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FIG. 1A

type 1 fimbriae D-mannose specific adhesin [Escherichia coli FimH J96 ELL41155.1
[E.coli J96]; 300 aa

```

1 MKRVITLFAV LLMGWSVNAW SFACKTANGT AIPIGGGSAN VYVNLAPVVN
  51 VGQNLVVDLS TQIFCHNDYP ETITDYVTLQ RGSAYGGVLS NFSGTVKYSG
 101 SSYPFPTTSE TPRVVYNSRT DKPWPVALYL TPVSSAGGVA IKAGSLIAVL
 151 ILRQTNNYNS DDFQFVWNIY ANNDVVVPTG GCDVSARDVT VTLPDYPGSV
 201 PIPLTVYCAK SQNLGYLLSG TTADAGNSIF TNTASFSPAQ GVGVLTRNG
 251 TIIPANNTVS LGAVGTSAVS LGLTANYART GGQVTAGNVQ SIIGVTFVYQ
(SEQ ID NO: 1)

```

FimH J96 sequence

```

1 MKRVITLFAV LLMGWSVNAW SFACKTANGT AIPIGGGSAN VYVNLAPVVN
  51 VGQNLVVDLS TQIFCHNDYP ETITDYVTLQ RGSAYGGVLS NFSGTVKYSG
 101 SSYPFPTTSE TPRVVYNSRT DKPWPVALYL TPVSSAGGVA IKAGSLIAVL
 151 ILRQTNNYNS DDFQFVWNIY ANNDVVVPTG GCDVSARDVT VTLPDYPGSV
 201 PIPLTVYCAK SQNLGYLLSG TTADAGNSIF TNTASFSPAQ GVGVLTRNG
 251 TIIPANNTVS LGAVGTSAVS LGLTANYART GGQVTAGNVQ SIIGVTFVYQ (SEQ ID
NO: 1)

```

Fragment of FimH, corresponding to aa residues 22-300 of SEQ ID NO: 1 [mature FimH
protein]

```

1 facttangt aipiggggsan vyvnlapvvv vgqnlvvdls tqifchndyp etitdyvtlq
 rgsayggvls nfsgtvkyeg ssypfpttse tprvvynsrt dkpwpvalyl tpvssaggva
 ikagsliavl ilrqtnnyns ddfqfvwniy anndvvvptg gcdvsardvt vtlpdypgsv
 pipltvycak sqnlgyllsg ttadagnsif tntasfspa qvgvqltrng tiipanntvs
 lgavgtsavs lgltanyart ggqvtagnvq siigvtfvyq 279 (SEQ ID NO: 2)

```

FimH lectin domain (SEQ ID NO: 3, which corresponds to aa residues 1–158 of SEQ ID
NO: 2)

```

1 facttangt aipiggggsan vyvnlapvvv vgqnlvvdls tqifchndyp etitdyvtlq
 rgsayggvls nfsgtvkyeg ssypfpttse tprvvynsrt dkpwpvalyl tpvssaggva
 ikagsliavl ilrqtnnyns ddfqfvwniy anndvvv 158 (SEQ ID NO: 3)

```

FIG. 1A continued

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FIG. 1A continued

FimH pilin domain (SEQ ID NO: 4, which corresponds to aa residues 160–279 of SEQ ID NO: 2)

160 gcdvsardvt vtlpdypgsv pipltvycak sgnlggyisg ttadagnsif tntasfspa
gvgvqltrng tiipanntvs lgavgtssav lgtanyart ggqvtagnvq siigvtfvyq 279
(SEQ ID NO: 4)

pSB02198 - FimH mlgK signal pept / F22..Q300 J96 FimH N28S V48C L55C N91S N249Q / 7 AA linker / FimG A1..K14 / GGHs8 in pcDNA3.1(+)

VETDTLLLWVLLWVPGSTGFACKTASGTAIPIGGGSANVYVNLAPCVNVGQNCVVDLSTQI
FCHNDYPETITDYVTLQRGSAYGGVLSSFSGTVKYSGSSYPFPTTSETPRVVYNSRTDKPW
PVALYLTVPSSAGGVAIKAGSLIAVLILRQTNNYNSDDFQFVWNIYANNDVVVPTGGCDVSA
RDVTVTLPDYPGSPVPIPLTVYCAKSQNLGYLSGTTADAGNSIFTNTASFSPAQGGVGVQLTR
QGTIIPANNTVSLGAVGTSAVSLGLTANYARTGGQVTAGNVQSIIGVTFVYQGGSSGGGAD
VTITVNGKVVAKGGHHHHHHHH (SEQ ID NO: 5)

pSB02307 - FimH mlgK signal pept / F22..Q300 J96 FimH N28S N91S N249Q / His8 in pcDNA3.1(+)

METDT LLLWV LLLWV PGSTG FACKT ASGTA IPIGG GSANV YVNLA PVVNV GQNLV
VDLST QIFCH NDYPE TITDY VTLQR GSAYG GVLSS FSGTV KYSGS SYPFP TTSET
PRVVY NSRTD KPWPV ALYLT PVSSA GGVAI KAGSL IAVLI LRQTN NYNSD DFQFV
WNIYA NNDVV VPTGG CDVSA RDVTV TLPDY PGSVP IPLTV YCAKS QNLGY YLSGT
TADAG NSIFT NTASF SPAQG VGVQL TRQGT IIPAN NTVSL GAVGT SAVSL GLTAN
YARTG GQVTA GNVQS IIGVT FVYQG GSSGG GADVT ITVNG KVVAK GHHHH HHHHH
(SEQ ID NO: 6)

Number of amino acids: 310 Molecular weight: 32095.80 Theoretical pI: 7.25

pSB02083 FimH Lectin Domain Wild Type construct

METDT LLLWV LLLWV PGSTG FACKT ASGTA IPIGG GSANV YVNLA PVVNV GQNLV
VDLST QIFCH NDYPE TITDY VTLQR GSAYG GVLSS FSGTV KYSGS SYPFP TTSET
PRVVY NSRTD KPWPV ALYLT PVSSA GGVAI KAGSL IAVLI LRQTN NYNSD DFQFV
WNIYA NNDVV VPTGG HHHHHHHH (SEQ ID NO: 7)

pSB02158 FimH Lectin Domain Lock Mutant

METDTLLLWVLLWVPGSTG FACKT ASGTA IPIGG GSANV YVNLA PCVNV GQNCV
VDLST QIFCH NDYPE TITDY VTLQR GSAYG GVLSS FSGTV KYSGS SYPFP TTSET

FIG. 1A continued

FIG. 1A continued

PRVVY NSRTD KPWPV ALYLT PVSSA GGVAI KAGSL IAVLI LRQTN NYNSD DFQFV
WNIYA NNDVV VPTGG HHHHHHHH (SEQ ID NO: 8)

FIG. 1B

FimG A1..K14 sequence
ADVTI TVNGK VVAK (SEQ ID NO: 9)

ADVT ITVNG KVVAK GHHH HHHH (SEQ ID NO: 21)

FIG. 1C

FimC sequence

1 MSNKNVNVVRK SQEITFCLLA GILMFMMVM AGRAEAGVAL GATRVITYPAG
51 QKQVQLAVTN NDENSTYLIQ SWVENADGVK DGRFIVTPPL FAMKGKKENT
101 LRILDATNNG LPQDRESLFW MNVKAIPSMQ KSKLTENTLQ LAIISRIKLY
151 YRPAKLALFP DQAAEKLRFK RSANSLTLIN PTFYYLTVTE LNAGTRVLEN
201 ALVEPPMGEST VKLPDAGSN ITYRTINDYG ALTPKMTQVM E (SEQ ID NO: 10)

FIG. 1D

DNKQ	4 aa	(SEQ ID NO: 11)
GGSGG	5 aa	(SEQ ID NO: 12)
GGSSG G	6 aa	(SEQ ID NO: 13)
GGSSG GG	7 aa	(SEQ ID NO: 14)
GGGSS GGG	8 aa	(SEQ ID NO: 15)
GGGSG SGGG	9 aa	(SEQ ID NO: 16)
GGGSG GSGGG	10 aa	(SEQ ID NO: 17)

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FIG. 1E**FimH J96 signal sequence**

MKRVI TLFV LLMGW SVNAW S (SEQ ID NO: 18)

pSB02198 - FimH mlgK signal pept / F22..Q300 J96 FimH N28S V48C L55C N91S N249Q / 7 AA linker / FimG A1..K14 / GGH8 in pcDNA3.1(+) [Number of amino acids: 310
Molecular weight: 32089.79 Theoretical pI: 7.23]

VETDT LLLWV LLLWV PGSTG (SEQ ID NO: 19) FACKT ASGTA IPIGG
GSANV YVNLA PCVNV GQNCV VDLST QIFCH NDYPE TITDY VTLQR
GSAYG GVLSS FSGTV KYSGS SYPFP TTSET PRVVY NSRTD KPWPV
ALYLT PVSSA GGVAI KAGSL IAVLI LRQTN NYNSD DFQFV WNIYA
NNDVV VPTGG CDVSA RDVTI TLPDY PGSVP IPLTV YCAKS QNLGY
YLSGT TADAG NSIFT NTASF SPAQG VGVQL TRQGT IIPAN NTVSL
GAVGT SAVSL GLTAN YARTG GQVTA GNVQS IIGVT FVYQ (SEQ ID NO:
20) GGSSG GG (SEQ ID NO: 14) ADVTI TVNGK VVAK GGHHH HHHHH
(SEQ ID NO: 21)

pSB02307 - FimH mlgK signal pept / F22..Q300 J96 FimH N28S N91S N249Q / His8 in
pcDNA3.1(+)

METDT LLLWV LLLWV PGSTG (SEQ ID NO: 22)
FACKT ASGTA IPIGG GSANV YVNLA PVVNV GQNLV VDLST QIFCH
NDYPE TITDY VTLQR GSAYG GVLSS FSGTV KYSGS SYPFP TTSET
PRVVY NSRTD KPWPV ALYLT PVSSA GGVAI KAGSL IAVLI LRQTN
NYNSD DFQFV WNIYA NNDVV VPTGG CDVSA RDVTI TLPDY PGSVP
IPLTV YCAKS QNLGY YLSGT TADAG NSIFT NTASF SPAQG VGVQL
TRQGT IIPAN NTVSL GAVGT SAVSL GLTAN YARTG GQVTA GNVQS
IIGVT FVYQ (SEQ ID NO: 23) GGSSG GG (SEQ ID NO: 14)
ADVITVNG KVVAK GGHHH HHHHH (SEQ ID NO: 21)

FIG. 1E continued

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FIG. 1E continued**pSB02083** FimH Lectin Domain Wild Type construct

METDT LLLWV LLLWV PGSTG (SEQ ID NO: 22)
 FACKT ASGTA IPIGG GSANV YVNLA PVVNV GQNLV VDLST QIFCH
 NDYPE TITDY VTLQR GSAYG GVLSS FSGTV KYSGS SYPFP TTSET
 PRVVY NSRTD KPWPV ALYLT PVSSA GGVAI KAGSL IAVLI LRQTN
 NYNSD DFQFV WNIYA NNDVV VPTGG (SEQ ID NO: 24) HHHHH HHH
 (SEQ ID NO: 25)

pSB02158 FimH Lectin Domain Lock Mutant

METDT LLLWV LLLWV PGSTG (SEQ ID NO: 22)
 FACKT ASGTA IPIGG GSANV YVNLA PCVNV GQNCV VDLST QIFCH
 NDYPE TITDY VTLQR GSAYG GVLSS FSGTV KYSGS SYPFP TTSET
 PRVVY NSRTD KPWPV ALYLT PVSSA GGVAI KAGSL IAVLI LRQTN
 NYNSD DFQFV WNIYA NNDVV VPTGG (SEQ ID NO: 26) HHHHHHHH
 (SEQ ID NO: 25)

FIG. 1F**pSB01878** processed sequence:

FACKT**ANGTA**IPIGGGSANVYVNLA**PVVNV**GQNLVVDLSTQIFCHNDYP
 ETITDYVTLQRGSAYGGVLS**NF**SGTVKYSGSSYPFPTTSETPRVVYNSRTD
 KPWPVALYLT**PVSSA**GGVAIKAGSLIAVLILRQTN**NYNSD**DFQFVWNIYA
 NNDVVVPTGGHHHHHHHHH (SEQ ID NO: 27)

NXS/T sites are indicated in bold text as these are potentially glycosylated.

pSB02083 FimH Lectin Domain Wild Type with murine IgK signal peptide

METDTLLLWVLLLWVPGSTGFACKTASGTAIPIGGGSANVYVNLA**PVVNV**GQNLVVDLSTQIFCHNDYP
 ETITDYVTLQRGSAYGGVLS**SF**SGTVKYSGSSYPFPTTSETPRVVYNSRTDKPWPVALYLT**PVSSA**GGVAIK
 AGSLIAVLILRQTN**NYNSD**DFQFVWNIYANNDVVVPTGGHHHHHHHHH (SEQ ID NO: 7)

FIG. 1F continued

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FIG. 1F continued

pSB02158 FimH Lectin Domain Lock Mutant with murine IgK signal peptide

METDTLLLVLLLVPGSTGFACKTASGTAIPIGGGSANVYVNLAPCVNVGQNCVVDLSTQIFCHNDYPE
 TITDYVTLQRGSAYGGVLSFSGTVKYSGSYPFPTTSETPRVVYN5RTDKPWPVALYLPVSSAGGVAIKAG
 SLIAVLILRQTNNYNSDDFQFVWNIYANNDVVVPTGGHHHHHHHHH (SEQ ID NO: 8)

FIG. 1G

Amino acid sequence of FimH of K12

FACKTANGTAIPIGGGSANV YVNLAPVNVGQNLVVDLST QIFCHNDYPETITDYVTLQR
 GSAYGGVLSNFSGTVKYSGS SYFPPTTSETPRVVYNSRTD KPNPVALYLPVSSAGGVAI
 KAGSLIAVLILRQTNNYNSD DFQFVWNIYANNDVVVPTGG CDVSARDVTVTLFDYFGSVF
 IPLTVYCAKSQLGYLSGT TADAGNSIFTNTASFSPAQG VGVQLTRNGTILPANNTVSL
 GAVGTSAVSLGLTANYARTG GQVTAGNVQSIIGVTFVYQ* (SEQ ID NO: 28)

Amino acid sequence of FimH of UT189, which differs from the FimH of K12

FACKTANGTAIPIGGGSANV YVNLAPVNVGQNLVVDLST QIFCHNDYPETITDYVTLQR
 GAAYGGVLSSESGTVKYNGS SYFPPTTSETPRVVYNSRTD KPNPVALYLPVSSAGGVAI
 KAGSLIAVLILRQTNNYNSD DFQFVWNIYANNDVVVPTGG CDVSARDVTVTLFDYFGSVF
 IPLTVYCAKSQLGYLSGT TADAGNSIFTNTASFSPAQG VGVQLTRNGTILPANNTVSL
 GAVGTSAVSLGLTANYARTG GQVTAGNVQSIIGVTFVYQ* (SEQ ID NO: 29)

FIG. 1H

Exemplary wzzB sequences include:

>O25b 2401 WzzB

MRVENNNVSGQNHDPEQIDLIDLLVQLWRGKMTIIISVIVAIALAIGYLAVAKEKWTSTAIITQP
 DVGQIAGYNNAMNVIYGQAAPKVSDLQETLIGRFSSAFSALAETLDNQEEPEKLTIEPSVK
 QQLPLTVSYVGQTAEGAQMCLAQYIQQVDDKVNQELEKDLKDNIALGRKNLQDSLRTQEVV
 AQEQKDLRIRIQEALQYANQEQVTKPQVQQTEDVTQDTLFLGSEALESNIKHEATRPLVF
 SSNYYQTRQNLLDIESLKVDDLDIHAYRYVMKPTLPIRRDSPKKAITLILAVLLGGMVGAGIVL
 GRNALRNYNAK (SEQ ID NO: 30)

>O25a:K5:H1 WzzB

MRVENNNVSGQNNDPEQIDLIDLLVQLWRGKMTIIISVIVAIALAIGYLAVAKEKWTSTAIITQP
 DVGQIAGYNNAMNVIYGQAAPKVSDLQETLIGRFSSAFSALAETLDNQDEPEKLTIEPSVK
 QQLPLTVSYVGQTAEGAQMCLAQYIQQVDDKVNQELEKDLKDNIALGRKNLQDSLRTQEVV

FIG. 1H continued

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FIG. 1H continued

AQEQKDLRIRQIQEALQYANQAQVTKPQIQQTGEDITQDTLFLLGSEALESMIKHEATRPLVF
SPNYYQTRQNLLDIESLKVDDLDIHAYRYVMKPTLPIRRDSPKKAITLILAVLLGGMVGAGIVL
GRNALRNYNAK (SEQ ID NO: 31)

>O25a ETEC ATCC WzzB

MRVENNNVSGQNHDPEDIDLLVQLWRGKMTIIISVVVAIALAIGYLAVAKEKWTSTAITQ
PDVGQIAGYNNAMNVIYGQAAPKVSQDLQETLIGRFSSAFSALAETLDNQKEPEKLTIEPSVK
NQQLPLTVSYVGQTAEDAQMCLAQYIQQVDDKVNQELEKDLKDNALGRKNLQDSLRTQE
VVAQEQKDLRIRQIQEALQYANQAQVTKPQIQQTGEDITQDTLFLLGSEALESMIKHEATRPL
VFSPNYYQTRQNLLDIENLKVDDLDIHAYRYVMKPTLPIRRDSPKKAITLILAVLLGGMVGAGI
VLGRNALRNYNSK (SEQ ID NO: 32)

>K12 W3110 WzzB

MRVENNNVSGQNHDPEDIDLLVQLWRGKMTIIISVIVAIALAIGYLAVAKEKWTSTAITQP
DVGQIAGYNNAMNVIYGQAAPKVSQDLQETLIGRFSSAFSALAETLDNQEEREKLTIEPSVK
QQLPLTVSYVGQTAEGAQMCLAQYIQQVDDKVNQELEKDLKDNIALGRKNLQDSLRTQEVV
AQEQKDLRIRQIQEALQYANQAQVTKPQIQQTGEDITQDTLFLLGSEALESMIKHEATRPLVF
SPNYYQTRQNLLDIESLKVDDLDIHAYRYVMKPTLPIRRDSPKKAITLILAVLLGGMVGAGIVL
GRNALRNYNAK (SEQ ID NO: 33)

>Salmonella LT2 WzzB

MTVDSNTSSGRGNDPEQIDLIELLQLWRGKMTIIVAVIIALLAVGYLMIAKEKWTSTAITQP
DAAQVATYTNALNVLYGGNAPKISEVQANFISRFSSAFSALSEVLDNQKEREKLTIEQSVKG
QALPLSVSYVSTTAEGAQRRLAEYIQQVDEEVAKELEVLDKNITLQTKTLQESLETQEVVA
QEQLDLRIKQIEEALRYADEAKITQPQIQQTQDVTQDTMFLGSDALKSMIQNEATRPLVFS
PAYYQTKQTLDDIKNLKVTADTVHVYRYVMKPTLPVRRDSPKTAITLILAVLLGGMIGAGIVL
GRNALRSYKPKAL (SEQ ID NO: 34)

Exemplary FepE sequences include:

>O25b GAR2401 FepE

MSSLNIKQGSDAHFPDYPLASPSNNEIDLLNLISVLWRAKKTVMAVVFACAGLLISFILPQ
KWTSAVVTPPEPVQWQELEKSFTKLRVLDLDIKIDRTEAFNLFIKKFQSVSLLEEYLRSSPY
VMDQLKEAKIDELDLHRAIVALSEKMKAVDDNASKKKDEPSLYTSWTLSFTAPTSEEQTVL
SGYIDYISTLVVKESLENVRNKLEIKTQFEKEKLAQDRIKTNQLDANIQRNLNYSLDIANAAGIK
KPVYSNGQAVKDDPDFSISLGADGIERKLEIEKAVTDVAELNGELRNRYQLVEQLTKAHVND
VNFTPFKYQLSPSLPVKKDGPCKAIIIVLSALIGGMVACGGVLLRYAMASRKQDAMMADHLV
(SEQ ID NO: 35)

FIG. 1H continued

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FIG. 1H continued

>O25a:K5:H1 FepE

MSSLNIKQGSEAHFPEYPLASPSNNEIDLLNLIEVLWRAKKTVMVVFACAGLLISFILPQK
 WTSAAVVTPPEPVQWQELEKTFTKLRVLDLDIKIDRTEAFNLFIKKFQSVSLLEEYLRSSPYV
 MDQLKEAKIDPLDLHRAIVALSEKMKAVDDNASKKKDESALYTSWTLSTAPTSEEQAQKVL
 GYIDYISALVVKESIENVRNKLEIKTQFEKEKLAQDRIKTKNQLDANIQRNLNYSLDIANAAGIKK
 PVYSNGQAVKDDPDFSISLGADGIERKLEIEKAVTDVAELNGELRNRYLVEQLTKTNINDV
 NFTPFFKYQLRPSLPVKKDGGQKAIIVLSALVGGMVACGGVLLRHAMASRKQDAMMADHLV
 (SEQ ID NO: 36)

> O25a ETEC ATCC FepE

MSSLNIKQGSDAHFPDYPLASPSNNEIDLLNLISVLWRAKKTVMVVFACAGLLISFILPQ
 KWTSAAVVTPPEPVQWQELEKSFTKLRVLDLDIKIDRTEAFNLFIKKFQSVSLLEEYLRSSPY
 VMDQLKEAKIDELDLHRAIVALSEKMKAVDDNASKKKDEPSLYTSWTLSTAPTSEEQAQTVL
 SGYIDYISTLVVKESLENVRNKLEIKTQFEKEKLAQDRIKTKNQLDANIQRNLNYSLDIANAAGIK
 KPVYSNGQAVKDDPDFSISLGADGIERKLEIEKAVTDVAELNGELRNRYLVEQLTKAHVND
 VNFTPFFKYQLSPSLPVKKDGGPGKAIIVLSALIGGMVACGGVLLRYAMASRKQDAMMADHLV
 (SEQ ID NO: 37)

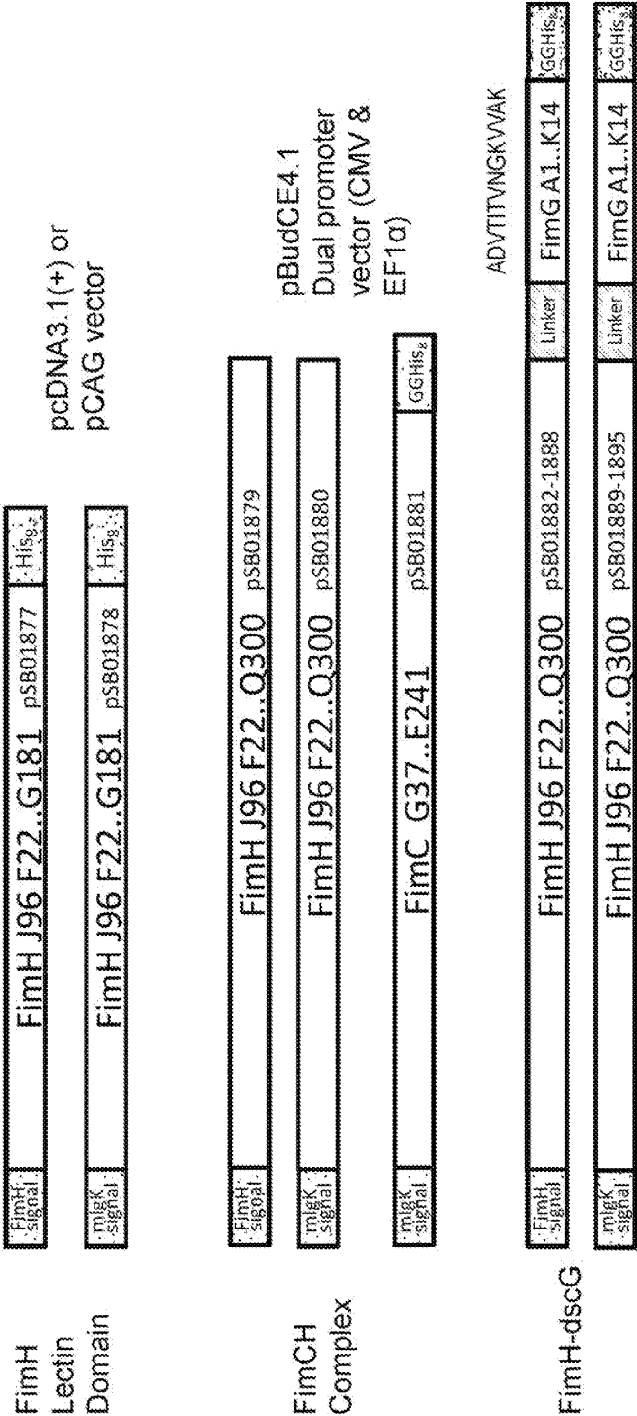
> O157 FepE

MSSLNIKQGSDAHFPDYPLASPSNNEIDLLNLISVLWRAKKTVMVVFACAGLLISFILPQ
 KWTSAAVVTPPEPVQWQELEKTFTKLRVLDLDIKIDRTEAFNLFIKKFQSVSLLEEYLRSSPY
 VMDQLKEAKIDELDLHRAIVALSEKMKAVDDNASKKKDEPSLYTSWTLSTAPTSEEQAQTVL
 SGYIDYISALVVKESIENVRNKLEIKTQFEKEKLAQDRIKMKNQLDANIQRNLNYSLDIANAAGIK
 KPVYSNGQAVKDDPDFSISLGADGIERKLEIEKAVTDVAELNGELRNRYLVEQLTKANIND
 VNFTPFFKYQLSPSLPVKKDGGPGKAIIVLSALIGGMVACGVSLLRYAMASRKQDAMMADHLV
 (SEQ ID NO: 38)

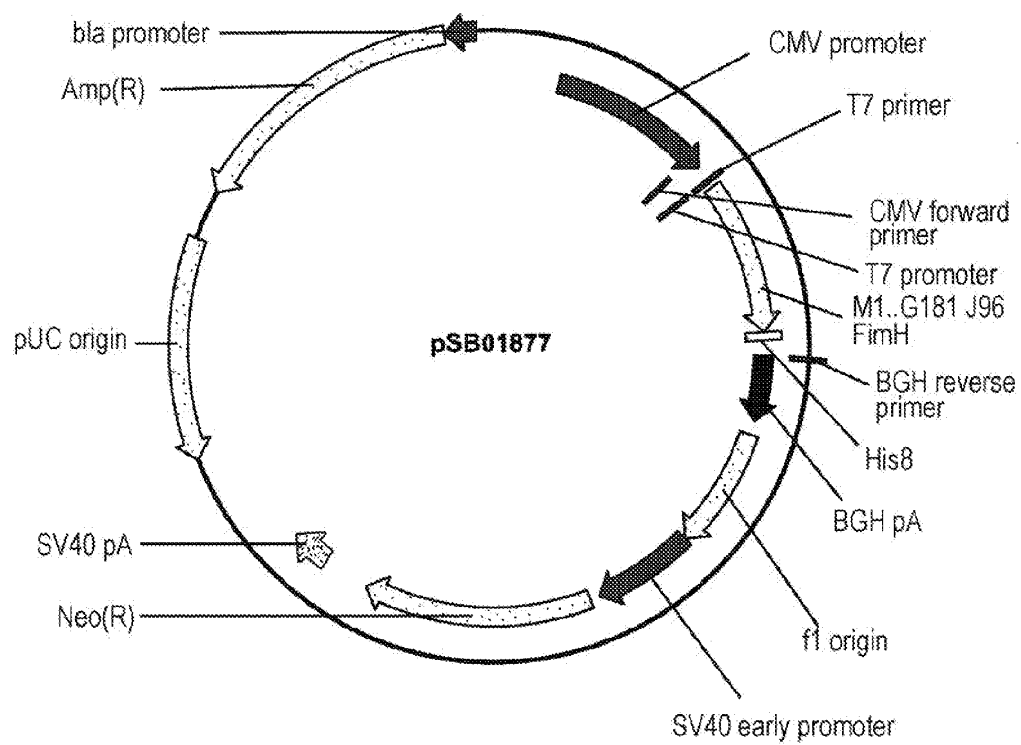
>Salmonella LT2 FepE

MPSLNVKQEKNSFAGYSLPPANSHEIDLFSLIEVLWQAKRRILATVFAFACVGLLLSFLLPQ
 KWTSQAIVTPAESVQWQGLERTLTALRVLDMEVSVDRGSVFNLFIKKFSSPSLLEEYLRSSP
 YVMDQLKGAQIDEQDLHRAIVLLSEKMKAVDSNVGKKNETSLFTSWTLSTAPTREEAQKV
 LAGYIQYISDIVVKETLENIRNQLEIKTRYEQEKLAMDRVRLKNQLDANIQRNLHYSLEIANAAGI
 KRPVYSNGQAVKDDPDFSISLGADGISRKLEIEKGVTDVAEIDGDLRNRYHVEQLAAMNV
 SDVKFTPFKYQLSPSLPVKKDGGPGKAIIVLSALIGGMMACGGVLLRHAMVSRKMENALAIDE
 RLV (SEQ ID NO: 39)

FIG. 2A



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FIG. 2B

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FIG. 2C

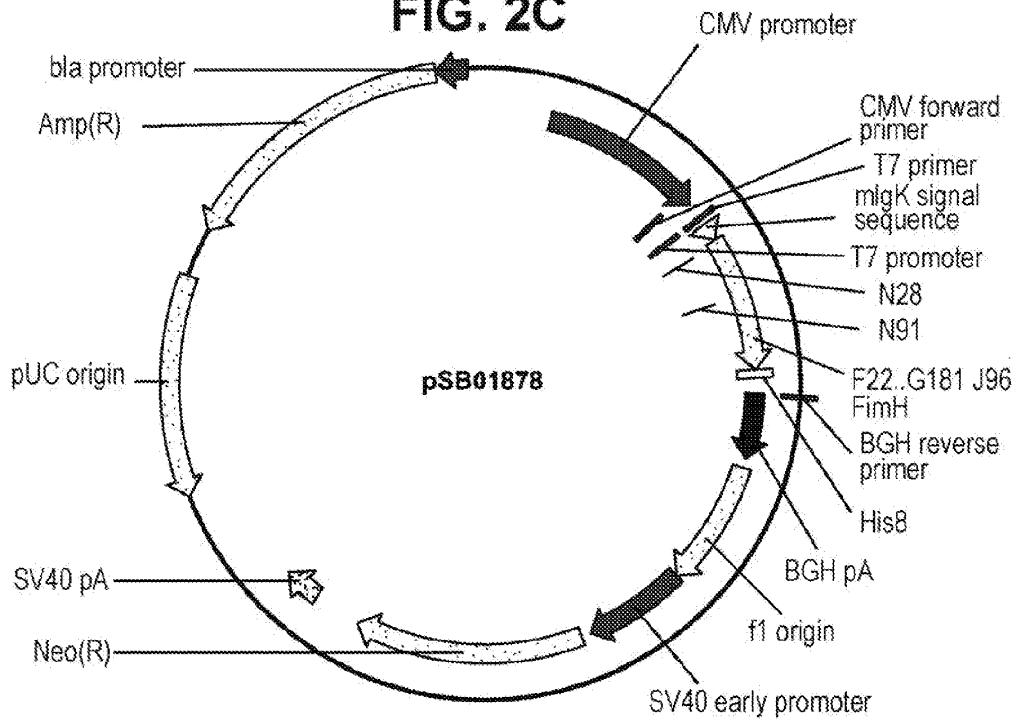
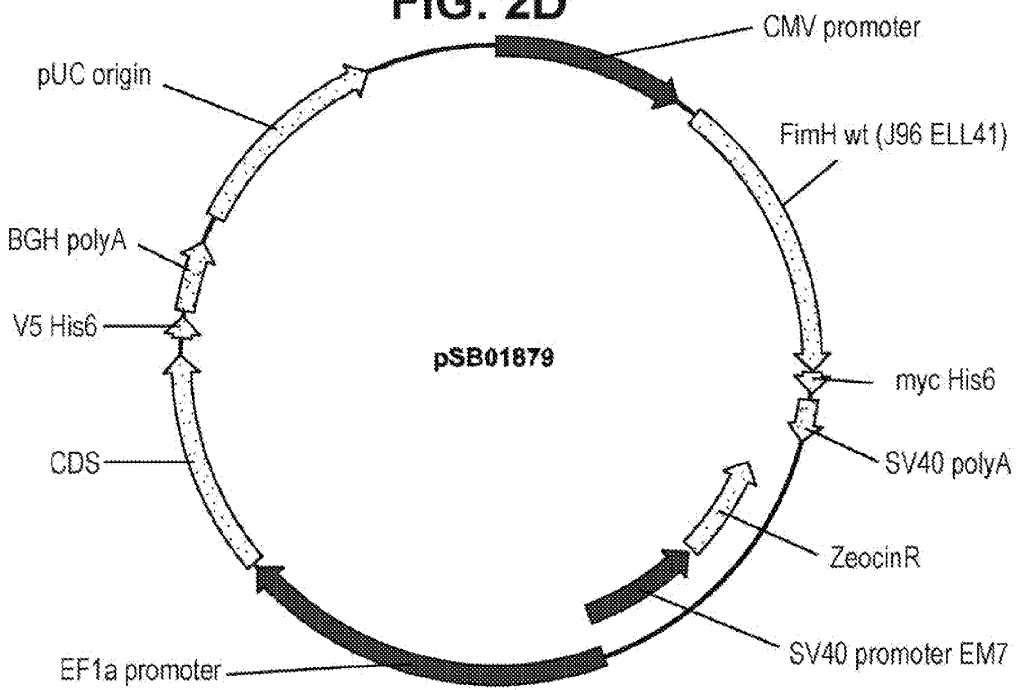
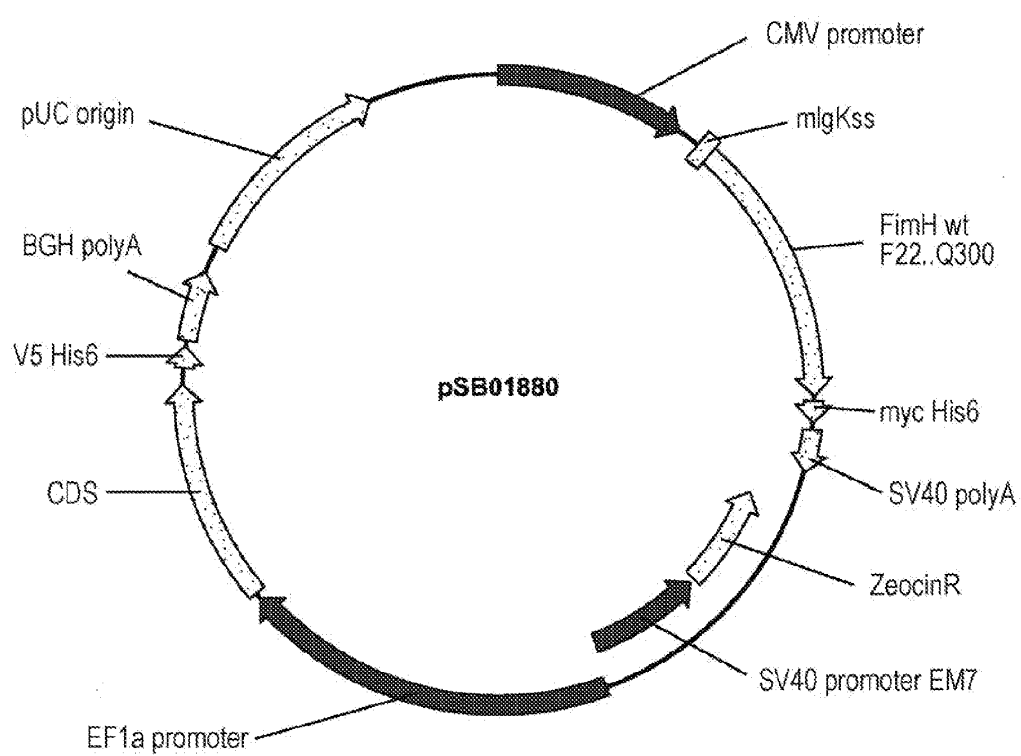


FIG. 2D



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FIG. 2E

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FIG. 2F

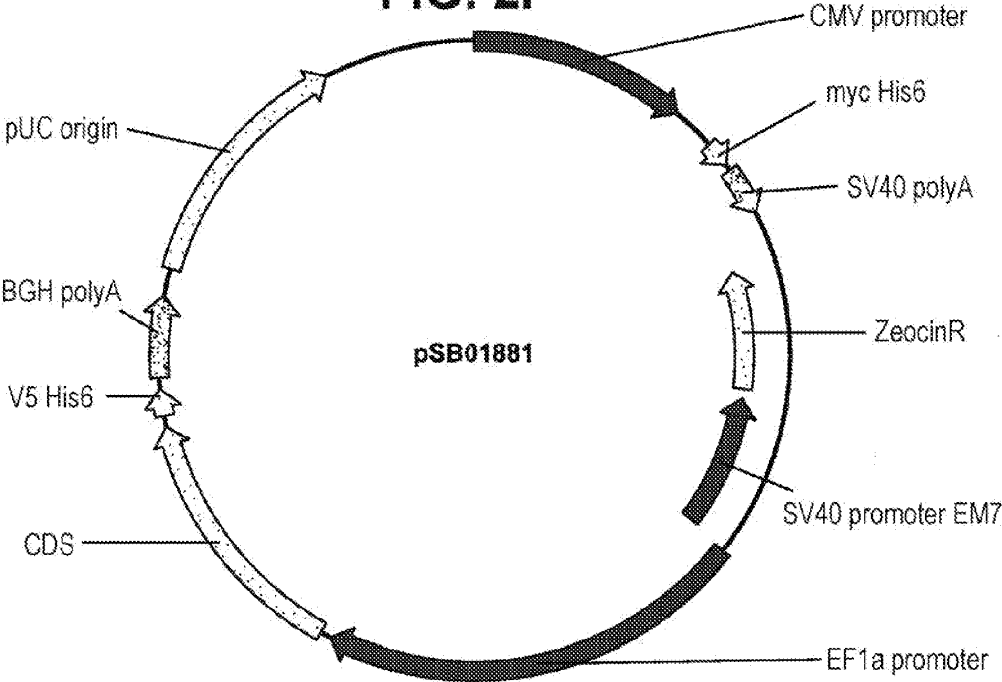
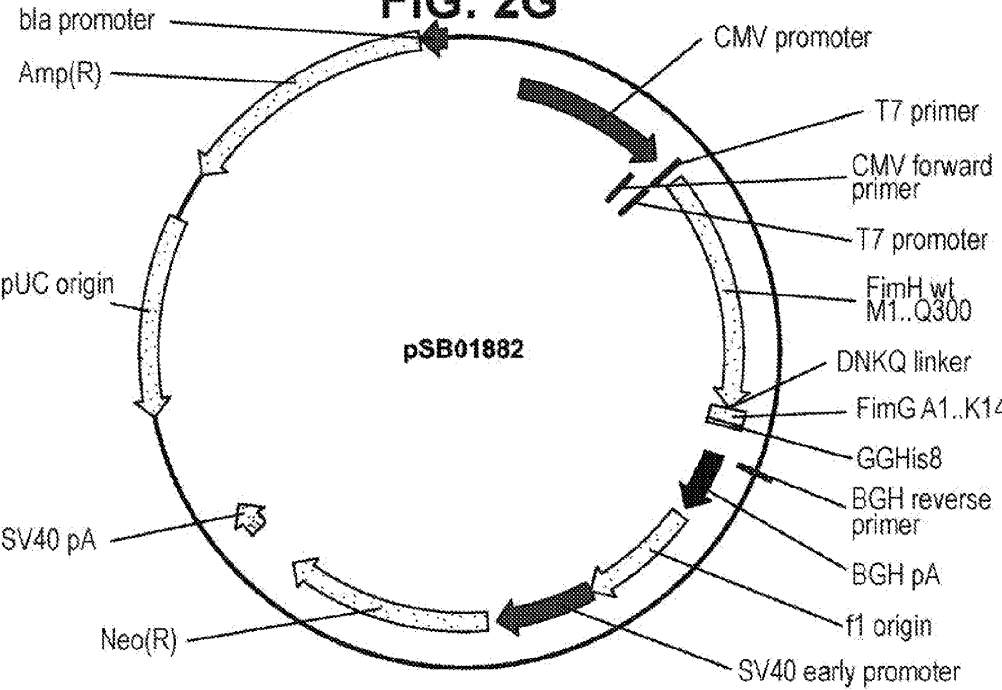


FIG. 2G



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FIG. 2H

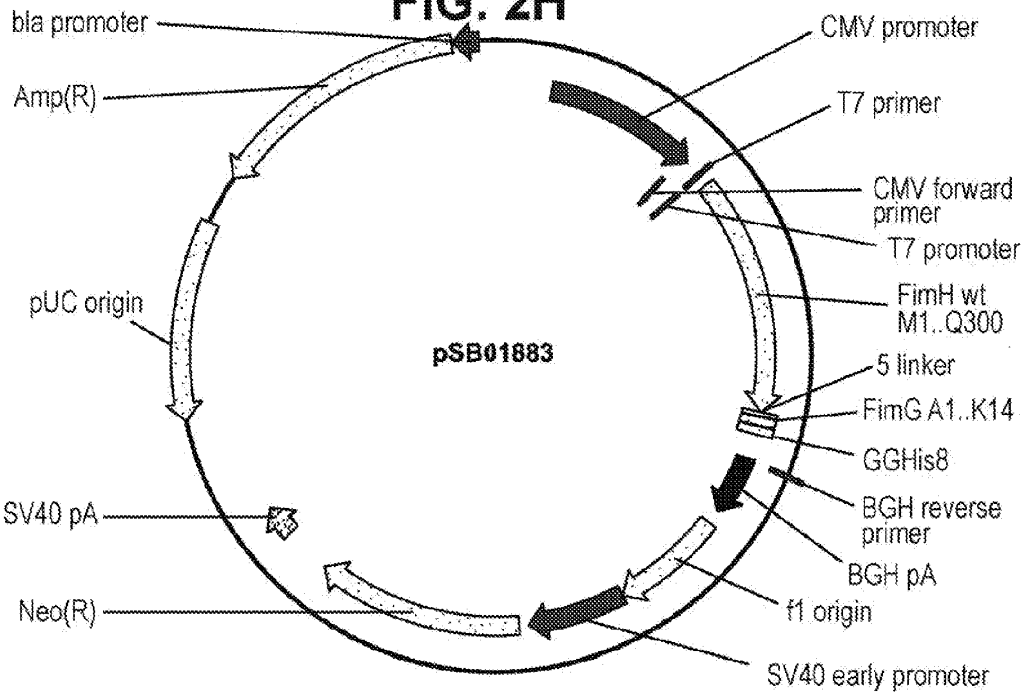
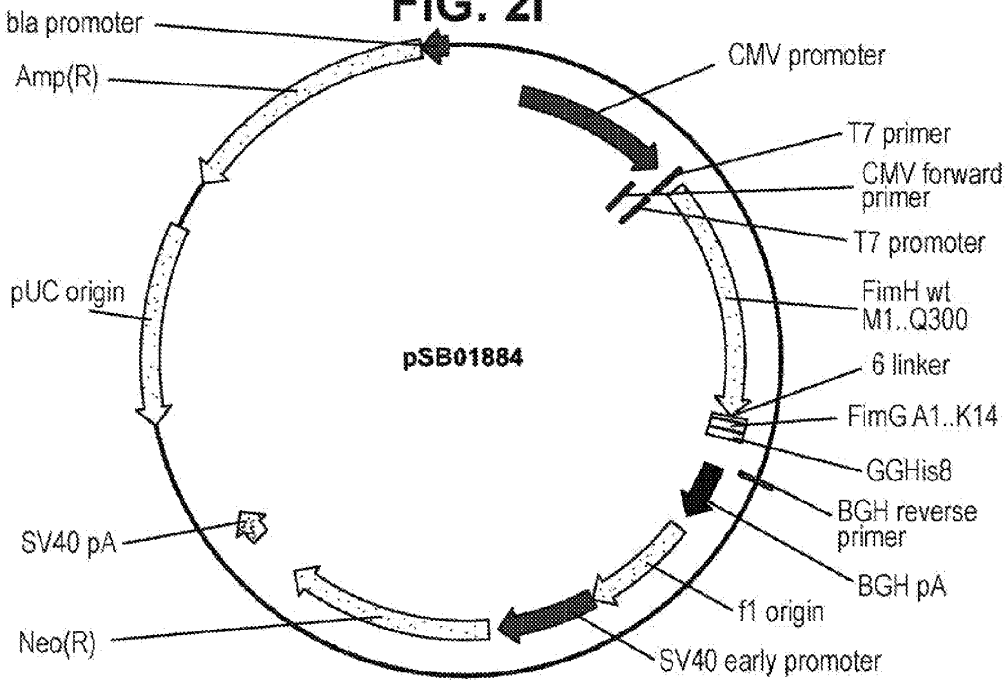


FIG. 2I



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FIG. 2J

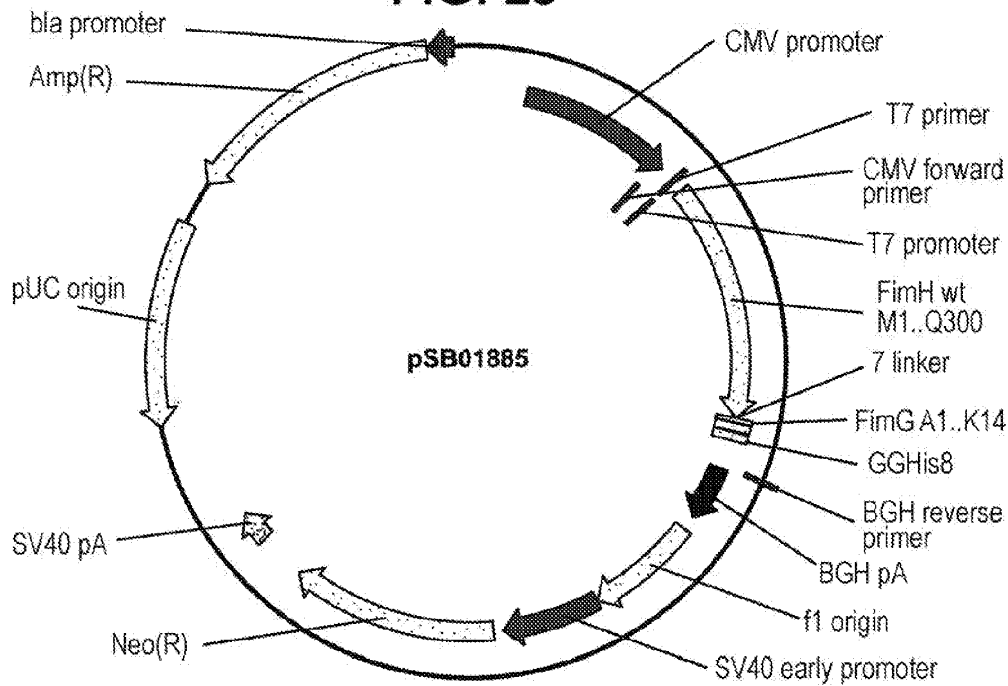
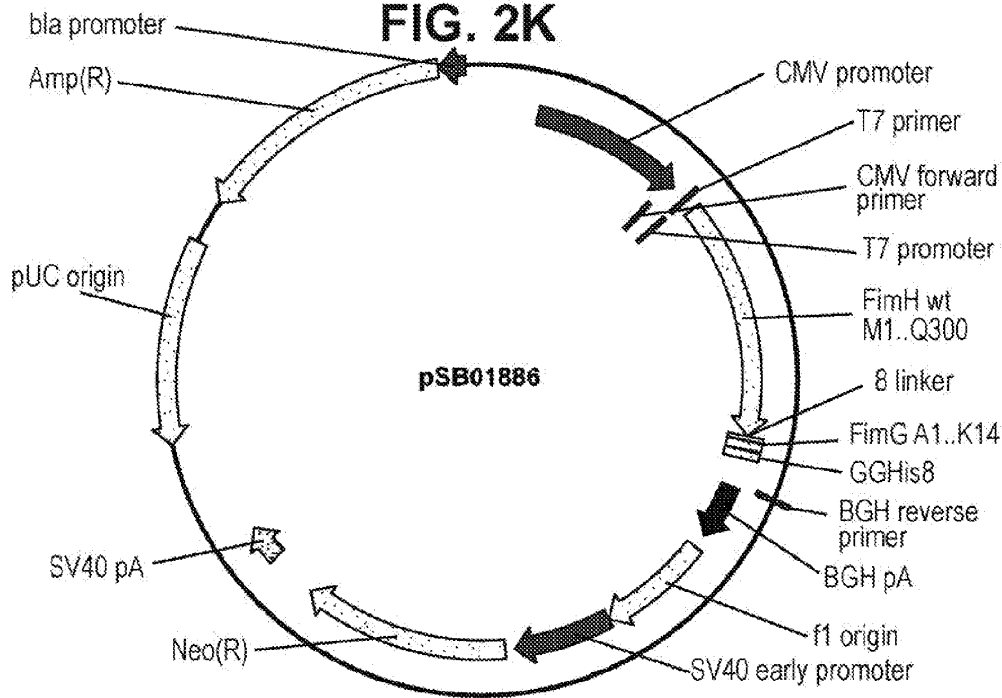


FIG. 2K



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FIG. 2L

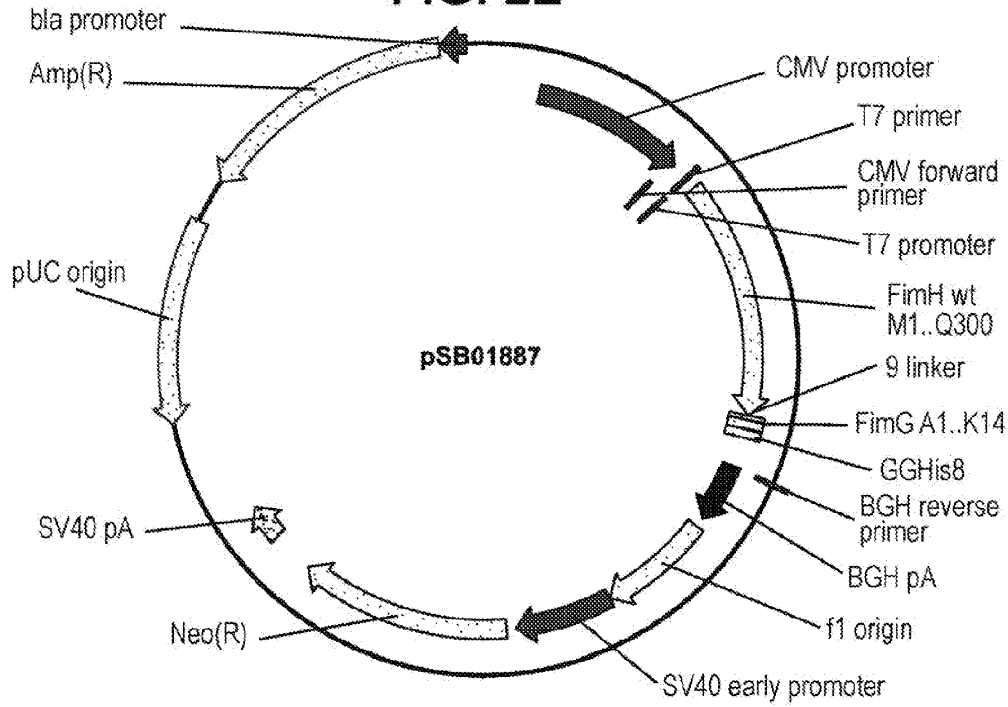
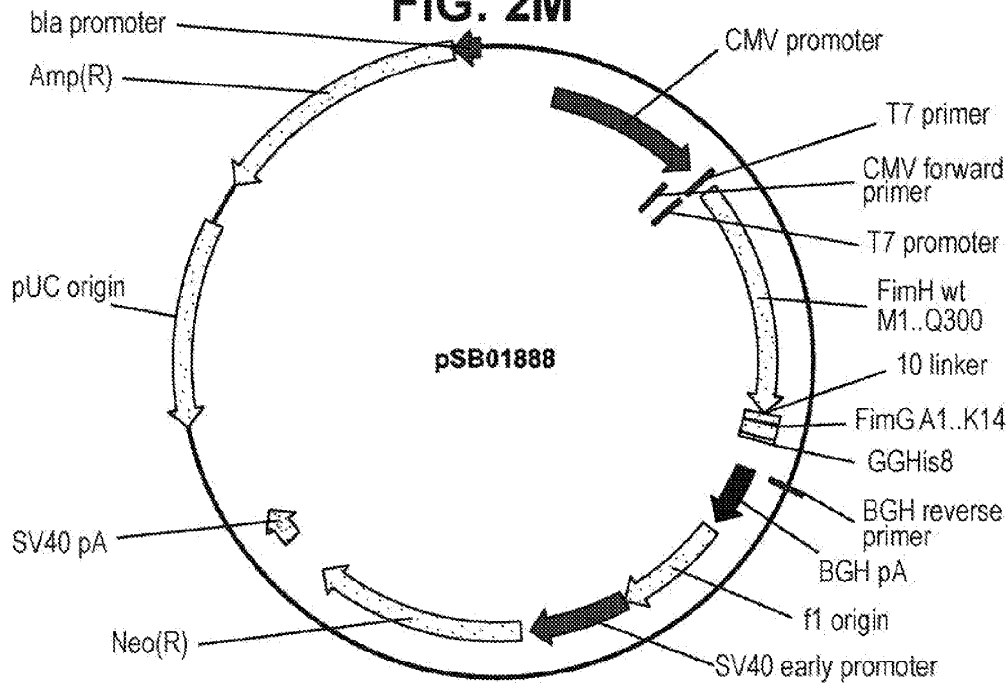


FIG. 2M



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FIG. 2N

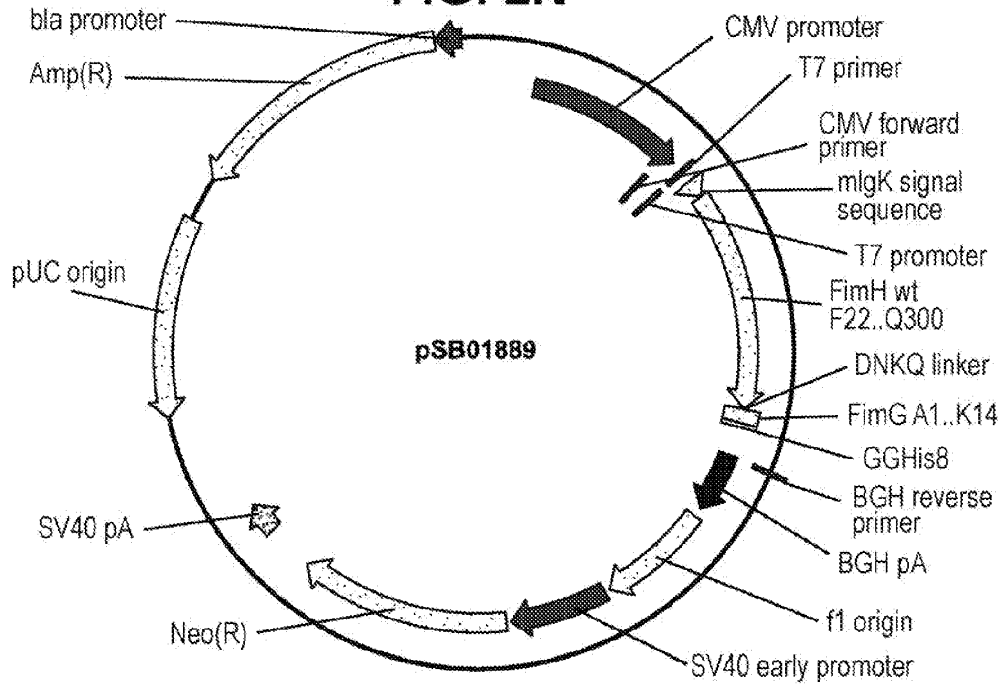
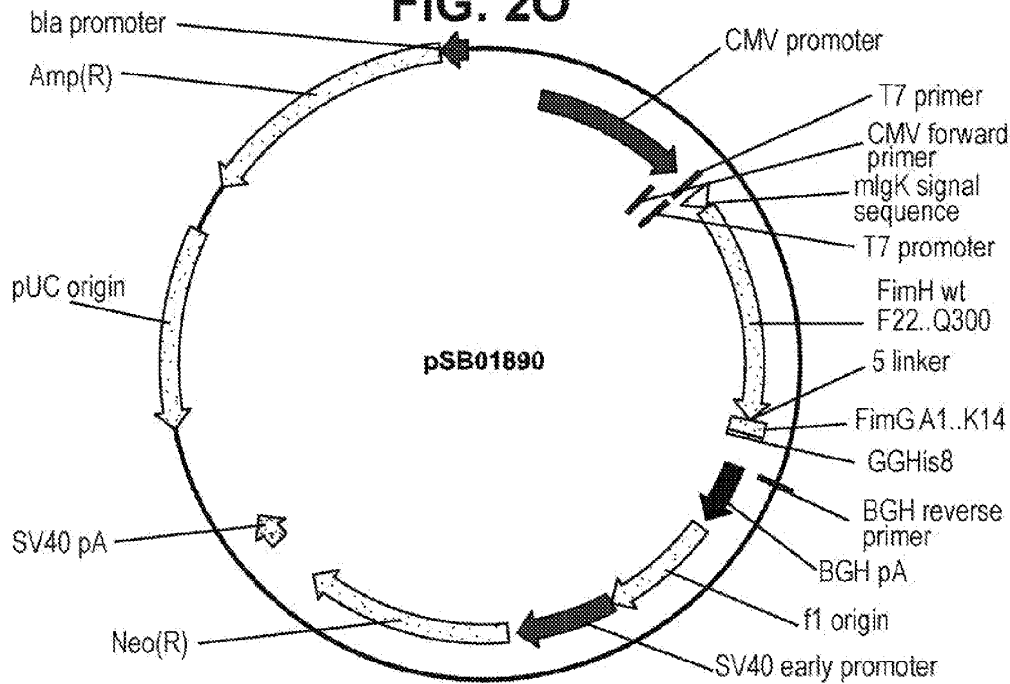


FIG. 2O



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FIG. 2P

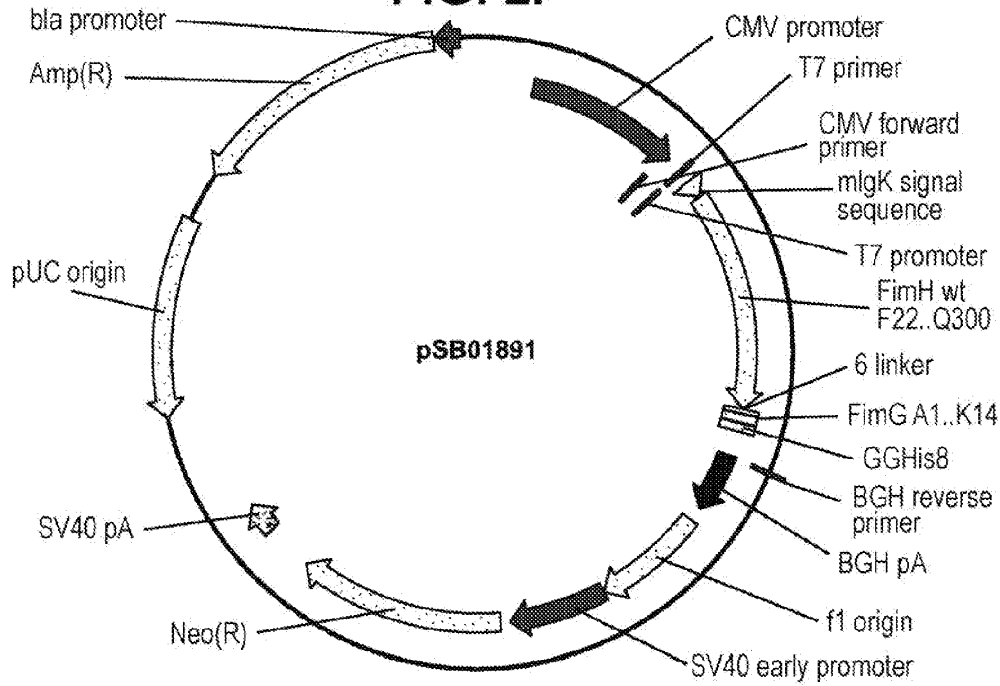
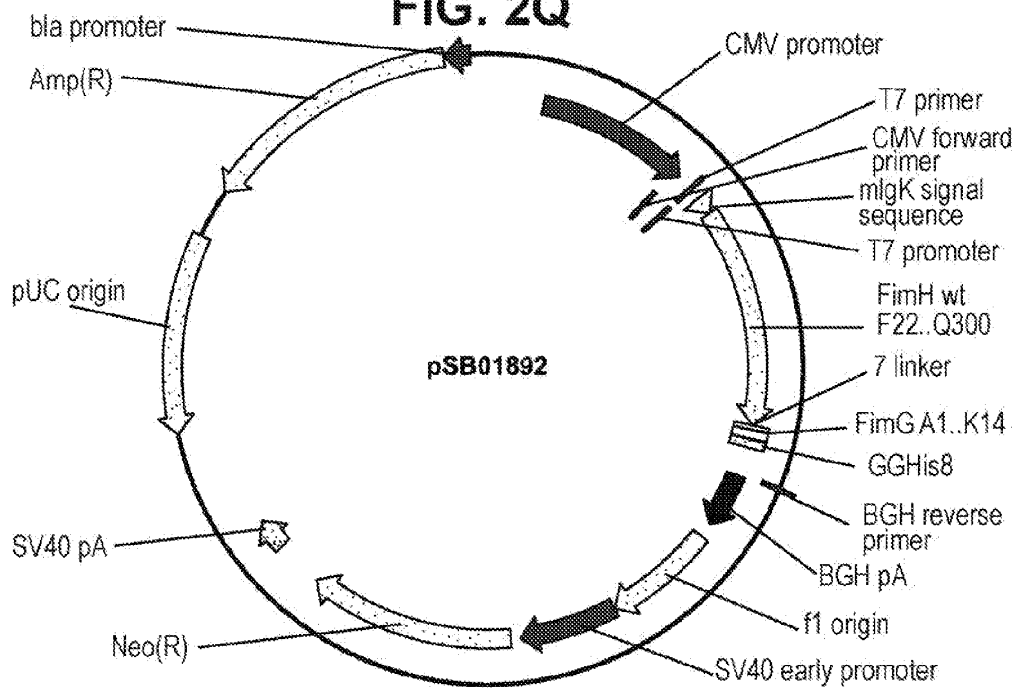


FIG. 2Q



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FIG. 2R

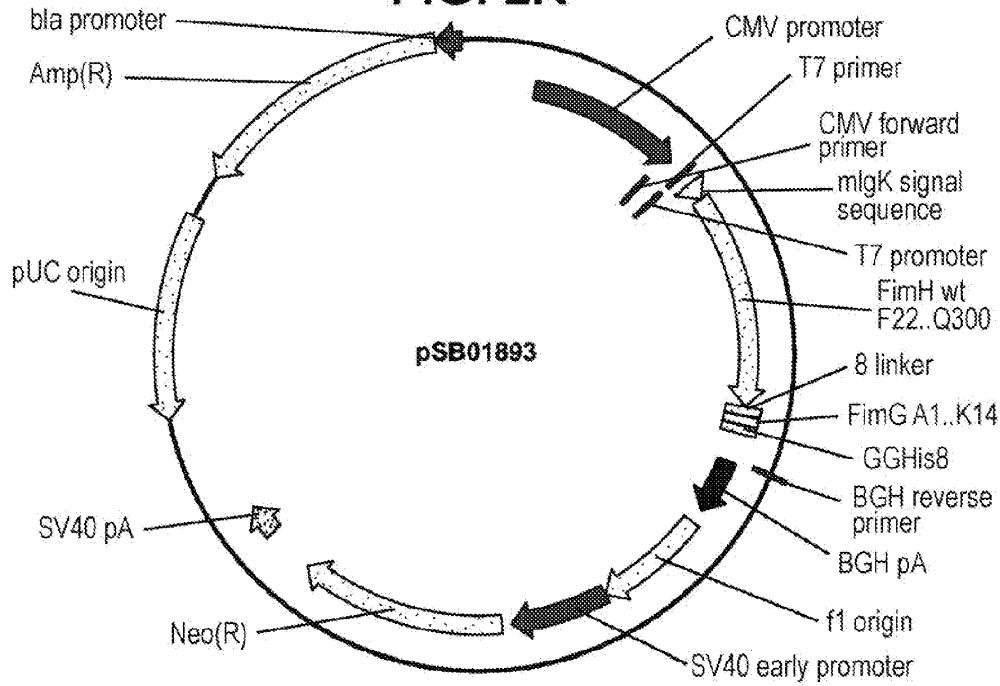
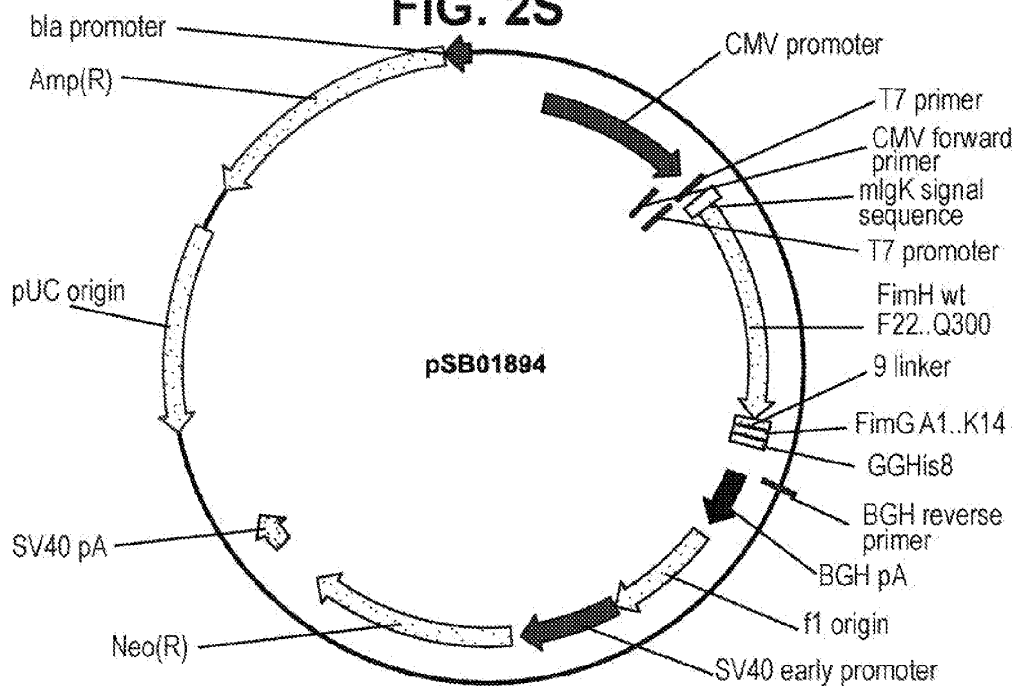


FIG. 2S



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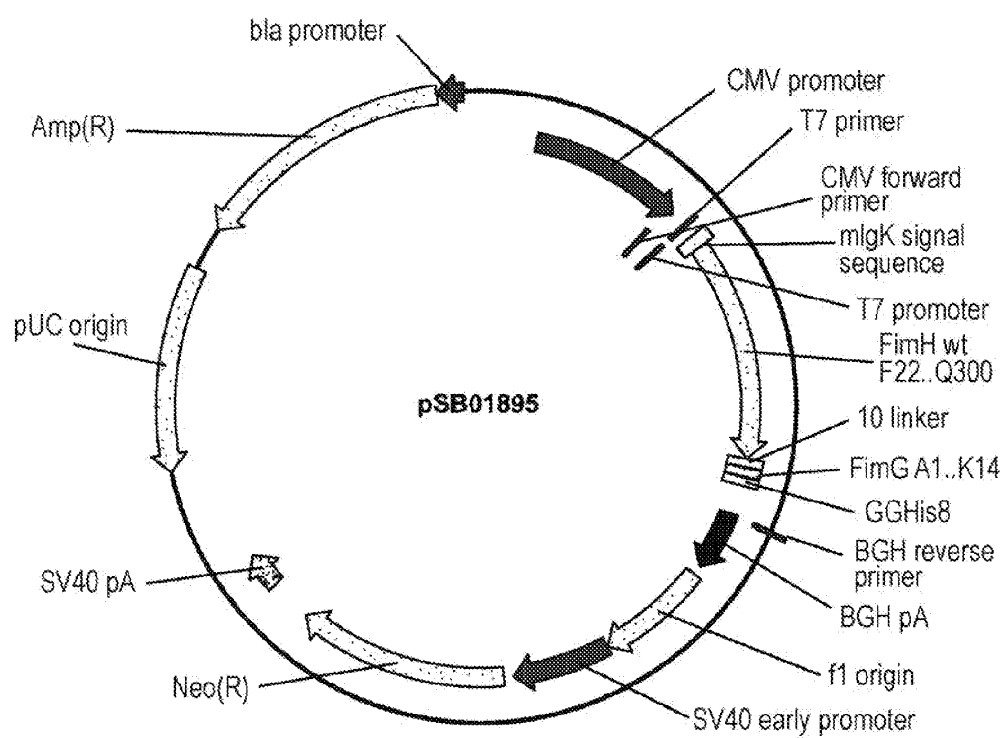
FIG. 2T

FIG. 3

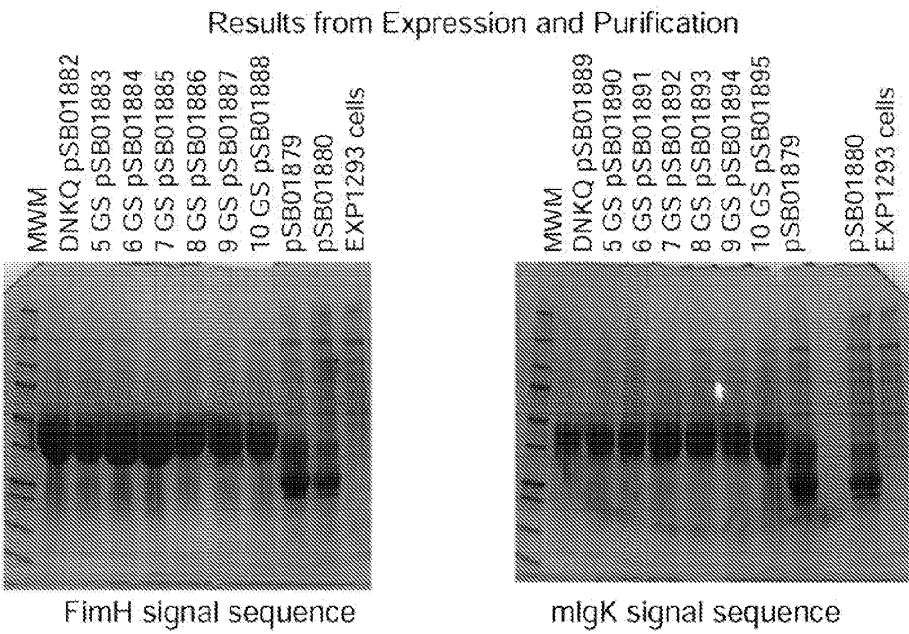


FIG. 4

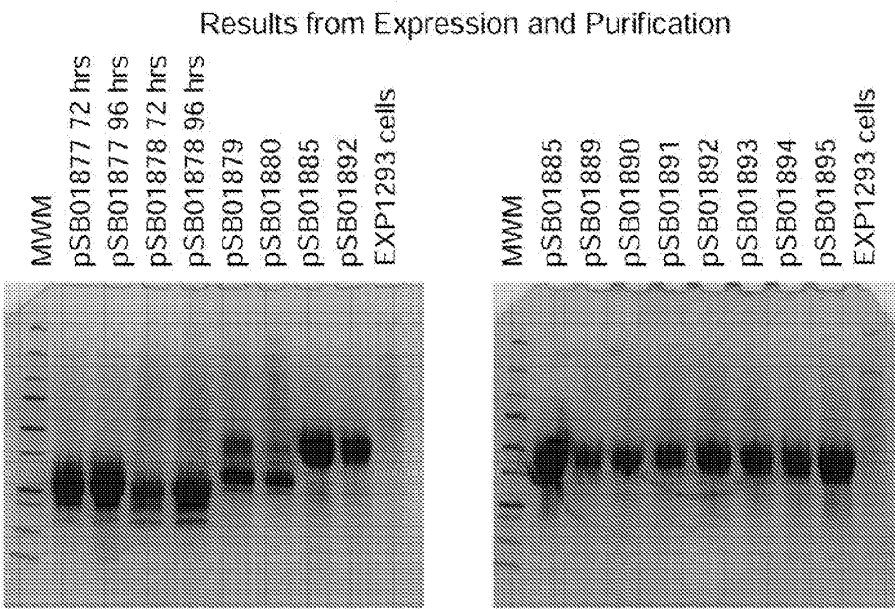
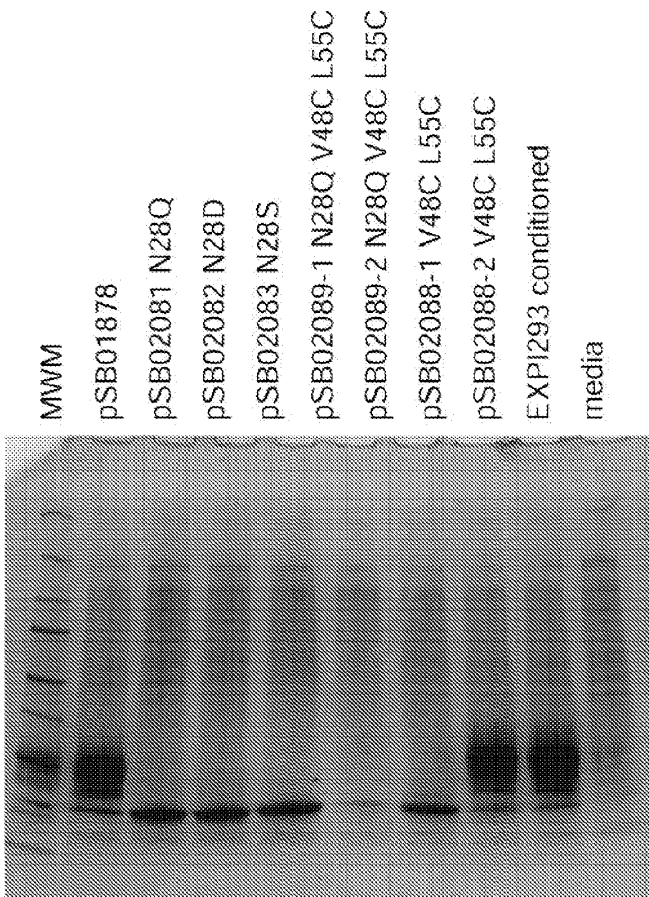


FIG. 5



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FIG. 6A

pSB02083



17 mg total yield

FIG. 6B

pSB02158



10.8 mg total yield

FIG. 6C

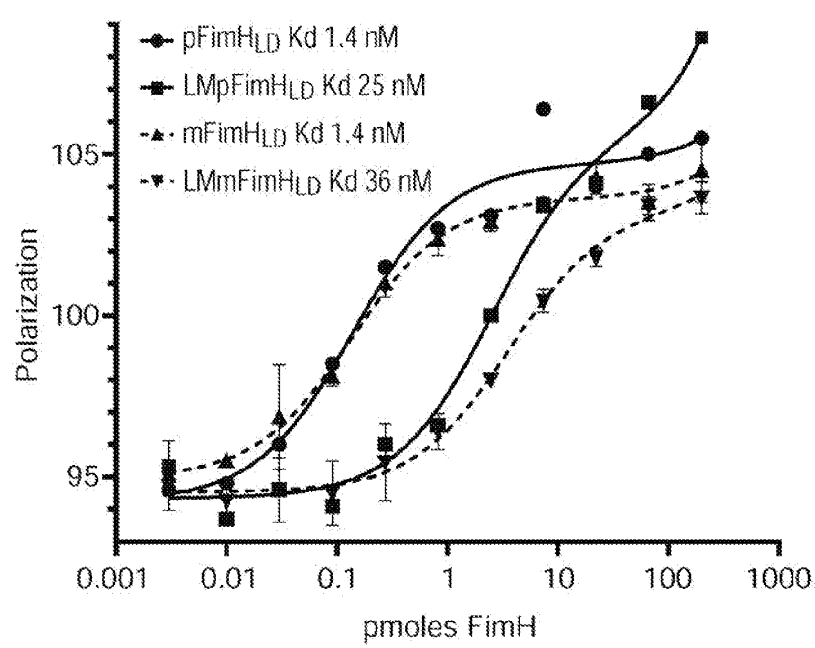
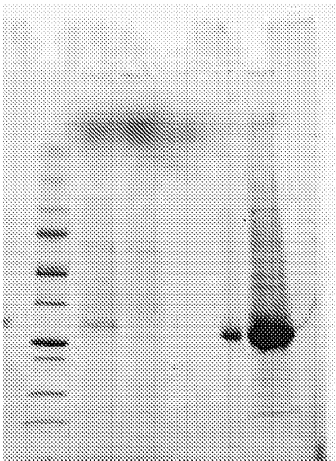


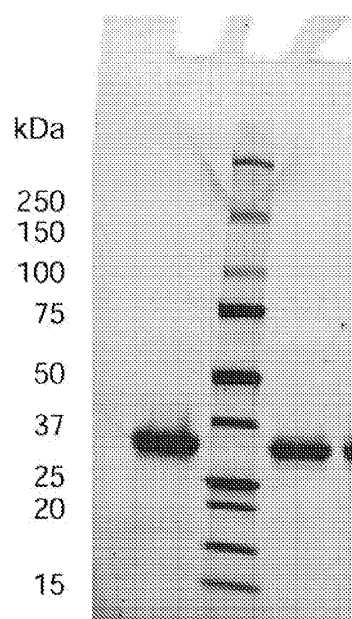
FIG. 7



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FIG. 8

Expression of pSB2307 FimH dscG wild type



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FIG. 9A

Serogroup	Structure
O1A, O1A1	$\rightarrow 3\text{-}\alpha\text{-L-Rha-(1}\rightarrow 3\text{)-}\alpha\text{-L-Rha-(1}\rightarrow 3\text{)-}\beta\text{-L-Rha-(1}\rightarrow 4\text{)-}\beta\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}$
O1B	$\rightarrow 3\text{-}\alpha\text{-L-Rha-(1}\rightarrow 2\text{)-}\alpha\text{-L-Rha-(1}\rightarrow 2\text{)-}\alpha\text{-D-Gal-(1}\rightarrow 3\text{)-}\beta\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}\beta\text{-D-ManNAc-(1}\rightarrow 2\text{)-}$
O1C	$\rightarrow 3\text{-}\alpha\text{-L-Rha-(1}\rightarrow 2\text{)-}\alpha\text{-L-Rha-(1}\rightarrow 3\text{)-}\alpha\text{-D-Gal-(1}\rightarrow 3\text{)-}\beta\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}\beta\text{-D-ManNAc-(1}\rightarrow 2\text{)-}$
O2	$\rightarrow 3\text{-}\alpha\text{-L-Rha-(1}\rightarrow 2\text{)-}\alpha\text{-L-Rha-(1}\rightarrow 3\text{)-}\beta\text{-L-Rha-(1}\rightarrow 4\text{)-}\beta\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}\alpha\text{-D-Fuc3NAc-(1}\rightarrow 2\text{)-}$
O3	$\beta\text{-L-RhaNAc-(1}\rightarrow 4\text{)-}\alpha\text{-D-Glc-(1}\rightarrow 4\text{)-}\beta\text{-D-GlcNAc-(1}\rightarrow 3\text{)-}\alpha\text{-D-Gal-(1}\rightarrow 3\text{)-}\beta\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}$
O4:K52	$\rightarrow 2\text{-}\alpha\text{-L-Rha-(1}\rightarrow 6\text{)-}\alpha\text{-D-Glc-(1}\rightarrow 3\text{)-}\alpha\text{-L-FucNAc-(1}\rightarrow 3\text{)-}\beta\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}$
O4:K6	$\alpha\text{-D-Glc-(1}\rightarrow 3\text{)-}\beta\text{-D-GlcNAc-(1}\rightarrow 6\text{)-}\alpha\text{-D-Glc-(1}\rightarrow 3\text{)-}\alpha\text{-L-FucNAc-(1}\rightarrow 3\text{)-}\beta\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}$
O5ab	$\rightarrow 4\text{-}\beta\text{-D-Qui3NAc-(1}\rightarrow 3\text{)-}\beta\text{-D-Ribf-(1}\rightarrow 4\text{)-}\beta\text{-D-Gal-(1}\rightarrow 3\text{)-}\alpha\text{-D-GalNAc-(1}\rightarrow 2\text{)-}$
O5ac(strain 180/C3)	$\rightarrow 2\text{-}\beta\text{-D-Qui3NAc-(1}\rightarrow 3\text{)-}\beta\text{-D-Ribf-(1}\rightarrow 4\text{)-}\beta\text{-D-Gal-(1}\rightarrow 3\text{)-}\alpha\text{-D-GalNAc-(1}\rightarrow 2\text{)-}$
O6:K2, K13, K15	$\rightarrow 4\text{-}\alpha\text{-D-GalNAc-(1}\rightarrow 3\text{)-}\beta\text{-D-Man-(1}\rightarrow 4\text{)-}\beta\text{-D-Man-(1}\rightarrow 3\text{)-}\alpha\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}$
O6:K54	$\rightarrow 4\text{-}\alpha\text{-D-GalNAc-(1}\rightarrow 3\text{)-}\beta\text{-D-Man-(1}\rightarrow 4\text{)-}\beta\text{-D-Man-(1}\rightarrow 3\text{)-}\alpha\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}$
O7	$\alpha\text{-L-Rha-(1}\rightarrow 3\text{)-}\beta\text{-D-Qui4NAc-(1}\rightarrow 2\text{)-}\alpha\text{-D-Man-(1}\rightarrow 4\text{)-}\beta\text{-D-Gal-(1}\rightarrow 3\text{)-}\alpha\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}$
O10	$\rightarrow 3\text{-}\alpha\text{-L-Rha-(1}\rightarrow 3\text{)-}\alpha\text{-L-Rha-(1}\rightarrow 3\text{)-}\alpha\text{-D-Gal-(1}\rightarrow 3\text{)-}\beta\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}\alpha\text{-D-Fuc4NAcyl-(1}\rightarrow 2\text{)-}$
	Acyl=acetyl (60%) or (R)-3-hydroxybutyryl (40%)
O16	$\rightarrow 2\text{-}\beta\text{-D-Galf-(1}\rightarrow 6\text{)-}\alpha\text{-D-Glc-(1}\rightarrow 3\text{)-}\alpha\text{-L-Rha2Ac-(1}\rightarrow 3\text{)-}\alpha\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}$
O17	$\alpha\text{-D-Glc-(1}\rightarrow 6\text{)-}\beta\text{-D-Man-(1}\rightarrow 2\text{)-}\alpha\text{-D-Man-(1}\rightarrow 2\text{)-}\beta\text{-D-Man-(1}\rightarrow 3\text{)-}\alpha\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}$
O18A, O18ac	$\rightarrow 2\text{-}\alpha\text{-L-Rha-(1}\rightarrow 6\text{)-}\alpha\text{-D-Glc-(1}\rightarrow 4\text{)-}\alpha\text{-D-Gal-(1}\rightarrow 3\text{)-}\alpha\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}\beta\text{-D-GlcNAc-(1}\rightarrow 3\text{)-}$
O18A1	$\alpha\text{-D-Glc-(1}\rightarrow 6\text{)-}\beta\text{-D-Man-(1}\rightarrow 6\text{)-}\alpha\text{-D-Glc-(1}\rightarrow 4\text{)-}\alpha\text{-D-Gal-(1}\rightarrow 3\text{)-}\alpha\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}$
O18B	$\rightarrow 3\text{-}\alpha\text{-L-Rha-(1}\rightarrow 6\text{)-}\alpha\text{-D-Glc-(1}\rightarrow 4\text{)-}\alpha\text{-D-Gal-(1}\rightarrow 3\text{)-}\alpha\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}$
O18B1	$\alpha\text{-D-Glc-(1}\rightarrow 4\text{)-}\beta\text{-D-Man-(1}\rightarrow 6\text{)-}\alpha\text{-D-Glc-(1}\rightarrow 4\text{)-}\alpha\text{-D-Gal-(1}\rightarrow 3\text{)-}\alpha\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}$
O21	$\beta\text{-D-Gal-(1}\rightarrow 4\text{)-}\beta\text{-D-Gal-(1}\rightarrow 4\text{)-}\beta\text{-D-Glc-(1}\rightarrow 3\text{)-}\beta\text{-D-GalNAc-(1}\rightarrow 2\text{)-}$
O23A	$\alpha\text{-D-Glc-(1}\rightarrow 6\text{)-}\alpha\text{-D-Glc-(1}\rightarrow 4\text{)-}\beta\text{-D-Gal-(1}\rightarrow 3\text{)-}\alpha\text{-D-GalNAc-(1}\rightarrow 3\text{)-}\beta\text{-D-GlcNAc-(1}\rightarrow 2\text{)-}$
O24	$\rightarrow 7\text{-}\alpha\text{-Neu5Ac-(2}\rightarrow 3\text{)-}\beta\text{-D-Glc-(1}\rightarrow 3\text{)-}\beta\text{-D-GalNAc-(1}\rightarrow 2\text{)-}$

FIG. 9B

	β -GlcP- 1 ↓ 6	
O25b	α -Rhap-(1→3)- α -GlcP-(1→3)-Rhap20Ac-(1→3)- β -GlcPNAc-	
O25	β -D-Glc-(1→6) →4)- α -D-Glc-(1→3)- α -L-FucNAc-(1→3)- β -D-GlcNAc-(1→ α -L-Rha-(1→3)	
O26	→3)- α -L-Rha-(1→4)- α -L-FucNAc-(1→3)- β -D-GlcNAc-(1→	
O28	→2)-(R)-Gro-1-P→4)- β -D-GlcNAc-(1→3)- β -D-Galf2Ac-(1→3)- α -D-GlcNAc-(1→	
O44	a-D-Glc-(1→4) →6)-a-D-Man-(1→2)-a-D-Man-(1→2)-b-D-Man-(1→3)-a-D-GlcNAc-(1→	
O45	→2)-b-D-Glc-(1→3)-a-L-6dTal2Ac-(1→3)-a-D-FucNAc-(1→	
O45rel	→2)-b-D-Glc-(1→3)-a-L-6dTal2Ac-(1→3)-b-D-GlcNAc-(1→	
O55	→6)-b-D-GlcNAc-(1→3)-a-D-Gal-(1→3)-b-D-GalNAc-(1→ a-Col-(1→2)-b-D-Gal-(1→3)	
O56	→7)-a-Neu5Ac-(2→3)-b-D-Glc-(1→3)-b-D-GlcNAc-(1→ a-D-Gal-(1→2)	
O58	3-O-[(R)-1-carboxyethyl]-a-L-Rha-(1→3) →4)-a-D-Man-(1→4)-a-D-Man2Ac-(1→3)-b-D-GlcNAc-(1→	
O64	b-D-Gal-(1→6) →3)-a-D-ManNAc-(1→3)-b-D-GlcA-(1→3)-b-D-Gal-(1→3)-b-D-GlcNAc-(1→	
O69	→2)-a-L-Rha-(1→2)-a-L-Rha-(1→2)-a-D-Gal-(1→3)-b-D-GlcNAc-(1→Erbing et al. (1977)	
O73 (Strain 73-1)	a-D-Glc-(1→3) →4)-a-D-Man-(1→2)-a-D-Man-(1→2)-b-D-Man-(1→3)-a-D-GalNAc-(1→	
O75	b-D-Man-(1→4) →3)-a-D-Gal-(1→4)-a-L-Rha-(1→3)-b-D-GlcNAc-(1→	
O77	→6)-a-D-Man-(1→2)-a-D-Man-(1→2)-b-D-Man-(1→3)-a-D-GlcNAc-(1→	
O78	→4)-b-D-GlcNAc-(1→4)-b-D-Man-(1→4)-a-D-Man-(1→3)-b-D-GlcNAc-(1→	
O86	a-D-Gal-(1→3) →4)-a-L-Fuc-(1→2)-b-D-Gal-(1→3)-a-D-GalNAc-(1→3)-b-D-GalNAc-(1→	
O88	a-L-6dTal-(1→3) →4)-a-D-Man-(1→3)-a-D-Man-(1→3)-b-D-GlcNAc-(1→	
O90	→4)-a-L-Fuc2/3Ac-(1→2)-b-D-Gal-(1→3)-a-D-GalNAc-(1→3)-b-D-GalNAc-(1→	
O98	→3)-a-L-QuiNAc-(1→4)-a-D-GalNAcA-(1→3)-a-L-QuiNAc-(1→3)-b-D-GlcNAc-(1→	
O104	→4)-a-D-Gal-(1→4)-a-Neu5,7,9Ac3-(2→3)-b-D-Gal-(1→3)-b-D-GalNAc-(1→	
O111	a-Col-(1→6) →4)-a-D-Glc-(1→4)-a-D-Gal-(1→3)-b-D-GlcNAc-(1→ a-Col-(1→3)	
O113	→4)-a-D-GalNAc-(1→4)-a-D-GalA-(1→3)-a-D-Gal-(1→3)-b-D-GlcNAc-(1→ b-D-Gal-(1→3)	
O114	→4)-b-D-Qui3N(N-acetyl-L-seryl)-(1→3)-b-D-Ribf-(1→4)-b-D-Gal-(1→3)-a-D-GlcNAc-(1→	

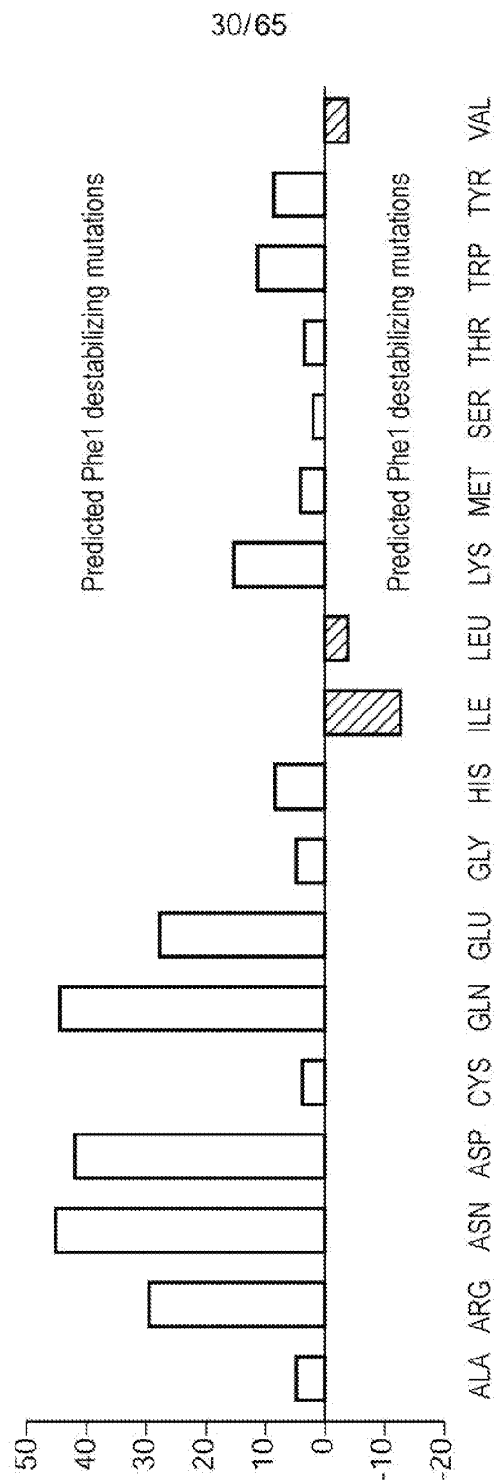
FIG. 10A

O22	→6)-α-D-Glc-(1→4)-β-D-GlcA-(1→4)-β-D-GalNAc3Ac-(1→3)-α-D-Gal-(1→3)-β-D-GalNAc-(1→
O35	→3)-α-L-Rha-(1→2)-α-L-Rha-(1→3)-α-L-Rha-(1→2)-α-L-Rha-(1→3)-β-D-GlcNAc-(1→ α-D-GalNAcA6N-(1→2)
O65	→2)-β-D-Qui3NAc-(1→4)-α-D-GalA6N-(1→4)-α-D-GalNAc-(1→4)-β-D-GalA-(1→3)-α-D-GlcNAc-(1→
O66	→2)-β-D-Man-(1→3)-α-D-GlcNAc-(1→2)-β-D-Glc3Ac-(1→3)-α-L-6dTal-(1→3)-α-D-GlcNAc-(1→
O83	→6)-α-D-Glc-(1→4)-β-D-GlcA-(1→6)-β-D-Gal-(1→4)-β-D-Gal-(1→4)-β-D-GlcNAc-(1→
O91	→4)-α-D-Qui3NAcyl-(1→4)-β-D-Gal-(1→4)-β-D-GlcNAc-(1→4)-β-D-GlcA6NGly-(1→3)-β-D-GlcNAc-(1→Acyl=(R)-3-hydroxybutyryl
O105	β-D-Ribf-(1→3) →4)-α-D-GlcA2Ac3Ac-(1→2)-α-L-Rha4Ac-(1→3)-β-L-Rha-(1→4)-β-L-Rha-(1→3)-β-D-GlcNAc6Ac-(1→
O116	→2)-β-D-Qui4NAc-(1→6)-α-D-GlcNAc-(1→4)-α-D-GalNAc-(1→4)-α-D-GalA-(1→3)-β-D-GlcNAc-(1→
O117	→4)-β-D-GalNAc-(1→3)-α-L-Rha-(1→4)-α-D-Glc-(1→4)-β-D-Gal-(1→3)-α-D-GalNAc-(1→
O139	β-D-Glc-(1→3) →3)-α-L-Rha-(1→4)-α-D-GalA-(1→2)-α-L-Rha-(1→3)-α-L-Rha-(1→2)-α-L-Rha-(1→3)-α-D-GlcNAc-(1→
O153	→2)-β-D-Ribf-(1→4)-β-D-Gal-(1→4)-α-D-GlcNAc-(1→4)-β-D-Gal-(1→3)-α-D-GlcNAc-(1→Rathayake (1994a)
O167	α-D-Galf-(1→4) →2)-β-D-GalA6N(L)Ala-(1→3)-α-D-GlcNAc-(1→2)-β-D-Galf-(1→5)-β-D-Galf-(1→3)-β-D-GlcNAc-(1→
O172	→3)-α-L-FucNAc-(1→4)-α-D-Glc6Ac-(1-P→4)-α-D-Glc-(1→3)-α-L-FucNAc-(1→3)-α-D-GlcNAc-(1→

FIG. 10B

O8	→2)-α-D-Man-(1→2)-α-D-Man-(1→3)-β-D-Man-(1→
O9a	→2)-α-D-Man-(1→2)-α-D-Man-(1→3)-α-D-Man-(1→3)-α-D-Man-(1→
O9	→2)-[α-D-Man-(1→2)]2-α-D-Man-(1→3)-α-D-Man-(1→3)-α-D-Man-(1→
O20ab	→2)-β-D-Ribf-(1→4)-α-D-Gal-(1→Vasiliev & Zakharova (1976)
O20ac	α-D-Gal-(1→3) →2)-β-D-Ribf-(1→4)-α-D-Gal-(1→
O52	→3)-β-D-Fucf-(1→3)-β-D-6dmanHep2Ac-(1→
O97	→3)-α-L-Rha-(1→3)-β-L-Rha-(1→ β-D-Xulf-(2→2)β-D-Xulf-(2→2)
O101	→6)-α-D-GlcNAc-(1→4)-α-D-GalNAc-(1→

FIG. 11



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FIG. 12A

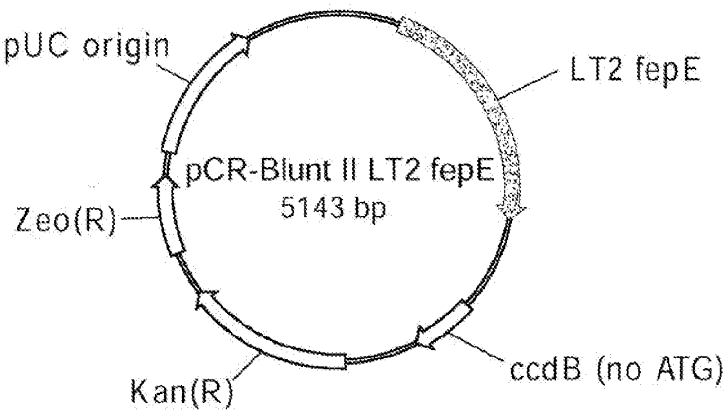


FIG. 12B

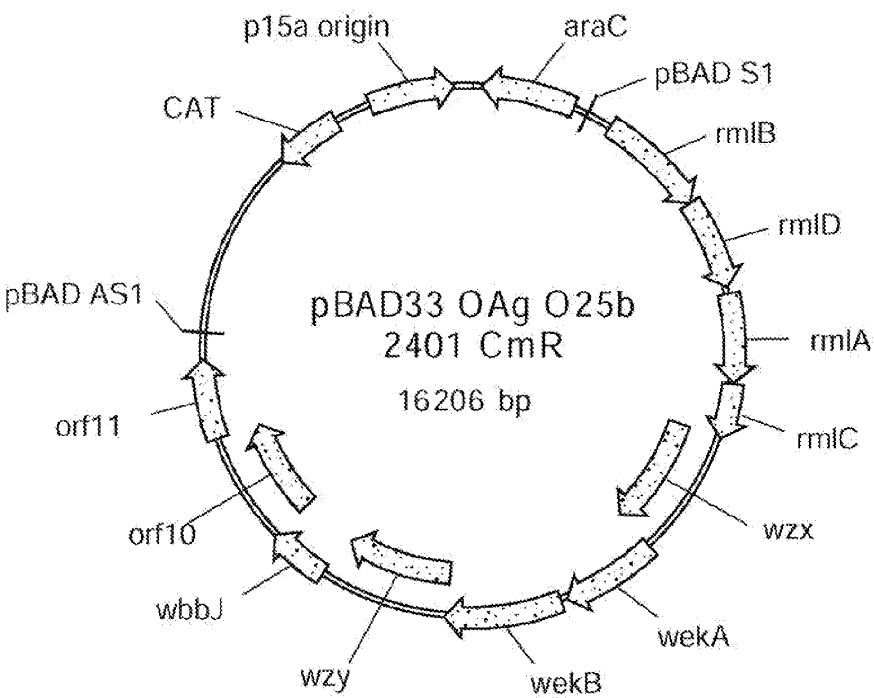


FIG. 13A

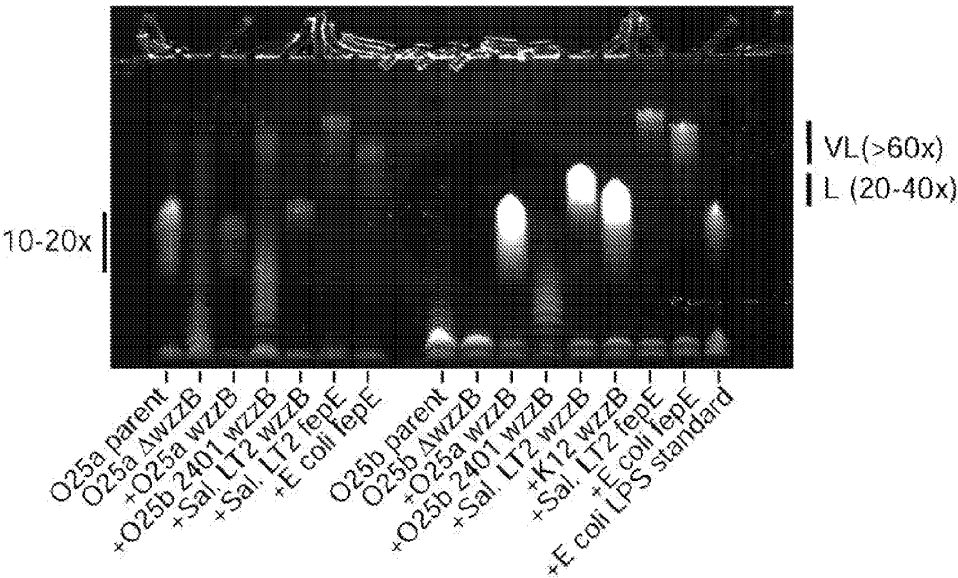


FIG. 13B

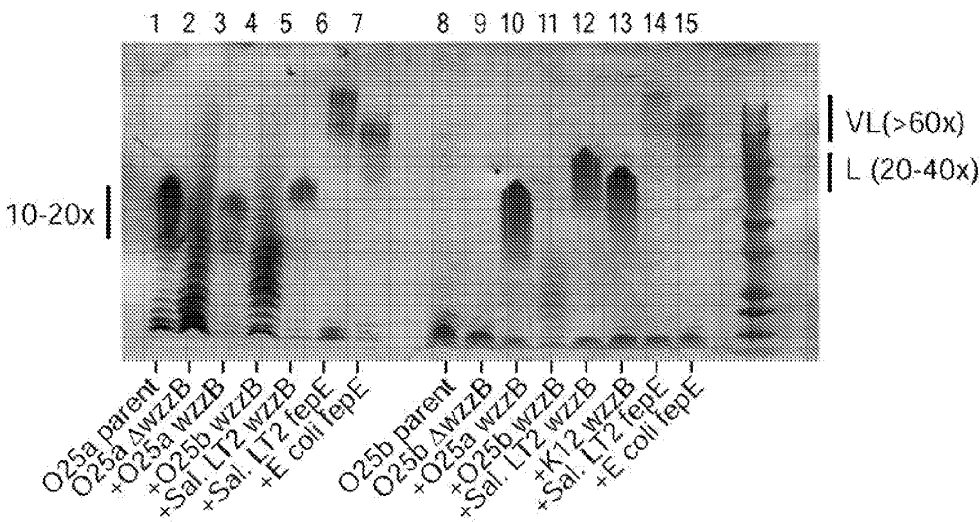


FIG. 14

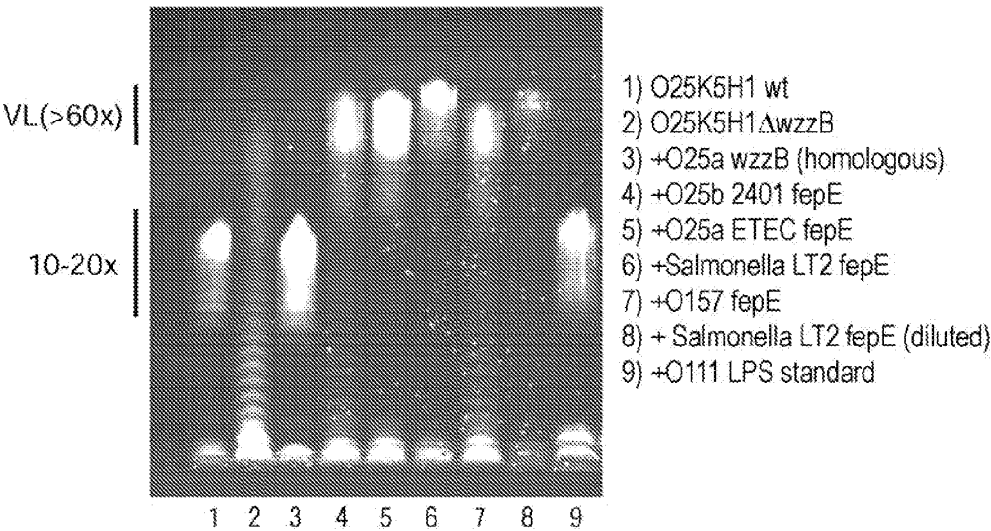


FIG. 15

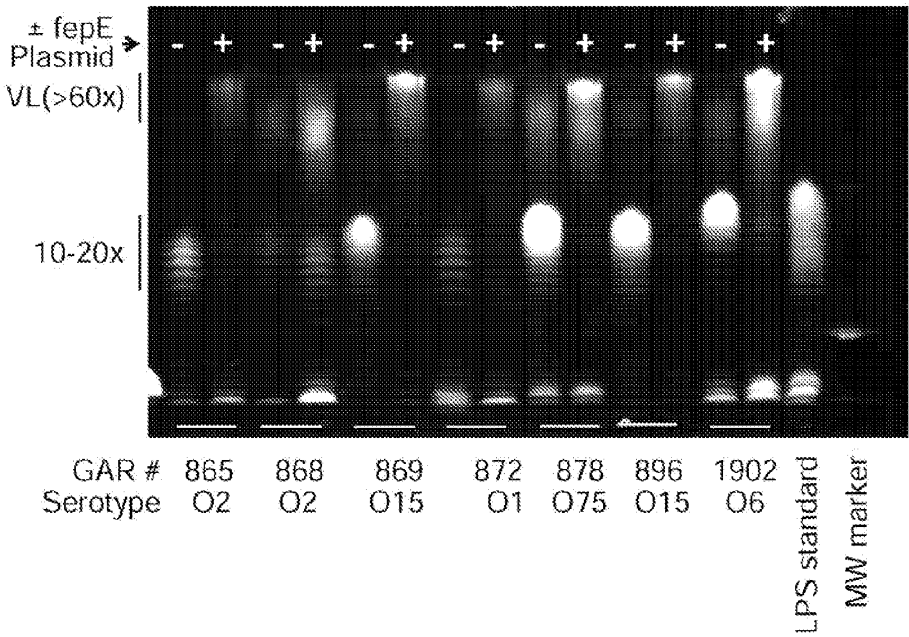


FIG. 16A

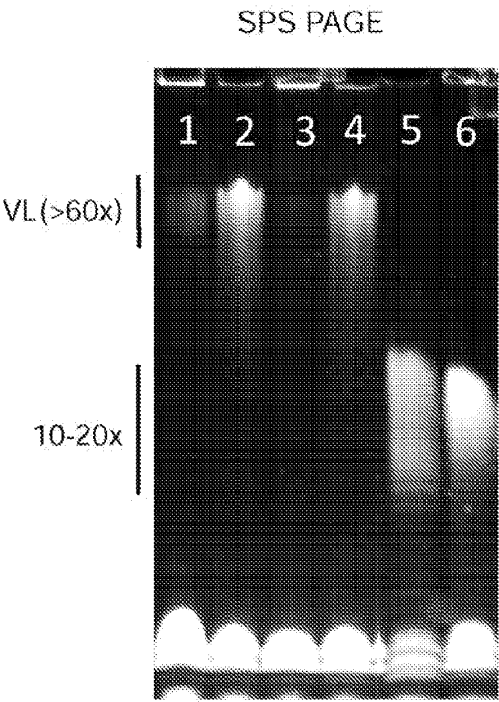
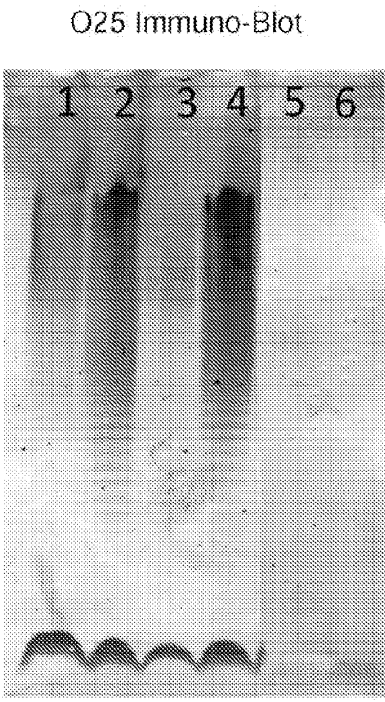
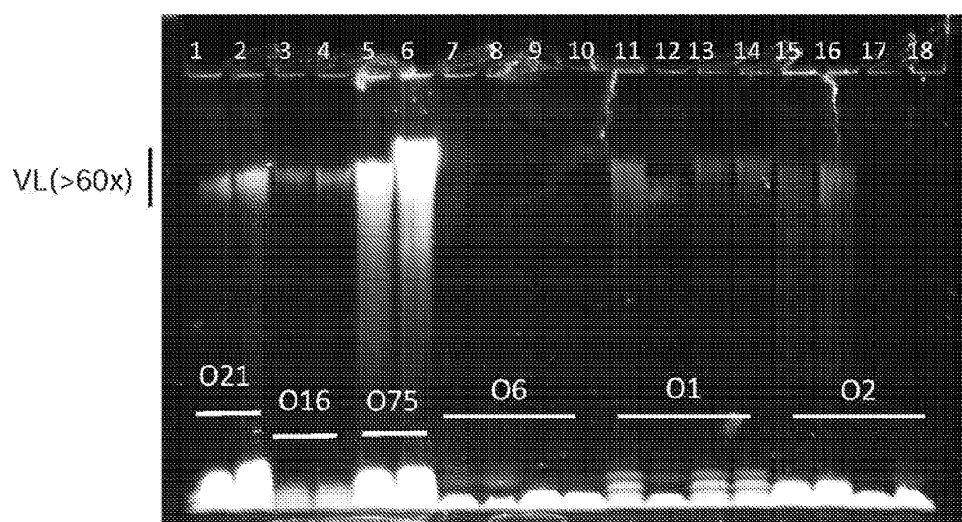


FIG. 16B

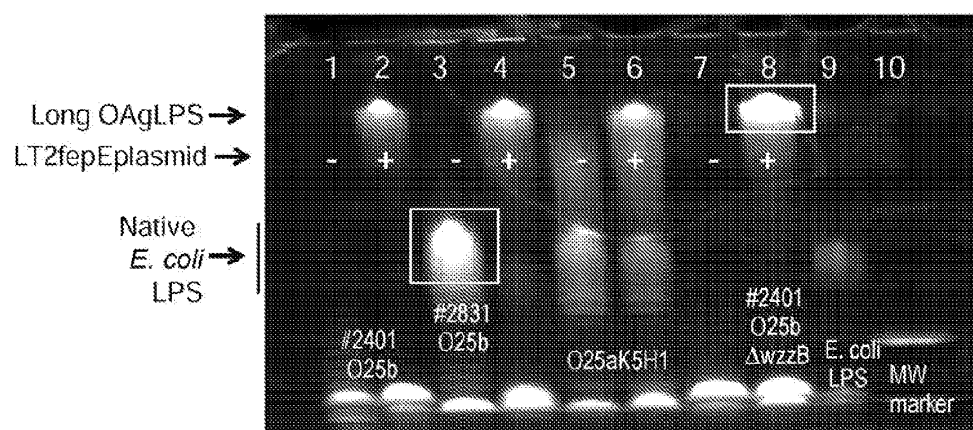


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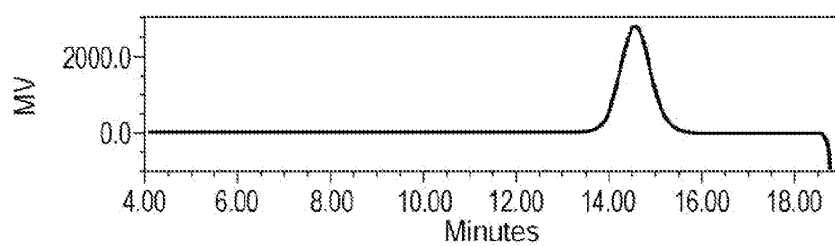
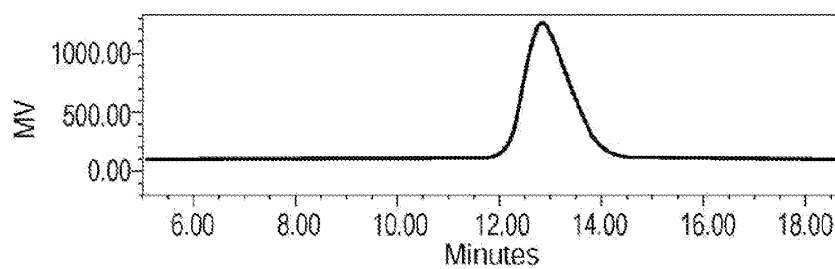
FIG. 17

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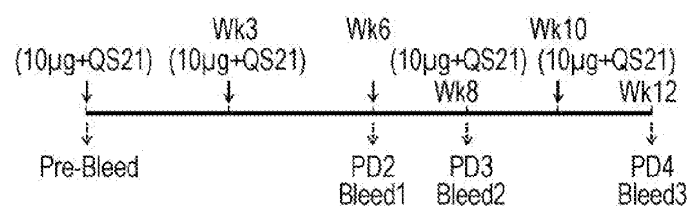
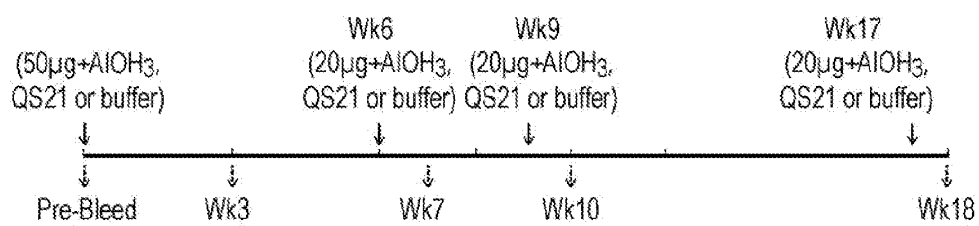
FIG. 18



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FIG. 19A**FIG. 19B**

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FIG. 20A**FIG. 20B**

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FIG. 21A

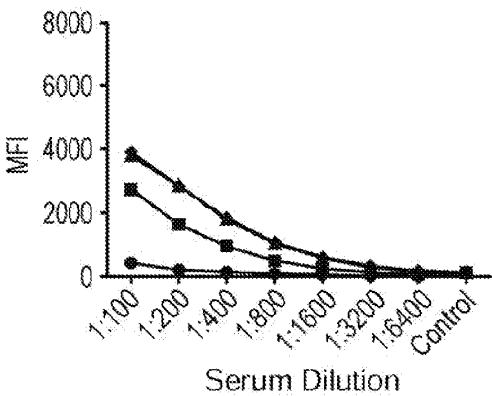


FIG. 21B

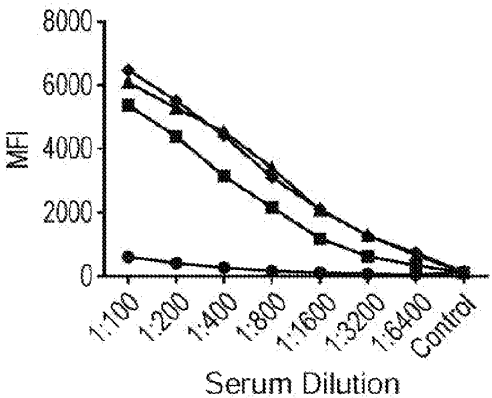
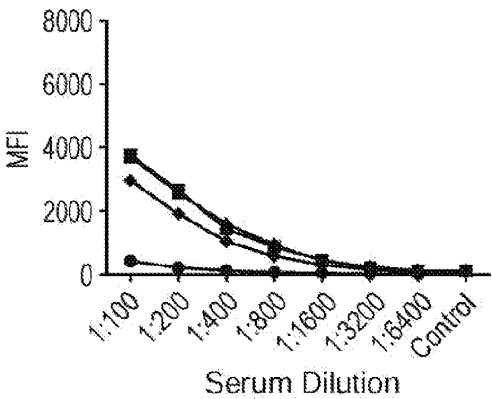


FIG. 21C



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FIG. 22A

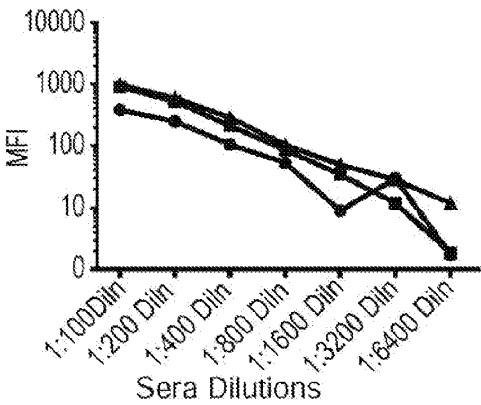


FIG. 22B

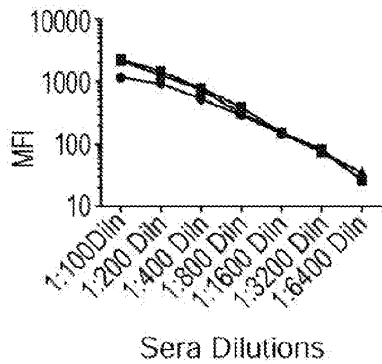


FIG. 22C

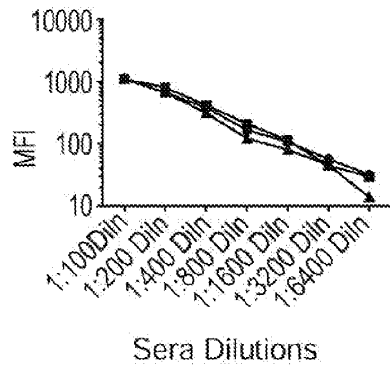


FIG. 22D

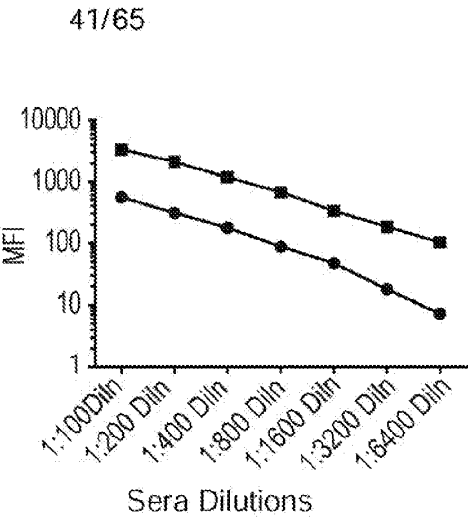


FIG. 22E

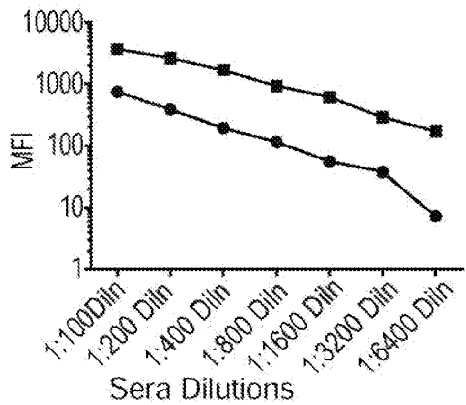


FIG. 22F



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FIG. 23A

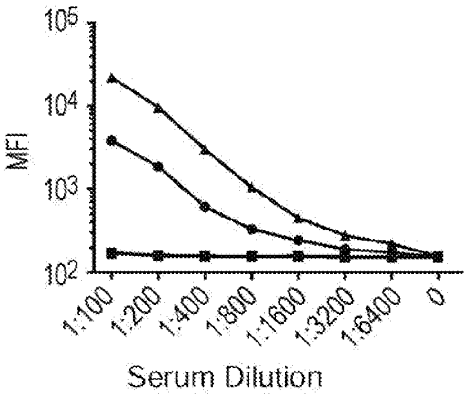


FIG. 23B

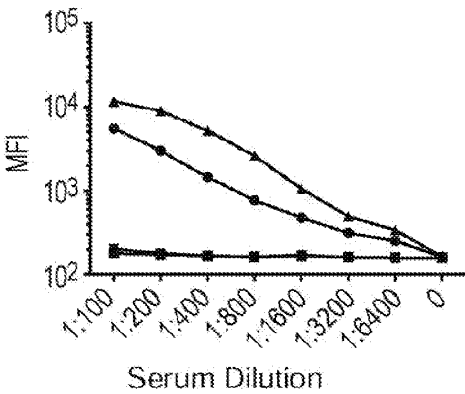
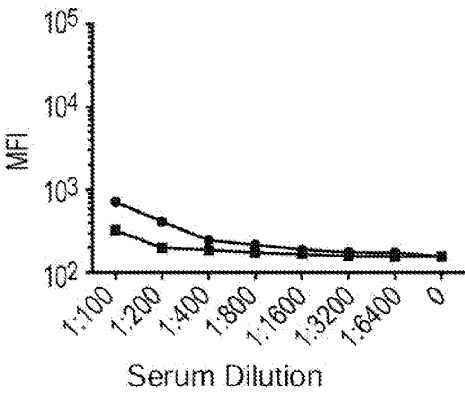
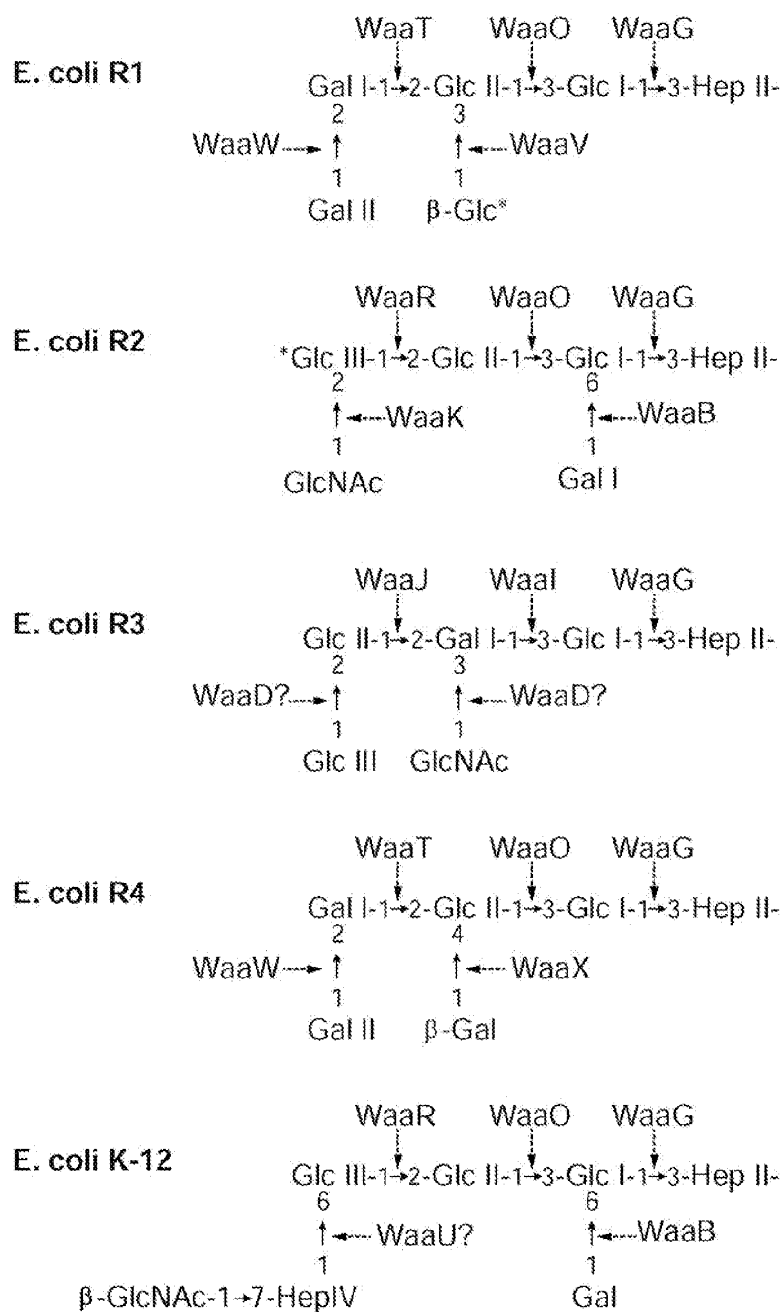


FIG. 23C





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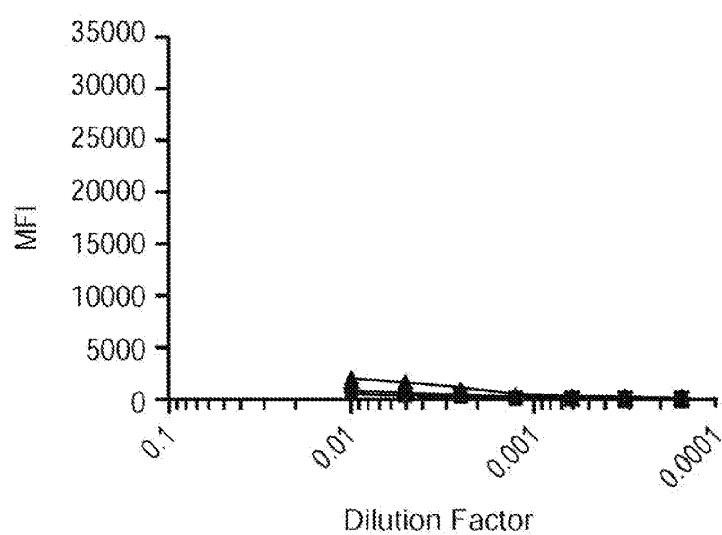
FIG. 25

FIG. 26A

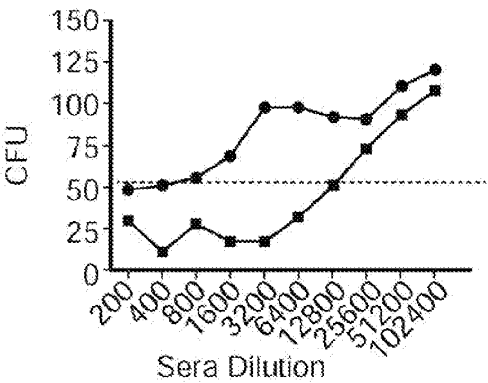


FIG. 26B

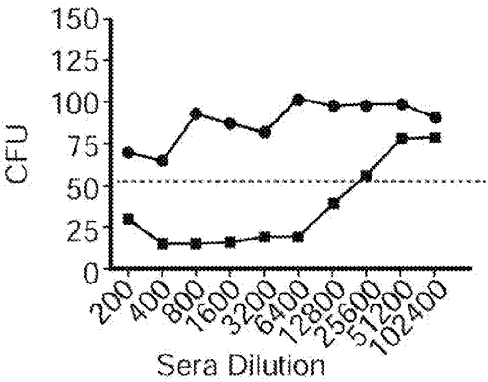


FIG. 26C

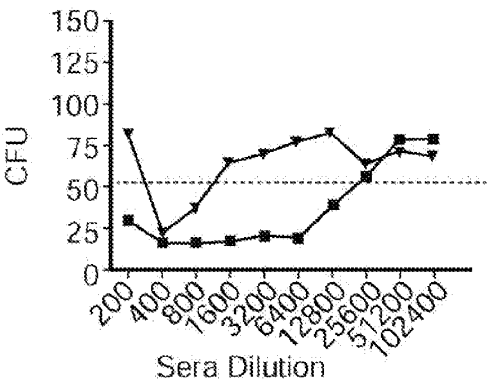


FIG. 27A

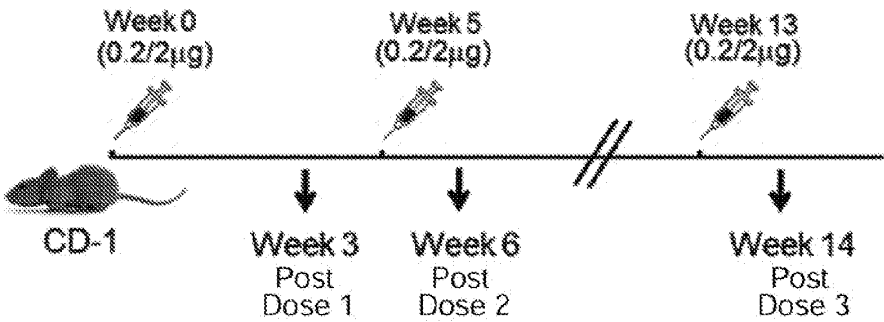


FIG. 27B

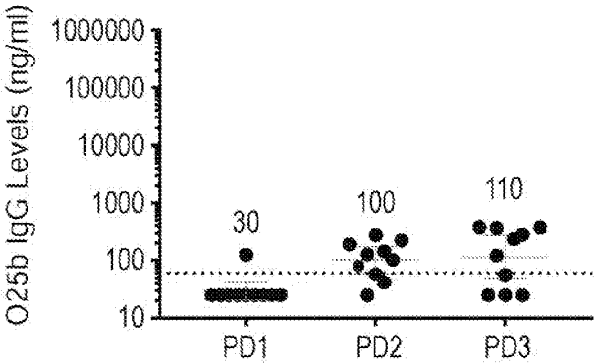
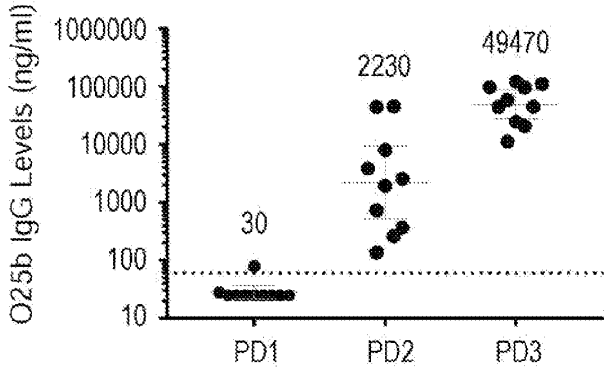


FIG. 27C



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FIG. 28A

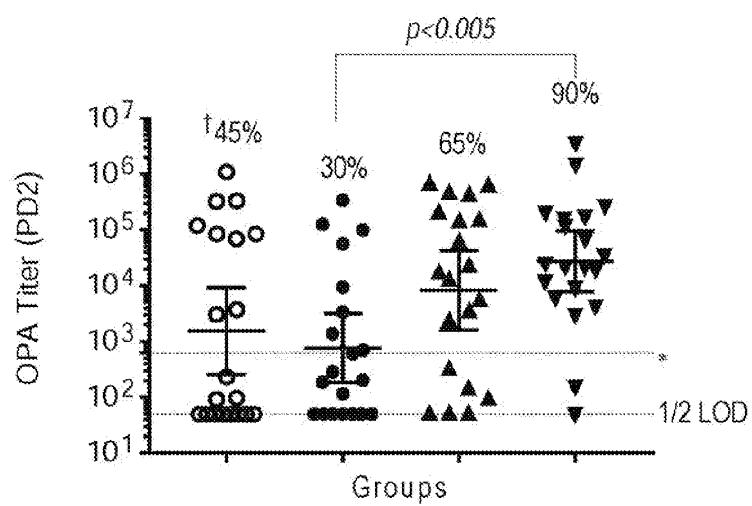
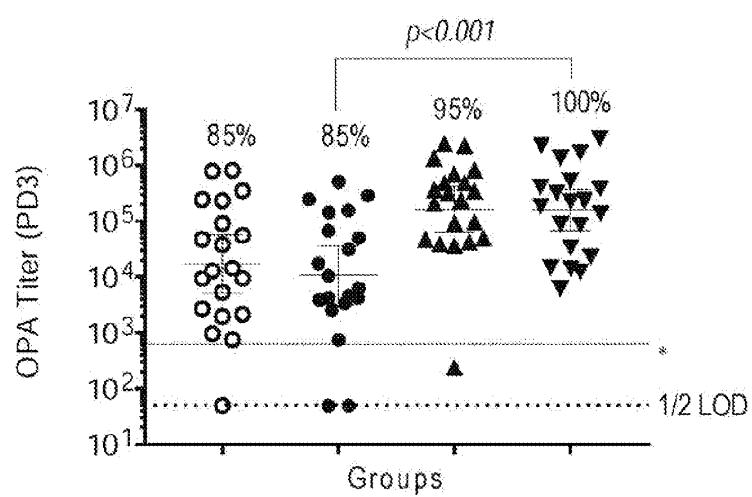
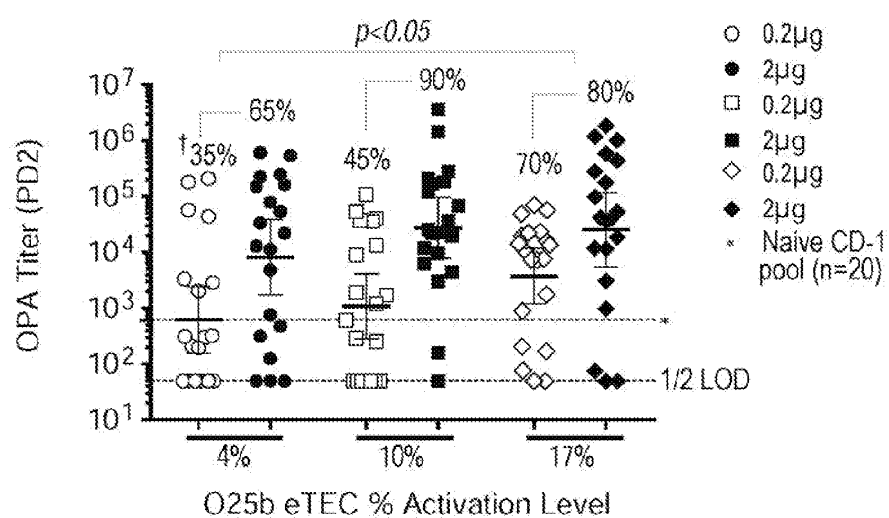


FIG. 28B



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FIG. 29



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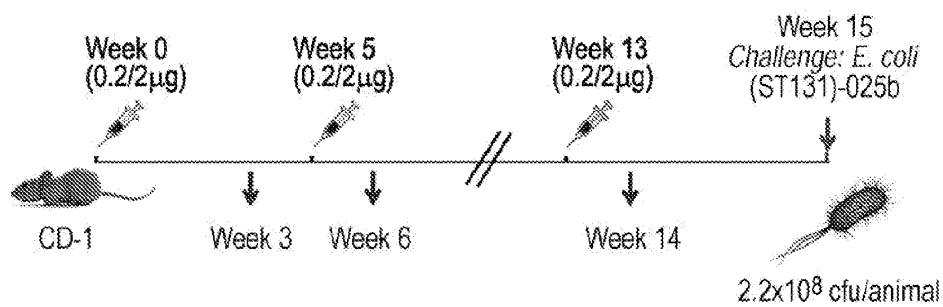
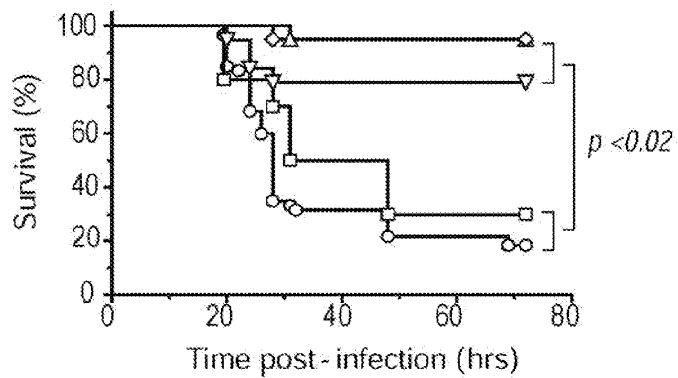
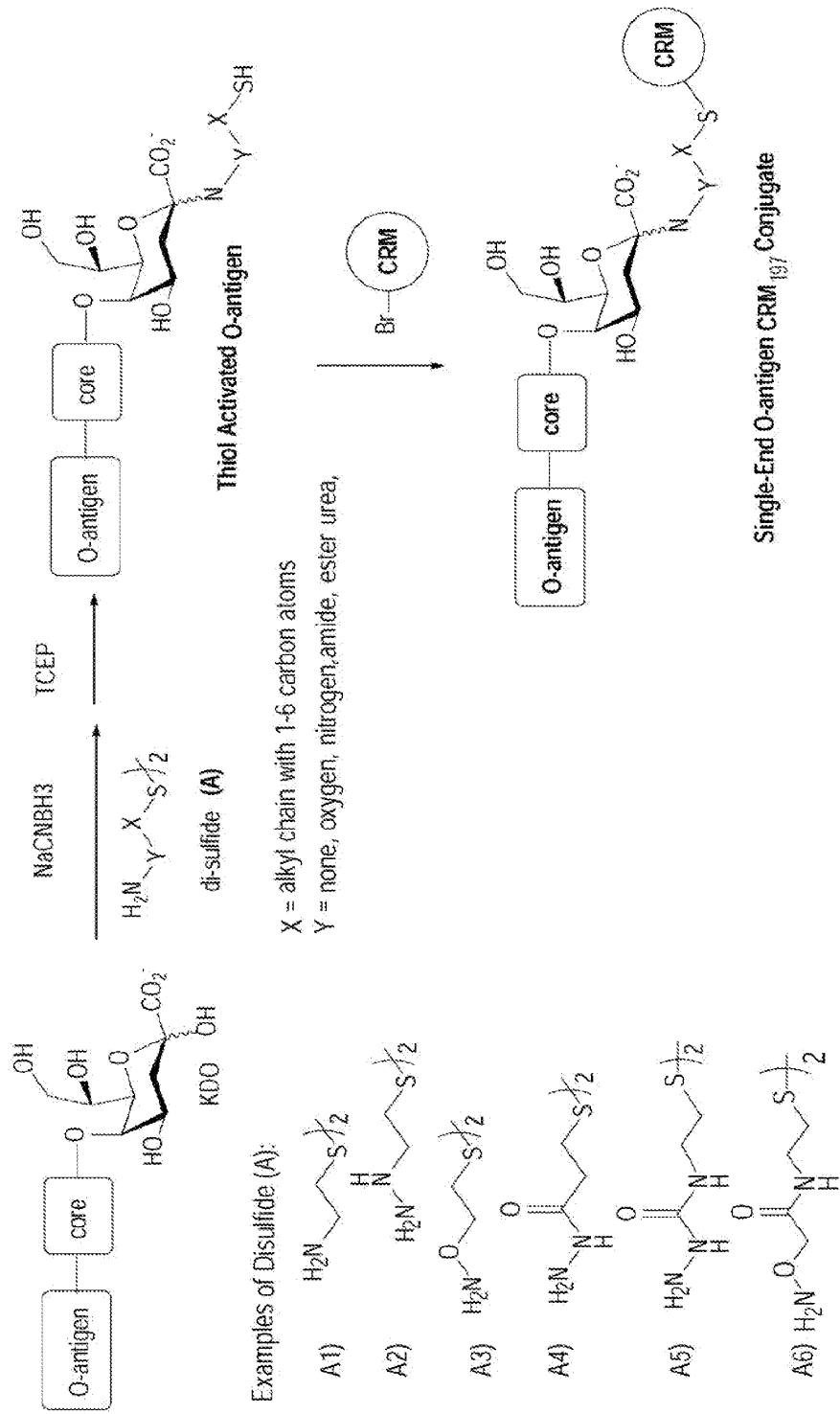
FIG. 30A**FIG. 30B**

FIG. 31



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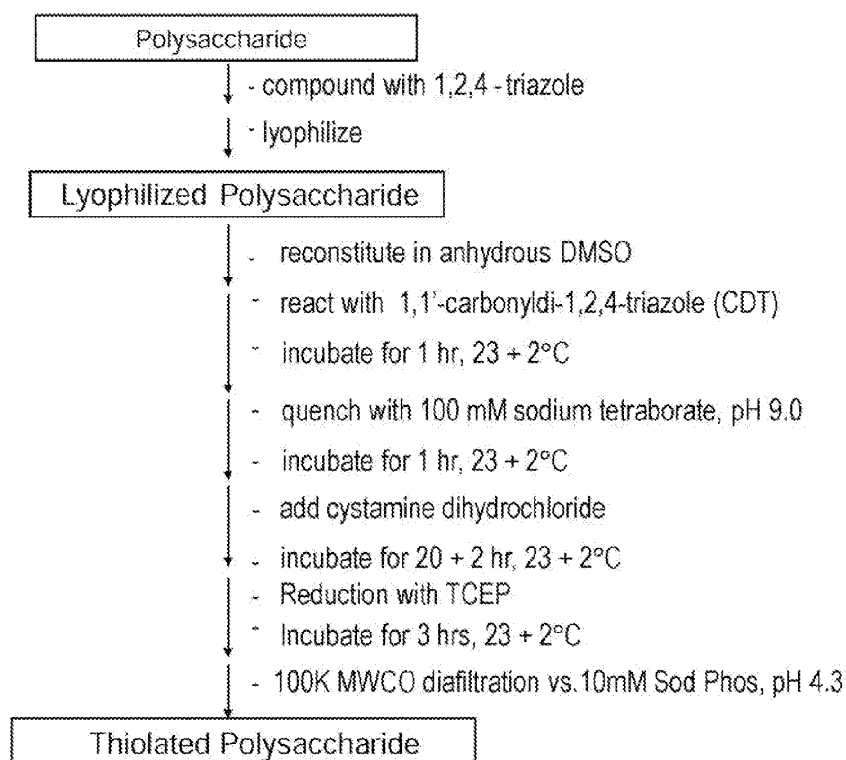
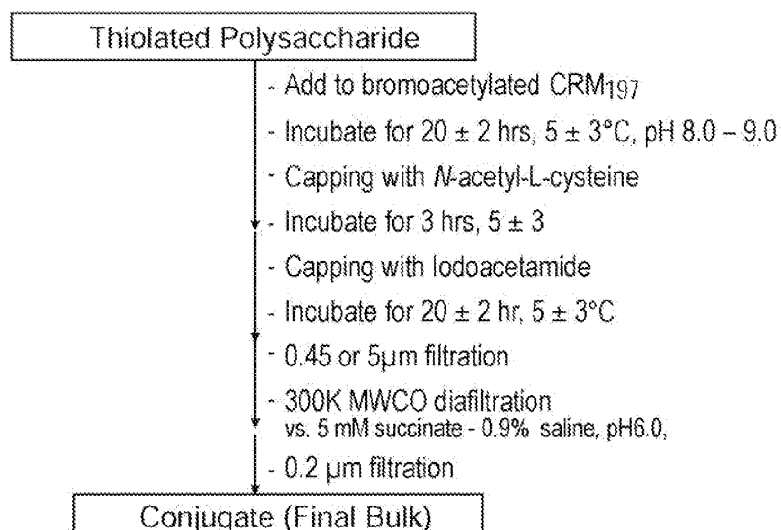
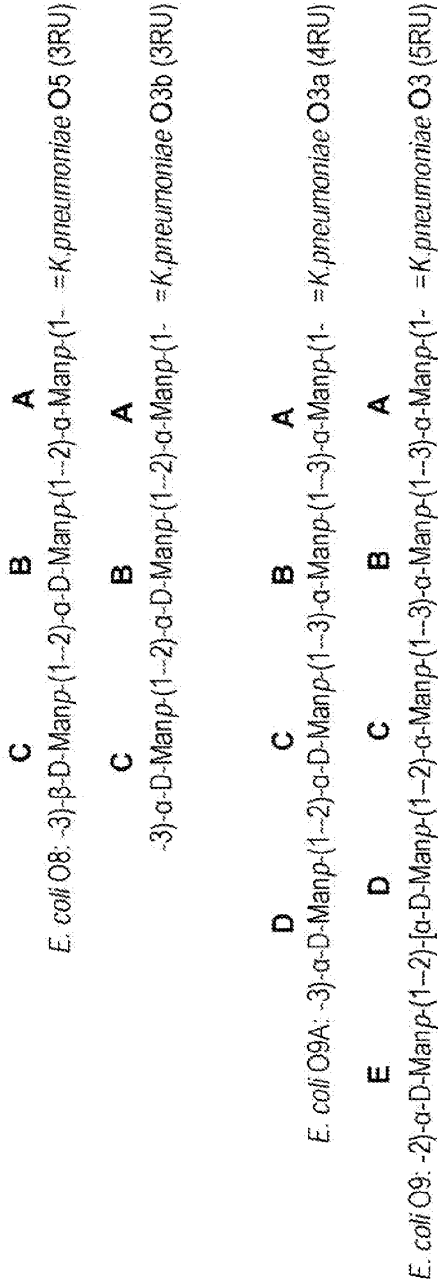
FIG. 32A**FIG. 32B**

FIG. 33



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FIG. 34A

Ec O8 OPA with 3% BRC

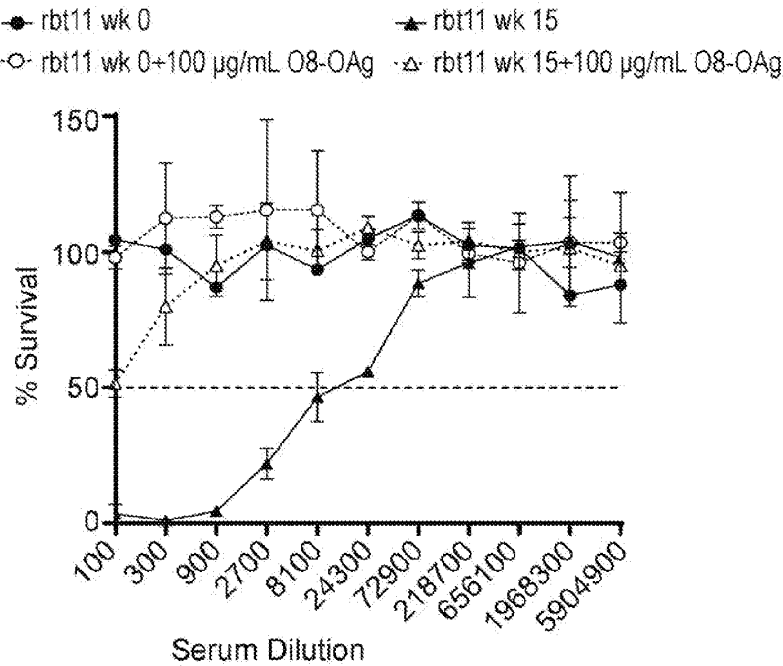
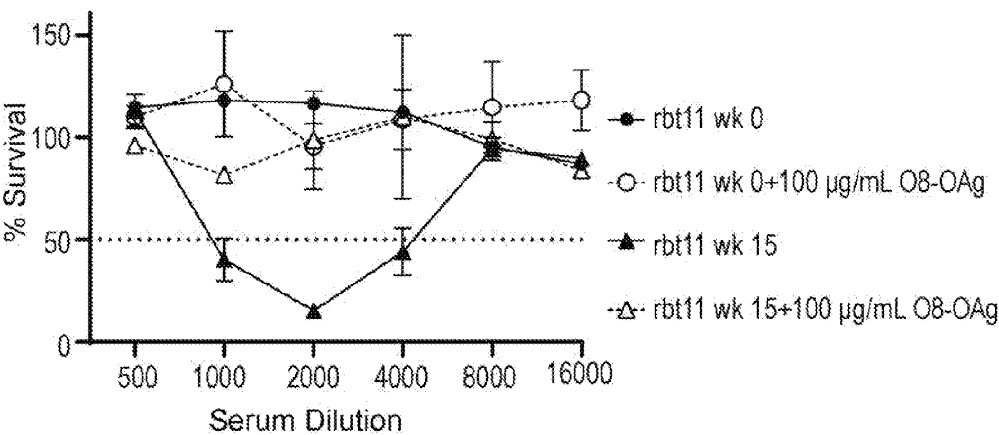
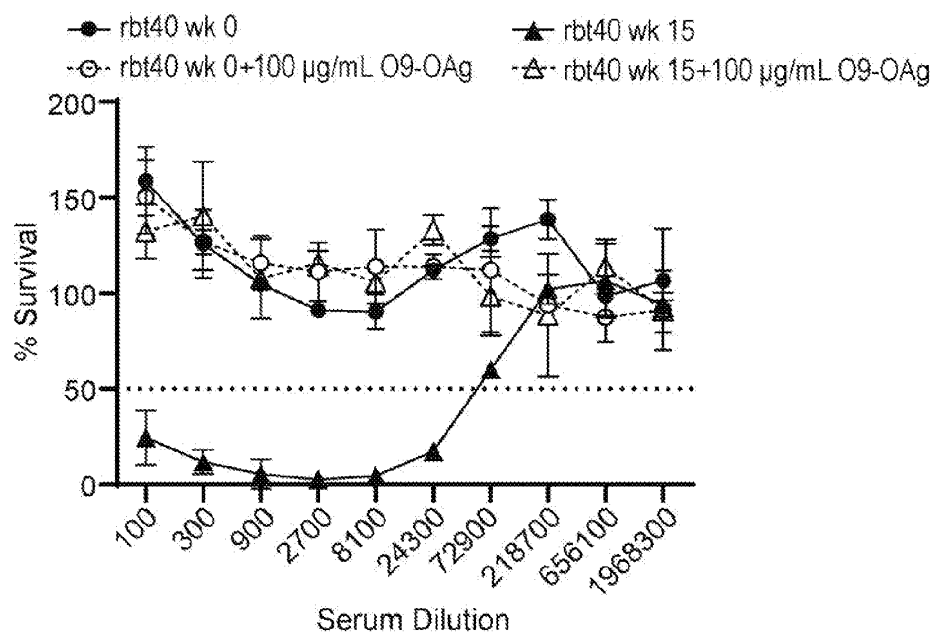
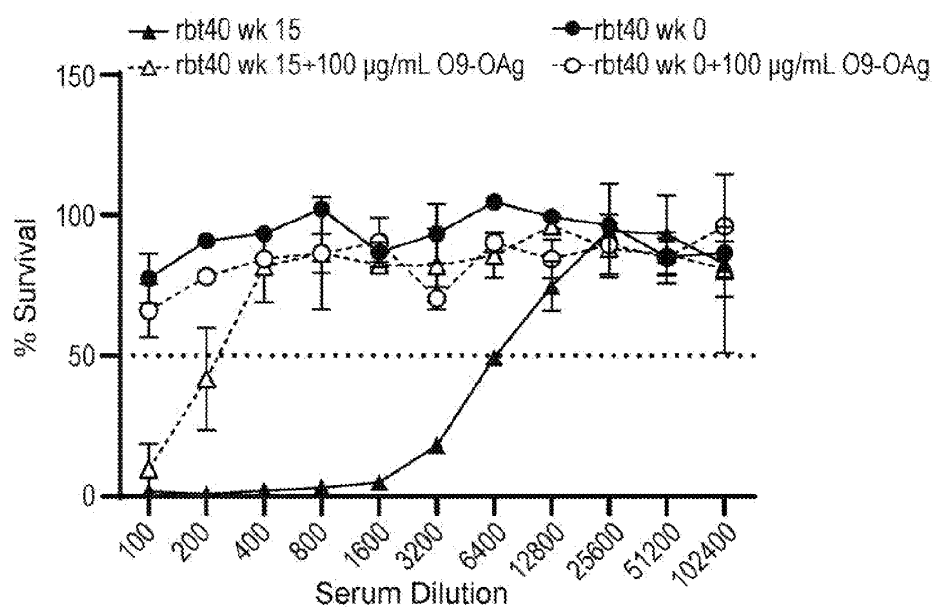


FIG. 34B

Kp O5 hSBA with 10% hC



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FIG. 35A Ec O9 OPA with 3% BRC**FIG. 35B** Kp O3 OPA with 15% hC

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FIG. 36A

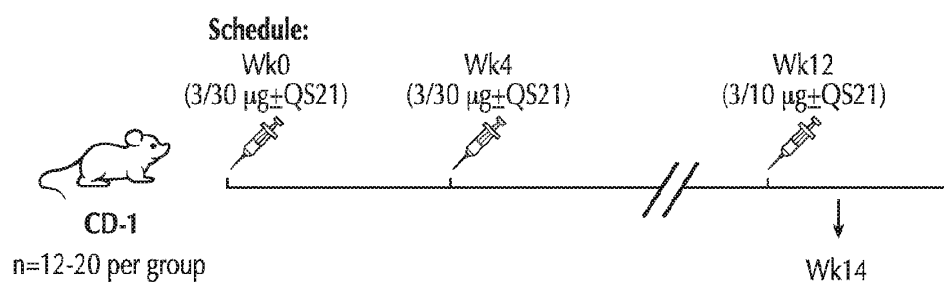
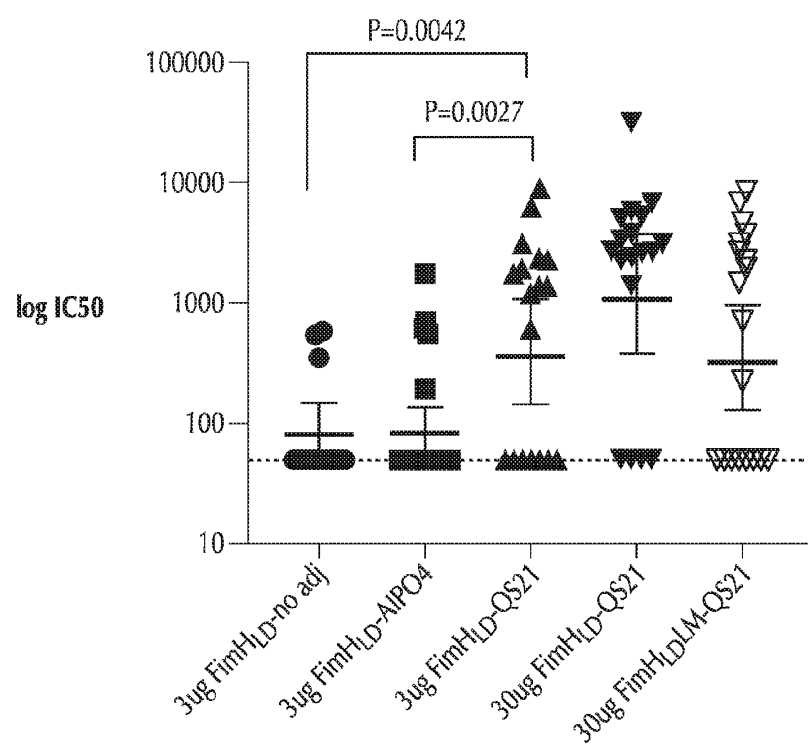


FIG. 36B



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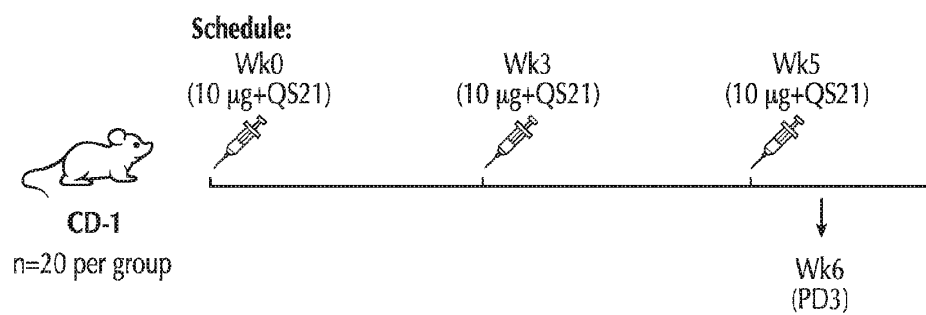
FIG. 37A

FIG. 37B

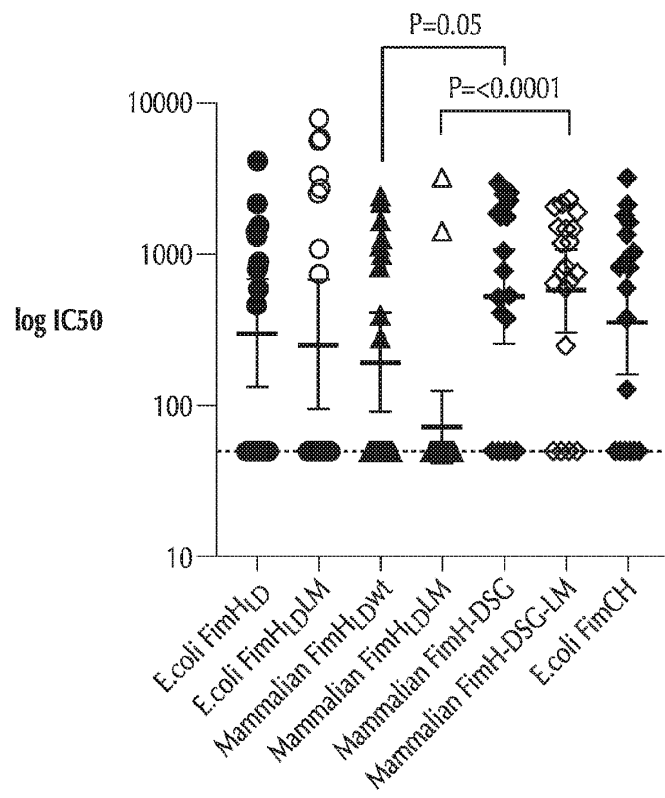


FIG. 38

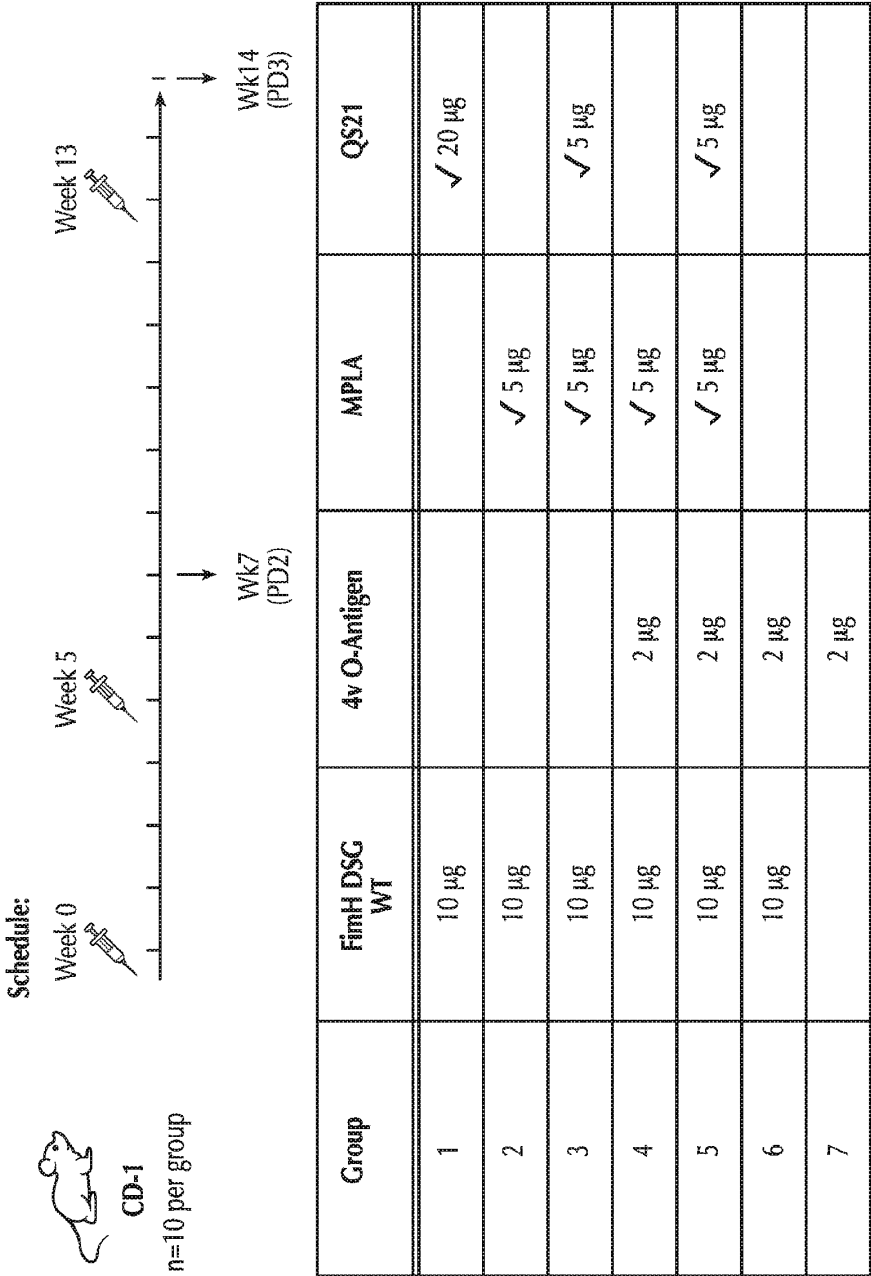


FIG. 39B

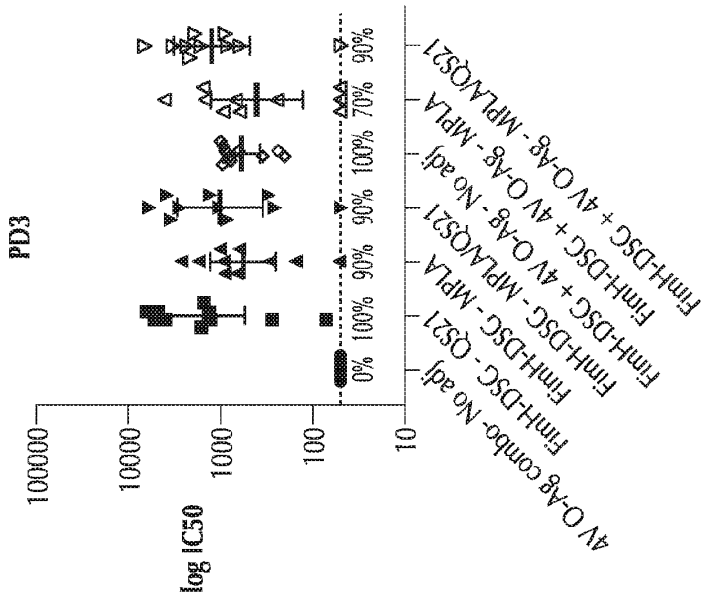


FIG. 39A

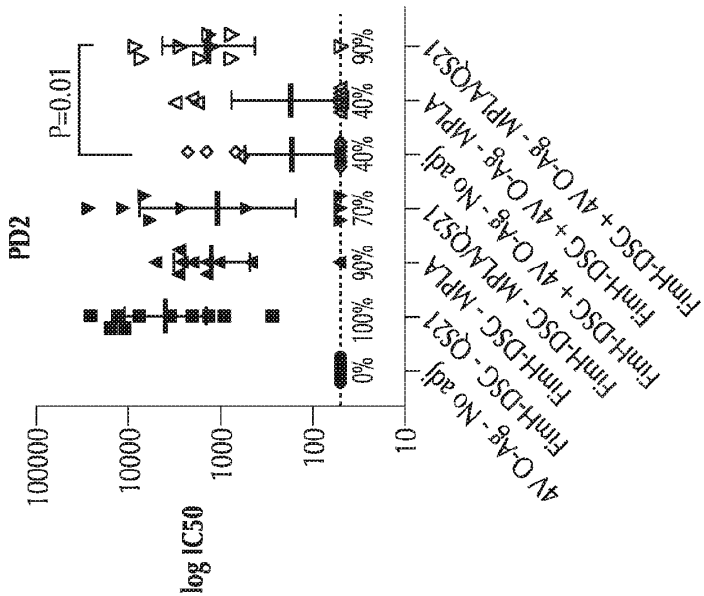
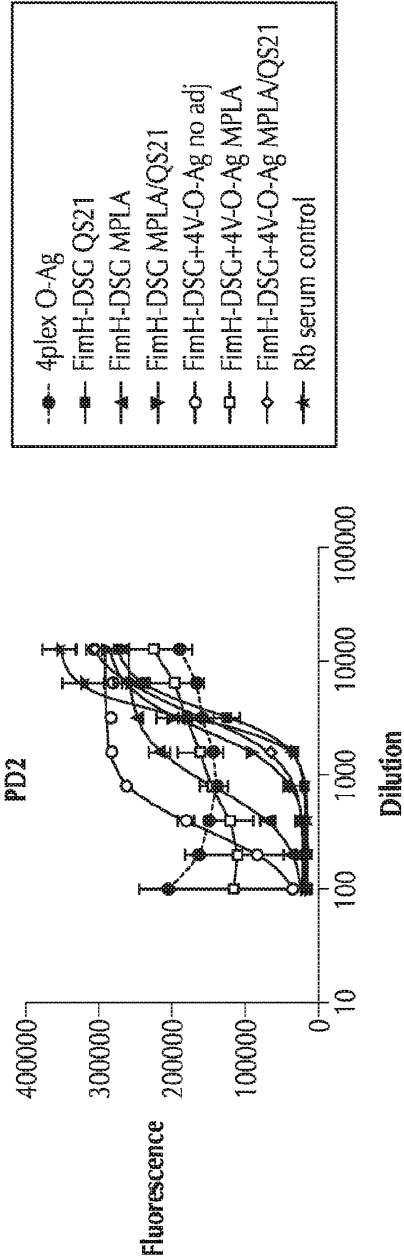


FIG. 40A



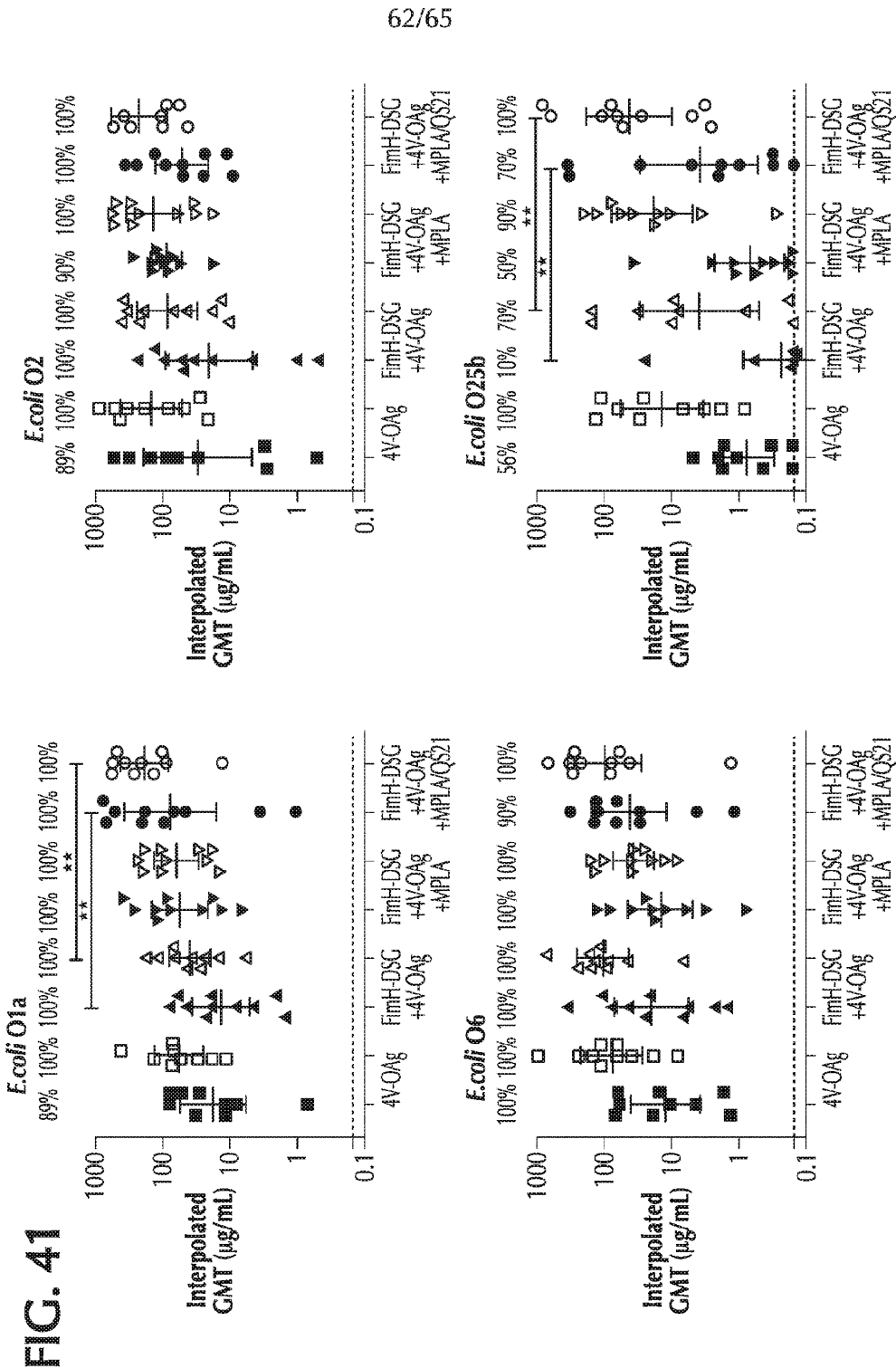


FIG. 42

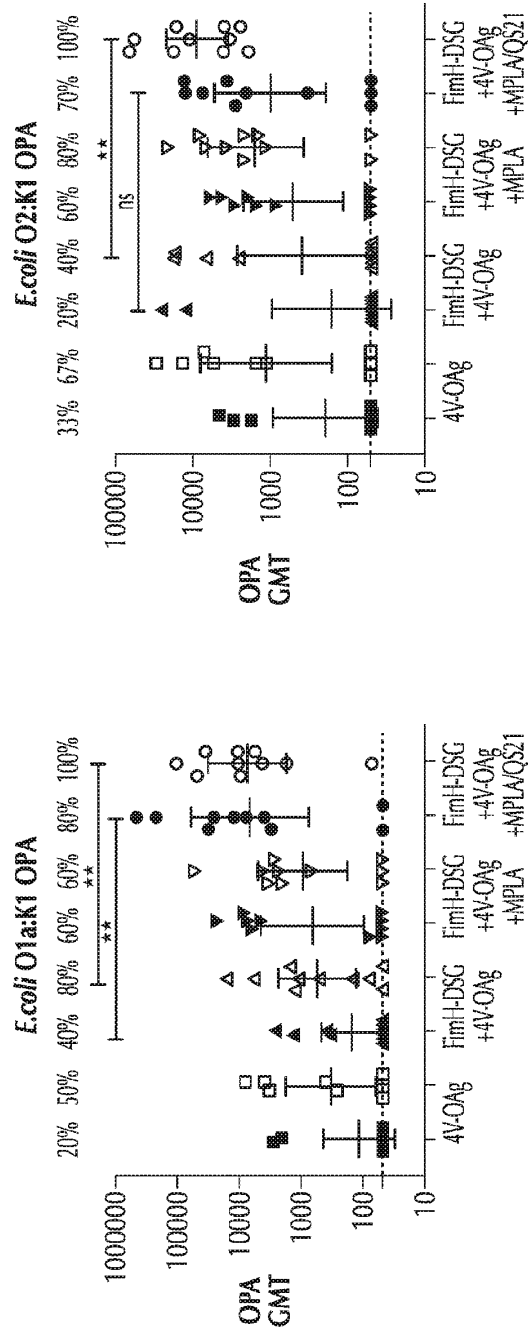


FIG. 42
Continued

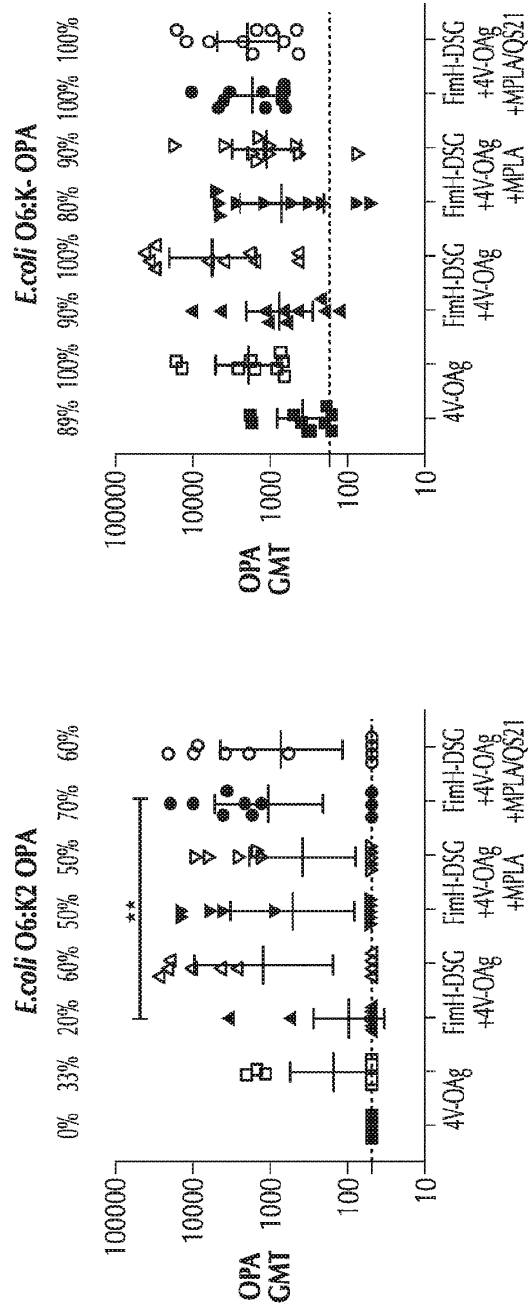


FIG. 42
Continued

