactctgacaacgagacccaaatggcaaagctctatggggactcaaagcccagaagt
tcacctcatctgccaacggagtgaccacacattacgtttcacagattggtggcttcccaaatcaaacaga
agacggaggactaccacaaagtggcagaattgttgttgattacatggtgcaaaaatctggaaaaacagga
acaattacctatcaaagaggtattttattgcctcaaaaggtgtggtgcgcaagtggcaggagcaaggtaa
taaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaacaaaag
caagccttactacacaggggaacatgcaaaggccataggaaattgcccaatatgggtgaaaacacccttg
aagctggccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggttggcacg
gatacacatcccatggggcacatggagttagcgtggcagcagaccttaagagcactcaagaggccataaa
caagataacaaaaaatctcaactctttgagttagctggaagtaagaatcttcaaagactaagcgggtgcc
atggatgaactccacaacgaaatactagaactagatgagaaagtggatgatctcagagctgatacaataa
gctcacaatatagaactcgcagtcctgctttccaatgaaggaataataaacagtgaagatgaacatctctt
ggcgcttgaaagaaagctgaagaaaatgctgggcccctctgctgtagagatagggaaatggatgctttgaa
accaaacacaagtgaaccagacctgtctcgacagaatagctgctggtacctttgatgcaggagaatttt
ctctccccacctttgattcactgaatattactgctgcatctttaaatgacgatggattggataattacca
gattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctggggggaatcagtttc
tggatgtgctctaattgggtctctacagtgtagaatatgtattttaa

Figure 16BI**PDI-B Vic-G138A (Pri-) AA (SEQ ID NO:183)**

MAKNVAIFGLLFSLLVLPVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGVIPLTPTTKSHFANLKG
TETRGKLCPKCLNCTDLVALSRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGGPYE IATSGSCPNI TNNGFFATMAWAVPKNKTATNPLTIEVPYICTEGEDQIT
VWGFHSDNETQMAKLYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKTG
TITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKS KPYYTGEHAKAIGNCPIWVKTPL
KLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGA
MDELHNEILELDEKVDDLADTISQIELAVLLSNEGIINSEDEHLLALERKLLKMLGPSAVEIGNGCFE
TKHKCNQTCLDRIAAGTFDAGEFSLPTFDSL NITAA SLNDDGLDNYQILAIYSTVASSLVLVSLGAISF
WMCSNGSLQCRICI

Figure 16BJ**PDI-B Vic-S140A (Pri-) DNA (SEQ ID NO:184)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttggttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgagcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaattagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagatgcaccaggaggacctacgagattggaaccg
ccgggtcttgccctaactaccattacgaatggaacggattcttcgcaacaatggcttggggccgtcccaaaaa
caaacagcaacaaatccattaacaatagaagtaccatacatttgtacagaaggagaagaccaaattacc
gtttgggggttccactctgacaacgagacccaaatggcaaagctctatggggactcaaagcccagaagt
tcacctcatctgccaacggagtgaccacacattacgtttcacagattggtggcttcccaaatcaaacaga
agacggaggactaccacaaagtggcagaattgttgttgattacatggtgcaaaaatctggaaaaacagga
acaattacctatcaaagaggtattttattgcctcaaaaggtgtggtgcgcaagtggcaggagcaaggtaa
taaaaggatccttgcccttaattggagaagcagattgcctccatgaaaaatacgggtggattaacaaaaag
caagccttactacacaggggaacatgcaaaggccataggaaattgcccaatatgggtgaaaacacccttg
aagctggccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggttggcacg
gatacacatcccatggggcacatggagttagcgtggcagcagaccttaagagcactcaagaggccataaa
caagataacaaaaaatctcaactctttgagttagctggaagtaagaatcttcaaagactaagcgggtgcc
atggatgaactccacaacgaaatactagaactagatgagaaagtggatgatctcagagctgatacaataa
gctcacaatatagaactcgcagtcctgctttccaatgaaggaataataaacagtgaagatgaacatctctt
ggcgcttgaaagaaagctgaagaaaatgctgggcccctctgctgtagagatagggaaatggatgctttgaa
accaaacacaagtgaaccagacctgtctcgacagaatagctgctggtacctttgatgcaggagaatttt
ctctccccacctttgattcactgaatattactgctgcatctttaaatgacgatggattggataattacca
gattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctggggggaatcagtttc
tggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16BK**PDI-B Vic-S140A (Pri-) AA (SEQ ID NO:185)**

MAKNVAIFGLLFSLVLVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGVIPLTTTPTKSHFANLKG
TETRGKLCPKCLNCTDLVALSRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGGPYEIGTAGSCPNITNGNGFFATMAWAVPKNKTATNPLTIEVPYICTEGEDQIT
VWGFHSDNETQMAKLYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKTG
TITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKSHPYYTGEHAKAIGNCPIWVKTPL
KLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGA
MDELHNEILELDEKVDDLADTISQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVEIGNGCFE
TKHKCNQTCLDRIAAGTFDAGEFSLPTFDSLNTAASLNDGDLNYQILAIYSTVASSLVLVSLGAISF
WMCSNGSLQCRICI

Figure 16BL**PDI-B Vic-S142A (Pri-) DNA (SEQ ID NO:186)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccagggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgagcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaattagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagatgcaccaggaggacctacgagattggaacct
caggggcctgcctaactaccattacgaatggaacggattcttcgcaacaatggcttggggccgtcccaaaaa
caaacagcaacaaatccattaacaatagaagtaccatacatttgtacagaaggagaagaccaaattacc
gtttgggggttccactctgacaacgagacccaaatggcaaagctctatggggactcaaagcccagaagt
tcacctcatctgccaacggagtgaccacacattacgtttcacagattggtggcttcccaaatcaaacaga
agacggaggactaccacaaagtggcagaattgttgttgattacatggtgcaaaaatctggaaaaacagga
acaattacctatcaaagaggtattttattgcctcaaaaggtgtggtgcgcaagtggcaggagcaaggtaa
taaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaacaaaaag
caagccttactacacaggggaacatgcaaaggccataggaaattgcccaatatgggtgaaaacacccttg
aagctggccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggttggcacg
gatacacatcccatggggcacatggagttagcgtggcagcagaccttaagagcactcaagaggccataaa
caagataacaaaaaatctcaactctttgagttagctggaagtaagaatcttcaaagactaagcgggtgcc
atggatgaactccacaacgaaatactagaactagatgagaaagtggatgatctcagagctgatacaataa
gctcacaataagaactcgcagtcctgctttccaatgaaggaataataaacagtgaagatgaacatctctt
ggcgcttgaaagaaagctgaagaaaatgctgggcccctctgctgtagagatagggaaatggatgctttgaa
accaaacacaagtgaaccagacctgtctcgacagaatagctgctggtacctttgatgcaggagaatttt
ctctccccacctttgattcactgaatattactgctgcatctttaaatgacgatggattggataattacca
gattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctgggggcaatcagtttc
tggatgtgctctaattgggtctctacagtgtagaatatgtattttaa

Figure 16BM**PDI-B Vic-S142A (Pri-) AA (SEQ ID NO:187)**

MAKNVAIFGLLFSLLVLPVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSHFANLKG
TETRGKLCPKCLNCTDLVALSRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGGPYEIGTSGACPNITNGNGFFATMAWAVPKNKTATNPLTIEVPYICTEGEDQIT
VWGFHSDNETQMAKLYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKTG
TITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKSHPYYTGEHAKAIGNCPIWVKTPL
KLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGA
MDELHNEILELDEKVDDLADTISQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVEIGNGCFE
TKHKCNQTCLDRIAAGTFDAGEFSLPTFDSLNTAASLNDGDLNYQILAIYSTVASSLVLVSLGAISF
WMCSNGSLQCRICI

Figure 16BN**PDI-B Vic-D193G (Prl-) DNA (SEQ ID NO:188)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgagcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaattagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagatgcaccaggaggacctacgagattggaacct
cagggctcttgccctaactaccattacgaatggaacggattcttcgcaacaatggcttggggccgtcccaaaaa
caaacagcaacaaatccattaacaatagaagtaccatacatttgtacagaaggagaagaccaaattacc
gtttgggggttccactctggcaacgagacccaaatggcaaagctctatggggactcaaagcccagaagt
tcacctcatctgccaacggagtgaccacacattacgtttcacagattggtggcttcccaaatcaaacaga
agacggaggactaccacaaagtggcagaattgttgttgattacatggtgcaaaaatctggaaaaacagga
acaattacctatcaaagaggtattttattgcctcaaaaggtgtggtgcgcaagtggcaggagcaaggtaa
taaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaacaaaaag
caagccttactacacaggggaacatgcaaaggccataggaaattgcccaatatgggtgaaaacacccttg
aagctggccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggttggcacg
gatacacatcccatggggcacatggagttagcgtggcagcagaccttaagagcactcaagaggccataaa
caagataacaaaaaatctcaactctttgagttagctggaagtaagaatcttcaaagactaagcgggtgcc
atggatgaactccacaacgaaatactagaactagatgagaaagtggatgatctcagagctgatacaataa
gctcacaatatagaactcgcagtcctgctttccaatgaaggaataataaacagtgaagatgaacatctctt
ggcgcttgaaagaaagctgaagaaaatgctgggcccctctgctgtagagatagggaatggatgctttgaa
accaaacacaagtgaaccagacctgtctcgacagaatagctgctggtacctttgatgcaggagaatttt
ctctccccacctttgattcactgaatattactgctgcatctttaaatgacgatggattggataattacca
gattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctggggggaatcagtttc
tggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16BO**PDI-B Vic-D193G (Prl-) AA (SEQ ID NO:189)**

MAKNVAIFGLLFSLLVLPVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGVIPLTTTPTKSHFANLKG
TETRGKLCPKCLNCTDLVALSRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGGPYEIGTSGSCPNI TNNGFFATMAWAVPKNKTATNPLTIEVPYICTEGEDQIT
VWGFHSGNETQMAKLYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKTG
TITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKS KPYYTGEHAKAIGNCPIWVKTPL
KLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGA
MDELHNEILELDEKVDDLADTISQIELAVLLSNEGIINSEDEHLLALERKLKMLGPSAVEIGNGCFE
TKHKCNQTCLDRIAAGTFDAGEFSLPTFDSL NITAASLNDGLDNYQILAIYSTVASSLVLVSLGAISF
WMCSNGSLQCRICI

Figure 16BP**PDI-B Vic-L201A (Pri-) DNA (SEQ ID NO:190)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttctgtgttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgagcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaattagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacgttatcaatgcagaagatgcaccaggaggacctacgagattggaacct
cagggctcttgccctaactaccattacgaatggaacggattcttcgcaacaatggcttggggccgtcccaaaaa
caaacagcaacaaatccattaacaatagaagtaccatacatttgtacagaaggagaagaccaaattacc
gtttgggggttccactctgacaacgagacccaaatggcaaaggcctatggggactcaaagcccagaagt
tcacctcatctgccaacggagtgaccacacattacgtttcacagattggtggcttcccaaatcaaacaga
agacggaggactaccacaaagtggcagaattgttgttgattacatggtgcaaaaatctggaaaaacagga
acaattacctatcaaagaggtattttattgcctcaaaagggtgtggtgcgcaagtggcaggagcaaggtaa
taaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaacaaaaag
caagccttactacacaggggaacatgcaaaggccataggaaattgccaatattgggtgaaaacacccttg
aagctggccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggttggcacg
gatacacatcccatggggcacatggagttagcgtggcagcagaccttaagagcactcaagaggccataaa
caagataacaaaaaatctcaactctttgagttagctggaagtaagaatcttcaaagactaagcgggtgcc
atggatgaactccacaacgaaatactagaactagatgagaaagtggatgatctcagagctgatacaataa
gctcacaatatagaactcgcagtcctgctttccaatgaaggaataataaacagtgaagatgaacatctctt
ggcgcttgaaagaaagctgaagaaaatgctgggcccctctgctgtagagatagggaaatggatgctttgaa
accaaacacaagtgaaccagacctgtctcgacagaatagctgctggtacctttgatgcaggagaatttt
ctctccccacctttgattcactgaatattactgctgcatctttaaatgacgatggattggataattacca
gattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctggggggaatcagtttc
tggatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16BQ**PDI-B Vic-L201A (Pri-) AA (SEQ ID NO:191)**

MAKNVAIFGLLFSLLVLPVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSHFANLKG
TETRGLKCPKCLNCTDLVALSRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGGPYEIGTSGSCPNI TNNGFFATMAWAVPKNKTATNPLTIEVPYICTEGEDQIT
VWGFHSDNETQMAKAYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKTG
TITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKS KPYYTGEHAKAIGNCPIWVKTPL
KLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGA
MDELHNEILELDEKVDDLADTISQIELAVLLSNEGIINSEDEHLLALERKLLKMLGPSAVEIGNGCFE
TKHKCNQTCLDRIAAGTFDAGEFSLPTFDSL NITAASLNDGLDNYQILAIYSTVASSLVLVSLGAISF
WMCSNGLQCRICI

Figure 16BR**PDI-B Vic-L201W (PrI-) DNA (SEQ ID NO:192)**

atggcgaaaaacgttgcgattttcggccttattgttttctcttcttggttggttccttctcagatcttcg
cggatcgaatctgcactgggataacatcgtaaaactcaccacatgctcgtaaaactgctactcaagggga
ggatcaatgtgaccgggtgtaataccactgacaacaacacccaccaaactctcattttgcaaatctcaaagga
acagaaaccaggggggaaactatgccccaaatgcctcaactgcacagatctggatgtagccttgagcagac
caaaatgcacaggggaaaataccctctgcaagggtttcaatactccatgaagtcagacctgttacatctgg
gtgctttcctataatgcacgatagaacaaaaattagacagctgcctaaccttctccgaggatacgaacat
gtcaggttatcaactcacaacggttatcaatgcagaagatgcaccaggaggacctacgagattggaacct
cagggctcttgccctaactaccattacgaatggaacggattcttcgcaacaatggcttggggccgtcccaaaaa
caaacagcaacaaatccattaacaatagaagtaccatacatttgtagagaaggagaagaccaaattacc
gtttgggggttccactctgacaacgagacccaaatggcaaagtggatggggactcaaagcccagaagt
tcacctcatctgccaacggagtgaccacacattacgtttcacagattggtggcttcccaaatcaaacaga
agacggaggactaccacaaagtggcagaattgttgttgattacatggtgcaaaaatctggaaaaacagga
acaattacctatcaaagaggtattttattgcctcaaaagggtgtggtgcgcaagtggcaggagcaaggtaa
taaaaggatccttgccctttaattggagaagcagattgcctccatgaaaaatacgggtggattaacaaaaag
caagccttactacacaggggaacatgcaaaggccataggaaattgcccaatatgggtgaaaacacccttg
aagctggccaatggaaccaaataatagacctcctggtggaggatgggaaggaatgattgcaggttggcacg
gatacacatcccatggggcacatggagttagcgtggcagcagaccttaagagcactcaagaggccataaa
caagataacaaaaaatctcaactctttgagttagctggaagtaagaatcttcaaagactaagcgggtgcc
atggatgaactccacaacgaaatactagaactagatgagaaagtggatgatctcagagctgatacaataa
gctcacaataagaactcgcagtcctgctttccaatgaaggaataataaacagtgaagatgaacatctctt
ggcgcttgaaagaaagctgaagaaaatgctgggcccctctgctgtagagatagggaatggatgctttgaa
accaaacacaagtgaaccagacctgtctcgacagaatagctgctggtacctttgatgcaggagaatttt
ctctccccacctttgattcactgaatattactgctgcatctttaaatgacgatggattggataattacca
gattttggcgatctattcaactgtcgccagttcattggtactggtagtctccctggggggaatcagtttc
tggtatgtgctctaattgggtctctacagtgtagaatatgtatttaa

Figure 16BS**PDI-B Vic-L201W (PrI-) AA (SEQ ID NO:193)**

MAKNVAIFGLLFSLLVLPVPSQIFADRICTGITSSNSPHVVKATATQGEVNVTVGIPLTTTPTKSHFANLKG
TETRGLKCPKCLNCTDLVALSRPKCTGKIPSARVSILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGYEH
VRLSTHNVINAEDAPGGPYEIGTSGSCPNI TNNGFFATMAWAVPKNKTATNPLTIEVPYICTEGEDQIT
VWGFHSDNETQMAKWYGDSKPQKFTSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRIVVDYMVQKSGKTG
TITYQRGILLPQKVWCASGRSKVIKGSPLIGEADCLHEKYGGLNKS KPYYTGEHAKAIGNCPIWVKTPL
KLANGTKYRPPGGGWEGMIAGWHGYTSHGAHGVAAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGA
MDELHNEILELDEKVDDLADTISQIELAVLLSNEGIINSEDEHLLALERKLLKMLGPSAVEIGNGCFE
TKHKCNQTCLDRIAAGTFDAGEFSLPTFDSL NITAASLNDGLDNYQILAIYSTVASSLVLVSLGAISF
WMCSNGSLQCRICI

Figure 16BT**HA0_A-California-7-09_H1N1 (SEQ ID NO:203)**

DTLCIGYHANNSTDTVDTVLEKNVTVTHSVNLLLEDKHNGLCKLRGVAPLHLGKCNIAGWILGNPECESL
STASSWSYIVETPSSDNGTCYPGDFIDYEELREQLSSVSSFERFEIFPKTSSWPNHDSNKGVTAAACPHAG
AKSFYKNLIWLVKKGNSYPKLSKSYINDKGKEVLVLWGIHHPSTSADQQSLYQNADAYVFGSSRYSKKF
KPEIAIRPKVRDQEGRMNYYWTLVEPGDKITFEATGNLVVPRYAFAMERNAGSGIIISDTPVHDCNTTCQ
TPKGAINSTLPPQNIHPITIGKCPKYVKSTKLRLATGLRNIPSIQSRGLFGAIAGFIEGGWTGMVDGWYG
YHHQNEQGSYAADLKSTQNAIDEITNKVNSVIEKMNTQFTAVGKEFNHLEKRIENLNKKVDDGFLDIWT
YNAELLVLENERLTLDYHDSNVKNLYEKVRSQKNNAKEIGNGCFFYHKCDNTCMESVKNGTYDYPKYS
EEAKLNREEIDGVKLESTRIYQILAIYSTVASSLVLVVSLGAISFWMCSNGSLQCRICI

Figure 16BU**HA0_A-Kansas-14-17_H3N2 (SEQ ID NO:204)**

QKIPGNDNSTATLCLGHHAVPNGTIVKTTINDRIEVTNATELVQNSSIGEICDSPHQILDGENCTLIDAL
LGDPQCDGFQNKKWDLFVERNKAYSNCYPYDVPDYASLRSLVASSGTLEFNNEFSFNWAGVTQNGTSSSCI
RGSKSSFFSRLNWLTHLNSKYPALNVTMPNNEQFDKLYIWGVHHPGTDKDQISLYAQSSGRITVSTKRSQ
QAVIPNIGSRPRIRDIPSRIYWTIVKPGDILLINSTGNLIAPRGYFKIRSGKSSIMRSDAPIGKCKSE
CITPNGSIPNDKPFQNVNRITYGACPRYVKQSTLKLATGMRNVPERQTRGIFGAIAGFIENGWEGMVDGW
YGFRHQNSEGRGQAADLKSTQAAIDQINGKLNRLIGKTNEKFHQIEKEFSEVEGRIQDLEKYVEDTKIDL
WSYNAELLVALENQHTIDLTDSEMKNLFEKTKQLRENAEDMGNGCFKIYHKCDNACMGSI RNNGTYDHNV
YRDEALNNRFQIKGVELKSGYKDWILWISFAISCFLLCVALLGFIMWACQKGNIRCNICI

Figure 16BV**HA0_A-Indonesia-5-05_H5N1 (SEQ ID NO:205)**

DQICIGYHANNSTEQVDTIMEKNVTVTHAQDILEKTHNGKLCDLDGVKPLILRDCSVAGWLLGNPMCEDEF
INVPEWSYIVEKANPTNDLCYPGSFNDYEELKHLLSRINHFEKIQIIPKSSWSDHEASSGVSSACPYLGS
PSFFRNVVWLIKKNSTYPTIKKSYNNTNQEDLLVLWGIHHPNDAAEQTRLYQNPTTYISIGTSTLNQRLV
PKIATRISKVNGQSGRMEFFWTILKPNDAINFESNGNFIAPEYAYKIVKKGDSAIMKSELEYGNCNTKCQT
PMGAINSSMPFHNIHPLTIGECPKYVKSRLVLTATGLRNSPQRESRRKKRGLFGAIAGFIEGGWQGMVDG
WYGYHHSNEQGSYAADKESTQKAIDGVTNKVNSIIDKMNTQFEAVGREFNNLERRIENLNKKMEDGFLD
VWTYNAELLVLMENERTLDFHDSNVKNLYDKVRLQLRDNAKELGNGCFFYHKCDNECMESIRNGTYNYP
QYSEEARLKREEISGVKLESIGTYQILSIYSTVASSLALAIMMAGLSLWMCNGLQCRICI

Figure 16BW**HA0_A-Shanghai-2-13_H7N9 (SEQ ID NO:206)**

DKICLGHHAVSNGTKVNTLTERGVEVNVNATETVERTNIPRICSKGKRTVDLGQCGLLGTTITGPPQCDQFL
EFSADLIIERREGSDVCYPGKFVNNEALRQILRESGGIDKEAMGFTYSGIRTNGATSACRRSGSSFYAEM
KWLLSNTDNAAFPQMTKSYKNTRKSPALIVWGIHHSVSTAEQTKLYGSGNKLVTVGSSNYQQSFVPSGA
RPQVNGLSGRIDFHWLMLNPNDTVTFSENGAFIAPDRASFLRGKSMGIQSGVQVDANCEGDCYHSGGTII
SNLPFQNIIDSRVAGKCPRYVKQRSLLLATGMKNVPEIPKGRGLFGAIAAGFIENGWEGLIDGWYGFRHQNA
QGEGTAADYKSTQSAIDQITGKLNRLIEKTNQQFELIDNEFNEVEKQIGNVINWTRDSITEVWSYNAELL
VAMENQHTIDLADSEMDKLYERVKRQLRENAEEDGTGCFEIFHKCDDDCMASIRNNTYDHSKYREEAMQN
RIQIDPVKLSGGYKDVILWFSFGASCFILLAIVMGLVFICVKNGNMRCITICI

Figure 16BX**HA_B-Phuket-3703-13_Yam (SEQ ID NO:207)**

DRICTGITSSNSPHVVKATQGEVNVTVGIPLTTTPTKSYFANLKGTRTRGKLCPCDCLNCTDLVALGRP
MCVGTTPSAKASILHEVRPVTSGCFPIIMHRTKIRQLPNLLRGYEKIRLSTQNVIDAEKAPGGPYRLGTS
GSCP NATSKIGFFATMAWAVPKDNYKNATNPLTVEVPYICTEGEDQITVWGFHSDNKTQMKSLYGDSNPQ
KFTSSANGVTTHYVSQIGDFPDQTEDGGLPQSGRIVVDYMMQKPGKTGTIVYQRGVLLPQKVWCASGRSK
VIKGSPLIGEADCLHEEYGGNLKSKPYITGKHAKAIGNCFIWVKTPLKLANGTKYRPPAKLLKERGFFG
AIAGFLEGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGAMDELH
NEILELDEKVDDLADTISSQIELAVLLSNEGIINSEDEHLLALERKLLKMLGPSAVDIGNGCFETKHKC
NQTCLDRIAAGTFNAGEFSLPTFDSL NITAASLNDDGLDNHTILLYYSTAASSLAVTLMIAIFIVYMVSR
DNVSCSICL

Figure 16BY**HA_B-Maryland-15-16_Vic (SEQ ID NO:208)**

DRICTGITSSNSPHVVKATQGEVNVTVGIPLTTTPTKSHFANLKGTETRGKLCPCCLNCTDLVALGRP
KCTGKIP SARVSI LHEVRPVTSGCFPIIMHRTKIRQLPNLLRGYEHVRLSTHNVINAEDAPGGPYKIGTS
GSCP NITNGNGFFATMAWAVPKDKNTATNPLTIEVPYVCTEGEDQITVWGFHSDNETQMAKLYGDSKPQK
FTSSANGVTTHYVSQIGGFPNQTEDGGLPQSGRIVVDYMVQKSGKTGTITYQRGILLPQKVWCASGRSKV
IKGSLPLIGEADCLHEKYGGNLKSKPYITGEHAKAIGNCFIWVKTPLKLANGTKYRPPAKLLKERGFFGA
IAGFLEGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGAMDELHN
EILELDEKVDDLADTISSQIELAVLLSNEGIINSEDEHLLALERKLLKMLGPSAVEIGNGCFETKHKCN
QTCLDKIAAGTFDAGEFSLPTFDSL NITAASLNDDGLDNHTILLYYSTAASSLAVTLMIAIFVVMVSRD
NVSCSICL

Figure 16BZ**HA_B-Victoria-705-18_Vic (SEQ ID NO:209)**

DRICTGITSSNSPHVVKATATQGEVNVTVGVIPLTTTPTKSHFANLKGTETRGKLCPKCLNCTDL DVALSRP
KCTGKIP SARVSILHEVRPVTSGCFPIIMHDRTKIRQLPNLLRGYEHVRLSTHNVINAEDAPGGPYEIGTS
GSCPNI TNNGFFATMAWAVPKNKTATNPLTIEVPYICTEGEDQITVWGFHSDNETQMAKLYGDSKPQKF
TSSANGVTTHYVSQIGGFNPQTEDGGLPQSGRI VVDYMVQKSGKTGTITYQRGILLPQKVWCASGRSKVI
KGSLPLIG EADCLHEKYGGLNKSYPYTGEHAKAIGNCPIWVKTP LKLANGTKYRPPAKLLKERGFFGAI
AGFLEGGWEGMIAGWHGYTSHGAGVAVAADLKSTQEAINKITKNLNSLSELEVKNLQRLSGAMDELHNE
ILELDEKVDDL RADTISSQIELAVLLSNEGIINSEDEHLLALERK LKKMLGPSAVEIGNGC FETKHKCNQ
TCLDR IAAGTFDAGEFSLPTFDSL NITAASLNDDGLDNHTILLYYSTAASSLAVTLMIAIFVVMVSRDS
VSCSICL

Figure 17A**Cloning vector 1190 from left to right T-DNA (SEQ ID NO: 5)**

TGGCAGGATATATTGTGGTGTAAACAAATTGACGCTTAGACAACCTTAATAACACATTGCGGACGTTTTTA
ATGTACTGAATTAACGCCGAATCCCGGGCTGGTATATTTATATGTTGTCAAATAACTCAAAAACCATAAA
AGTTTAAAGTTAGCAAGTGTGTACATTTTTACTTGAACAAAAATATTCACCTACTACTGTTATAAATCATT
ATTAAACATTAGAGTAAAGAAATATGGATGATAAGAACAAGAGTAGTGATATTTTGACAACAATTTTGT
GCAACATTTGAGAAAATTTTGTGTCTCTCTTTTCATTGGTCAAAAACAATAGAGAGAGAAAAAGGAAG
AGGGAGAATAAAAAACATAATGTGAGTATGAGAGAGAAAAGTTGTACAAAAGTTGTACCAAATAGTTGTAC
AAATATCATTGAGGAATTTGACAAAAGCTACACAAAATAGGGTTAATTGCTGTAAATAAATAAGGATGAC
GCATTAGAGAGATGTACCATTAGAGAATTTTTGGCAAGTCATTAAAAAGAAAGAATAAATTATTTTTAAA
ATTAAGAGTTGAGTCATTTGATTAACATGTGATTATTTAATGAATTGATGAAAGAGTTGGATTAAAGTT
GTATTAGTAATTAGAATTTGGTGTCAAATTTAATTTGACATTTGATCTTTTCTATATATTGCCCATAG
AGTCAGTTAACTCATTTTTATATTTTATAGATCAAATAAGAGAAAATAACGGTATATTAATCCCTCCAAA
AAAAAAAACGGTATATTTACTAAAAATCTAAGCCACGTAGGAGGATAACAGGATCCCCGTAGGAGGATA
ACATCCAATCCAACCAATCACACAATCCTGATGAGATAACCCACTTTAAGCCCACGCATCTGTGGCACA
TCTACATTATCTAAATCACACATTTCTCCACACATCTGAGCCACACAAAAACCAATCCACATCTTTATCA
CCCATTCTATAAAAAATCACACTTTGTGAGTCTACACTTTGATTCCCTTCAAACACATACAAAGAGAAGA
GACTAATTAATTAATTAATCATCTTGAGAGAAAAATGGAACGAGCTATACAAGGAAACGACGCTAGGGAAC
AAGCTAACAGTGAACGTTGGGATGGAGGATCAGGAGGTACCACTTCTCCCTTCAAACCTTCTGACGAAAG
TCCGAGTTGGACTGAGTGGCGGTACATAACGATGAGACGAATTCGAATCAAGATAATCCCTTGGTTTC
AAGGAAAGCTGGGGTTTCGGGAAAGTTGTATTTAAGAGATATCTCAGATACGACAGGACGGAAGCTTAC
TGCACAGAGTCCTTGATCTTGACGGGAGATTCGGTTAACTATGCAGCATCTCGATTTTTCGGTTTCGA
CCGATCGGATGTACCTATAGTATTCGGTTTCGAGGAGTTAGTATCACCGTTTCTGGAGGGTCGCGAAT
CTTCAGCATCTCTGTGAGATGGCAATTCGGTCTAAGCAAGAACTGCTACAGCTTGCCCCAATCGAAGTGG
AAAGTAATGTATCAAGAGGATGCCCTGAAGTACTCAAACCTTCGAAAAAGAAAGCGAGTAAGTTAAAT
GCTTCTTCGTCTCCTATTTATAATATGGTTTGTATTGTAAATTTGTCTTGTAGAAGAGCTTAATTAA
TCGTTGTTGTTATGAAATACTATTTGTATGAGATGAACTGGTGTAAATGAATTCATTTACATAAGTGGAG
TCAGAATCAGAATGTTTCCCTCCATAACTAAGTACATGAAGACCTGCCGCTACAATTGTCTTATATTT
GAACAATAAAATGAACATCTTTGCCACAACCTTTATAAGTGGTAAATATAGCTCAAATATATGGTCAA
GTTCAATAGATTAATAATGGAATATCAGTTATCGAAATTCATTAACAATCAACTTAACGTTATTAAC
CTAATTTTATATCATCCCTTTGATAAATGATAGTACACCAATTAGGAAGGAGCATGCTCGCCTAGGAGA
TTGTCGTTTCCCGCCTTCAGTTTGCAAGCTGCTTAGCCGTGTAGCCAATACGCAAACCGCCTCTCCCCG
CGCGTTGGGAATTACTAGCGCGTGTGACAAAGCTTGCATGCCGTTCAACATGGTGGAGCACGACACACTT
GTCTACTCCAAAAATATCAAAGATACAGTCTCAGAAGACCAAAGGGCAATTGAGACTTTTCAACAAAGGG
TAATATCCGGAAACCTCCTCGGATTCATTGCCAGCTATCTGTCACCTTATTGTGAAGATAGTGAAAA
GGAAGGTGGCTCCTACAAATGCCATCATTGCGATAAAGGAAAGGCCATCGTTGAAGATGCCTCTGCCGAC
AGTGGTCCCAAAGATGGACCCCCACCCACGAGGAGCATCGTGAAAAAGAAGACGTTCCAACCACGCTCTT
CAAAGCAAGTGGATTGATGTGATAACATGGTGGAGCAGACACACTTGTCTACTCCAAAAATATCAAAGA
TACAGTCTCAGAAGACCAAAGGGCAATTGAGACTTTTCAACAAAGGGTAATATCCGGAAACCTCCTCGGA
TTCCATTGCCAGCTATCTGTCACCTTATTGTGAAGATAGTGAAAAAGGAAGGTGGCTCCTACAAATGCC
ATCATTGCGATAAAGGAAAGGCCATCGTTGAAGATGCCCTCTGCCGACAGTGGTCCCAAAGATGGACCCCC
ACCCACGAGGAGCATCGTGAAAAAGAAGACGTTCCAACCACGCTCTTCAAAGCAAGTGGATTGATGTGAT
ATCTCCACTGACGTAAGGGATGACGCACAATCCCACTATCCTTCGCAAGACCTTCTCTATATAAGGAA
GTTCAATTTCAATTTGGAGAGGTATTAATCTTAATAGGTTTTGATAAAGCGAACGTGGGGAAACCCGAA
CCAAACCTTCTTCTAACTCTCTCTCATCTCTCTTAAGCAAACTTCTCTCTTGTCTTTCTTGCCTGAGC
GATCTTCAACGTTGTCAGATCGTGCTTCGGCACCGCGGATGGCGAAAAACGTTGCGATTTTTCGGCTTATT

Figure 17A-1 (continued)

GTTCCTCTCTTCTGTGTTGGTTCCTTCTCAGATCTTCGCCTGCAGGCTCCTCAGCCAAAACGACACCCCC
ATCTGTCTATCCACTGGCCCCCTGGATCTGCTGCCAAAATACTCCATGGTGACCCTGGGATGCCTGGTC
AAGGGCTATTTCCCTGAGCCAGTGACAGTGACCTGGAACTCTGGATCCCTGTCCAGCGGTGTGCACACCT
TCCAGCTGTCTGCAGTCTGACCTCTACACTCTGAGCAGCTCAGTGAAGTGTCCCTCCAGCACCTGGCC
CAGCGAGACCGTCACCTGCAACGTTGCCACCCGGCCAGCAGCACCAAGGTGGACAAGAAAATTGTGCC
AGGGATTGTGGTTGTAAGCCTTGCATATGTACAGTCCCAGAAAGTATCATCTGTCTTCATCTTCCCCCAA
AGCCCAAGGATGTGCTCACCATTACTCTGACTCCTAAGGTCACGTGTGTTGTGGTAGACATCAGCAAGGA
TGATCCCAGAGTCCAGTTCAGCTGGTTTGTAGATGATGTGGAGGTGCACACAGCTCAGACGCAACCCCGG
GAGGAGCAGTTCAACAGCACTTTCCGCTCAGTCAGTGAAGTCCCATCATGCACCAGGACTGGCTCAATG
GCAAGGAGCGATCGCTCACCATCACCATCACCATCACCATCACCATTAAAGGCCTATTTTCTTTAGTTTG
AATTTACTGTTATTCGGTGTGCATTTCTATGTTTGGTGAGCGGTTTTCTGTGCTCAGAGTGTGTTTATTT
TATGTAATTTAATTTCTTTGTGAGCTCCTGTTTAGCAGGTCGTCCCTTCAGCAAGGACACAAAAGATTT
TAATTTTATTAAAAAAGACCGGAATTCGATATCAAGCTTATCGACCTGCAGATCGTT
CAAACATTTGGCAATAAAGTTTCTTAAGATTGAATCCTGTTGCCGGTCTTGCGATGATTATCATATAATT
TCTGTTGAATTACGTTAAGCATGTAATAATTAACATGTAATGCATGACGTTATTTATGAGATGGGTTTTT
ATGATTAGAGTCCCGCAATTATACATTTAATACGCGATAGAAAACAAAATATAGCGCGCAAACTAGGATA
AATTATCGCGCGCGGTGTCTATCTATGTTACTAGATCTCTAGAGTCTCAAGCTTGGCGCGCCACGTGACT
AGTGGCACTGGCCGTCGTTTTACAACGTCGTGACTGGGAAAACCTGGCGTTACCCAACCTAATCGCCTT
GCAGCACATCCCCCTTTGCCAGCTGGCGTAATAGCGAAGAGGCGCCGACCGATCGCCCTTCCCAACAGT
TGCGCAGCCTGAATGGCGAATGCTAGAGCAGCTTGAGCTTGATCAGATTGTCTGTTTCCGCGCTTCAGTT
TAACTATCAGTGTTTGACAGGATATATTGGCGGTAAACCTAAGAGAAAAGAGCGTTTA

Figure 17B**Construct 1314 from 2X35S prom to NOS term (SEQ ID NO: 6)**

GTCAACATGGTGGAGCACGACACACTTGTCTACTCCAAAAATATCAAAGATACAGTCTCAGAAGACAAA
GGGCAATTGAGACTTTTCAACAAAGGGTAATATCCGGAAACCTCCTCGGATTCCATTGCCAGCTATCTG
TCACTTTATTGTGAAGATAGTGGAAGGAAGGTGGCTCCTACAAATGCCATCATTGCGATAAAGGAAAG
GCCATCGTTGAAGATGCCTCTGCCGACAGTGGTCCCAAAGATGGACCCCCACCCACGAGGAGCATCGTGG
AAAAAGAAGACGTTCCAACCACGTCTTCAAAGCAAGTGGATTGATGTGATAACATGGTGGAGCACGACAC
ACTTGTCTACTCCAAAAATATCAAAGATACAGTCTCAGAAGACCAAAGGGCAATTGAGACTTTTCAACAA
AGGTAATATCCGGAACCTCCTCGGATTCCATTGCCAGCTATCTGTCACTTTATTGTGAAGATAGTGG
AAAAGGAAGGTGGCTCCTACAAATGCCATCATTGCGATAAAGGAAAGGCCATCGTTGAAGATGCCTCTGC
CGACAGTGGTCCCAAAGATGGACCCCCACCCACGAGGAGCATCGTGGAAAAAGAAGACGTTCCAACCACG
TCTTCAAAGCAAGTGGATTGATGTGATATCTCCACTGACGTAAGGGATGACGCACAATCCCACTATCCTT
CGCAAGACCCTTCTCTATATAAGGAAGTTCAATTCATTTGGAGAGGTATTAATACTTAATAGGTTTTG
ATAAAAGCGAACGTGGGGAACCCGAACCAAACCTTCTTCTAAACTCTCTCTCATCTCTCTTAAAGCAAA
CTTCTCTCTTGTCTTTCTTGGCGTGAGCGATCTTCAACGTTGTCAGATCGTGCTTCGGCACCAGTACAATG
GCGAAAAACGTTGCGATTTTTCGGCTTATTGTTTTCTTCTTGTGTTGGTTTCTTCTCAGATCTTCGCTG
ACACATTATGTATAGTTTATCATGCGAACAATTCAACAGACACTGTAGACACAGTACTAGAAAAGAATGT
AACAGTAACACACTCTGTTAACCTTCTAGAAGACAAGCATAACGGGAAACTATGCAAACTAAGAGGGGTA
GCCCCATTGCATTTGGGTAAATGTAACATTGCTGGCTGGATCCTGGGAAATCCAGAGTGTGAATCACTCT
CCACAGCAAGCTCATGGTCTACATTGTGGAACACCTAGTTCAGACAATGGAACGTGTTACCCAGGAGA
TTTCATCGATTATGAGGAGCTAAGAGAGCAATTGAGCTCAGTGTATCATTTGAAAGGTTTGAGATATTC

Figure 17B-1 (continued)

CCCCAAGACAAGTTCATGGCCCAATCATGACTCGAACAAAGGTGTAACGGCAGCATGTCCTCATGCTGGAG
CAAAAAGCTTCTACAAAAATTTAATATGGCTAGTTAAAAAAGGAAATTCATACCCAAAGCTCAGCAAATC
CTACATTAATGATAAAGGGAAAGAAGTCCTCGTGCTATGGGGCATTACCATCCATCTACTAGTGCTGAC
CAACAAAGTCTCTATCAGAATGCAGATGCATATGTTTTGTGGGGTCATCAAGATACAGCAAGAAGTTCA
AGCCGGAAATAGCAATAAGACCCAAAGTGAGGGATCAAGAAGGGAGAATGAACTATTACTGGACACTAGT
AGAGCCGGGAGACAAAATAACATTCGAAGCAACTGGAAATCTAGTGGTACCGAGATATGCATTGCGAATG
GAAAGAAATGCTGGATCTGGTATTATCATTTTCAGATACACCAGTCCACGATTGCAATACAACCTTGTCAAA
CACCCAAGGGTGCTATAAACACCAGCCTCCCATTTCAGAATATACATCCGATCACAATTGGAAAATGTCC
AAAATATGTAAAAAGCACAAAATTGAGACTGGCCACAGGATTGAGGAATATCCCGTCTATTCAATCTAGA
GGACTATTTGGGGCCATTGCCGGTTTCATTGAAGGGGGGTGGACAGGGATGGTAGATGGATGGTACGGTT
ATCACCATCAAAATGAGCAGGGGTGAGGATATGCAGCCGACCTGAAGAGCACACAGAATGCCATTGACGA
GATTACTAACAAAGTAAATTCTGTTATTGAAAAGATGAATACACAGTTCACAGCAGTAGGTAAAGAGTTC
AACCACCTGGAAAAAAGAATAGAGAATTTAAATAAAAAAGTTGATGATGGTTTCTGGACATTTGGACTT
ACAATGCCGAAGTGTGGTTCTATTGAAAATGAAAGAACTTTGGACTACCACGATTCAAATGTGAAGAA
CTTATATGAAAAGGTAAGAAGCCAGCTAAAAACAATGCCAAGGAAATTGGAAACGGCTGCTTTGAATTT
TACCACAAATGCGATAACACGTGCATGGAAAGTGTCAAAAATGGGACTTATGACTACCCAAAATACTCAG
AGGAAGCAAAATTAAACAGAGAAGAAATAGATGGGGTAAAGCTGGAATCAACAAGGATTTACCAGATTTT
GGCGATCTATTCAACTGTCGCCAGTTCATTGGTACTGGTAGTCTCCCTGGGGGCAATCAGTTTCTGGATG
TGCTCTAATGGGTCTCTACAGTGTAGAATATGTATTTAAAGGCCTATTTTCTTTAGTTTGAATTTACTGT
TATTCGGTGTGCATTTCTATGTTTGGTGAGCGGTTTCTGTGCTCAGAGTGTGTTTATTTTATGTAATTT
AATTTCTTTGTGAGCTCCTGTTTAGCAGGTGTCCTTCAGCAAGGACACAAAAAGATTTTAATTTTATT
AAAAAAAAAAAAAAAAAAGACCGGAATTCGATATCAAGCTTATCGACCTGCAGATCGTTCAAACATTTG
GCAATAAAGTTTCTTAAGATTGAATCCTGTTGCCGGTCTTGCGATGATTATCATATAATTTCTGTTGAAT
TACGTTAAGCATGTAATAATTAACATGTAATGCATGACGTTATTTATGAGATGGGTTTTTATGATTAGAG
TCCCGCAATTATACATTTAATACGCGATAGAAAACAAAATATAGCGCGCAAACTAGGATAAATTATCGCG
CGCGGTGTCATCTATGTTACTAGAT

Figure 17C**Cloning vector 3637 from left to right T-DNA (SEQ ID NO: 9)**

TGGCAGGATATATTGTGGTGTAACAAATTGACGCTTAGACAACCTTAATAACACATTGCGGACGTTTTTA
ATGTACTGAATTAACGCCGAATCCCGGGCTGGTATATTTATATGTTGTCAAATAACTCAAAAACCATAAA
AGTTTAAAGTTAGCAAGTGTGTACATTTTTACTTGAACAAAATATTCACCTACTACTGTTATAAATCATT
ATTAAACATTAGAGTAAAGAAATATGGATGATAAGAACAAGAGTAGTGATATTTTGACAACAATTTTGTT
GCAACATTTGAGAAAATTTTGTTGTTCTCTCTTTTCATTGGTCAAAAACAATAGAGAGAGAAAAAGGAAG
AGGGAGAATAAAAAACATAATGTGAGTATGAGAGAGAAAGTTGTACAAAAGTTGTACCAAATAGTTGTAC
AAATATCATTGAGGAATTTGACAAAAGCTACACAAATAGGGTTAATTGCTGTAAATAAATAAGGATGAC
GCATTAGAGAGATGTACCATTAGAGAATTTTTGGCAAGTCATTAAAAAGAAAGAATAAATTATTTTTAAA
ATTAAGAGTTGAGTCATTTGATTAAACATGTGATTATTTAATGAATTGATGAAAGAGTTGGATTAAAGTT
GTATTAGTAATTAGAATTTGGTGTCAAATTTAATTTGACATTTGATCTTTTCTATATATTGCCCCATAG
AGTCAGTTAACTCATTTTTATATTTTCATAGATCAAATAAGAGAAATAACGGTATATTAATCCCTCCAAAA
AAAAAAAAACGGTATATTTACTAAAAATCTAAGCCACGTAGGAGGATAACAGGATCCCGTAGGAGGATA
ACATCCAATCCAACCAATCACACAATCCTGATGAGATAACCCACTTTAAGCCCACGCATCTGTGGCACA
TCTACATTATCTAAATCACACATTCTTCCACACATCTGAGCCACACAAAAACCAATCCACATCTTTATCA

Figure 17C-1 (continued)

CCCATTCTATAAAAAATCACACTTTGTGAGTCTACACTTTGATTCCCTTCAAACACATACAAAGAGAAGA
GACTAATTAATTAATTAATCATCTTGAGAGAAAATGGAACGAGCTATACAAGGAAACGACGCTAGGGAAC
AAGCTAACAGTGAACGTTGGGATGGAGGATCAGGAGGTACCCTTCTCCCTTCAAACCTCCTGACGAAAG
TCCGAGTTGGACTGAGTGGCGGTACATAACGATGAGACGAATTCGAATCAAGATAATCCCCTTGGTTTC
AAGGAAAGCTGGGGTTTCGGGAAAGTTGTATTTAAGAGATATCTCAGATACGACAGGACGGAAGCTTCAC
TGCACAGAGTCCTTGGATCTTGGACGGGAGATTTCGGTTAACTATGCAGCATCTCGATTTTTTCGGTTTCGA
CCAGATCGGATGTACCTATAGTATTCGGTTTCGAGGAGTTAGTATCACCGTTTCTGGAGGGTCGCGAACT
CTTCAGCATCTCTGTGAGATGGCAATTCGGTCTAAGCAAGAACTGCTACAGCTTGCCCCAATCGAAGTGG
AAAGTAATGTATCAAGAGGATGCCCTGAAGGTACTCAAACCTTCGAAAAAGAAAGCGAGTAAGTTAAAAT
GCTTCTTCGTCTCCTATTTATAATATGGTTTGTATTGTTAATTTTGTCTTGTAGAAGAGCTTAATTAA
TCGTTGTTGTTATGAAATACTATTTGTATGAGATGAACTGGTGAATGTAATTCATTTACATAAGTGGAG
TCAGAATCAGAATGTTTCTCCATAACTAAGTACATGAAGACCTGCCGCGTACAATTGTCTTATATTT
GAACAATAAAATGAACATCTTTTGCCACAACCTTTATAAGTGGTTAATATAGCTCAAATATATGGTCAA
GTTCAATAGATTAATAATGAAATATCAGTTATCGAAATTCATTAACAATCAACTTAACGTTATTAACATA
CTAATTTTATATCATCCCCTTTGATAAATGATAGTACACCAATTAGGAAGGAGCATGCTCGCCTAGGAGA
TTGTCGTTTCCCGCCTTCAGTTTGCAAGCTGCTCTAGCCGTGTAGCCAATACGCAAACCGCCTCTCCCCG
CGCGTTGGGAATTACTAGCGCGTGTGACAAAGCTTGCATGCCGTCACATGGTGGAGCACGACACACTT
GTCTACTCCAAAAATATCAAAGATACAGTCTCAGAAGACCAAAGGGCAATTGAGACTTTTCAACAAAGGG
TAATATCCGGAAACCTCCTCGGATTCATTGCCAGCTATCTGTCACTTTATTGTGAAGATAGTGGAAAA
GGAAGGTGGCTCCTACAAATGCCATCATTGCGATAAAGGAAAGGCCATCGTTGAAGATGCCTCTGCCGAC
AGTGGTCCCAAAGATGGACCCCCACCCACGAGGAGCATCGTGGAAAAAGAAGACGTTCCAACCACGTCTT
CAAAGCAAGTGGATTGATGTGATAACATGGTGGAGCACGACACACTTGTCTACTCCAAAAATATCAAAGA
TACAGTCTCAGAAGACCAAAGGGCAATTGAGACTTTTCAACAAAGGGTAATATCCGGAAACCTCCTCGGA
TTCCATTGCCAGCTATCTGTCACTTTATTGTGAAGATAGTGGAAAAAGGAAGGTGGCTCCTACAAATGCC
ATCATTGCGATAAAGGAAAGGCCATCGTTGAAGATGCCCTCTGCCGACAGTGGTCCCAAAGATGGACCCCC
ACCCACGAGGAGCATCGTGGAAAAAGAAGACGTTCCAACCACGTCTTCAAAGCAAGTGGATTGATGTGAT
ATCTCCACTGACGTAAGGGATGACGCACAATCCCACTATCCTTTCGCAAGACCCCTTCTCTATATAAGGAA
GTTCAATTCATTTGGAGAGGTATTAATCTTAATAGGTTTTGATAAAAGCGAACGTGGGGAAACCCGAA
CCAAACCTTCTTCTAAACTCTCTCTCATCTCTCTTAAAGCAAACTTCTCTCTTGTCTTTCTTGCCTGAGC
GATCTTCAACGTTGTGAGATCGTGCTTCGGCACCGCGGATGGCGAAAAACGTTGCGATTTTTCGGCTTATT
GTTTTCTCTTCTTGTGTTGGTTTCCTTCTCAGATCTTCGCCCTGCAGGCTCCTCAGCCAAAACGACACCCCC
ATCTGTCTATCCACTGGCCCCCTGGATCTGCTGCCCAAACTAACTCCATGGTGACCCTGGGATGCCTGGTC
AAGGGCTATTTCCCTGAGCCAGTGACAGTGACCTGGAACCTCTGGATCCCTGTCCAGCGGTGTGCACACCT
TCCCAGCTGTCTGACGTCTGACCTCTACACTCTGAGCAGCTCAGTGACTGTCCCCTCCAGCACCTGGCC
CAGCGAGACCGTCACCTGCAACGTTGCCACCCGGCCAGCAGCACCAAGGTGGACAAGAAAATTGTGCC
AGGGATTGTGGTTGTAAGCCTTGCAATGTACAGTCCCAGAAAGTATCATCTGTCTTCATCTTCCCCCAA
AGCCCAAGGATGTGCTCACCATTACTCTGACTCCTAAGGTCACGTGTGTTGTGGTAGACATCAGCAAGGA
TGATCCCAGGTCAGTTTCTGAGTGGTTTGTAGATGATGTGGAGGTGCACACAGCTCAGACGCAACCCCGG
GAGGAGCAGTTCAACAGCACTTTCGGCTCAGTCAGTGAACCTCCCATCATGCACCAGGACTGGCTCAATG
GCAAGGAGCGATCGCTCACCATCACCATCACCATCACCATCACCATTAAAGGCCTATTTTCTTTAGTTTG
AATTTACTGTTATTCGGTGTGCATTTCTATGTTTGGTGAGCGGTTTTCTGTGCTCAGAGTGTGTTTATTT
TATGTAATTTAATTTCTTTGTGAGCTCCTGTTTAGCAGGTCGTCCCTTCAGCAAGGACACAAAAGATTT
TAATTTTATTATCGTTCAAACATTTGGCAATAAAGTTTCTTAAGATTGAATCCTGTTGCCGGTCTTGCGA
TGATTATCATATAATTTCTGTTGAATTACGTTAAGCATGTAATAATTAAACATGTAATGCATGACGTTATT
TATGAGATGGGTTTTTATGATTAGAGTCCCGCAATTATACATTTAATACGCGATAGAAAACAAAATATAG
CGCGCAAACTAGGATAAATTATCGCGCGCGGTGTCATCTATGTTACTAGATCTCTAGAGTCTCAAGCTTG

Figure 17C-2 (continued)

GCGCGCCACGTGACTAGTGGCACTGGCCGTCGTTTACAAACGTCTGACTGGGAAAACCTGGCGTTAC
CCAACTTAATCGCCTTGCAGCACATCCCCCTTCGCCAGCTGGCGTAATAGCGAAGAGGCCCGCACCGAT
CGCCCTTCCCAACAGTTGCGCAGCCTGAATGGCGAATGCTAGAGCAGCTTGAGCTTGGATCAGATTGTCTG
TTTCCCGCCTTCAGTTTAACTATCAGTGTGACAGGATATATTGGCGGGTAAACCTAAGAGAAAAGAG
CGTTTA

Figure 17D**Construct 6100 from 2X35S prom to NOS term (SEQ ID NO: 10)**

GTCAACATGGTGGAGCACGACACACTTGTCTACTCCAAAAATATCAAAGATACAGTCTCAGAAGACCAAA
GGGCAATTGAGACTTTTCAACAAAGGGTAATATCCGGAAACCTCCTCGGATTCCATTGCCCAGCTATCTG
TCACTTTATTGTGAAGATAGTGGAAAAGGAAGGTGGCTCCTACAAATGCCATCATTGCGATAAAGGAAAG
GCCATCGTTGAAGATGCCTCTGCCGACAGTGGTCCCAAAGATGGACCCCCACCCACGAGGAGCATCGTGG
AAAAAGAAGACGTTCCAACCACGTCTTCAAAGCAAGTGGATTGATGTGATAACATGGTGGAGCACGACAC
ACTTGTCTACTCCAAAAATATCAAAGATACAGTCTCAGAAGACCAAAAGGGCAATTGAGACTTTTCAACAA
AGGGTAATATCCGGAAACCTCCTCGGATTCCATTGCCCAGCTATCTGTCACTTTATTGTGAAGATAGTGG
AAAAGGAAGGTGGCTCCTACAAATGCCATCATTGCGATAAAGGAAAGGCCATCGTTGAAGATGCCTCTGC
CGACAGTGGTCCCAAAGATGGACCCCCACCCACGAGGAGCATCGTGGAAAAAGAAGACGTTCCAACCACG
TCTTCAAAGCAAGTGGATTGATGTGATATCTCCACTGACGTAAGGGATGACGCACAATCCCACTATCCTT
CGCAAGACCCTTCCTCTATATAAGGAAGTTCATTTCAATTTGGAGAGGTATTAAAATCTTAATAGTTTTG
ATAAAAGCGAACGTGGGGAAACCCGAACCAACCTTCTTCTAACTCTCTCTCATCTCTCTTAAAGCAAA
CTTCTCTCTTGTCTTTCTTGCCTGAGCGATCTTCAACGTTGTGAGATCGTGCTTCGGCACCAGTACAATG
GCGAAAAACGTTGCGATTTTTCGGCTTATTGTTTTCTCTTCTGTGTTGGTTTCCTTCTCAGATCTTCGCTG
ACACATTATGTATAGGTTATCATGCGAACAATTCAACAGACACTGTAGACACAGTACTAGAAAAGAATGT
AACAGTAACACACTCTGTAAACCTTCTAGAAGACAAGCATAACGGGAAACTATGCAAATAAGAGGGGTA
GCCCCATTGCATTTGGGTAAATGTAACATTGCTGGCTGGATCCTGGGAAATCCAGAGTGTGAATCACTCT
CCACAGCAAGCTCATGGTCTTACATTGTGGAAACACCTAGTTCAGACAATGGAACGTGTTTCCCAGGAGA
TTTCATCGATTATGAGGAGCTAAGAGAGCAATTGAGCTCAGTGTCATCATTGAAAGGTTTGAGATATTC
CCCAAGACAAGTTCATGGCCCAATCATGACTCGAACAAAGGTGTAACGGCAGCATGTCTCATGCTGGAG
CAAAAAGCTTCTACAAAAATTTAATATGGCTAGTTAAAAAAGGAAATTCATACCCAAAGCTCAGCAAATC
CTACATTAATGATAAAGGGAAGAAGTCCCTCGTGCTATGGGGCATTACCATCCATCTACTAGTGCTGAC
CAACAAAGTCTCTATCAGAATGCAGATGCATATGTTTTGTGGGGTCATCAAGATACAGCAAGAAGTTCA
AGCCGGAAATAGCAATAAGACCCAAAGTGAGGGATCAAGAAGGAGAATGAATATTACTGGACACTAGT
AGAGCCGGGAGACAAAATAACATTGCAAGCAACTGGAAATCTAGTGGTACCGAGATATGCATTGCGAATG
GAAAGAAATGCTGGATCTGGTATTATCATTTGAGATACACCAGTCCACGATTGCAATACAACCTGTCAAA
CACCCAAGGGTGCTATAAACACCAGCCTCCCATTTGAGAAATATACATCCGATCACAATTGGAAAATGTCC
AAAAATATGTAAAAAGCACAAAATTGAGACTGGCCACAGGATTGAGGAATATCCCGTCTATTCAATCTAGA
GGACTATTTGGGGCCATTGCCGGTTTCATTGAAGGGGGGTGGACAGGGATGGTAGATGGATGGTACGGTT
ATCACCATCAAAATGAGCAGGGGTGAGGATATGCAGCCGACCTGAAGAGCACACAGAATGCCATTGACGA
GATTACTAACAAGTAAATTCTGTTATTGAAAAGATGAATACACAGTTCACAGCAGTAGGTAAAGAGTTC
AACCACCTGGAAAAAAGAATAGAGAATTTAAATAAAAAAGTTGATGATGGTTTCCTGGACATTTGGACTT
ACAATGCCGAAGTGTGGTTCTATTGGAAGTGAAGAACTTTGGACTACCACGATTCAAATGTGAAGAA
CTTATATGAAAAGGTAAGAAGCCAGCTAAAAACAATGCCAAGGAAATTTGAAAACGGCTGCTTTGAATTT
TACCACAAATGCGATAACACGTGCATGGAAAGTGTCAAAAATGGGACTTATGACTACCCAAAATACTCAG

Figure 17D-1 (continued)

AGGAAGCAAAATTAAACAGAGAAGAAATAGATGGGGTAAAGCTGGAATCAACAAGGATTTACCAGATTTT
GGCGATCTATTCAACTGTCGCCAGTTCATTGGTACTGGTAGTCTCCCTGGGGGCAATCAGTTTCTGGATG
TGCTCTAATGGGTCTCTACAGTGTAGAATATGTATTTAAAGGCTATTTTCTTTAGTTTGAATTTACTGT
TATTCGGTGTGCATTTCTATGTTTGGTGAGCGGTTTTCTGTGCTCAGAGTGTGTTTATTTTATGTAATTT
AATTTCTTTGTGAGCTCCTGTTTAGCAGGTCGTCCTTCAGCAAGGACACAAAAAGATTTTAATTTTATT
ATCGTTCAAACATTTGGCAATAAAGTTTCTTAAGATTGAATCCTGTTGCCGGTCTTGCGATGATTATCAT
ATAATTTCTGTTGAATTACGTTAAGCATGTAATAATTAACATGTAATGCATGACGTTATTTATGAGATGG
GTTTTTATGATTAGAGTCCCGCAATTATACATTTAATACGCGATAGAAAACAAAATATAGCGCGCAACT
AGGATAAATTATCGCGCGCGGTGTCATCTATGTTACTAGAT

Figure 17E**Cloning vector 2530 from left to right T-DNA (SEQ ID NO: 54)**

TGGCAGGATATATTGTGGTGTAAACAAATTGACGCTTAGACAACTTAATAACACATTGCGGACGTTTTTA
ATGTACTGAATTAACGCCGAATCCCGGGCTGGTATATTTATATGTTGTCAAATAACTCAAAAACCATAAA
AGTTTAAAGTTAGCAAGTGTGTACATTTTTACTTGAACAAAAATATTCACCTACTACTGTTATAAATCATT
ATTAAACATTAGAGTAAAGAAATATGGATGATAAGAACAGAGTAGTGATATTTTGACAACAATTTTGTT
GCAACATTTGAGAAAATTTTGTTGTTCTCTCTTTTCATTGGTCAAAAACAATAGAGAGAGAAAAAGGAAG
AGGGAGAATAAAAAACATAATGTGAGTATGAGAGAGAAAGTTGTACAAAAGTTGTACCAAAATAGTTGTAC
AAATATCATTGAGGAATTTGACAAAAGCTACACAAATAAGGGTTAATTGCTGTAAATAAATAAGGATGAC
GCATTAGAGAGATGTACCATTAGAGAATTTTTGGCAAGTCATTAAAAAGAAAGAATAAATTATTTTTTAA
ATTAAGAGTTGAGTCATTTGATTAAACATGTGATTATTTAATGAATTGATGAAAGAGTTGGATTAAAGTT
GTATTAGTAATTAGAATTTGGTGTCAAATTTAATTTGACATTTGATCTTTTCTATATATTGCCCCATAG
AGTCAGTTAACTCATTTTTATATTTTCATAGATCAAATAAGAGAAATAACGGTATATTAATCCCTCCAAA
AAAAAAAACGGTATATTTACTAAAAAATCTAAGCCACGTAGGAGGATAACAGGATCCCCGTAGGAGGATA
ACATCCAATCCAACCAATCACACAATCCTGATGAGATAACCCACTTTAAGCCCACGCATCTGTGGCACA
TCTACATTATCTAAATCACACATTCTTCCACACATCTGAGCCACACAAAAACCAATCCACATCTTTATCA
CCCATTCTATAAAAAATCACACTTTGTGAGTCTACACTTGATTCCCTTCAAACACATACAAAGAGAAGA
GACTAATTAATTAATTAATCATCTTGAGAGAAAAATGGAACGAGCTATACAAGGAAACGACGCTAGGGAAC
AAGCTAACAGTGAACGTTGGGATGGAGGATCAGGAGGTACCACTTCTCCCTTCAAACCTTCTGACGAAAG
TCCGAGTTGGACTGAGTGGCGGCTACATAACGATGAGACGAATTCGAATCAAGATAATCCCCTTGGTTTT
AAGGAAAGCTGGGGTTTCGGGAAAGTTGTATTTAAGAGATATCTCAGATACGACAGGACGGAAGCTTCAC
TGCACAGAGTCCTTGGATCTTGACGGGAGATTTCGTTAACTATGCAGCATCTCGATTTTTTCGGTTTTCGA
CCAGATCGGATGTACCTATAGTATTCGGTTTCGAGGAGTTAGTATCACCGTTTCTGGAGGGTCGCGAAT
CTTCAGCATCTCTGTGAGATGGCAATTCGGTCTAAGCAAGAACTGCTACAGCTTGCCCCAATCGAAGTGG
AAAGTAATGTATCAAGAGGATGCCCTGAAGGTACTCAAACCTTCGAAAAAGAAAGCGAGTAAGTTAAAT
GCTTCTTCGTCTCCTATTTATAATATGGTTTGTATTGTTAATTTTGTCTTGTAGAAGAGCTTAATTA
TCGTTGTTGTTATGAAATACTATTTGTATGAGATGAACTGGTGAATGTAATTCATTTACATAAGTGGAG
TCAGAATCAGAATGTTTCTCCATAACTAAGTAGACATGAAGACCTGCCGCGTACAATTGTCTTATATTT
GAACAATAAAATTGAACATCTTTTGCCACAACCTTTATAAGTGGTTAATATAGCTCAAATATATGGTCAA
GTTCAATAGATTAATAATGGAATATCAGTTATCGAAATTCATTAACAATCAACTTAACGTTATTAACATA
CTAATTTTATATCATCCCTTTGATAAATGATAGTACACCAATTAGGAAGGAGCATGCTCGCCTAGGAGA
TTGTGCTTTCCCGCCTTCAGTTTGCAAGCTGCTCTAGCCGTGTAGCCAATACGCAAACCGCCTCTCCCCG
CGCGTTGGGAATTACTAGCGCGTGTGACACGCGTGGCGCGCCCTGGTATATTTATATGTTGTCAAATAA

Figure 17E-1 (continued)

CTCAAAAACCATAAAAGTTTAAAGTTAGCAAGTGTGTACATTTTTACTTGAACAAAAATATTCACCTACTA
CTGTTATAAATCATTATTAAACATTAGAGTAAAGAAATATGGATGATAAGAACAAGAGTAGTGATATTTT
GACAACAATTTTGTGCAACATTTGAGAAAATTTTGTGTCTCTCTTTTCATTGGTCAAAAACAATAGA
GAGAGAAAAAGGAAGAGGGAGAATAAAAAACATAATGTGAGTATGAGAGAGAAAGTTGTACAAAAGTTGTA
CCAAAATAGTTGTACAAATATCATTGAGGAATTTGACAAAAGCTACACAAATAAGGGTTAATTGCTGTAA
ATAAATAAGGATGACGCATTAGAGAGATGTACCATTAGAGAATTTTTGGCAAGTCATTA AAAAGAAAGAA
TAAATTATTTTTTAAAATTAAAAGTTGAGTCATTTGATTAAACATGTGATTATTTAATGAATTGATGAAAG
AGTTGGATTAAAGTTGTATTAGTAATTAGAATTTGGTGTCAAATTTAATTTGACATTTGATCTTTTCCTA
TATATTGCCCCATAGAGTCAGTTAACTCATTTTTATATTTTCATAGATCAAATAAGAGAAATAACGGTATA
TTAATCCCTCCAAAAA AAAAAACGGTATATTTACTAAAAAATCTAAGCCACGTAGGAGGATAACAGGAT
CCCCGTAGGAGGATAACATCCAATCCAACCAATCACAACAATCCTGATGAGATAACCCACTTTAAGCCCA
CGCATCTGTGGCACATCTACATTATCTAAATCACACATTTCTCCACACATCTGAGCCACACAAAAACCAA
TCCACATCTTTATCACCCATTCTATAAAAAATCACACTTTGTGAGTCTACACTTTGATTCCCTTCAAACA
CATACAAAGAGAAGAGACTAATTAATTAATTAATCATCTTGAGAGAAAATGAGTCTTCTAACCGAGGTCTG
AAACGCCTATCAGAAACGAATGGGGGTGCAGATGCAACGATTCAGTGATCCTCTTGTTGTTGCCGCAAG
TATAATTGGGATTGTGCACCTGATATTGTGGATTATTGATCGCCTTTTTTCCAAAAGCATTATCGTATC
TTTAAACACGGTTTAAAAGAGGGCCTTCTACGGAAGGAGTACCAGAGTCTATGAGGGAAGAATATCGAG
AGGAACAGCAGAATGCTGTGGATGCTGACGATGGTCATTTTGTGAGCATAGAGCTGGAGTAAGAGCTCTA
AGTTAAAATGCTTCTTCGTCTCCTATTTATAATATGGTTTGTATTGTTAATTTTGTTCCTGTAGAAGAG
CTTAATTAATCGTTGTTGTTATGAAATACTATTTGTATGAGATGAAGTGGTGAATGTAATTCATTTACA
TAAGTGGAGTCAGAATCAGAATGTTTCCCTCCATAACTAAGTACATGAAGACCTGCCGCGTACAATTGT
CTTATATTTGAACAACATAAATTGAACATCTTTTGCCACAACCTTTATAAGTGGTTAATATAGCTCAAATA
TATGGTCAAGTTCAATAGATTAATAATGGAATATCAGTTATCGAAATTCATTAACAATCAACTTAACGT
TATTAACCTACTAATTTTTATATCATCCCCCTTGATAAATGATAGTACACCAATTAGGAAGGAAGTAGGAGA
TTGTGCTTTTCCCGCCTTCAGTTTGCAAGCTGCTCTAGCCGTGTAGCCAATACGCAAACCGCCTCTCCCCG
CGCGTTGGGAATTACTAGCGCGTGTGACAAAGCTTGCATGCCGGTCAACATGGTGGAGCACGACACACTT
GTCTACTCCAAAAATATCAAAGATACAGTCTCAGAAGACCAAAGGGCAATTGAGACTTTTCAACAAAGGG
TAATATCCGGAAACCTCCTCGGATTCCATTGCCAGCTATCTGTCACTTTATTGTGAAGATAGTGGAAAA
GGAAGGTGGCTCCTACAAATGCCATCATTGCGATAAAGGAAAGGCCATCGTTGAAGATGCCTCTGCCGAC
AGTGGTCCCAAAGATGGACCCCCACCCACGAGGAGCATCGTGGAAAAAGAAGACGTTCCAACCACGTCTT
CAAAGCAAGTGGATTGATGTGATAACATGGTGGAGCACGACACACTTGTCTACTCCAAAAATATCAAAGA
TACAGTCTCAGAAGACCAAAGGGCAATTGAGACTTTTCAACAAAGGGTAATATCCGGAAACCTCCTCGGA
TTCCATTGCCAGCTATCTGTCACTTTATTGTGAAGATAGTGGAAAAGGAAGGTGGCTCCTACAAATGCC
ATCATTGCGATAAAGGAAAGGCCATCGTTGAAGATGCCTCTGCCGACAGTGGTCCCAAAGATGGACCCCC
ACCCACGAGGAGCATCGTGGAAAAAGAAGACGTTCCAACCACGTCTTCAAAGCAAGTGGATTGATGTGAT
ATCTCCACTGACGTAAGGGATGACGCACAATCCCACTATCCTTCGCAAGACCCTTCCTCTATATAAGGAA
GTTCAATTCATTTGGAGAGGTATTAAAATCTTAATAGGTTTTGATAAAAGCGAACGTGGGGAAACCCGAA
CCAAACCTTCTTCTAAACTCTCTCTCATCTCTCTTAAGCAAACTTCTCTCTTGTCTTTCTTGCGTGAGC
GATCTTCAACGTTGTGAGATCGTGCTTCGGCACCAGTACAATGGCGAAAAACGTTGCGATTTTTCGGCTTA
TTGTTTTCTCTTCTTGTGTTGGTTCCCTCTCAGATCTTCGCGACGTCACCTCCTCAGCCAAAACGACACCC
CCATCTGTCTATCCACTGGCCCCCTGGATCTGCTGCCCAAACTAAGTCCATGGTGACCCTGGGATGCCTGG
TCAAGGGCTATTTCCCTGAGCCAGTGACAGTGACCTGGAACCTCTGGATCCCTGTCCAGCGGTGTGCACAC
CTTCCCAGCTGTCTGACGTCTGACCTCTACACTCTGAGCAGCTCAGTGACTGTCCCCTCCAGCACCTGG
CCCAGCGAGACCGTCACCTGCAACGTTGCCACCCGGCCAGCAGCACCAAGGTGGACAAGAAAATTGTGC
CCAGGGATTGTGGTTGTAAGCCTTGCAATATGTACAGTCCAGAAGTATCATCTGTCTTCATCTTCCCCC
AAAGCCCAAGGATGTGCTCACCATTACTCTGACTCCTAAGGTCACGTGTGTTGTGGTAGACATCAGCAAG

Figure 17E-2 (continued)

GATGATCCCAGGTCAGTTCAGCTGGTTTGTAGATGATGTGGAGGTGCACACAGCTCAGACGCAACCCC
GGGAGGAGCAGTTCAACAGCACTTTCCGCTCAGTCAGTGAACCTCCCATCATGCACCAGGACTGGCTCAA
TGGCAAGGAGACGTCCAGATTTTGGCGATCTATTCAACTGTCGCCAGTTCATTGGTACTGGTAGTCTCCC
TGGGGGCAATCAGTTTCTGGATGTGCTCTAATGGGTCTCTACAGTGTAGAATATGTATTTAAAGGCCTAT
TTTCTTTAGTTTGAATTTACTGTTATTCGGTGTGCATTTCTATGTTTGGTGAGCGGTTTTCTGTGCTCAG
AGTGTGTTTTATTTTATGTAATTTAATTTCTTTGTGAGCTCCTGTTTAGCAGGTCGTCCCTTCAGCAAGGA
CACAAAAAGATTTTAATTTTATTAATAAAAAAAAAAAAAAAAAAGACCGGAATTCGATATCAAGCTTATCGA
CCTGCAGATCGTTCAAACATTTGGCAATAAAGTTTCTTAAGATTGAATCCTGTTGCCGGTCTTGCGATGA
TTATCATATAATTTCTGTTGAATTACGTTAAGCATGTAATAATTAACATGTAATGCATGACGTTATTTAT
GAGATGGGTTTTTATGATTAGAGTCCCGCAATTATACATTTAATACGCGATAGAAAACAAAATATAGCGC
GCAAACTAGGATAAATTATCGCGCGCGGTGTCATCTATGTTACTAGATCTCTAGAGTCTCAAGCTTGGCG
CGCCACGTGACTAGTGGCACTGGCCGTGTTTTACAACGTCTGACTGGGAAAACCTGGCGTTACCCA
ACTTAATCGCCTTGCAGCACATCCCCCTTTGCCAGCTGGCGTAATAGCGAAGAGGCCCGCACCGATCGC
CCTTCCCAACAGTTGCGCAGCCTGAATGGCGAATGCTAGAGCAGCTTGAGCTTGGATCAGATTGTCGTTT
CCGCCTTCAGTTTAACTATCAGTGTGTGACAGGATATATTGGCGGGTAAACCTAAGAGAAAAGAGCGT
TTA

Figure 17F**Construct 2835 from 2X35S prom to NOS term (SEQ ID NO: 55)**

GTCAACATGGTGGAGCACGACACACTTGTCTACTCCAAAAATATCAAAGATACAGTCTCAGAAGACCAAA
GGGCAATTGAGACTTTTCAACAAAGGGTAATATCCGGAAACCTCCTCGGATTCCATTGCCCAGCTATCTG
TCACTTTATTGTGAAGATAGTGGAAAAGGAAGGTGGCTCCTACAAATGCCATCATTGCGATAAAGGAAAG
GCCATCGTTGAAGATGCCTCTGCCGACAGTGGTCCCAAAGATGGACCCCCACCCACGAGGAGCATCGTGG
AAAAAGAAGACGTTCCAACCACGTCTTCAAAGCAAGTGGATTGATGTGATAACATGGTGGAGCACGACAC
ACTTGTCTACTCCAAAAATATCAAAGATACAGTCTCAGAAGACCAAAAGGGCAATTGAGACTTTTCAACAA
AGGGTAATATCCGGAAACCTCCTCGGATTCCATTGCCCAGCTATCTGTCACTTTATTGTGAAGATAGTGG
AAAAGGAAGGTGGCTCCTACAAATGCCATCATTGCGATAAAGGAAAGGCCATCGTTGAAGATGCCTCTGC
CGACAGTGGTCCCAAAGATGGACCCCCACCCACGAGGAGCATCGTGGAAAAAGAAGACGTTCCAACCACG
TCTTCAAAGCAAGTGGATTGATGTGATATCTCCACTGACGTAAGGGATGACGCACAATCCCACTATCCTT
CGCAAGACCTTCTCTATATAAGGAAGTTCATTTCAATTTGGAGAGGTATTAAATCTTAATAGGTTTTTG
ATAAAAGCGAACGTGGGGAACCCGAACCAACCTTCTTCTAAACTCTCTCTCATCTCTCTTAAAGCAAA
CTTCTCTTTGTCTTTCTTGCGTGAGCGATCTTCAACGTTGTCAGATCGTGCTTCGGCACCAGTACAATG
GCGAAAAACGTTGCGATTTTTCGGCTTATTGTTTTCTTCTTGTGTTGGTTCTTCTCAGATCTTTCGCGG
ATCGAATCTGCACTGGGATAACATCTTCAAACCTCACCTCATGTGGTCAAAACAGCTACTCAAGGGGAGGT
CAATGTGACTGGCGTGATACCACTGACAACAACCAACAAAATCTTATTTTGCAAATCTCAAAGGAACA
AGGACCAGAGGGAAACTATGCCCGGACTGTCTCAACTGTACAGATCTGGATGTGGCCTTGGGCAGGCCAA
TGTGTGTGGGGACCACACCTTCTGTCTAAAGCTTCAATACTCCATGAGGTGAGACCTGTTACATCCGGGTG
CTTTCTTATAATGCACGACAGAACAAAAATCAGGCAACTACCCAATCTTCTCAGAGGATATGAAAAGATC
AGGTTATCAACCCAAAACGTTATCGATGCAGAAAAAGCACCAGGAGGACCCTACAGACTTGGAACCTCAG
GATCTTGGCCTAACGCTACCAAGTAAATCGGATTTTTTGAACAATGGCTTGGGCTGTCCCAAAGGACAA
CTACAAAAATGCAACGAACCCACTAACAGTGGAAGTACCATACATTTGTACAGAAGGGGAAGACCAATT
ACTGTTTGGGGGTTCCATTTCGATAACAAAACCCAAATGAAGAGCCTCTATGGAGACTCAAATCCTCAA
AGTTCACCTCATCTGCTAATGGAGTAACCACGCATTATGTTTCTCAGATTGGCGACTTCCAGATCAAAC

Figure 17F-1 (continued)

AGAAGACGGAGGACTACCACAAAGCGGCAGAATTGTTGTTGATTACATGATGCAAAAACCTGGGAAAACA
GGAACAATTGTCTATCAAAGGGGTGTTTTGTTGCCCTCAAAAAGGTGTGGTGCGCGAGTGGCAGGAGCAAAG
TAATAAAAGGGTCATTGCCTTTAATTGGTGAAGCAGATTGCCTTCATGAAGAATACGGTGGATTAAACAA
AAGCAAGCCTTACTACACAGGAAAACATGCAAAAGCCATAGGAAATTGCCCAATATGGGTAAAAACACCT
TTGAAGCTTGCCAATGGAACCAAATATAGACCTCCTGGTGGAGGATGGGAAGGAATGATTGCAGGTTGGC
ACGGATACACATCTCACGGAGCACATGGAGTGGCAGTGGCGGCAGACCTTAAGAGTACACAAGAAGCTAT
AAATAAGATAACAAAAAATCTCAATTCTTTGAGTGAAGTAGAAGTAAAGAACCTTCAAAGACTAAGTGGT
GCCATGGATGAACTCCACAACGAAATACTCGAGCTGGATGAAAAAGTGGATGATCTCAGAGCTGACACTA
TAAGCTCACAAATAGAAGTTGCAGTCTTGCTTTCCAACGAAGGAATAATAAACAGTGAAGACGAGCATCT
ATTGGCACTTGAGAGAAAACTAAAGAAAATGCTGGGTCCCTCTGCTGTAGACATAGGAAACGGATGCTTC
GAAACCAAACACAAATGCAACCAGACCTGCTTAGACAGGATAGCTGCTGGCACCTTTAATGCAGGAGAAT
TTTCTCTCCCCACTTTTGATTCAATTGAACATTACTGCTGCATCTTTAAATGATGATGGATTGGATAACTA
CCAGATTTTGGCGATCTATTCAACTGTCGCCAGTTCAATTGGTACTGGTAGTCTCCCTGGGGGCAATCAGT
TTCTGGATGTGCTCTAATGGGTCTCTACAGTGTAGAATATGTATTTAAAGGCCTATTTTCTTTAGTTTGA
ATTTACTGTTATTCGGTGTGCATTTCTATGTTTGGTGAGCGGTTTTCTGTGCTCAGAGTGTGTTTATTTT
ATGTAATTTAATTTCTTTGTGAGCTCCTGTTTAGCAGTCTGTCCTTCAGCAAGGACACAAAAAGATTTT
AATTTTATTAATAAAAAAAAAAAAAAAAAAGACCGGGAATTCGATATCAAGCTTATCGACCTGCAGATCGTTC
AAACATTTGGCAATAAAGTTTCTTAAGATTGAATCCTGTTGCCGGTCTTGCGATGATTATCATATAATTT
CTGTTGAATTACGTTAAGCATGTAATAATTAACATGTAATGCATGACGTTATTTATGAGATGGGTTTTTA
TGATTAGAGTCCCGCAATTATACATTTAATACGCGATAGAAAACAAAATATAGCGCGCAAACCTAGGATAA
ATTATCGCGCGCGGTGTCATCTATGTTACTAGAT

Figure 17G**Cloning vector 4499 from left to right T-DNA (SEQ ID NO: 56)**

TGGCAGGATATATTGTGGTGTAAACAAATTGACGCTTAGACAACTTAATAACACATTGCGGACGTTTTTA
ATGTACTGAATTAACGCCGAATCCCGGGCTGGTATATTTATATGTTGTCAAATAACTCAAAAACCATAAA
AGTTTAAGTTAGCAAGTGTGTACATTTTTACTTGAACAAAAATATTCACCTACTACTGTTATAAATCATT
ATTAAACATTAGAGTAAAGAAATATGGATGATAAGAACAAGAGTAGTGATATTTTGACAACAATTTTGT
GCAACATTTGAGAAAATTTTGTGTTCTCTCTTTTCATTGGTCAAAAACAATAGAGAGAGAAAAAGGAAG
AGGGAGAATAAAAAACATAATGTGAGTATGAGAGAGAAAGTTGTACAAAAGTTGTACCAAATAGTTGTAC
AAATATCATTGAGGAATTTGACAAAAGCTACACAAATAAGGGTTAATTGCTGTAATAAATAAGGATGAC
GCATTAGAGAGATGTACCATTAGAGAATTTTTGGCAAGTCATTAAAAAGAAAGAATAAATTATTTTTAAA
ATTTAAAGTTGAGTCATTTGATTAAACATGTGATTATTTAATGAATTGATGAAAGAGTTGGATTAAAGTT
GTATTAGTAATTAGAATTTGGTGTCAAATTTAATTTGACATTTGATCTTTTCTATATATTGCCCATAG
AGTCAGTTAACTCATTTTTATATTTCATAGATCAAATAAGAGAAATAACGGTATATTAATCCCTCCAAAA
AAAAAAAACGGTATATTTACTAAAAATCTAAGCCACGTAGGAGGATAACAGGATCCCCGTAGGAGGATA
ACATCCAATCCAACCAATCACAACAATCCTGATGAGATAACCCACTTTAAGCCCACGCATCTGTGGCACA
TCTACATTATCTAAATCACACATTCTTCCACACATCTGAGCCACACAAAAACCAATCCACATCTTTATCA
CCCATTCTATAAAAAATCACACTTTGTGAGTCTACACTTTGATTCCCTTCAAACACATACAAAGAGAAGA
GACTAATTAATTAATTAATCATCTTGAGAGAAAATGGAACGAGCTATACAAGGAAACGACGCTAGGGAAC
AAGCTAACAGTGAACGTTGGGATGGAGGATCAGGAGGTACCCTTCTCCCTTCAAACCTTCTGACGAAAG
TCCGAGTTGGACTGAGTGGCGGCTACATAACGATGAGACGAATTCGAATCAAGATAATCCCTTGGTTTC
AAGGAAAGCTGGGGTTTTCGGGAAGTTGTATTTAAGAGATATCTCAGATACGACAGGACGGAAGCTTCAC

Figure 17G-1 (continued)

TGCACAGAGTCCTTGATCTTGGACGGGAGATTCGGTTAACTATGCAGCATCTCGATTTTTTCGGTTTCGA
CCAGATCGGATGTACCTATAGTATTCGGTTTCGAGGAGTTAGTATCACCGTTTCTGGAGGGTCGCGAACT
CTTCAGCATCTCTGTGAGATGGCAATTCGGTCTAAGCAAGAACTGCTACAGCTTGCCCCAATCGAAGTGG
AAAGTAATGTATCAAGAGGATGCCCTGAAGGTACTCAAACCTTCGAAAAAGAAAGCGAGTAAGTTAAAAT
GCTTCTTCGTCTCCTATTTATAATATGGTTTGTATTGTAAATTTTGTTCCTGTAGAAGAGCTTAATTAA
TCGTTGTTGTTATGAAATACTATTTGTATGAGATGAACTGGTGAATGTAATTCATTTACATAAGTGGAG
TCAGAATCAGAATGTTTCTCCATAACTAAGTACATGAAGACCTGCCGCGTACAATTGTCTTATATTT
GAACAACATAAAATTGAACATCTTTTGCCACAACCTTTATAAGTGGTGAATATAGCTCAAATATATGGTCAA
GTTCAATAGATTAATAATGGAATATCAGTTATCGAAATTCATTAACAATCAACTTAACGTTATTAACATA
CTAATTTTATATCATCCCTTTGATAAATGATAGTACACCAATTAGGAAGGAGCATGCTCGCCTAGGAGA
TTGTCGTTTTCCCGCCTTCAGTTTGCAAGCTGCTCTAGCCGTGTAGCCAATACGCAAACCGCCTCTCCCCG
CGCGTTGGGAATTACTAGCGCGTGTGACACGCGTGGCGCGCCCTGGTATATTTATATGTTGTCAAATAA
CTCAAAAACCATATAAAGTTAAGTTAGCAAGTGTGTACATTTTACTTGAACAAAAATATTACCTACTA
CTGTTATAAATCATTATTAACATTAGAGTAAAGAAATATGGATGATAAGAACAAGAGTAGTGATATTTT
GACAACAATTTTGTGCAACATTTGAGAAAATTTTGTGTTCTCTCTTTTCATTGGTCAAAAACAATAGA
GAGAGAAAAAGGAAGAGGGAGAATAAAAAACATAATGTGAGTATGAGAGAGAAAGTTGTACAAAAGTTGTA
CCAAAATAGTTGTACAAATATCATTGAGGAATTTGACAAAAGCTACACAAATAAGGGTTAATTGCTGTAA
ATAAATAAGGATGACGCATTAGAGAGATGTACCATTAGAGAATTTTGGCAAGTCATTAAAAAGAAAGAA
TAAATTATTTTTTAAAATTTAAGTTGAGTCATTTGATTAAACATGTGATTATTTAATGAATTGATGAAAG
AGTTGGATTAAAGTTGTATTAGTAATTAGAATTTGGTGTCAAATTTAATTTGACATTTGATCTTTTCCTA
TATATTGCCCCATAGAGTCAGTTAACTCATTTTTATATTTTCATAGATCAAATAAGAGAAATAACGGTATA
TTAATCCCTCCAAAAAACCGGTATATTTACTAAAAAATCTAAGCCACGTAGGAGGATAACAGGAT
CCCCGTAGGAGGATAACATCCAATCCAACCAATCACAACAATCCTGATGAGATAACCCACTTTAAGCCCA
CGCATCTGTGGCACATCTACATTATCTAAATCACACATCTCTCCACACATCTGAGCCACACAAAAACCAA
TCCACATCTTTATCACCCATTCTATAAAAAATCACACTTTGTGAGTCTACACTTTGATTCCCTTCAAACA
CATACAAAGAGAAGAGACTAATTAATTAATTAATCATCTTGAGAGAAAATGAGTCTTCTAACCGAGGTCTG
AAACGCCTATCAGAAACGAATGGGGGTGCAGATGCAACGATTCAAGTGATCCTCTTGTTGTTGCCGCAAG
TATAATTGGGATTGTGCACCTGATATTGTGGATTATTGATCGCCTTTTTTCCAAAAGCATTATCGTATC
TTTAAACACGGTTTTAAAAGAGGGCCTTCTACGGAAGGAGTACCAGAGTCTATGAGGGAAGAATATCGAG
AGGAACAGCAGAATGCTGTGGATGCTGACGATGGTCATTTTGTGAGCATAGAGCTGGAGTAAGAGCTCTA
AGTTAAAATGCTTCTTCGTCTCCTATTTATAATATGGTTTGTATTGTTAATTTTGTTCCTGTAGAAGAG
CTTAATTAATCGTTGTTGTTATGAAATACTATTTGTATGAGATGAACTGGTGAATGTAATTCATTTACA
TAAGTGGAGTCAGAATCAGAATGTTTCCCTCCATAACTAAGTACATGAAGACCTGCCGCGTACAATTGT
CTTATATTTGAACAACATAAATTTGAACATCTTTTGCCACAACCTTTATAAGTGGTGAATATAGCTCAAATA
TATGGTCAAGTTCAATAGATTAATAATGGAATATCAGTTATCGAAATTCATTAACAATCAACTTAACGT
TATTAACATAATTTTATATCATCCCTTTGATAAATGATAGTACACCAATTAGGAAGGAACTAGGAGA
TTGTCGTTTTCCCGCCTTCAGTTTGCAAGCTGCTCTAGCCGTGTAGCCAATACGCAAACCGCCTCTCCCCG
CGCGTTGGGAATTACTAGCGCGTGTGACAAAGCTTGCATGCCGGTCAACATGGTGGAGCACGACACACTT
GTCTACTCCAAAAATATCAAAGATACAGTCTCAGAAGACCAAAGGGCAATTGAGACTTTTCAACAAAGGG
TAATATCCGGAAACCTCCTCGGATTCCATTGCCGATAAAGGAAAGGCCATCGTTGAAGATGCCTCTGCCGAC
AGTGGTCCCAAAGATGGACCCCCACCCACGAGGAGCATCGTGGAAAAAGAAGACGTTCCAACCACGTCTT
CAAAGCAAGTGGATTGATGTGATAACATGGTGGAGCACGACACACTTGTCTACTCCAAAAATATCAAAGA
TACAGTCTCAGAAGACCAAAGGGCAATTGAGACTTTTCAACAAAGGGTAATATCCGGAAACCTCCTCGGA
TTCCATTGCCAGCTATCTGTCACTTTATTGTGAAGATAGTGGAAAAGGAAGGTGGCTCCTACAAATGCC
ATCATTGCGATAAAGGAAAGGCCATCGTTGAAGATGCCTCTGCCGACAGTGGTCCCAAAGATGGACCCCC

Figure 17G-2 (continued)

ACCCACGAGGAGCATCGTGGAAAAAGAAGACGTTCCAACCACGTCTTCAAAGCAAGTGGATTGATGTGAT
ATCTCCACTGACGTAAGGGATGACGCACAATCCCACTATCCTTCGCAAGACCCTTCCTCTATATAAGGAA
GTTCAATTTCAATTTGGAGAGGTATTAATCTTAATAGGTTTTGATAAAAGCGAACGTGGGGAAACCCGAA
CCAAACCTTCTTCTAACTCTCTCTCATCTCTCTTAAAGCAAACCTTCTCTCTTGTCTTTCTTGCCTGAGC
GATCTTCAACGTTGTGAGATCGTGCTTCGGCACCAGTACAATGGCGAAAAACGTTGCGATTTTTCGGCTTA
TTGTTTTCTCTTCTTGTGTTGGTTCCCTTCTCAGATCTTCGCGACGTCACTCCTCAGCCAAAACGACACCC
CCATCTGTCTATCCACTGGCCCCCTGGATCTGCTGCCCAAACCTAACTCCATGGTGACCCTGGGATGCCTGG
TCAAGGGCTATTTCCCTGAGCCAGTGACAGTGACCTGGAACCTCTGGATCCCTGTCCAGCGGTGTGCACAC
CTTCCAGCTGTCTGACGTCTGACCTCTACACTCTGAGCAGCTCAGTGACTGTCCCTCCAGCACCTGG
CCCAGCGAGACCGTCACCTGCAACGTTGCCACCCGGCCAGCAGCACCAAGGTGGACAAGAAAATTGTGC
CCAGGGATTGTGGTTGTAAGCCTTGACATATGTACAGTCCCAGAAGTATCATCTGTCTTCATCTTCCCCC
AAAGCCCAAGGATGTGCTCACCATTACTCTGACTCCTAAGGTCACGTGTGTTGTGGTAGACATCAGCAAG
GATGATCCCGAGGTCCAGTTCAGCTGGTTTGTAGATGATGTGGAGGTGCACACAGCTCAGACGCAACCCC
GGGAGGAGCAGTTCAACAGCACTTTCGGCTCAGTCAGTGAACCTCCCATCATGCACCAGGACTGGCTCAA
TGGCAAGGAGACGTCCAGATTTTGGCGATCTATTCAACTGTGCCAGTTTCATTGGTACTGGTAGTCTCCC
TGGGGGCAATCAGTTTCTGGATGTGCTCTAATGGGTCTCTACAGTGTAGAATATGTATTTAAAGGCCTAT
TTTCTTTAGTTTGAATTTACTGTTATTCGGTGTGCATTTCTATGTTTGGTGAGCGGTTTTCTGTGCTCAG
AGTGTGTTTATTTTATGTAATTTAATTTCTTTGTGAGCTCCTGTTTAGCAGGTGCTCCCTTCAGCAAGGA
CACAAAAGATTTTAATTTTATTATCGTTCAAACATTTGGCAATAAAGTTTCTTAAGATTGAATCCTGTT
GCCGGTCTTGCGATGATTATCATATAATTTCTGTTGAATTACGTTAAGCATGTAATAATTAACATGTAAT
GCATGACGTTATTTATGAGATGGGTTTTTATGATTAGAGTCCCGCAATTATACATTTAATACGCGATAGA
AAACAAAATATAGCGCGCAAACCTAGGATAAATTATCGCGCGCGGTGTCATCTATGTTACTAGATCTCTAG
AGTCTCAAGCTTGGCGCGCCACGTGACTAGTGGCACTGGCCGTGCTTTTACAACGTGCTGACTGGGAAA
ACCCTGGCGTTACCCAACCTTAATCGCCTTGCAGCACATCCCCCTTTCGCCAGCTGGCGTAATAGCGAAGA
GGCCCGCACCGATCGCCCTTCCCAACAGTTGCGCAGCCTGAATGGCGAATGCTAGAGCAGCTTGAGCTTG
GATCAGATTGTCGTTTTCCGCGCTTCAGTTTAAACTATCAGTGTTTGACAGGATATATTGGCGGGTAAACC
TAAGAGAAAAGAGCGTTTA

Figure 17H**Construct 8352 from 2X35S prom to NOS term (SEQ ID NO: 57)**

GTCAACATGGTGGAGCACGACACACTTGTCTACTCCAAAAATATCAAAGATACAGTCTCAGAAGACCAA
GGGCAATTGAGACTTTTCAACAAAGGGTAATATCCGGAAACCTCCTCGGATTCCATTGCCAGCTATCTG
TCACTTTATTGTGAAGATAGTGGAAAAGGAAGGTGGCTCCTACAAATGCCATCATTGCGATAAAGGAAAG
GCCATCGTTGAAGATGCCTCTGCCGACAGTGGTCCCAAAGATGGACCCCCACCCACGAGGAGCATCGTGG
AAAAAGAAGACGTTCCAACCACGTCTTCAAAGCAAGTGGATTGATGTGATAACATGGTGGAGCACGACAC
ACTTGTCTACTCCAAAAATATCAAAGATACAGTCTCAGAAGACCAAAGGGCAATTGAGACTTTTCAACAA
AGGGTAATATCCGGAAACCTCCTCGGATTCCATTGCCAGCTATCTGTCACTTTATTGTGAAGATAGTGG
AAAAGGAAGGTGGCTCCTACAAATGCCATCATTGCGATAAAGGAAAGGCCATCGTTGAAGATGCCTCTGC
CGACAGTGGTCCCAAAGATGGACCCCCACCCACGAGGAGCATCGTGGAAAAAGAAGACGTTCCAACCACG
TCTTCAAAGCAAGTGGATTGATGTGATATCTCCACTGACGTAAGGGATGACGCACAATCCCACTATCCTT
CGCAAGACCCTTCCTCTATATAAGGAAGTTCATTTCAATTTGGAGAGGTATTAATCTTAATAGGTTTTG
ATAAAAGCGAACGTGGGGAAACCCGAACCAAACCTTCTTCTAAACTCTCTCTCATCTCTCTTAAAGCAA
CTTCTCTCTTGTCTTTCTTGCCTGAGCGATCTTCAACGTTGTGAGATCGTGCTTCGGCACCAGTACAATG

Figure 17H-1 (continued)

GCGAAAAACGTTGCGATTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTTCCTTCTCAGATCTTCGCGG
ATCGAATCTGCACTGGGATAACATCTTCAAACCTCACCTCATGTGGTCAAAACAGCTACTCAAGGGGAGGT
CAATGTGACTGGCGTGATACCACTGACAACAACCAACAAAAATCTTATTTTGCAAATCTCAAAGGAACA
AGGACCAGAGGGAACTATGCCCGGACTGTCTCAACTGTACAGATCTGGATGTGGCCTTGGGCAGGCCAA
TGTGTGTGGGGACCACACCTTCTGCTAAAGCTTCAATACTCCATGAGGTGAGACCTGTTACATCCGGGTG
CTTTCCTATAATGCACGACAGAACAAAAATCAGGCAACTACCCAATCTTCTCAGAGGATATGAAAAGATC
AGGTTATCAACCCAAAACGTTATCGATGCAGAAAAAGCACCAGGAGGACCCTACAGACTTGGAACCGCCG
GATCTTGCCCTAACGCTACCAGTAAAATCGGATTTTTTGCACAATGGCTTGGGCTGTCCCAAAGGACAA
CTACAAAAATGCAACGAACCCACTAACAGTGGAAGTACCATACATTTGTACAGAAGGGGAAGACCAATT
ACTGTTTGGGGGTTCCATTTCGGATAACAAAACCCAAATGAAGAGCCTCTATGGAGACTCAAATCCTCAA
AGTTCACCTCATCTGCTAATGGAGTAACCACGCATTATGTTTCTCAGATTGGCGACTTCCCAGATCAAAC
AGAAGACGGAGGACTACCACAAAGCGGCAGAAATGTTGTTGATTACATGATGCAAAAACCTGGGAAAACA
GGAACAATTGTCTATCAAAGGGGTGTTTTGTTGCCTCAAAAGGTGTGGTGC GCGAGTGGCAGGAGCAAAG
TAATAAAAGGGTCATTGCCTTTAATTGGTGAAGCAGATTGCCTTCATGAAGAATACGGTGGATTAAACAA
AAGCAAGCCTTACTACACAGGAAAACATGCAAAAGCCATAGGAAATTGCCAATATGGGTAAAAACACCT
TTGAAGCTTGCCAATGGAACCAAATATAGACCTCCTGGTGGAGGATGGGAAGGAATGATTGCAGGTTGGC
ACGGATACACATCTCACGGAGCACATGGAGTGGCAGTGGCGGCAGACCTTAAGAGTACACAAGAAGCTAT
AAATAAGATAACAAAAAATCTCAATTCTTTGAGTGAAGTAAAGAACCTTCAAAGACTAAGTGGT
GCCATGGATGAACTCCACAACGAATACTCGAGCTGGATGAAAAAGTGGATGATCTCAGAGCTGACACTA
TAAGCTCACAAATAGAACTTGCAGTCTTGCTTTCCAACGAAGGAATAATAAACAGTGAAGACGAGCATCT
ATTGGCACTTGAGAGAAAATAAGAAAATGCTGGTCCCTCTGCTGTAGACATAGGAAACGGATGCTTC
GAAACCAACACAAATGCAACCAGACCTGCTTAGACAGGATAGCTGCTGGCACCTTTAATGCAGGAGAAT
TTTCTCTCCCCACTTTTGATTCAATTGAACATTACTGCTGCATCTTTAAATGATGATGGATTGGATAACTA
CCAGATTTTGGCGATCTATTCAACTGTCGCCAGTTCATTGGTACTGGTAGTCTCCCTGGGGGCAATCAGT
TTCTGGATGTGCTCTAATGGGTCTCTACAGTGTAGAATATGTATTTAAAGGCCTATTTTCTTTAGTTTGA
ATTTACTGTTATTTCGGTGTGCATTTCTATGTTTGGTGAAGCGTTTTTCTGTGCTCAGAGTGTGTTATTTT
ATGTAATTTAATTTCTTTGTGAGCTCCTGTTTAGCAGGTCTGCCCTTCAGCAAGGACACAAAAAGATTTT
AATTTTATTATCGTTCAAACATTTGGCAATAAAGTTTCTTAAGATTGAATCCTGTTGCCGGTCTTTCGAT
GATTATCATATAATTTCTGTTGAATTACGTTAAGCATGTAATAATTAACATGTAATGCATGACGTTATTT
ATGAGATGGGTTTTTATGATTAGAGTCCCGCAATTATACATTTAATACGCGATAGAAAACAAAATATAGC
GCGCAAACTAGGATAAATTATCGCGCGCGGTGTCATCTATGTTACTAGAT

Figure 17I**Construct 7281 from 2X35S prom to NOS term (SEQ ID NO: 58)**

GTCAACATGGTGGAGCACGACACACTTGTCTACTCCAAAAATATCAAAGATACAGTCTCAGAAGACAAA
GGGCAATTGAGACTTTTCAACAAAGGGTAATATCCGGAACCTCCTCGGATTCCATTGCCAGCTATCTG
TCACTTTATTGTGAAGATAGTGGAAAAGGAAGGTGGCTCCTACAAATGCCATCATTGCGATAAAGGAAAG
GCCATCGTTGAAGATGCCTCTGCCGACAGTGGTCCCAAAGATGGACCCCCACCCACGAGGAGCATCGTGG
AAAAAGAAGACGTTCCAACCACGTCTTCAAAGCAAGTGGATTGATGTGATAACATGGTGGAGCACGACAC
ACTTGTCTACTCCAAAAATATCAAAGATACAGTCTCAGAAGACCAAAGGGCAATTGAGACTTTTCAACAA
AGGGTAATATCCGGAACCTCCTCGGATTCCATTGCCAGCTATCTGTCACTTTATTGTGAAGATAGTGG
AAAAGGAAGGTGGCTCCTACAAATGCCATCATTGCGATAAAGGAAAGGCCATCGTTGAAGATGCCTCTGC
CGACAGTGGTCCCAAAGATGGACCCCCACCCACGAGGAGCATCGTGGAAAAAGAAGACGTTCCAACCACG

Figure 17I-1 (continued)

TCTTCAAAGCAAGTGGATTGATGTGATATCTCCACTGACGTAAGGGATGACGCACAATCCCACTATCCTT
CGCAAGACCCTTCCTCTATATAAGGAAGTTCATTTTCATTTGGAGAGGTATTAAAATCTTAATAGGTTTTG
ATAAAAGCGAACGTGGGGAAACCCGAACCAAACCTTCTTCTAAACTCTCTCTCATCTCTCTTAAAGCAA
CTTCTCTCTTGTCTTTCTTGCGTGAGCGATCTTCAACGTTGTCAGATCGTGCTTCGGCACCAGTACAATG
GCGAAAAACGTTGCGATTTTTCGGCTTATTGTTTTCTCTTCTTGTGTTGGTTTCCTTCTCAGATCTTCGCGC
AAAAAATCCCTGGAAATGACAATAGCACGGCAACGCTGTGCCTTGGGCACCATGCAGTACCAAACGGAAC
GATAGTGAAAAACAATCACGAATGACCGAATTGAAGTTACTAATGCTACTGAGCTGGTTCAGAATTCCTCA
ATAGGTGAAATATGCGACAGTCCTCATCAGATCCTTGATGGAGAAAACCTGCACACTAATAGATGCTCTAT
TGGGAGACCCTCAGTGTGATGGCTTTCAAATAAGAAATGGGACCTTTTTGTTGAACGAAACAAAGCCTA
CAGCAACTGTTACCCTTATGATGTGCCGATTATGCCTCCCTTAGGTCACTAGTTGCCTCATCCGGCACA
CTGGAGTTTAAACAATGAAAGCTTCAATTGGGCTGGAGTCACTCAAACGGAACAAGTTCTTCTTGCATAA
GGGGATCTAAGAGTAGTTTCTTTAGTAGATTAAATTGGTTGACCCACTTAACTCCAAATACCCAGCATT
AAACGTGACTATGCCAAACAATGAACAATTTGACAAATTGTACATTTGGGGGGTTTACCACCCGGGTACG
GACAAGGACCAAATCAGCCTGTATGCACAATCATCAGGAAGAATCACAGTATCTACCAAAGAAGCCAAC
AAGCTGTAATCCCGAATATCGGATCTAGACCCAGAATAAGGGATATCCCTAGCAGAATAAGCATCTATTG
GACAATAGTAAACCCGGGAGACATACTTTTGATTAACAGCACAGGAATCTAATTGCTCCTAGGGGTTAC
TTCAAATACGAAGTGGGAAAAGCTCAATAATGAGATCAGATGCACCCATTGGCAAATGCAAGTCTGAAT
GCATCACTCCAAATGGAAGCATTCCCAATGACAAACCATTCCAAATGTAACAGGATCACATACGGGGC
CTGTCCCAGATATGTTAAGCAAAGCACTCTGAAATTGGCAACAGGAATGCGAAATGTACCAGAGAGACAA
ACTAGAGGCATATTTGGCGCAATAGCGGGTTTCATAGAAAATGGTTGGGAGGGAATGGTGGATGGTTGGT
ACGGCTTCAGGCATCAAATTTCTGAGGGAAGAGGACAAGCAGCAGATCTCAAAGCACTCAAGCAGCAAT
CGATCAAATCAATGGGAAGCTGGCTCGAGTTATCGGGAAAACCAACGAGAAATTCATCAGATTGAAAAA
GAATTCTCAGAAGTAGAAGGGAGAATTTCAGGACCTTGAGAAATATGTTGAGGACACAAAAATAGATCTCT
GGTCATACAACGCGGAGCTTCTTGTGCCCCTGGAGAACCAACATACAATTGATCTAACTGACTCAGAAAT
GAACAAACTGTTTTGAAAAAACAAAGAAGCAACTGAGGGAAAAATGCTGAGGATATGGGCAATGGTTGTTTC
AAAAATATACCACAAATGTGACAATGCCTGCATGGGATCAATCAGAAATGGAACCTTATGACCACAACGTAT
ACAGGGATGAAGCATTAAACAACCGGTTCCAGATCAAGGGAGTTGAGCTGAAGTCAGGGTACAAAGATTG
GATCCTATGGATTTTCTTTGCCATATCATCCCTTGTAAGTTAGTTGCTTTGTTGGGGTTTCATCATGTGG
GCCTGCCAAAAGGGCAACATTAGGTGCAACATTTGCATTTGAAGGCCTATTTTCTTTAGTTTGAATTTAC
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CATATAATTTCTGTTGAATTACGTTAAGCATGTAATAATTAACATGTAATGCATGACGTTATTTATGAGA
TGGGTTTTTATGATTAGAGTCCCGCAATTATACATTTAATACGCGATAGAAAACAAAATATAGCGCGCAA
ACTAGGATAAATTATCGCGCGCGGTGTCATCTATGTTACTAGAT

Figure 17J**Construct 8179 from 2X35S prom to NOS term (SEQ ID NO: 59)**

GTCAACATGGTGGAGCACGACACACTTGTCTACTCCAAAAATATCAAAGATACAGTCTCAGAAGACCAAA
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Figure 18A

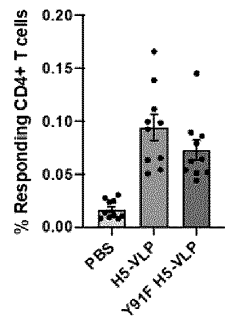
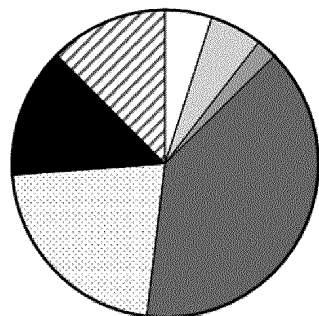
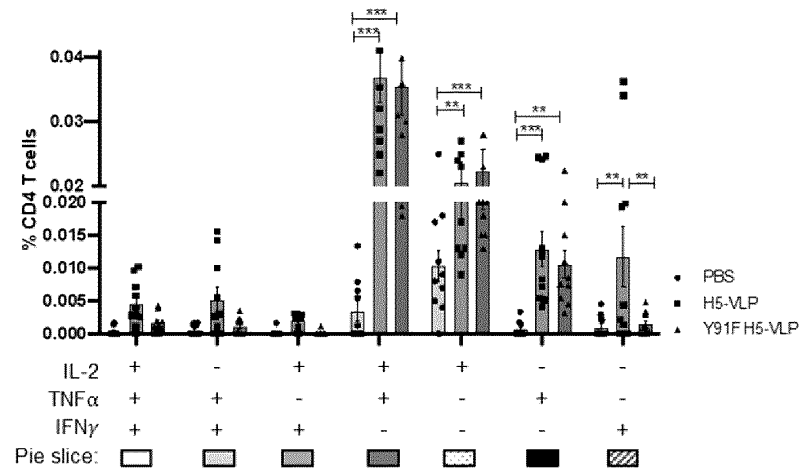
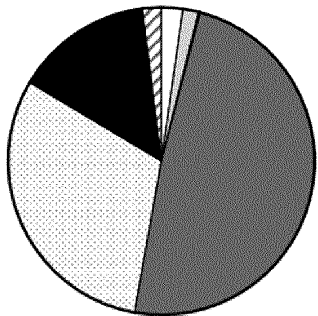


Figure 18B



H5-VLP



Y91F H5-VLP

Figure 18C

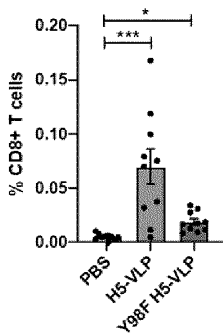
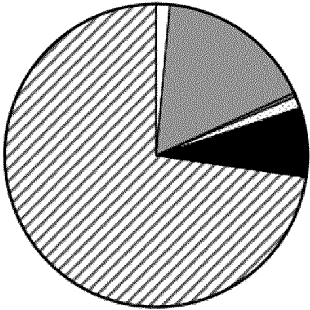
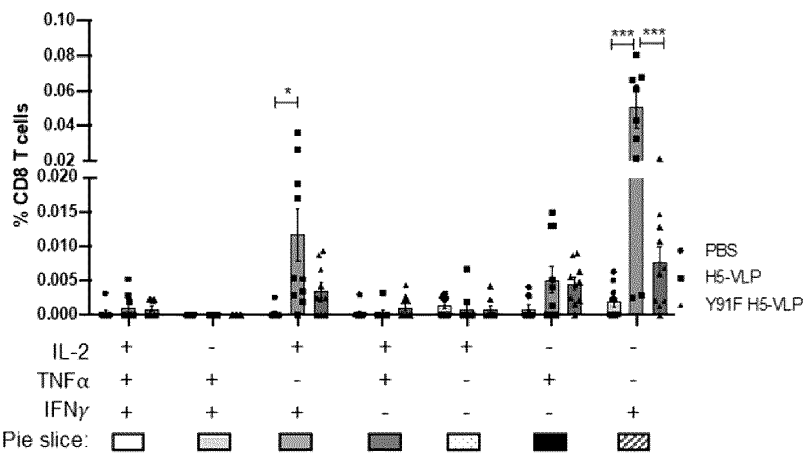
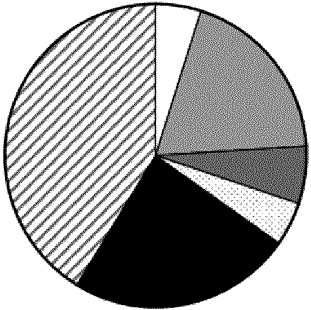


Figure 18D



H5-VLP



Y91F H5-VLP

Figure 18E

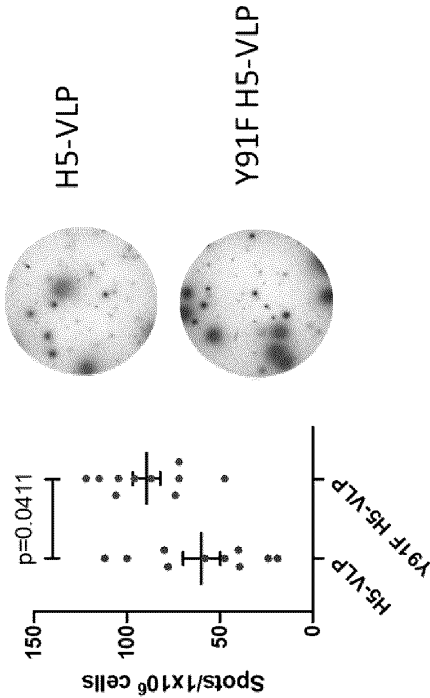


Figure 18F

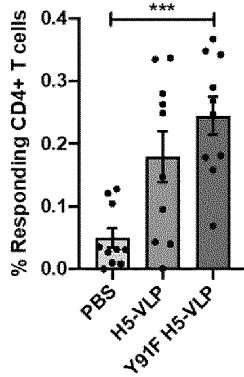
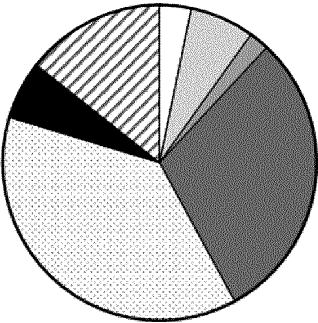
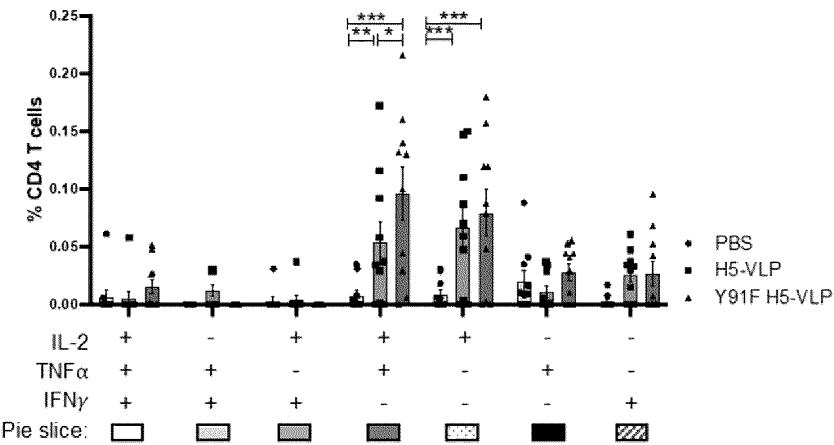
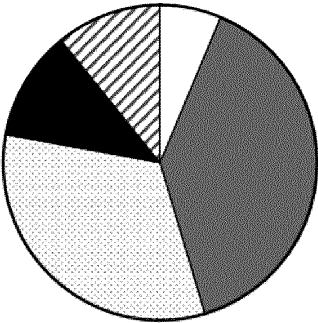


Figure 18G



H5-VLP



Y91F H5-VLP

Figure 19A

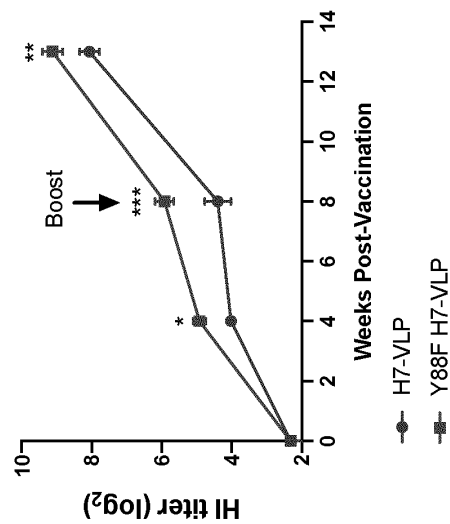


Figure 19B

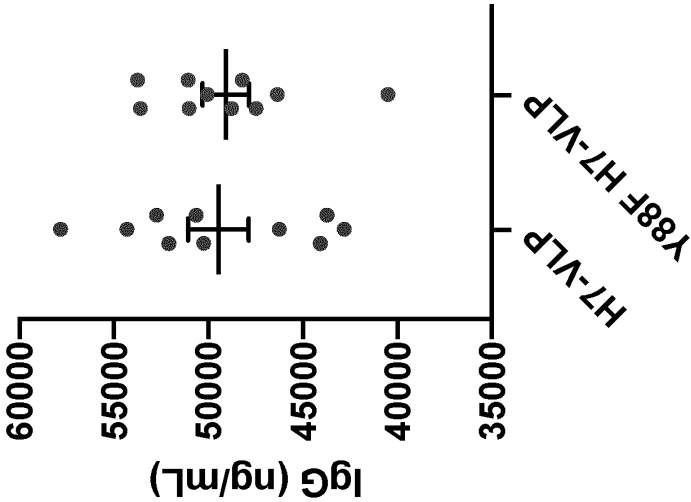


Figure 19C

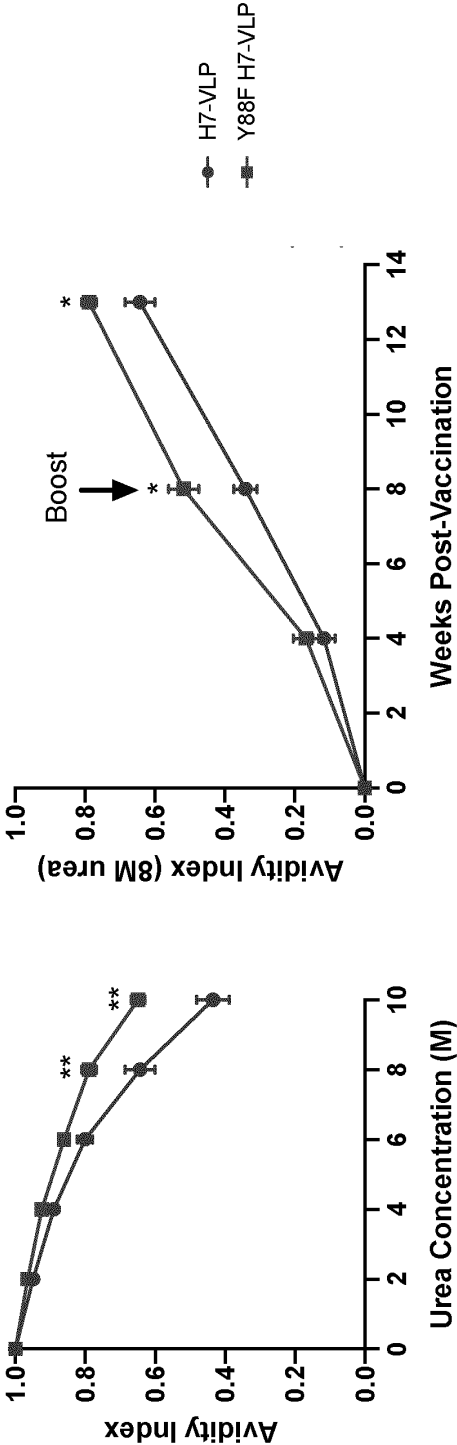


Figure 19D

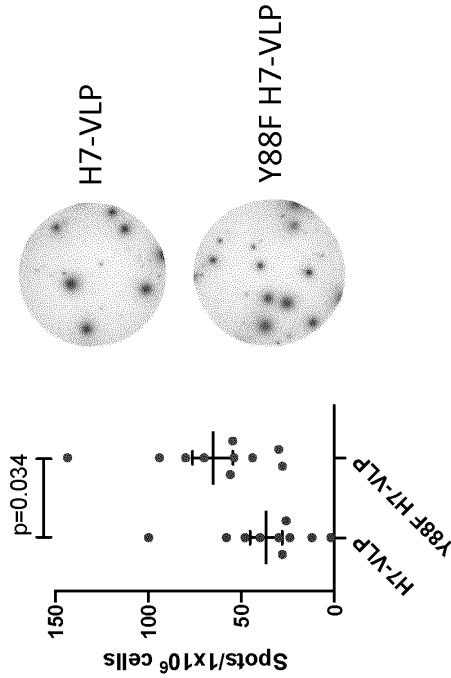


Figure 19E

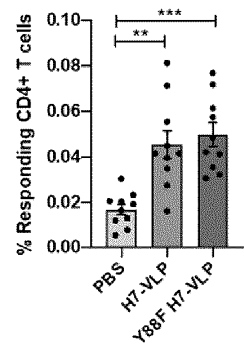


Figure 19F

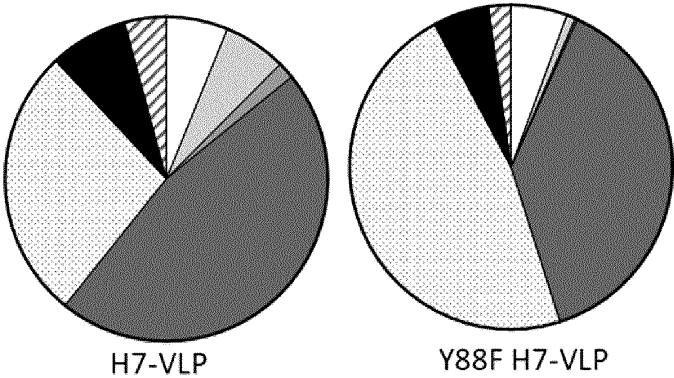
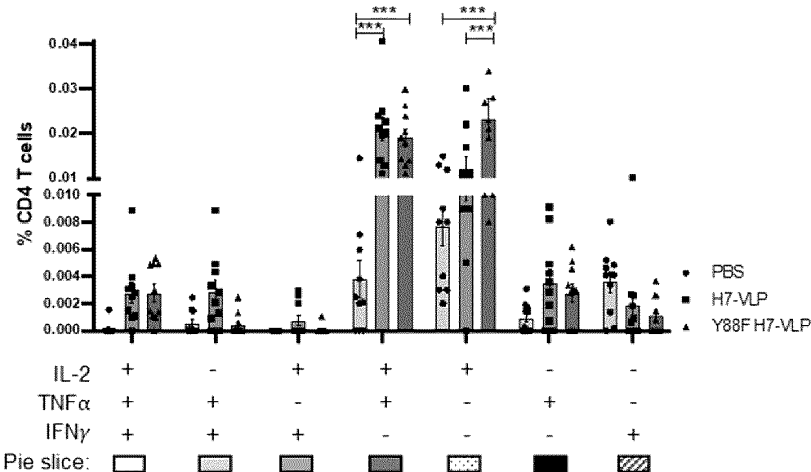


Figure 19G

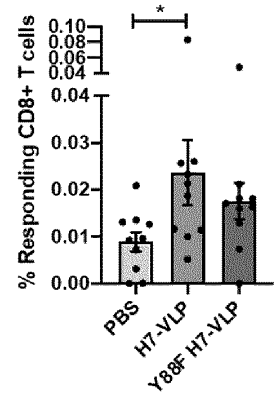
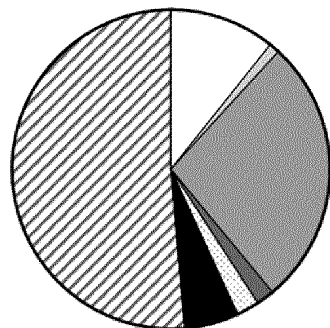
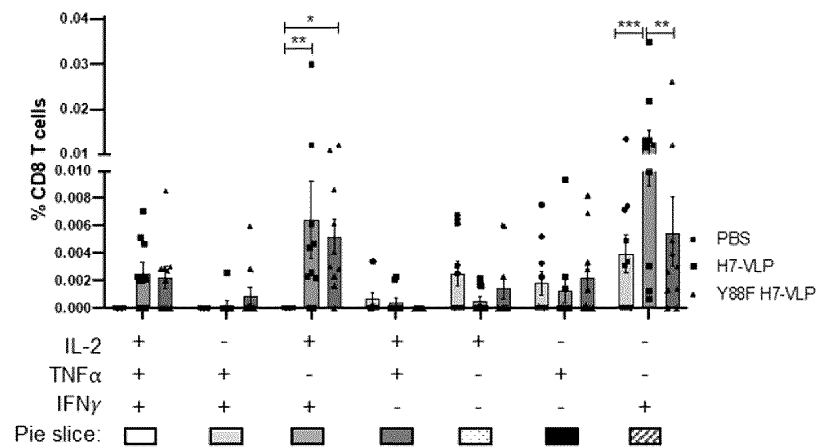
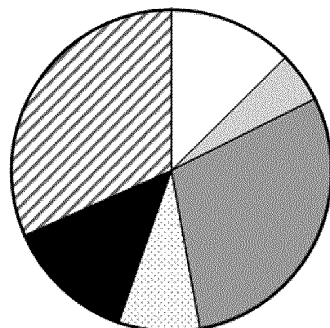


Figure 19H



H7-VLP



Y88F H7-VLP

Figure 20A

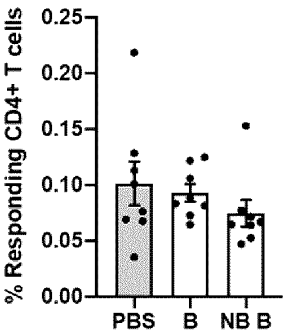
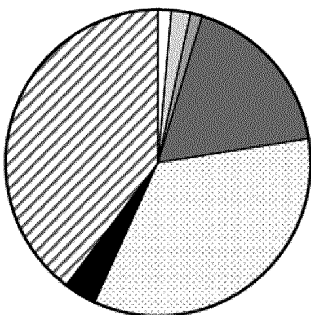
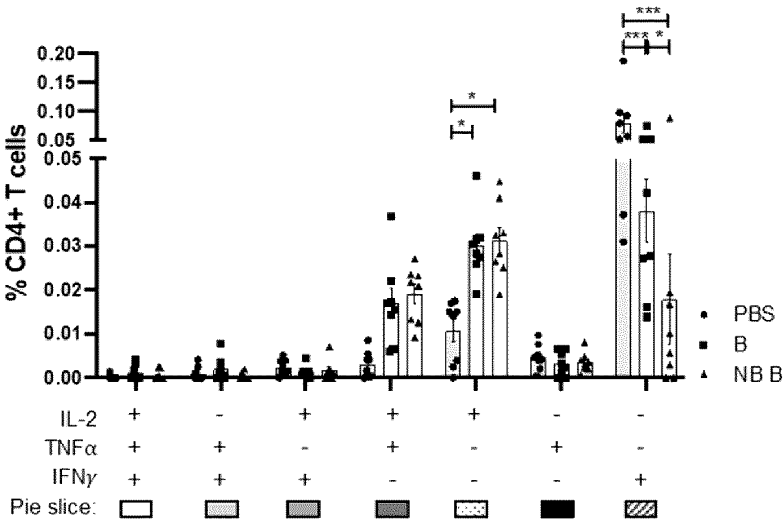
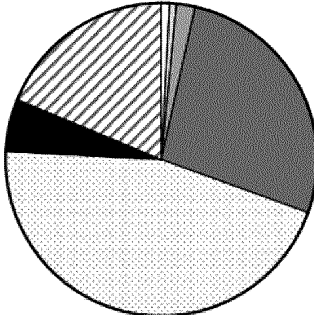


Figure 20B



B-VLP



NB B-VLP