FIGURE 1

SEQ ID NO:1 – sequence of toxin A

MSLISKEELIKLAYSIRPRENEYKTILTNLDEYNKLTTNNNENKYLQLKKLNESIDVFMN
KYKTSSRNRALSNLKKDILKEVILIKNSNTSPVEKNLHFVWIGGEVSDIALEYIKQWADI
NAEYNIKLWYDSEAFLVNTLKKAIVESSTTEALQLLEEEIQNPQFDNMKFYKKRMEFIYD
RQKRFINYYKSQINKPTVPTIDDIIKSHLVSEYNRDETVLESYRTNSLRKINSNHGIDIR
ANSLFTEQELLNIYSQELLNRGNLAAASDIVRLLALKNFGGVYLDVDMLPGIHSDLFKTI
SRPSSIGLDRWEMIKLEAIMKYKKYINNYTSENFDKLDQQLKDNFKLIIESKSEKSEIFS
KLENLNVSDLEIKIAFALGSVINQALISKQGSYLTNLVIEQVKNRYQFLNQHLNPAIESD
NNFTDTTKIFHDSLFNSATAENSMFLTKIAPYLQVGFMPEARSTISLSGPGAYASAYYDF
INLQENTIEKTLKASDLIEFKFPENNLSQLTEQEINSLWSFDQASAKYQFEKYVRDYTGG
SLSEDNGVDFNKNTALDKNYLLNNKIPSNNVEEAGSKNYVHYIIQLQGDDISYEATCNLF
SKNPKNSIIIQRNMNESAKSYFLSDDGESILELNKYRIPERLKNKEKVKVTFIGHGKDEF
NTSEFARLSVDSLSNEISSFLDTIKLDISPKNVEVNLLGCNMFSYDFNVEETYPGKLLLS
IMDKITSTLPDVNKNSITIGANQYEVRINSEGRKELLAHSGKWINKEEAIMSDLSSKEYI
FFDSIDNKLKAKSKNIPGLASISEDIKTLLLDASVSPDTKFILNNLKLNIESSIGDYIYY
EKLEPVKNIIHNSIDDLIDEFNLLENVSDELYELKKLNNLDEKYLISFEDISKNNSTYSV
RFINKSNGESVYVETEKEIFSKYSEHITKEISTIKNSIITDVNGNLLDNIQLDHTSQVNT
LNAAFFIQSLIDYSSNKDVLNDLSTSVKVQLYAQLFSTGLNTIYDSIQLVNLISNAVNDT
INVLPTITEGIPIVSTILDGINLGAAIKELLDEHDPLLKKELEAKVGVLAINMSLSIAAT
VASIVGIGAEVTIFLLPIAGISAGIPSLVNNELILHDKATSVVNYFNHLSESKKYGPLKT
EDDKILVPIDDLVISEIDFNNNSIKLGTCNILAMEGGSGHTVTGNIDHFFSSPSISSHIP
SLSIYSAIGIETENLDFSKKIMMLPNAPSRVFWWETGAVPGLRSLENDGTRLLDSIRDLY
PGKFYWRFYAFFDYAITTLKPVYEDTNIKIKLDKDTRNFIMPTITTNEIRNKLSYSFDGA
GGTYSLLLSSYPISTNINLSKDDLWIFNIDNEVREISIENGTIKKGKLIKDVLSKIDINK
NKLIIGNQTIDFSGDIDNKDRYIFLTCELDDKISLIIEINLVAKSYSLLLSGDKNYLISN
LSNTIEKINTLGLDSKNIAYNYTDESNNKYFGAISKTSQKSIIHYKKDSKNILEFYNDST
LEFNSKDFIAEDINVFMKDDINTITGKYYVDNNTDKSIDFSISLVSKNQVKVNGLYLNES
VYSSYLDFVKNSDGHHNTSNFMNLFLDNISFWKLFGFENINFVIDKYFTLVGKTNLGYVE
FICDNNKNIDIYFGEWKTSSSKSTIFSGNGRNVVVEPIYNPDTGEDISTSLDFSYEPLYG
IDRYINKVLIAPDLYTSLININTNYYSNEYYPEIIVLNPNTFHKKVNINLDSSSFEYKWS
TEGSDFILVRYLEESNKKILQKIRIKGILSNTQSFNKMSIDFKDIKKLSLGYIMSNFKSF
NSENELDRDHLGFKIIDNKTYYYDEDSKLVKGLININNSLFYFDPIEFNLVTGWQTINGK
KYYFDINTGAALTSYKIINGKHFYFNNDGVMQLGVFKGPDGFEYFAPANTQNNNIEGQAI
VYQSKFLTLNGKKYYFDNNSKAVTGWRIINNEKYYFNPNNAIAAVGLQVIDNNKYYFNPD
TAIISKGWQTVNGSRYYFDTDTAIAFNGYKTIDGKHFYFDSDCVVKIGVFSTSNGFEYFA
PANTYNNNIEGQAIVYQSKFLTLNGKKYYFDNNSKAVTGLQTIDSKKYYFNTNTAEAATG
WQTIDGKKYYFNTNTAEAATGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQ
IGVFKGPNGFEYFAPANTDANNIEGQAILYQNEFLTLNGKKYYFGSDSKAVTGWRIINNK
KYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDANNESKMVTGVFKG
PNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNL
NTAEAATGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFY
FNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQNKFLTLNGKKYYFGSDSKAVT
GLRTIDGKKYYFNTNTAVAVTGWQTINGKKYYFNTNTSIASTGYTIISGKHFYFNTDGIM
QIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGNNSKAATGWVTIDG
NRYYFEPNTAMGANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAI
RYQNRFLHLLGKIYYFGNNSKAVTGWQTINGKVYYFMPDTAMAAAGGLFEIDGVIYFFGV
DGVKAPGIYG

SEQ ID NO:2 – sequence of toxin B

MSLVNRKQLEKMANVRFRTQEDEYVAILDALEEYHNMSENTVVEKYLKLKDINSLTDIYI
DTYKKSGRNKALKKFKEYLVTEVLELKNNNLTPVEKNLHFVWIGGQINDTAINYINQWKD
VNSDYNVNVFYDSNAFLINTLKKTVVESAINDTLESFRENLNDPRFDYNKFFRKRMEIIY
DKQKNFINYYKAQREENPELIIDDIVKTYLSNEYSKEIDELNTYIEESLNKITQNSGNDV
RNFEEFKNGESFNLYEQELVERWNLAAASDILRISALKEIGGMYLDVDMLPGIQPDLFES

IEKPSSVTVDFWEMTKLEAIMKYKEYIPEYTSEHFDMLDEEVQSSFESVLASKSDKSEIF
SSLGDMEASPLEVKIAFNSKGIINQGLISVKDSYCSNLIVKQIENRYKILNNSLNPAISE
DNDFNTTTNTFIDSIMAEANADNGRFMMELGKYLRVGFFPDVKTTINLSGPEAYAAAYQD
LLMFKEGSMNIHLIEADLRNFEISKTNISQSTEQEMASLWSFDDARAKAQFEEYKRNYFE
GSLGEDDNLDFSQNIVVDKEYLLEKISSLARSSERGYIHYIVQLQGDKISYEAACNLFAK
TPYDSVLFQKNIEDSEIAYYYNPGDGEIQEIDKYKIPSIISDRPKIKLTFIGHGKDEFNT
DIFAGFDVDSLSTEIEAAIDLAKEDISPKSIEINLLGCNMFSYSINVEETYPGKLLLKVK
DKISELMPSISQDSIIVSANQYEVRINSEGRRELLDHSGEWINKEESIIKDISSKEYISF
NPKENKITVKSKNLPELSTLLQEIRNNSNSSDIELEEKVMLTECEINVISNIDTQIVEER
IEEAKNLTSDSINYIKDEFKLIESISDALCDLKQQNELEDSHFISFEDISETDEGFSIRF
INKETGESIFVETEKTIFSEYANHITEEISKIKGTIFDTVNGKLVKKVNLDTTHEVNTLN
AAFFIQSLIEYNSSKESLSNLSVAMKVQVYAQLFSTGLNTITDAAKVVELVSTALDETID
LLPTLSEGLPIIATIIDGVSLGAAIKELSETSDPLLRQEIEAKIGIMAVNLTTATTAIIT
SSLGIASGFSILLVPLAGISAGIPSLVNNELVLRDKATKVVDYFKHVSLVETEGVFTLLD
DKIMMPQDDLVISEIDFNNNSIVLGKCEIWRMEGGSGHTVTDDIDHFFSAPSITYREPHL
SIYDVLEVQKEELDLSKDLMVLPNAPNRVFAWETGWTPGLRSLENDGTKLLDRIRDNYEG
EFYWRYFAFIADALITTLKPRYEDTNIRINLDSNTRSFIVPIITTEYIREKLSYSFYGSG
GTYALSLSQYNMGINIELSESDVWIIDVDNVVRDVTIESDKIKKGDLIEGILSTLSIEEN
KIILNSHEINFSGEVNGSNGFVSLTFSILEGINAIIEVDLLSKSYKLLISGELKILMLNS
NHIQQKIDYIGFNSELQKNIPYSFVDSEGKENGFINGSTKEGLFVSELPDVVLISKVYMD
DSKPSFGYYSNNLKDVKVITKDNVNILTGYYLKDDIKISLSLTLQDEKTIKLNSVHLDES
GVAEILKFMNRKGNTNTSDSLMSFLESMNIKSIFVNFLQSNIKFILDANFIISGTTSIGQ
FEFICDENDNIQPYFIKFNTLETNYTLYVGNRQNMIVEPNYDLDDSGDISSTVINFSQKY
LYGIDSCVNKVVISPNIYTDEINITPVYETNNTYPEVIVLDANYINEKINVNINDLSIRY
VWSNDGNDFILMSTSEENKVSQVKIRFVNVFKDKTLANKLSFNFSDKQDVPVSEIILSFT
PSYYEDGLIGYDLGLVSLYNEKFYINNFGMMVSGLIYINDSLYYFKPPVNNLITGFVTVG
DDKYYFNPINGGAASIGETIIDDKNYYFNQSGVLQTGVFSTEDGFKYFAPANTLDENLEG
EAIDFTGKLIIDENIYYFDDNYRGAVEWKELDGEMHYFSPETGKAFKGLNQIGDYKYYFN
SDGVMQKGFVSINDNKHYFDDSGVMKVGYTEIDGKHFYFAENGEMQIGVFNTEDGFKYFA
HHNEDLGNEEGEEISYSGILNFNNKIYYFDDSFTAVVGWKDLEDGSKYYFDEDTAEAYIG
LSLINDGQYYFNDDGIMQVGFVTINDKVFYFSDSGIIESGVQNIDDNYFYIDDNGIVQIG
VFDTSDGYKYFAPANTVNDNIYGQAVEYSGLVRVGEDVYYFGETYTIETGWIYDMENESD
KYYFNPETKKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFNENGEMQFGYINIED
KMFYFGEDGVMQIGVFNTPDGFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYI
AATGSVIIDGEEYYFDPDTAQLVISE

SEQ ID NO:3 – sequence of Fusion 1

MGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQNEF
LTLNGKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDANN
ESKMVTGVFKGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNTAE
AATGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNGFE
YFAPANTDANNIEGQAILYQNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYYFN
TNTSIASTGYTIISGKHFYFNTDGIMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGNNS
KAATGWVTIDGNRYYFEPNTAMGANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAIRYQN
RFLHLLGKIYYFGNNSKAVTGWQTINGKVYYFMPDTAMAAAGGLFEIDGVIYFFGVDGVKAPGFVSINDNKHYFD
DSGVMKVGYTEIDGKHFYFAENGEMQIGVFNTEDGFKYFAHHNEDLGNEEGEEISYSGILNFNNKIYYFDDSFTA
VVGWKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFNDDGIMQVGFVTINDKVFYFSDSGIIESGVQNIDDNYFY
IDDNGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEYSGLVRVGEDVYYFGETYTIETGWIYDMENESDKYYFN
PETKKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFNENGEMQFGYINIEDKMFYFGEDGVMQIGVFNTPD
GFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYIAATGSVIIDGEEYYFDPDTAQLVISE

SEQ ID NO:4 – sequence of Fusion 2

MGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQNEF
LTLNGKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDANN
ESKMVTGVFKGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNTAE

AATGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNGFE
YFAPANTDANNIEGQAILYQNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYYFN
TNTSIASTGYTIISGKHFYFNTDGIMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGNNS
KAATGWVTIDGNRYYFEPNTAMGANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAIRYQN
RFLHLLGKIYYFGNNSKAVTGWQTINGKVYYFMPDTAMAAAGGLNQIGDYKYYFNSDGVMQKGFVSINDNKHYFD
DSGVMKVGYTEIDGKHFYFAENGEMQIGVFNTEDGFKYFAHHNEDLGNEEGEEISYSGILNFNNKIYYFDDSFTA
VVGWKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFNDDGIMQVGFVTINDKVFYFSDSGIIESGVQNIDDNYFY
IDDNGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEYSGLVRVGEDVYYFGETYTIETGWIYDMENESDKYYFN
PETKKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFNENGEMQFGYINIEDKMFYFGEDGVMQIGVFNTPD
GFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYIAATGSVIIDGEEYYFDPDTAQLVISE

SEQ ID NO:5 – sequence of Fusion 3

MGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQNEF
LTLNGKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDANN
ESKMVTGVFKGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNTAE
AATGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNGFE
YFAPANTDANNIEGQAILYQNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYYFN
TNTSIASTGYTIISGKHFYFNTDGIMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGNNS
KAATGWVTIDGNRYYFEPNTAMGANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEYFAHHNEDLGNEEGEEISYSG
ILNFNNKIYYFDDSFTAVVGWKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFNDDGIMQVGFVTINDKVFYFSD
SGIIESGVQNIDDNYFYIDDNGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEYSGLVRVGEDVYYFGETYTIE
TGWIYDMENESDKYYFNPETKKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFNENGEMQFGYINIEDKMF
YFGEDGVMQIGVFNTPDGFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYIAATGSVIIDGEEYYFDPD
TAQLVISE

SEQ ID NO:6 – sequence of Fusion 4

MGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQNEF
LTLNGKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDANN
ESKMVTGVFKGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNTAE
AATGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNGFE
YFAPANTDANNIEGQAILYQNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYYFN
TNTSIASTGYTIISGKHFYFNTDGIMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGNNS
KAATGWVTIDGNRYYFEPNTAMGANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAIRYQN
RFLHLLGKIYYFGNNSKAVTGWQTINGKVYYFMPDTAMAAAGGETIIDDKNYYFNQSGVLQTGVFSTEDGFKYFA
PANTLDENLEGEAIDFTGKLIIDENIYYFDDNYRGAVEWKELDGEMHYFSPETGKAFKGLNQIGDYKYYFNSDGV
MQKGFVSINDNKHYFDDSGVMKVGYTEIDGKHFYFAENGEMQIGVFNTEDGFKYFAHHNEDLGNEEGEEISYSGI
LNFNNKIYYFDDSFTAVVGWKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFNDDGIMQVGFVTINDKVFYFSDS
GIIESGVQNIDDNYFYIDDNGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEYSGLVRVGEDVYYFGETYTIET
GWIYDMENESDKYYFNPETKKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFNENGEMQFGYINIEDKMFY
FGEDGVMQIGVFNTPDGFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYIAATGSVIIDGEEYYFDPDT
AQLVISE

SEQ ID NO:7 – sequence of Fusion 5

MGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQNEF
LTLNGKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDANN
ESKMVTGVFKGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNTAE
AATGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNGFE
YFAPANTDANNIEGQAILYQNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYYFN
TNTSIASTGYTIISGKHFYFNTDGIMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGNNS
KAATGWVTIDGNRYYFEPNTAMGANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAIRYQN
RFLHLLGKIYYFGNNSKAVTGWQTINGKVYYFMPDTAMAAAGGLFEIDGVIYFFGVDGVKAPGIYGGGFVSINDN

KHYFDDSGVMKVGYTEIDGKHFYFAENGEMQIGVFNTEDGFKYFAHHNEDLGNEEGEEISYSGILNFNNKIYYFD
DSFTAVVGWKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFNDDGIMQVGFVTINDKVFYFSDSGIIESGVQNID
DNYFYIDDNGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEYSGLVRVGEDVYYFGETYTIETGWIYDMENESD
KYYFNPETKKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFNENGEMQFGYINIEDKMFYFGEDGVMQIGV
FNTPDGFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYIAATGSVIIDGEEYYFDPDTAQLVISE

SEQ ID NO:8 sequence of individual toxin A fragment

MASTGYTSINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQNKFLTLNGKKYYFGSDSKAVT
GLRTIDGKKYYFNTNTAVAVTGWQTINGKKYYFNTNTSIASTGYTIISGKHFYFNTDGIMQIGVFKGPDGFEYFA
PANTDANNIEGQAIRYQNRFLYLHDNIYYFGNNSKAATGWVTIDGNRYYFEPNTAMGANGYKTIDNKNFYFRNGL
PQIGVFKGSNGFEYFAPANTDANNIEGQAIRYQNRFLHLLGKIYYFGNNSKAVTGWQTINGKVYYFMPDTAMAAA
GGLFEIDGVIYFFGVDGVKAP

SEQ ID NO:9 – sequence of individual toxin B fragment

MILMSTSEENKVSQVKIRFVNVFKDKTLANKLSFNFSDKQDVPVSEIILSFTPSYYEDGLIGYDLGLVSLYNEKF
YINNFGMMVSGLIYINDSLYYFKPPVNNLITGFVTVGDDKYYFNPINGGAASIGETIIDDKNYYFNQSGVLQTGV
FSTEDGFKYFAPANTLDENLEGEAIDFTGKLIIDENIYYFDDNYRGAVEWKELDGEMHYFSPETGKAFKGLNQIG
DYKYYFNSDGVMQKGFVSINDNKHYFDDSGVMKVGYTEIDGKHFYFAENGEMQIGVFNTEDGFKYFAHHNEDLGN
EEGEEISYSGILNFNNKIYYFDDSFTAVVGWKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFNDDGIMQVGFVT
INDKVFYFSDSGIIESGVQNIDDNYFYIDDNGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEYSGLVRVGEDV
YYFGETYTIETGWIYDMENESDKYYFNPETKKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFNENGEMQF
GYINIEDKMFYFGEDGVMQIGVFNTPDGFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYIAATGSVII
DGEEYYFDPDTA

SEQ ID NO:10 – sequence of toxin A fragment from fusion 1

MGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQNEF
LTLNGKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDANN
ESKMVTGVFKGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNTAE
AATGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNGFE
YFAPANTDANNIEGQAILYQNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYYFN
TNTSIASTGYTIISGKHFYFNTDGIMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGNNS
KAATGWVTIDGNRYYFEPNTAMGANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAIRYQN
RFLHLLGKIYYFGNNSKAVTGWQTINGKVYYFMPDTAMAAAGGLFEIDGVIYFFGVDGVKAP

SEQ ID NO:11 – sequence of toxin A fragment from fusion 2

MGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQNEF
LTLNGKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDANN
ESKMVTGVFKGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNTAE
AATGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNGFE
YFAPANTDANNIEGQAILYQNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYYFN
TNTSIASTGYTIISGKHFYFNTDGIMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGNNS
KAATGWVTIDGNRYYFEPNTAMGANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAIRYQN
RFLHLLGKIYYFGNNSKAVTGWQTINGKVYYFMPDTAMAAAG

SEQ ID NO:12 – sequence of toxin A fragment from fusion 3

MGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQNEF
LTLNGKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDANN
ESKMVTGVFKGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNTAE
AATGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNGFE
YFAPANTDANNIEGQAILYQNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYYFN

TNTSIASTGYTIISGKHFYFNTDGIMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGNNS
KAATGWVTIDGNRYYFEPNTAMGANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEY

SEQ ID NO:13 – sequence of toxin A fragment from fusion 4

MGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQNEF
LTLNGKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDANN
ESKMVTGVFKGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNTAE
AATGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNGFE
YFAPANTDANNIEGQAILYQNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYYFN
TNTSIASTGYTIISGKHFYFNTDGIMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGNNS
KAATGWVTIDGNRYYFEPNTAMGANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAIRYQN
RFLHLLGKIYYFGNNSKAVTGWQTINGKVYYFMPDTAMAAAG

SEQ ID NO:14 – sequence of toxin A fragment from fusion 5

MGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQNEF
LTLNGKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDANN
ESKMVTGVFKGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNTAE
AATGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNGFE
YFAPANTDANNIEGQAILYQNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYYFN
TNTSIASTGYTIISGKHFYFNTDGIMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGNNS
KAATGWVTIDGNRYYFEPNTAMGANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAIRYQN
RFLHLLGKIYYFGNNSKAVTGWQTINGKVYYFMPDTAMAAAGGLFEIDGVIYFFGVDGVKAPGIYG

SEQ ID NO:15 – sequence of toxin B fragment from fusion 1

GFVSINDNKHYFDDSGVMKVGYTEIDGKHFYFAENGEMQIGVFNTEDGFKYFAHHNEDLGNEEGEEISYSGILNF
NNKIYYFDDSFTAVVGWKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFNDDGIMQVGFVTINDKVFYFSDSGII
ESGVQNIDDNYFYIDDNGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEYSGLVRVGEDVYYFGETYTIETGWI
YDMENESDKYYFNPETKKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFNENGEMQFGYINIEDKMFYFGE
DGVMQIGVFNTPDGFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYIAATGSVIIDGEEYYFDPDTAQL
VISE

SEQ ID NO:16 – sequence of toxin B fragment from fusion 2

GLNQIGDYKYYFNSDGVMQKGFVSINDNKHYFDDSGVMKVGYTEIDGKHFYFAENGEMQIGVFNTEDGFKYFAHH
NEDLGNEEGEEISYSGILNFNNKIYYFDDSFTAVVGWKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFNDDGIM
QVGFVTINDKVFYFSDSGIIESGVQNIDDNYFYIDDNGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEYSGLV
RVGEDVYYFGETYTIETGWIYDMENESDKYYFNPETKKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFNE
NGEMQFGYINIEDKMFYFGEDGVMQIGVFNTPDGFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYIAA
TGSVIIDGEEYYFDPDTAQLVISE

SEQ ID NO:17 – sequence of toxin B fragment from fusion 3

FAHHNEDLGNEEGEEISYSGILNFNNKIYYFDDSFTAVVGWKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFND
DGIMQVGFVTINDKVFYFSDSGIIESGVQNIDDNYFYIDDNGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEY
SGLVRVGEDVYYFGETYTIETGWIYDMENESDKYYFNPETKKACKGINLIDDIKYYFDEKGIMRTGLISFENNNY
YFNENGEMQFGYINIEDKMFYFGEDGVMQIGVFNTPDGFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDE
YIAATGSVIIDGEEYYFDPDTAQLVISE

SEQ ID NO:18 – sequence of toxin B fragment from fusion 4

GETIIDDKNYYFNQSGVLQTGVFSTEDGFKYFAPANTLDENLEGEAIDFTGKLIIDENIYYFDDNYRGAVEWKEL
DGEMHYFSPETGKAFKGLNQIGDYKYYFNSDGVMQKGFVSINDNKHYFDDSGVMKVGYTEIDGKHFYFAENGEMQ

IGVFNTEDGFKYFAHHNEDLGNEEGEEISYSGILNFNNKIYYFDDSFTAVVGWKDLEDGSKYYFDEDTAEAYIGL
SLINDGQYYFNDDGIMQVGFVTINDKVFYFSDSGIIESGVQNIDDNYFYIDDNGIVQIGVFDTSDGYKYFAPANT
VNDNIYGQAVEYSGLVRVGEDVYYFGETYTIETGWIYDMENESDKYYFNPETKKACKGINLIDDIKYYFDEKGIM
RTGLISFENNNYYFNENGEMQFGYINIEDKMFYFGEDGVMQIGVFNTPDGFKYFAHQNTLDENFEGESINYTGWL
DLDEKRYYFTDEYIAATGSVIIDGEEYYFDPDTAQLVISE

SEQ ID NO:19 – sequence of toxin B fragment from fusion 5

GFVSINDNKHYFDDSGVMKVGYTEIDGKHFYFAENGEMQIGVFNTEDGFKYFAHHNEDLGNEEGEEISYSGILNF
NNKIYYFDDSFTAVVGWKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFNDDGIMQVGFVTINDKVFYFSDSGII
ESGVQNIDDNYFYIDDNGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEYSGLVRVGEDVYYFGETYTIETGWI
YDMENESDKYYFNPETKKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFNENGEMQFGYINIEDKMFYFGE
DGVMQIGVFNTPDGFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYIAATGSVIIDGEEYYFDPDTAQL
VISE

SEQ ID NO :20 – nucleotide sequence of F54 Gly

ATGGCAACCGGTTGGCAGACCATCGATGGCAAAAAATATTATTTTAATACCAACACCGCAATTGCAAGCACCGGCTATACCATTATCAACGGCA
AACACTTTTATTTTAACACCGACGGCATTATGCAGATTGGTGTGTTTAAAGGTCCGAACGGCTTTGAATACTTTGCACCGGCAAATACCGATGC
CAATAATATTGAAGGCCAGGCCATTCTGTATCAGAATGAATTTCTGACCCTGAACGGCAAAAAATACTACTTTGGCAGCGATAGCAAAGCAGTT
ACCGGTTGGCGCATCATCAACAATAAGAAATATTACTTCAACCCGAATAATGCAATTGCAGCAATTCATCTGTGCACCATTAACAACGACAAAT
ATTATTTCAGCTATGACGGTATTCTGCAGAATGGCTACATTACCATCGAACGCAACAACTTTTATTTCGATGCCAACAACGAAAGCAAAATGGT
GACCGGTGTTTTCAAAGGCCCTAATGGTTTTGAGTATTTCGCTCCGGCAAACACCCATAATAACAACATTGAAGGTCAGGCGATCGTTTATCAG
AACAAATTCCTGACGCTGAATGGTAAGAAATACTATTTCGATAATGACAGCAAAGCCGTGACCGGCTGGCAGACAATTGACGGGAAGAAATATT
ACTTTAATCTGAATACCGCAGAAGCAGCAACCGGTTGGCAAACGATCGACGGTAAAAAGTACTACTTCAACCTGAACACAGCCGAAGCAGCCAC
AGGATGGCAGACTATTGATGGAAAAAAATACTATTTCAACACCAACACCTTTATTGCATCTACCGGTTATACCAGCATTAACGGTAAACATTTC
TACTTCAACACCGATGGTATCATGCAGATCGGCGTTTTCAAAGGTCCAAATGGTTTCGAATACTTTGCCCCTGCCAATACAGATGCAAATAACA
TCGAGGGTCAGGCAATCCTGTACCAAAACAAATTTCTGACCCTGAATGGGAAAAAATATTACTTTGGTAGCGATTCTAAAGCCGTTACCGGTCT
GCGTACCATTGATGGTAAAAAATACTACTTTAATACGAATACAGCCGTTGCGGTTACAGGCTGGCAGACCATTAACGGGAAAAAATACTATTTT
AACACAAATACCAGCATTGCCTCAACGGGTTATACCATTATTTCGGGTAAACACTTCTACTTTAATACCGATGGTATTATGCAAATCGGAGTCT
TTAAAGGACCTGATGGGTTCGAATATTTTGCGCCTGCGAACACTGATGCGAACAATATCGAAGGACAGGCAATCCGCTATCAGAATCGCTTTCT
GTATCTGCACGACAACATCTATTATTTTGGCAACAATTCAAAAGCAGCCACCGGCTGGGTTACAATTGATGGCAACCGCTACTATTTCGAACCG
AATACCGCAATGGGTGCAAATGGCTACAAAACCATCGATAATAAAAATTTCTATTTTCGCAACGGTCTGCCGCAGATCGGGGTATTTAAAGGTA
GCAACGGCTTCGAATACTTCGCTCCAGCGAATACGGACGCGAACAATATTGAGGGTCAAGCGATTCGTTATCAAAACCGTTTTCTGCATCTGCT
GGGCAAAATCTACTACTTTGGCAATAACAGTAAAGCAGTTACTGGATGGCAGACAATCAATGGTAAAGTGTACTATTTTATGCCGGATACCGCC
ATGGCAGCAGCCGGTGGTCTGTTTGAAATTGATGGCGTGATCTATTTTTTTGGTGTGGATGGTGTTAAAGCACCGGGAATATACGGTGGTACCG
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AAGAACTGGATGGCGAAATGCATTATTTTTCTCCGGAAACCGGTAAAGCGTTTAAAGGCCTGAACCAGATCGGCGATTACAAATACTACTTCAA
CAGCGATGGCGTGATGCAGAAAGGCTTTGTGAGCATCAACGATAACAAACACTATTTCGATGATAGCGGTGTGATGAAAGTGGGCTATACCGAA
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ACGAAGATCTGGGTAACGAAGAAGGCGAAGAAATTAGCTATAGCGGCATCCTGAACTTCAACAACAAAATCTACTACTTTGATGATAGCTTTAC
CGCGGTGGTGGGCTGGAAAGATCTGGAAGATGGCAGCAAATATTATTTCGATGAAGATACCGCGGAAGCGTATATTGGCCTGAGCCTGATTAAC
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TTGAAAGCGGCGTGCAGAACATTGATGATAACTACTTCTACATCGATGATAACGGCATTGTGCAGATCGGCGTTTTTGATACCAGCGATGGCTA
CAAATATTTCGCACCGGCCAATACCGTGAACGATAACATTTATGGCCAGGCGGTGGAATATAGCGGTCTGGTGCGTGTGGGCGAAGATGTGTAT
TATTTCGGCGAAACCTATACCATCGAAACCGGCTGGATTTATGATATGGAAAACGAAAGCGATAAATATTACTTTAATCCGGAAACGAAAAAAG
CGTGCAAAGGCATTAACCTGATCGATGATATCAAATACTATTTTGATGAAAAAGGCATTATGCGTACCGGTCTGATTAGCTTCGAAAACAACAA
CTATTACTTCAACGAAAACGGTGAAATGCAGTTCGGCTACATCAACATCGAAGATAAAATGTTCTACTTCGGCGAAGATGGTGTTATGCAGATT
GGTGTTTTTAACACCCCGGATGGCTTCAAATACTTTGCCCATCAGAATACCCTGGATGAAAATTTCGAAGGTGAAAGCATTAACTATACCGGCT
GGCTGGATCTGGATGAAAAACGCTACTACTTCACCGATGAATACATTGCGGCGACCGGCAGCGTGATTATTGATGGCGAAGAATACTACTTCGA
TCCGGATACCGCGCAGCTGGTGATTAGCGAACATCATCATCATCACCAT

SEQ ID NO :21 – amino acid of F54Gly

MATGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQNEFLTLN

GKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDANNESKMVTGVF

KGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYY

FNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILY

QNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYYFNTNTSIASTGYTIISGKHFYFNTDG

IMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGNNSKAATGWVTIDGNRYYFEPNTAMGANGYKT

IDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAIRYQNRFLHLLGKIYYFGNNSKAVTGWQTINGKVYYFMP

DTAMAAAGGLFEIDGVIYFFGVDGVKAPGIYGGTGFVTVGDDKYYFNPINGGAASIGETIIDDKNYYFNQSGVLQTGVFS

TEDGFKYFAPANTLDENLEGEAIDFTGKLIIDENIYYFDDNYRGAVEWKELDGEMHYFSPETGKAFKGLNQIGDYKYYFN

SDGVMQKGFVSINDNKHYFDDSGVMKVGYTEIDGKHFYFAENGEMQIGVFNTEDGFKYFAHHNEDLGNEEGEEISYSGIL

NFNNKIYYFDDSFTAVVGWKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFNDDGIMQVGFVTINDKVFYFSDSGIIESG

VQNIDDNYFYIDDNGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEYSGLVRVGEDVYYFGETYTIETGWIYDMENESD

KYYFNPETKKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFNENGEMQFGYINIEDKMFYFGEDGVMQIGVFNTPD

GFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYIAATGSVIIDGEEYYFDPDTAQLVISEHHHHHH

SEQ ID NO :22 – nucleotide sequence of F54 New

ATGGCAACCGGTTGGCAGACCATCGATGGCAAAAAATATTATTTTAATACCAACACCGCAATTGCAAGCACCGGCTATACCATTATCAACGGCA
AACACTTTTATTTTAACACCGACGGCATTATGCAGATTGGTGTGTTTAAAGGTCCGAACGGCTTTGAATACTTTGCACCGGCAAATACCGATGC
CAATAATATTGAAGGCCAGGCCATTCTGTATCAGAATGAATTTCTGACCCTGAACGGCAAAAAATACTACTTTGGCAGCGATAGCAAAGCAGTT
ACCGGTTGGCGCATCATCAACAATAAGAAATATTACTTCAACCCGAATAATGCAATTGCAGCAATTCATCTGTGCACCATTAACAACGACAAAT
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GACCGGTGTTTTCAAAGGCCCTAATGGTTTTGAGTATTTCGCTCCGGCAAACACCCATAATAACAACATTGAAGGTCAGGCGATCGTTTATCAG
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AATACCGCAATGGGTGCAAATGGCTACAAAACCATCGATAATAAAAATTTCTATTTTCGCAACGGTCTGCCGCAGATCGGGGTATTTAAAGGTA
GCAACGGCTTCGAATACTTCGCTCCAGCGAATACGGACGCGAACAATATTGAGGGTCAAGCGATTCGTTATCAAAACCGTTTTCTGCATCTGCT
GGGCAAAATCTACTACTTTGGCAATAACAGTAAAGCAGTTACTGGATGGCAGACAATCAATGGTAAAGTGTACTATTTTATGCCGGATACCGCC
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GTGATGATAAATACTATTTCAATCCGATTAACGGTGGTGCAGCGAGCATTGGCGAAACCATCATCGATGACAAAAACTATTATTTCAACCAGAG
CGGTGTGCTGCAGACCGGTGTGTTTAGCACCGAAGATGGCTTTAAATATTTTGCGCCAGCGAACACCCTGGATGAAAACCTGGAAGGCGAAGCG
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ACGAAGAAGGCGAAGAAATTAGCTATAGCGGCATCCTGAACTTCAACAACAAAATCTACTACTTTGATGATAGCTTTACCGCGGTGGTGGGCTG
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TTTAACGATGATGGCATTATGCAGGTGGGTTTCGTGACCATTAATGATAAAGTGTTCTATTTCAGCGATAGCGGCATTATTGAAAGCGGCGTGC
AGAACATTGATGATAACTACTTCTACATCGATGATAACGGCATTGTGCAGATCGGCGTTTTTGATACCAGCGATGGCTACAAATATTTCGCACC
GGCCAATACCGTGAACGATAACATTTATGGCCAGGCGGTGGAATATAGCGGTCTGGTGCGTGTGGGCGAAGATGTGTATTATTTCGGCGAAACC
TATACCATCGAAACCGGCTGGATTTATGATATGGAAAACGAAAGCGATAAATATTACTTTAATCCGGAAACGAAAAAAGCGTGCAAAGGCATTA
ACCTGATCGATGATATCAAATACTATTTTGATGAAAAAGGCATTATGCGTACCGGTCTGATTAGCTTCGAAAACAACAACTATTACTTCAACGA
AAACGGTGAAATGCAGTTCGGCTACATCAACATCGAAGATAAAATGTTCTACTTCGGCGAAGATGGTGTTATGCAGATTGGTGTTTTTAACACC
CCGGATGGCTTCAAATACTTTGCCCATCAGAATACCCTGGATGAAAATTTCGAAGGTGAAAGCATTAACTATACCGGCTGGCTGGATCTGGATG
AAAAACGCTACTACTTCACCGATGAATACATTGCGGCGACCGGCAGCGTGATTATTGATGGCGAAGAATACTACTTCGATCCGGATACCGCGCA
GCTGGTGATTAGCGAACATCATCATCATCACCAT

SEQ ID NO :23 amino acid sequence of F54 New

MATGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQN

EFLTLNGKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDANNESK

MVTGVFKGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNTAEAATGWQTI

DGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIE

GQAILYQNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYYFNTNTSIASTGYTIISGKHF

YFNTDGIMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGNNSKAATGWVTIDGNRYYFEPNTAMG

ANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAIRYQNRFLHLLGKIYYFGNNSKAVTGWQTINGK

VYYFMPDTAMAAAGGLFEIDGVIYFFGVDGVKAVTGFVTVGDDKYYFNPINGGAASIGETIIDDKNYYFNQSGVLQTGVF

STEDGFKYFAPANTLDENLEGEAIDFTGKLIIDENIYYFDDNYRGAVEWKELDGEMHYFSPETGKAFKGLNQIGDYKYYF

NSDGVMQKGFVSINDNKHYFDDSGVMKVGYTEIDGKHFYFAENGEMQIGVFNTEDGFKYFAHHNEDLGNEEGEEISYSGI

LNFNNKIYYFDDSFTAVVGWKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFNDDGIMQVGFVTINDKVFYFSDSGIIES

GVQNIDDNYFYIDDNGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEYSGLVRVGEDVYYFGETYTIETGWIYDMENES

DKYYFNPETKKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFNENGEMQFGYINIEDKMFYFGEDGVMQIGVFNTP

DGFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYIAATGSVIIDGEEYYFDPDTAQLVISEHHHHHH

SEQ ID NO :24 nucleotide sequence of F5 ToxB

ATGGCAACCGGTTGGCAGACCATCGATGGCAAAAAATATTATTTTAATACCAACACCGCAATTGCAAGCACCGGCTATACCATTATCAACGGCA
AACACTTTTATTTTAACACCGACGGCATTATGCAGATTGGTGTGTTTAAAGGTCCGAACGGCTTTGAATACTTTGCACCGGCAAATACCGATGC
CAATAATATTGAAGGCCAGGCCATTCTGTATCAGAATGAATTTCTGACCCTGAACGGCAAAAAATACTACTTTGGCAGCGATAGCAAAGCAGTT
ACCGGTTGGCGCATCATCAACAATAAGAAATATTACTTCAACCCGAATAATGCAATTGCAGCAATTCATCTGTGCACCATTAACAACGACAAAT
ATTATTTCAGCTATGACGGTATTCTGCAGAATGGCTACATTACCATCGAACGCAACAACTTTTATTTCGATGCCAACAACGAAAGCAAAATGGT
GACCGGTGTTTTCAAAGGCCCTAATGGTTTTGAGTATTTCGCTCCGGCAAACACCCATAATAACAACATTGAAGGTCAGGCGATCGTTTATCAG
AACAAATTCCTGACGCTGAATGGTAAGAAATACTATTTCGATAATGACAGCAAAGCCGTGACCGGCTGGCAGACAATTGACGGGAAGAAATATT
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TGCGGCGACCGGCAGCGTGATTATTGATGGCGAAGAATACTACTTCGATCCGGATACCGCGCAGCTGGTGATTAGCGAACATCATCATCATCAC
CAT

SEQ ID NO :25 amino acid sequence of F5 ToxB

MATGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQN

EFLTLNGKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDANNESK

MVTGVFKGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNTAEAATGWQTI

DGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIE

GQAILYQNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYYFNTNTSIASTGYTIISGKHF

YFNTDGIMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGNNSKAATGWVTIDGNRYYFEPNTAMG

ANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAIRYQNRFLHLLGKIYYFGNNSKAVTGWQTINGK

VYYFMPDTAMAAAGGLFEIDGVIYFFGVDGVKAVSGLIYINDSLYYFKPPVNNLITGFVTVGDDKYYFNPINGGAASIGE

TIIDDKNYYFNQSGVLQTGVFSTEDGFKYFAPANTLDENLEGEAIDFTGKLIIDENIYYFDDNYRGAVEWKELDGEMHYF

SPETGKAFKGLNQIGDYKYYFNSDGVMQKGFVSINDNKHYFDDSGVMKVGYTEIDGKHFYFAENGEMQIGVFNTEDGFKY

FAHHNEDLGNEEGEEISYSGILNFNNKIYYFDDSFTAVVGWKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFNDDGIMQ

VGFVTINDKVFYFSDSGIIESGVQNIDDNYFYIDDNGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEYSGLVRVGEDV

YYFGETYTIETGWIYDMENESDKYYFNPETKKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFNENGEMQFGYINI

EDKMFYFGEDGVMQIGVFNTPDGFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYIAATGSVIIDGEEYYFDPD

TAQLVISEHHHHHH

SEQ ID NO :26 - nucleotide sequence of F52 new

ATGGCAACCGGTTGGCAGACCATCGATGGCAAAAAATATTATTTTAATACCAACACCGCAATTGCAAGCACCGGCTATACCATTATCAACGGCA
AACACTTTTATTTTAACACCGACGGCATTATGCAGATTGGTGTGTTTAAAGGTCCGAACGGCTTTGAATACTTTGCACCGGCAAATACCGATGC
CAATAATATTGAAGGCCAGGCCATTCTGTATCAGAATGAATTTCTGACCCTGAACGGCAAAAAATACTACTTTGGCAGCGATAGCAAAGCAGTT
ACCGGTTGGCGCATCATCAACAATAAGAAATATTACTTCAACCCGAATAATGCAATTGCAGCAATTCATCTGTGCACCATTAACAACGACAAAT
ATTATTTCAGCTATGACGGTATTCTGCAGAATGGCTACATTACCATCGAACGCAACAACTTTTATTTCGATGCCAACAACGAAAGCAAAATGGT
GACCGGTGTTTTCAAAGGCCCTAATGGTTTTGAGTATTTCGCTCCGGCAAACACCCATAATAACAACATTGAAGGTCAGGCGATCGTTTATCAG
AACAAATTCCTGACGCTGAATGGTAAGAAATACTATTTCGATAATGACAGCAAAGCCGTGACCGGCTGGCAGACAATTGACGGGAAGAAATATT
ACTTTAATCTGAATACCGCAGAAGCAGCAACCGGTTGGCAAACGATCGACGGTAAAAAGTACTACTTCAACCTGAACACAGCCGAAGCAGCCAC
AGGATGGCAGACTATTGATGGAAAAAAATACTATTTCAACACCAACACCTTTATTGCATCTACCGGTTATACCAGCATTAACGGTAAACATTTC
TACTTCAACACCGATGGTATCATGCAGATCGGCGTTTTCAAAGGTCCAAATGGTTTCGAATACTTTGCCCCTGCCAATACAGATGCAAATAACA
TCGAGGGTCAGGCAATCCTGTACCAAAACAAATTTCTGACCCTGAATGGGAAAAAATATTACTTTGGTAGCGATTCTAAAGCCGTTACCGGTCT
GCGTACCATTGATGGTAAAAAATACTACTTTAATACGAATACAGCCGTTGCGGTTACAGGCTGGCAGACCATTAACGGGAAAAAATACTATTTT
AACACAAATACCAGCATTGCCTCAACGGGTTATACCATTATTTCGGGTAAACACTTCTACTTTAATACCGATGGTATTATGCAAATCGGAGTCT
TTAAAGGACCTGATGGGTTCGAATATTTTGCGCCTGCGAACACTGATGCGAACAATATCGAAGGACAGGCAATCCGCTATCAGAATCGCTTTCT
GTATCTGCACGACAACATCTATTATTTTGGCAACAATTCAAAAGCAGCCACCGGCTGGGTTACAATTGATGGCAACCGCTACTATTTCGAACCG
AATACCGCAATGGGTGCAAATGGCTACAAAACCATCGATAATAAAAATTTCTATTTTCGCAACGGTCTGCCGCAGATCGGGGTATTTAAAGGTA
GCAACGGCTTCGAATACTTCGCTCCAGCGAATACGGACGCGAACAATATTGAGGGTCAAGCGATTCGTTATCAAAACCGTTTTCTGCATCTGCT
GGGCAAAATCTACTACTTTGGCAATAACAGTAAAGCAGTTACTGGATGGCAGACAATCAATGGTAAAGTGTACTATTTTATGCCGGATACCGCC
ATGGCAGCAGCCGGTGGTCTGTTTGAAATTGATGGCGTGATCTATTTTTTTGGTGTGGATGGTGTTAAAGCAGTGAAAGGCCTGAACCAGATCG
GCGATTACAAATACTACTTCAACAGCGATGGCGTGATGCAGAAAGGCTTTGTGAGCATCAACGATAACAAACACTATTTCGATGATAGCGGTGT
GATGAAAGTGGGCTATACCGAAATTGATGGCAAACATTTCTACTTCGCGGAAAACGGCGAAATGCAGATTGGCGTGTTCAATACCGAAGATGGT
TTCAAATACTTCGCGCACCATAACGAAGATCTGGGTAACGAAGAAGGCGAAGAAATTAGCTATAGCGGCATCCTGAACTTCAACAACAAAATCT
ACTACTTTGATGATAGCTTTACCGCGGTGGTGGGCTGGAAAGATCTGGAAGATGGCAGCAAATATTATTTCGATGAAGATACCGCGGAAGCGTA
TATTGGCCTGAGCCTGATTAACGATGGCCAGTACTATTTTAACGATGATGGCATTATGCAGGTGGGTTTCGTGACCATTAATGATAAAGTGTTC
TATTTCAGCGATAGCGGCATTATTGAAAGCGGCGTGCAGAACATTGATGATAACTACTTCTACATCGATGATAACGGCATTGTGCAGATCGGCG
TTTTTGATACCAGCGATGGCTACAAATATTTCGCACCGGCCAATACCGTGAACGATAACATTTATGGCCAGGCGGTGGAATATAGCGGTCTGGT
GCGTGTGGGCGAAGATGTGTATTATTTCGGCGAAACCTATACCATCGAAACCGGCTGGATTTATGATATGGAAAACGAAAGCGATAAATATTAC
TTTAATCCGGAAACGAAAAAAGCGTGCAAAGGCATTAACCTGATCGATGATATCAAATACTATTTTGATGAAAAAGGCATTATGCGTACCGGTC
TGATTAGCTTCGAAAACAACAACTATTACTTCAACGAAAACGGTGAAATGCAGTTCGGCTACATCAACATCGAAGATAAAATGTTCTACTTCGG
CGAAGATGGTGTTATGCAGATTGGTGTTTTTAACACCCCGGATGGCTTCAAATACTTTGCCCATCAGAATACCCTGGATGAAAATTTCGAAGGT
GAAAGCATTAACTATACCGGCTGGCTGGATCTGGATGAAAAACGCTACTACTTCACCGATGAATACATTGCGGCGACCGGCAGCGTGATTATTG
ATGGCGAAGAATACTACTTCGATCCGGATACCGCGCAGCTGGTGATTAGCGAACATCATCATCATCACCAT

SEQ ID NO :27 – amino acid sequence of F52 New

MATGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQNEFLTLN

GKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDANNESKMVTGVF

KGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYY

FNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILY

QNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYYFNTNTSIASTGYTIISGKHFYFNTDG

IMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGNNSKAATGWVTIDGNRYYFEPNTAMGANGYKT

IDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAIRYQNRFLHLLGKIYYFGNNSKAVTGWQTINGKVYYFMP

DTAMAAAGGLFEIDGVIYFFGVDGVKAVKGLNQIGDYKYYFNSDGVMQKGFVSINDNKHYFDDSGVMKVGYTEIDGKHFY

FAENGEMQIGVFNTEDGFKYFAHHNEDLGNEEGEEISYSGILNFNNKIYYFDDSFTAVVGWKDLEDGSKYYFDEDTAEAY

IGLSLINDGQYYFNDDGIMQVGFVTINDKVFYFSDSGIIESGVQNIDDNYFYIDDNGIVQIGVFDTSDGYKYFAPANTVN

DNIYGQAVEYSGLVRVGEDVYYFGETYTIETGWIYDMENESDKYYFNPETKKACKGINLIDDIKYYFDEKGIMRTGLISF

ENNNYYFNENGEMQFGYINIEDKMFYFGEDGVMQIGVFNTPDGFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDE

YIAATGSVIIDGEEYYFDPDTAQLVISEHHHHHH

SEQ ID NO:28 – sequence of toxin A fragment of F54 Gly

MATGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQN
EFLTLNGKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDA
NNESKMVTGVFKGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNT
AEAATGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNG
FEYFAPANTDANNIEGQAILYQNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYY
FNTNTSIASTGYTIISGKHFYFNTDGIMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGN
NSKAATGWVTIDGNRYYFEPNTAMGANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAIRY
QNRFLHLLGKIYYFGNNSKAVTGWQTINGKVYYFMPDTAMAAAGGLFEIDGVIYFFGVDGVKAPGIYG

SEQ ID NO:29 – sequence of toxin A fragment of F54 New

MATGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQN
EFLTLNGKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDA
NNESKMVTGVFKGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNT
AEAATGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNG
FEYFAPANTDANNIEGQAILYQNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYY
FNTNTSIASTGYTIISGKHFYFNTDGIMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGN
NSKAATGWVTIDGNRYYFEPNTAMGANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAIRY
QNRFLHLLGKIYYFGNNSKAVTGWQTINGKVYYFMPDTAMAAAGGLFEIDGVIYFFGVDGVKAV

SEQ ID NO:30 – sequence of toxin A fragment of F5 ToxB

MATGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQN
EFLTLNGKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDA
NNESKMVTGVFKGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNT
AEAATGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNG
FEYFAPANTDANNIEGQAILYQNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYY
FNTNTSIASTGYTIISGKHFYFNTDGIMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGN
NSKAATGWVTIDGNRYYFEPNTAMGANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAIRY
QNRFLHLLGKIYYFGNNSKAVTGWQTINGKVYYFMPDTAMAAAGGLFEIDGVIYFFGVDGVKAV

SEQ ID NO:31 – sequence of toxin A fragment of F52 New

MATGWQTIDGKKYYFNTNTAIASTGYTIINGKHFYFNTDGIMQIGVFKGPNGFEYFAPANTDANNIEGQAILYQN
EFLTLNGKKYYFGSDSKAVTGWRIINNKKYYFNPNNAIAAIHLCTINNDKYYFSYDGILQNGYITIERNNFYFDA
NNESKMVTGVFKGPNGFEYFAPANTHNNNIEGQAIVYQNKFLTLNGKKYYFDNDSKAVTGWQTIDGKKYYFNLNT
AEAATGWQTIDGKKYYFNLNTAEAATGWQTIDGKKYYFNTNTFIASTGYTSINGKHFYFNTDGIMQIGVFKGPNG
FEYFAPANTDANNIEGQAILYQNKFLTLNGKKYYFGSDSKAVTGLRTIDGKKYYFNTNTAVAVTGWQTINGKKYY
FNTNTSIASTGYTIISGKHFYFNTDGIMQIGVFKGPDGFEYFAPANTDANNIEGQAIRYQNRFLYLHDNIYYFGN
NSKAATGWVTIDGNRYYFEPNTAMGANGYKTIDNKNFYFRNGLPQIGVFKGSNGFEYFAPANTDANNIEGQAIRY
QNRFLHLLGKIYYFGNNSKAVTGWQTINGKVYYFMPDTAMAAAGGLFEIDGVIYFFGVDGVKAV

SEQ ID NO:32 – sequence of toxin B fragment of F54Gly

TGFVTVGDDKYYFNPINGGAASIGETIIDDKNYYFNQSGVLQTGVFSTEDGFKYFAPANTLDENLEGEAIDFTGK
LIIDENIYYFDDNYRGAVEWKELDGEMHYFSPETGKAFKGLNQIGDYKYYFNSDGVMQKGFVSINDNKHYFDDSG
VMKVGYTEIDGKHFYFAENGEMQIGVFNTEDGFKYFAHHNEDLGNEEGEEISYSGILNFNNKIYYFDDSFTAVVG
WKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFNDDGIMQVGFVTINDKVFYFSDSGIIESGVQNIDDNYFYIDD
NGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEYSGLVRVGEDVYYFGETYTIETGWIYDMENESDKYYFNPET
KKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFNENGEMQFGYINIEDKMFYFGEDGVMQIGVFNTPDGFK
YFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYIAATGSVIIDGEEYYFDPDTAQLVISE

SEQ ID NO:33 – sequence of toxin B fragment of F54 New

TGFVTVGDDKYYFNPINGGAASIGETIIDDKNYYFNQSGVLQTGVFSTEDGFKYFAPANTLDENLEGEAIDFTGK
LIIDENIYYFDDNYRGAVEWKELDGEMHYFSPETGKAFKGLNQIGDYKYYFNSDGVMQKGFVSINDNKHYFDDSG
VMKVGYTEIDGKHFYFAENGEMQIGVFNTEDGFKYFAHHNEDLGNEEGEEISYSGILNFNNKIYYFDDSFTAVVG
WKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFNDDGIMQVGFVTINDKVFYFSDSGIIESGVQNIDDNYFYIDD
NGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEYSGLVRVGEDVYYFGETYTIETGWIYDMENESDKYYFNPET
KKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFNENGEMQFGYINIEDKMFYFGEDGVMQIGVFNTPDGFK
YFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYIAATGSVIIDGEEYYFDPDTAQLVISE

SEQ ID NO:34 – sequence of toxin B fragment of F5 ToxB

SGLIYINDSLYYFKPPVNNLITGFVTVGDDKYYFNPINGGAASIGETIIDDKNYYFNQSGVLQTGVFSTEDGFKY
FAPANTLDENLEGEAIDFTGKLIIDENIYYFDDNYRGAVEWKELDGEMHYFSPETGKAFKGLNQIGDYKYYFNSD
GVMQKGFVSINDNKHYFDDSGVMKVGYTEIDGKHFYFAENGEMQIGVFNTEDGFKYFAHHNEDLGNEEGEEISYS
GILNFNNKIYYFDDSFTAVVGWKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFNDDGIMQVGFVTINDKVFYFS
DSGIIESGVQNIDDNYFYIDDNGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEYSGLVRVGEDVYYFGETYTI
ETGWIYDMENESDKYYFNPETKKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFNENGEMQFGYINIEDKM
FYFGEDGVMQIGVFNTPDGFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYIAATGSVIIDGEEYYFDP
DTAQLVISE

SEQ ID NO:35 – sequence of toxin B fragment of F52 New

KGLNQIGDYKYYFNSDGVMQKGFVSINDNKHYFDDSGVMKVGYTEIDGKHFYFAENGEMQIGVFNTEDGFKYFAH
HNEDLGNEEGEEISYSGILNFNNKIYYFDDSFTAVVGWKDLEDGSKYYFDEDTAEAYIGLSLINDGQYYFNDDGI
MQVGFVTINDKVFYFSDSGIIESGVQNIDDNYFYIDDNGIVQIGVFDTSDGYKYFAPANTVNDNIYGQAVEYSGL
VRVGEDVYYFGETYTIETGWIYDMENESDKYYFNPETKKACKGINLIDDIKYYFDEKGIMRTGLISFENNNYYFN
ENGEMQFGYINIEDKMFYFGEDGVMQIGVFNTPDGFKYFAHQNTLDENFEGESINYTGWLDLDEKRYYFTDEYIA
ATGSVIIDGEEYYFDPDTAQLVISE

FIGURE 2

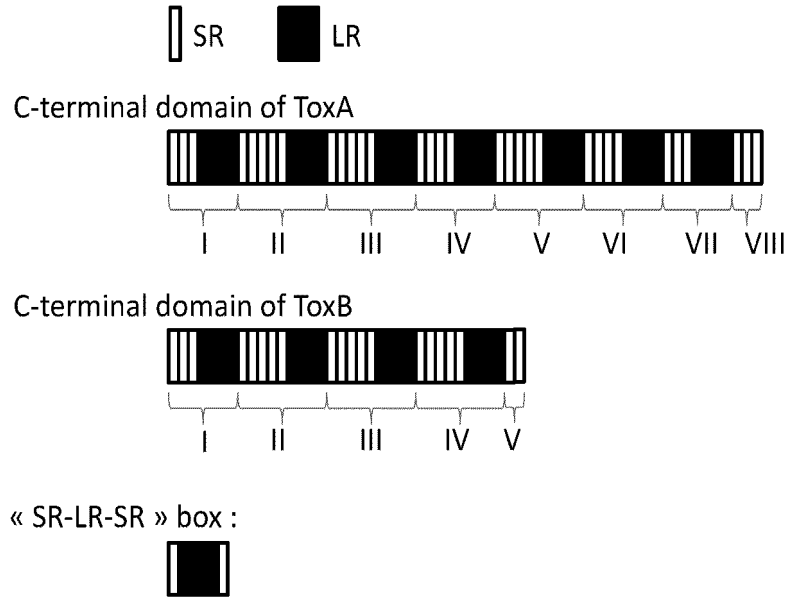

SR
LR
C-terminal domain of ToxA
I
II
III
IV
V
VI
VII
VIII
C-terminal domain of ToxB
I
II
III
IV
V
« SR-LR-SR » box :

FIGURE 3

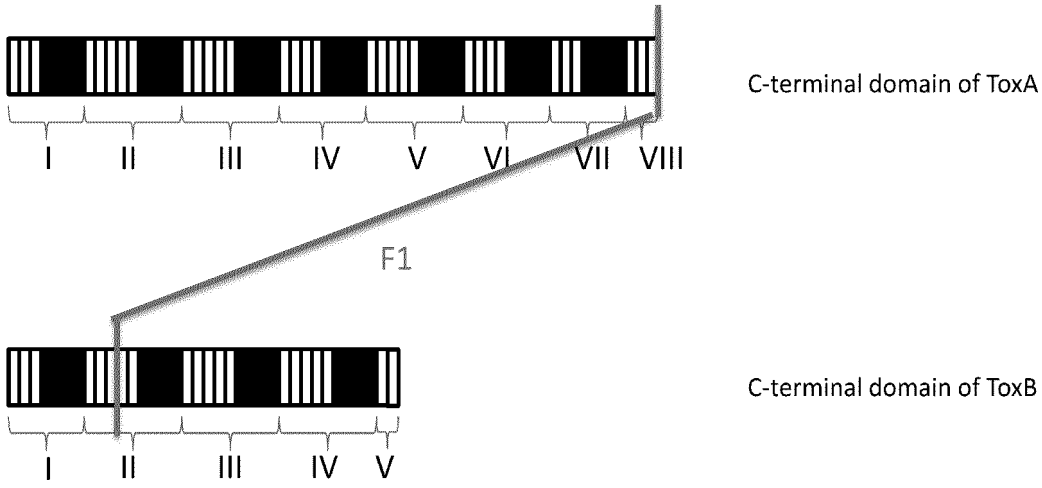

C-terminal domain of ToxA
I
II
III
IV
V
VI
VII
VIII
F1
C-terminal domain of ToxB
I
II
III
IV
V

FIGURE 4

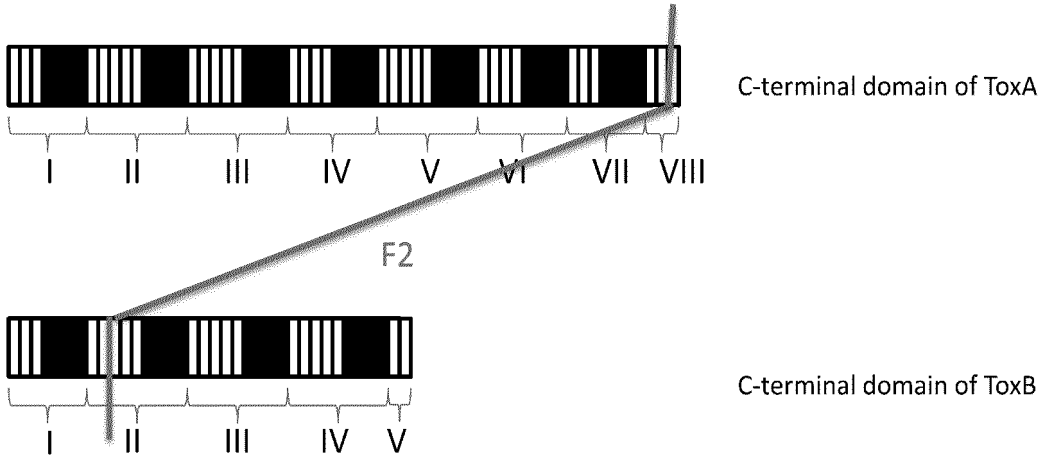

C-terminal domain of ToxA
I
II
III
IV
V
VI
VII
VIII
F2
C-terminal domain of ToxB
I
II
III
IV
V

FIGURE 5

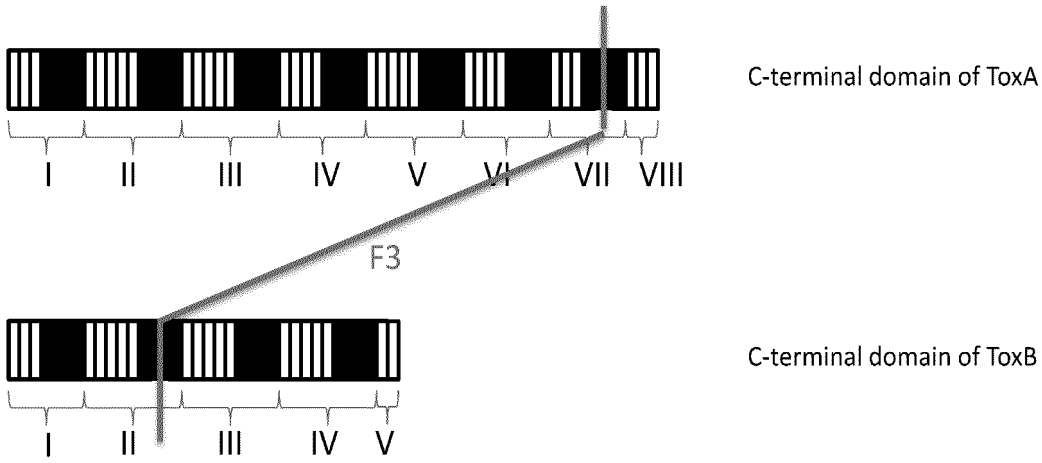

C-terminal domain of ToxA
I
II
III
IV
V
VI
VII
VIII
F3
C-terminal domain of ToxB
I
II
III
IV
V

FIGURE 6

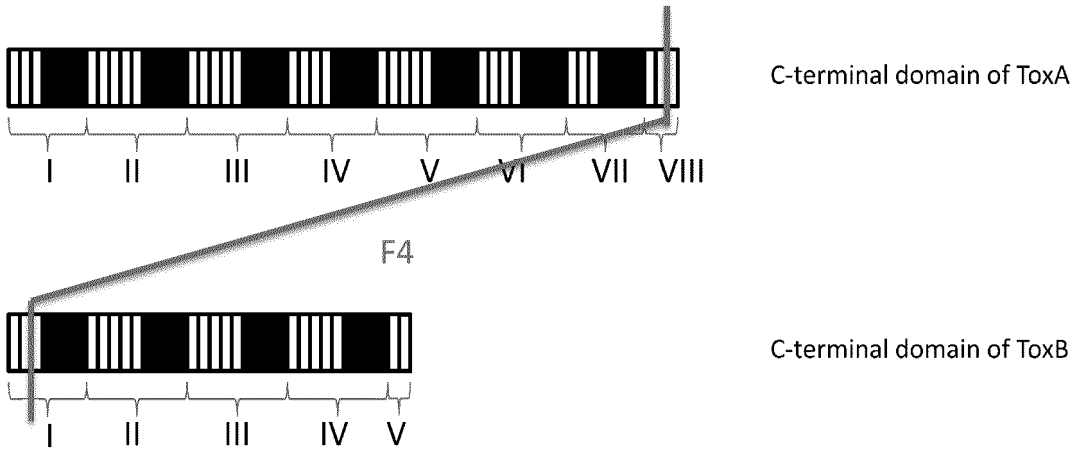

C-terminal domain of ToxA
I
II
III
IV
V
VI
VII
VIII
F4
C-terminal domain of ToxB
I
II
III
IV
V

FIGURE 7

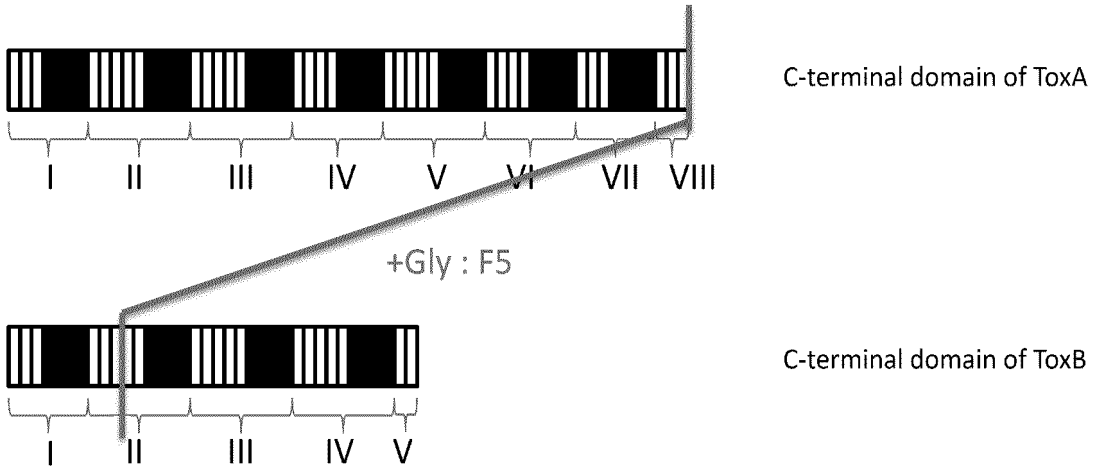
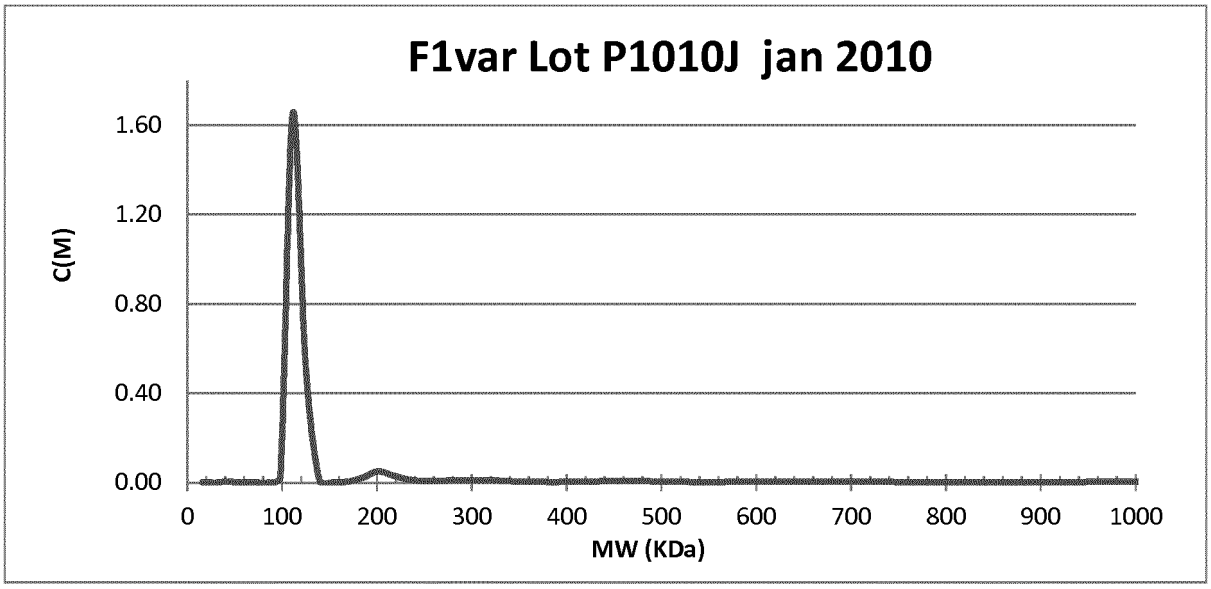
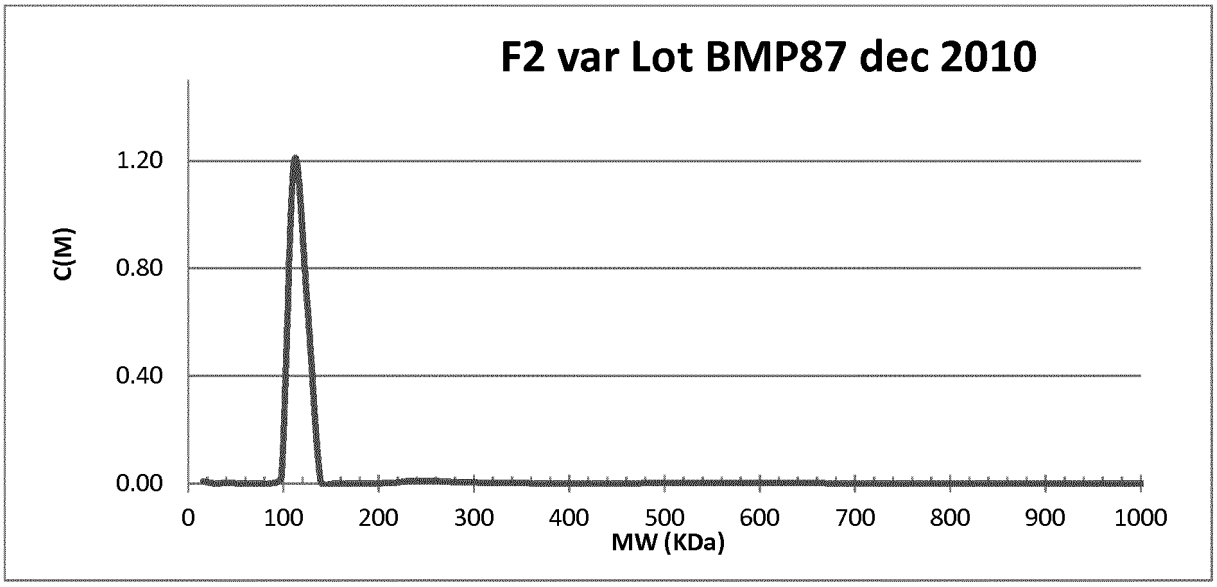

C-terminal domain of ToxA
I
II
III
IV
V
VI
VII
VIII
+Gly : F5
C-terminal domain of ToxB
I
II
III
IV
V

FIGURE 8

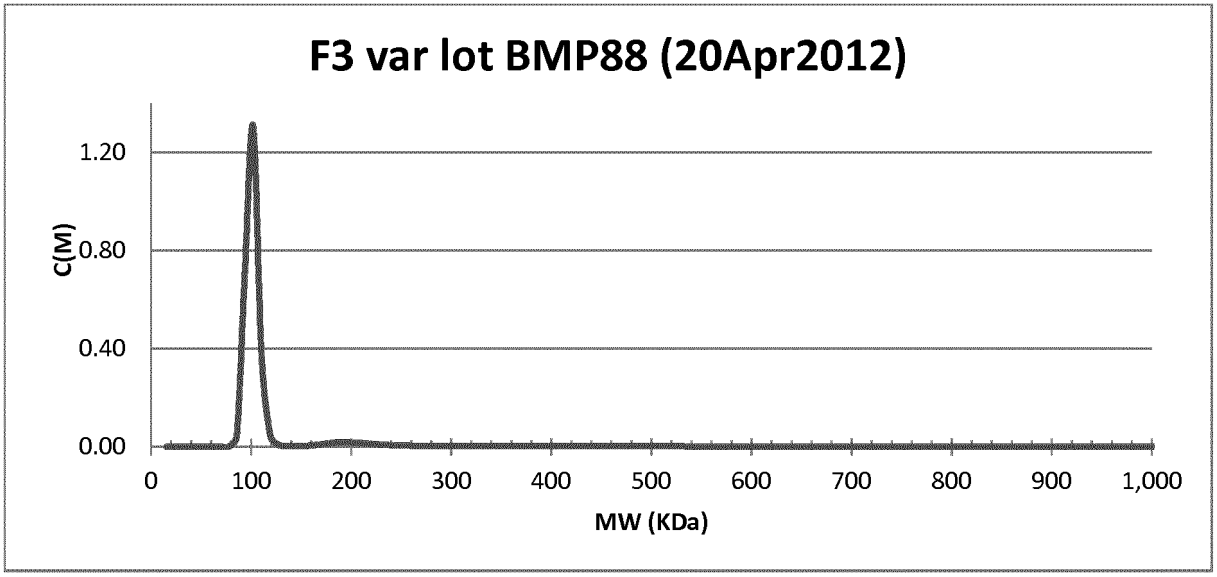
a)


F1var Lot P1010J jan 2010
C(M)
1.60
1.20
0.80
0.40
0.00
0
100
200
300
400
500
600
700
800
900
1000
MW (KDa)

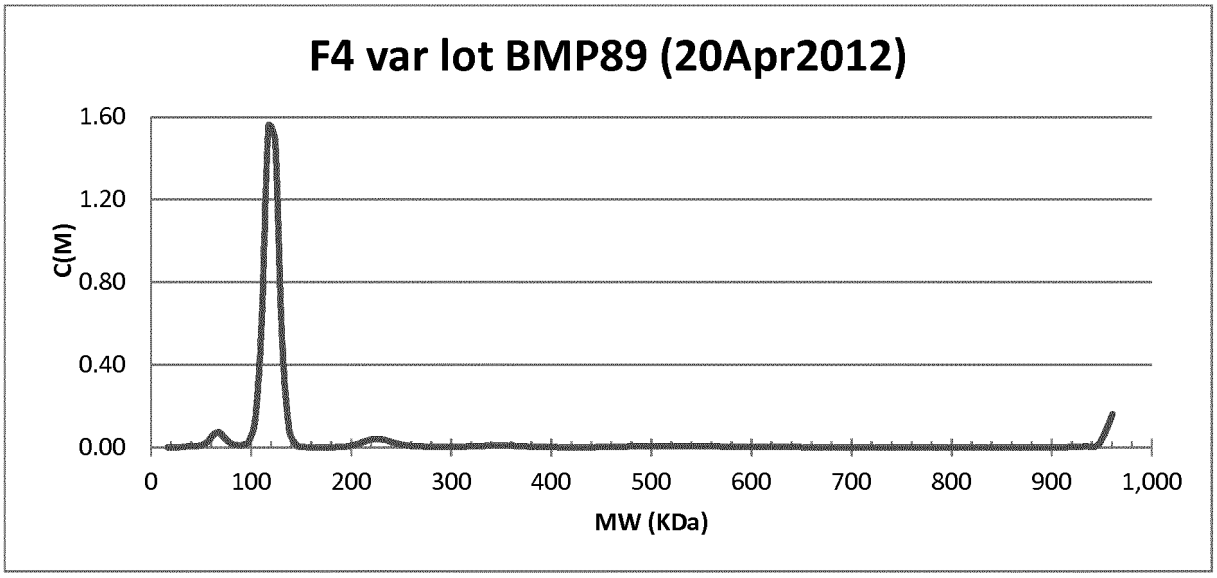
b)


F2 var Lot BMP87 dec 2010
C(M)
1.20
0.80
0.40
0.00
0
100
200
300
400
500
600
700
800
900
1000
MW (KDa)

c)


F3 var lot BMP88 (20Apr2012)
C(M)
1.20
0.80
0.40
0.00
0
100
200
300
400
500
600
700
800
900
1,000
MW (KDa)

d)


F4 var lot BMP89 (20Apr2012)
C(M)
1.60
1.20
0.80
0.40
0.00
0
100
200
300
400
500
600
700
800
900
1,000
MW (KDa)

e)

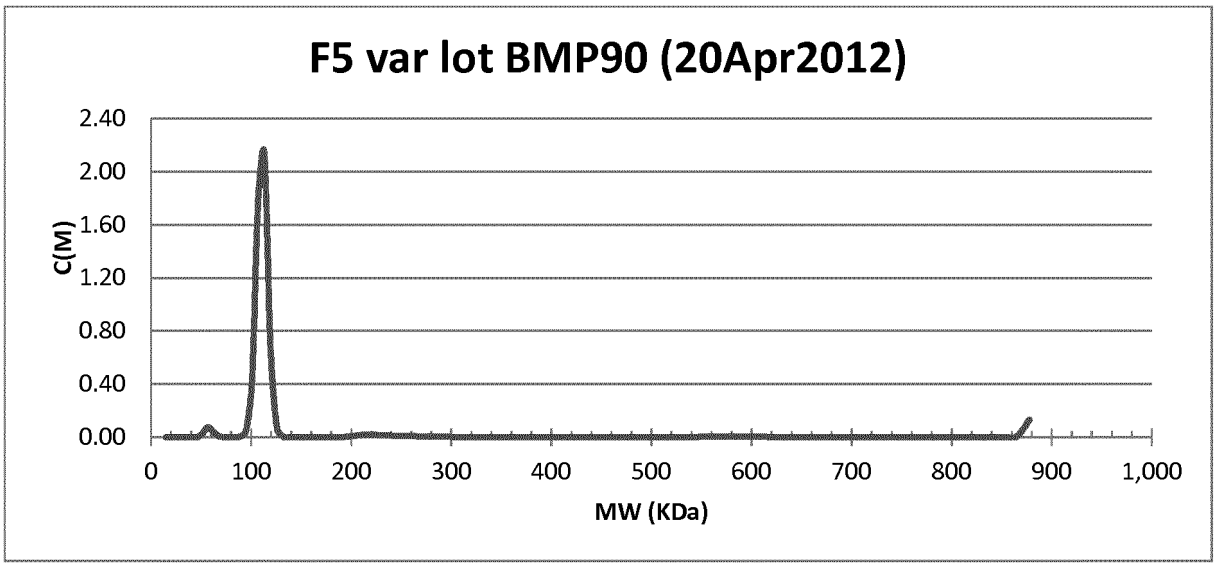

F5 var lot BMP90 (20Apr2012)
C(M)
2.40
2.00
1.60
1.20
0.80
0.40
0.00
0
100
200
300
400
500
600
700
800
900
1,000
MW (KDa)

FIGURE 9

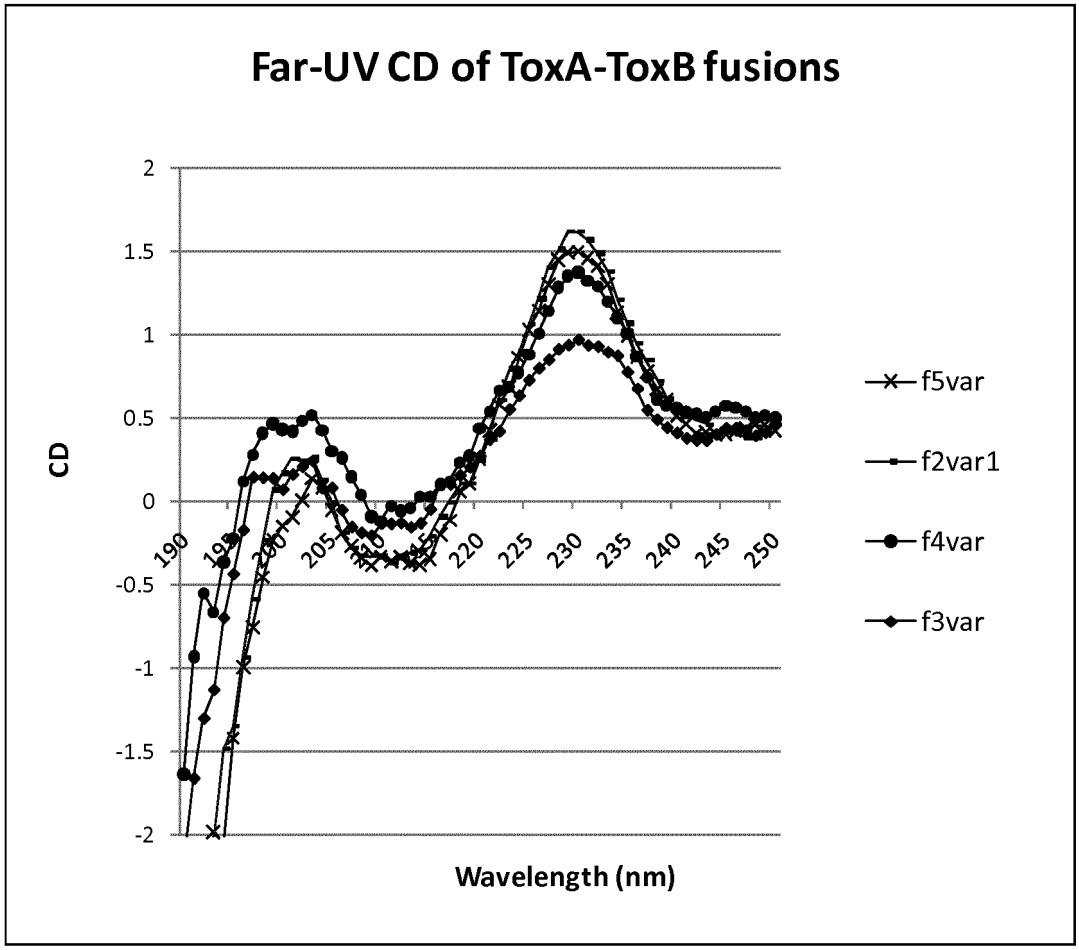

Far-UV CD of ToxA-ToxB fusions
CD
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
190
195
200
205
210
215
220
225
230
235
240
245
250
Wavelength (nm)
f5var
f2var1
f4var
f3var

FIGURE 10

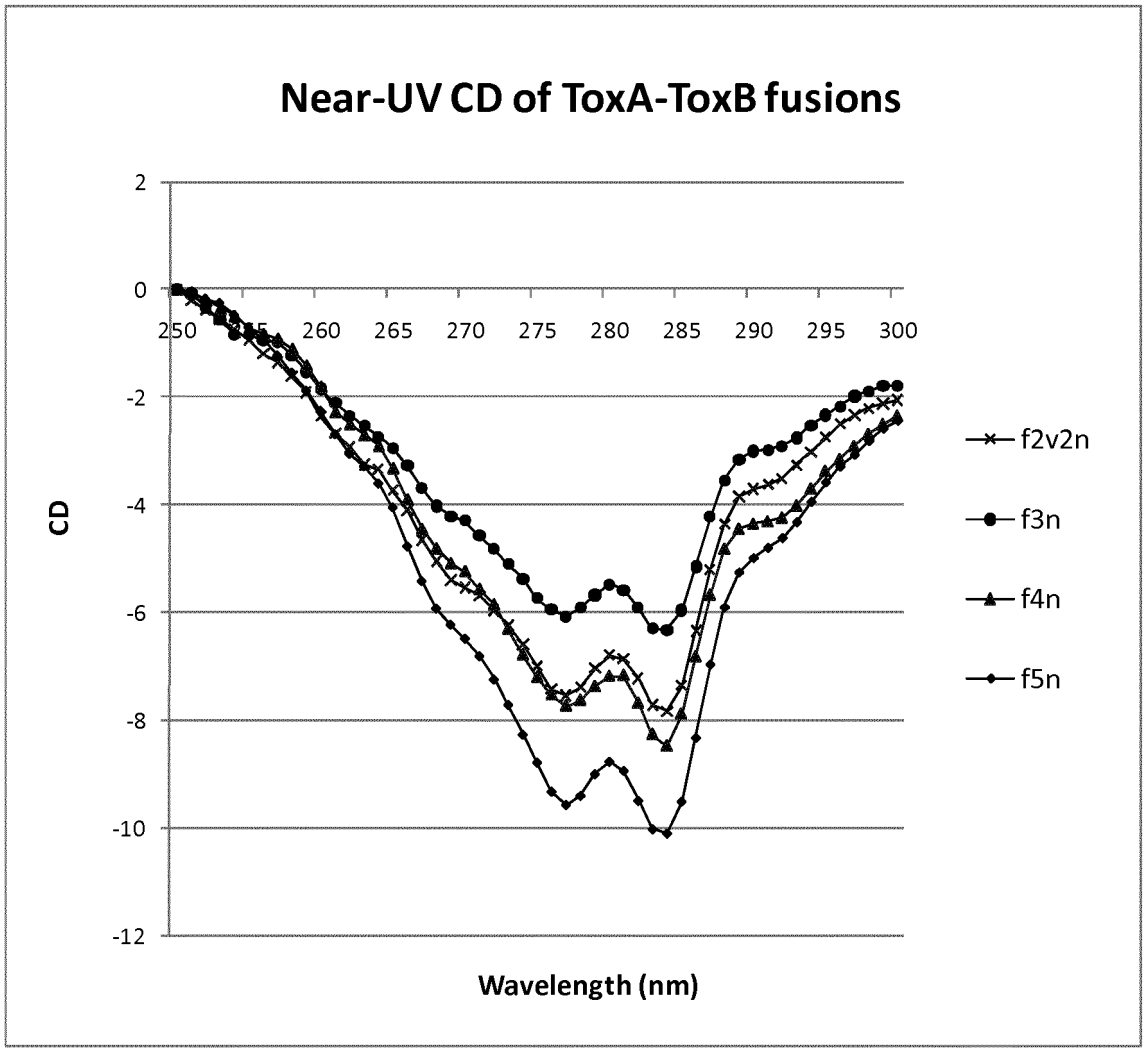

Near-UV CD of ToxA-ToxB fusions
CD
Wavelength (nm)
2
0
-2
-4
-6
-8
-10
-12
250
260
265
270
275
280
285
290
295
300
f2v2n
f3n
f4n
f5n

FIGURE 11

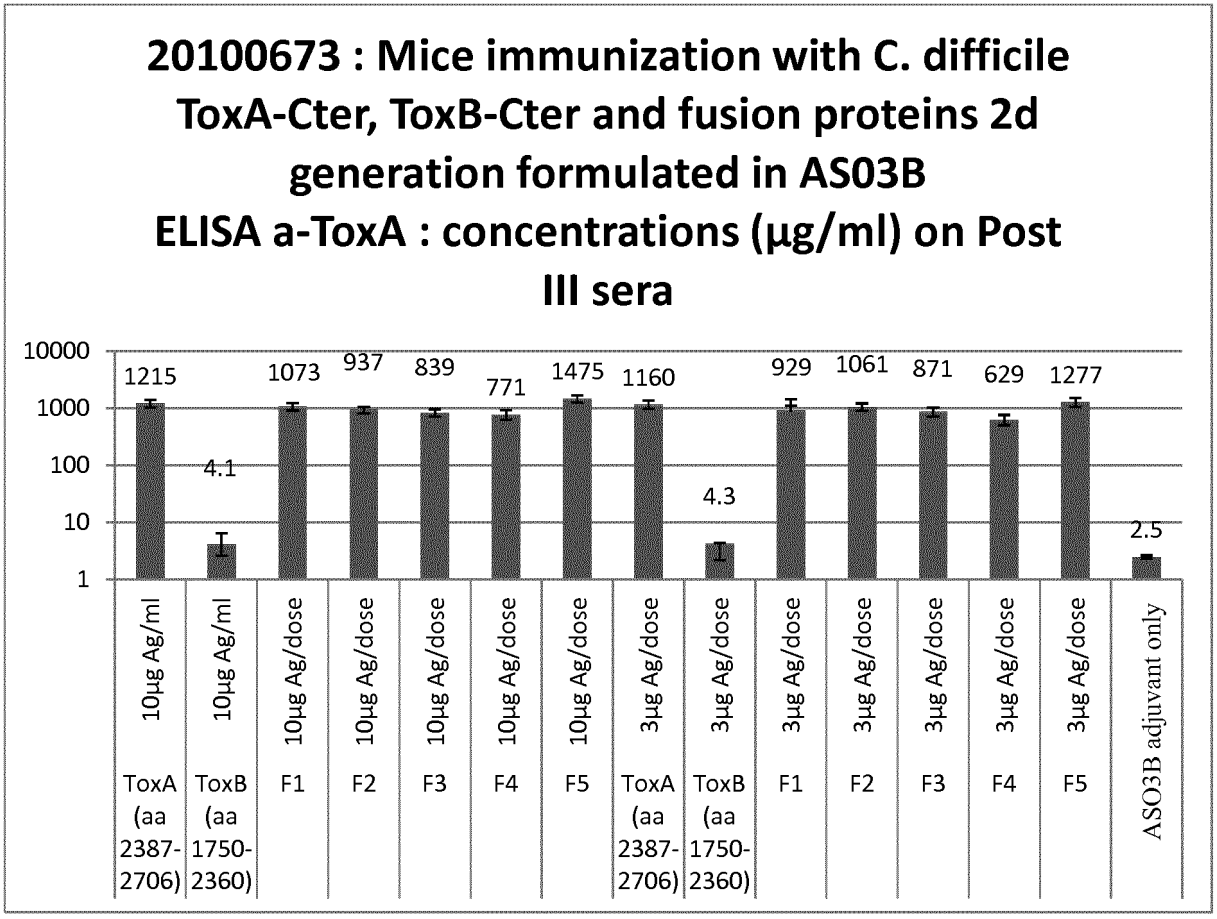

20100673 : Mice immunization with C. difficile ToxA-Cter, ToxB-Cter and fusion proteins 2d generation formulated in AS03B
ELISA a-ToxA : concentrations (µg/ml) on Post III sera
10000
1000
100
10
1
1215
4.1
1073
937
839
771
1475
1160
4.3
929
1061
871
629
1277
2.5
10µg Ag/ml ToxA (aa 2387-2706)
10µg Ag/ml ToxB (aa 1750-2360)
10µg Ag/dose F1
10µg Ag/dose F2
10µg Ag/dose F3
10µg Ag/dose F4
10µg Ag/dose F5
3µg Ag/dose ToxA (aa 2387-2706)
3µg Ag/dose ToxB (aa 1750-2360)
3µg Ag/dose F1
3µg Ag/dose F2
3µg Ag/dose F3
3µg Ag/dose F4
3µg Ag/dose F5
ASO3B adjuvant only

FIGURE 12

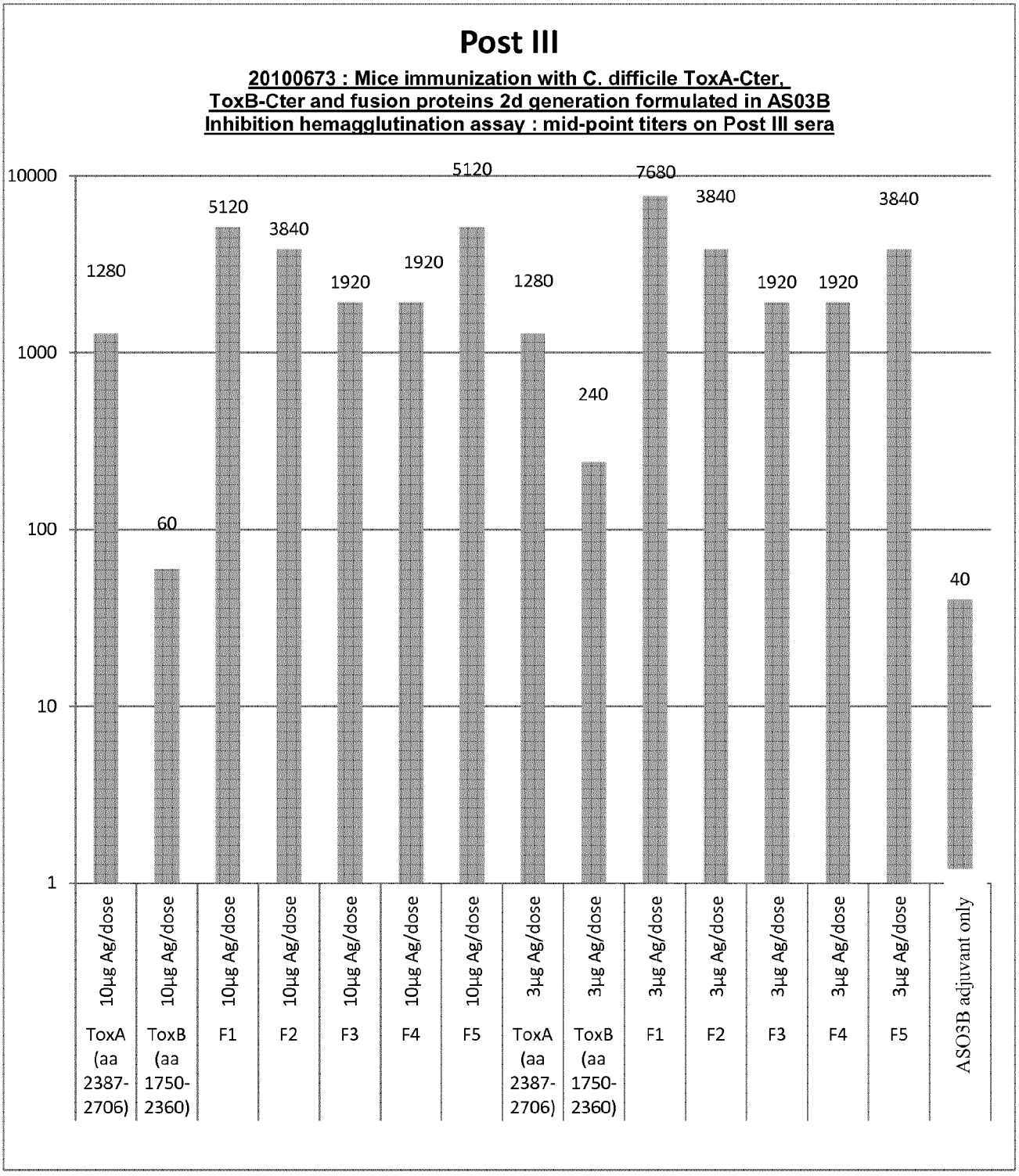

Post III
20100673 : Mice immunization with C. difficile ToxA-Cter, ToxB-Cter and fusion proteins 2d generation formulated in AS03B
Inhibition hemagglutination assay : mid-point titers on Post III sera
10000
1000
100
10
1
1280
60
5120
3840
1920
1920
5120
1280
240
7680
3840
1920
1920
3840
40
10µg Ag/dose ToxA (aa 2387-2706)
10µg Ag/dose ToxB (aa 1750-2360)
10µg Ag/dose F1
10µg Ag/dose F2
10µg Ag/dose F3
10µg Ag/dose F4
10µg Ag/dose F5
3µg Ag/dose ToxA (aa 2387-2706)
3µg Ag/dose ToxB (aa 1750-2360)
3µg Ag/dose F1
3µg Ag/dose F2
3µg Ag/dose F3
3µg Ag/dose F4
3µg Ag/dose F5
ASO3B adjuvant only

FIGURE 13

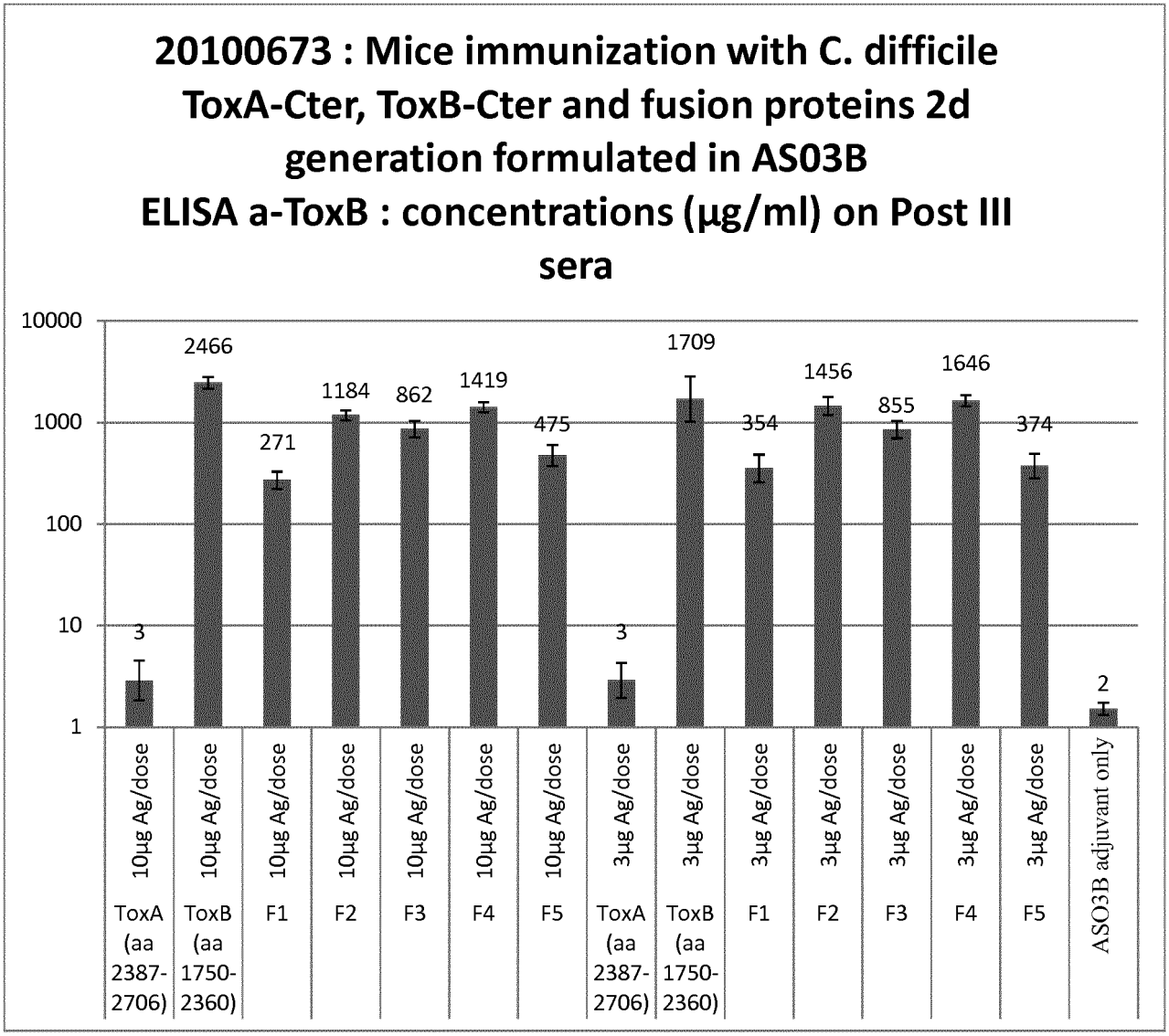

20100673 : Mice immunization with C. difficile ToxA-Cter, ToxB-Cter and fusion proteins 2d generation formulated in AS03B
ELISA a-ToxB : concentrations (µg/ml) on Post III sera
10000
1000
100
10
1
3
2466
271
1184
862
1419
475
3
1709
354
1456
855
1646
374
2
10µg Ag/dose ToxA (aa 2387-2706)
10µg Ag/dose ToxB (aa 1750-2360)
10µg Ag/dose F1
10µg Ag/dose F2
10µg Ag/dose F3
10µg Ag/dose F4
10µg Ag/dose F5
3µg Ag/dose ToxA (aa 2387-2706)
3µg Ag/dose ToxB (aa 1750-2360)
3µg Ag/dose F1
3µg Ag/dose F2
3µg Ag/dose F3
3µg Ag/dose F4
3µg Ag/dose F5
ASO3B adjuvant only

FIGURE 14

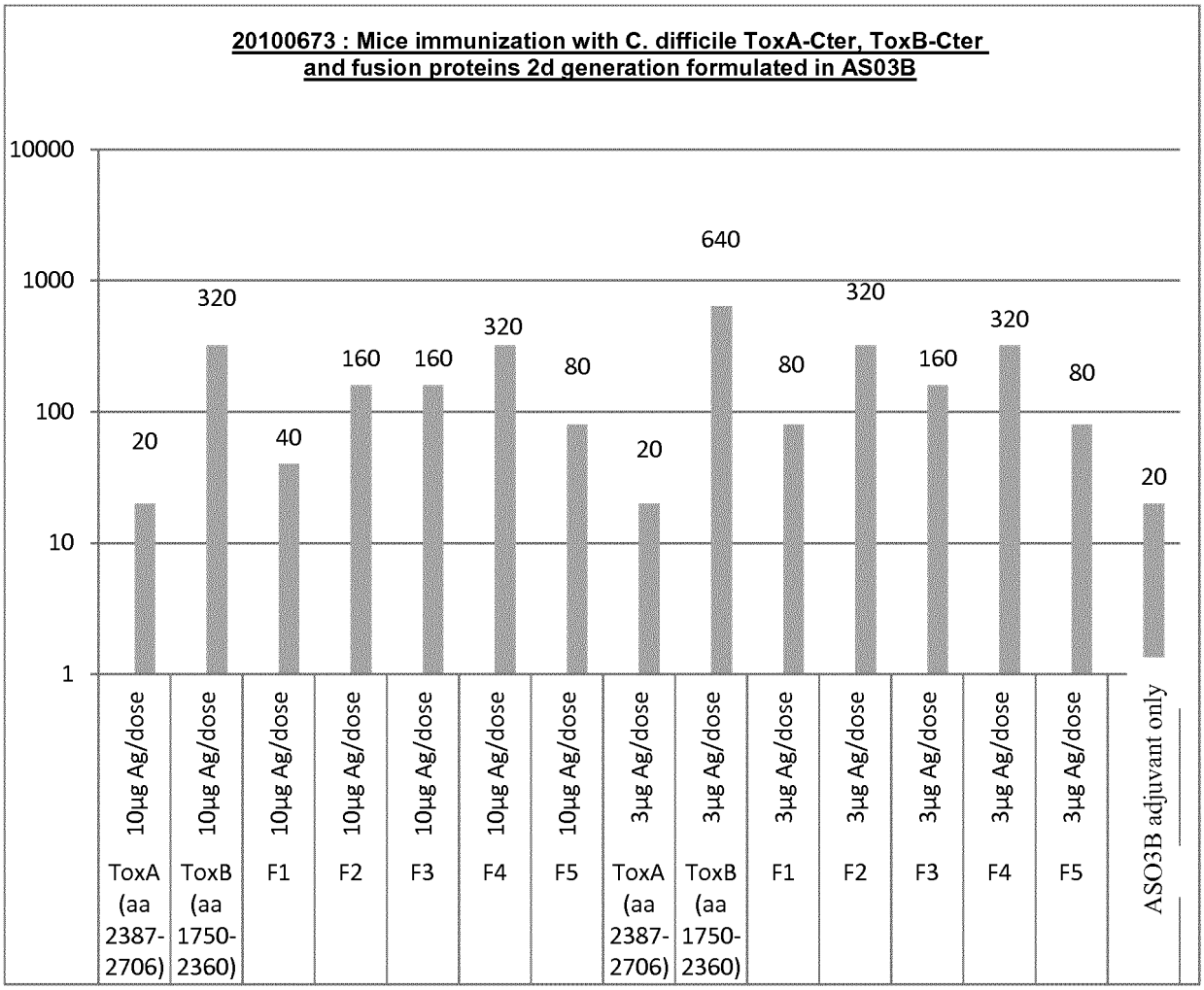
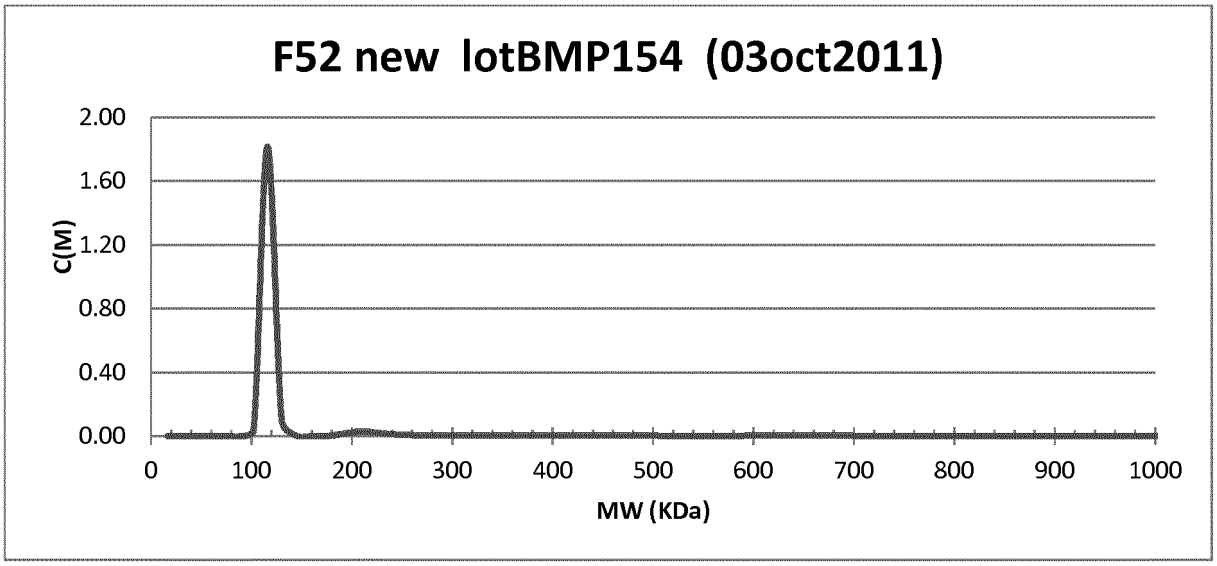
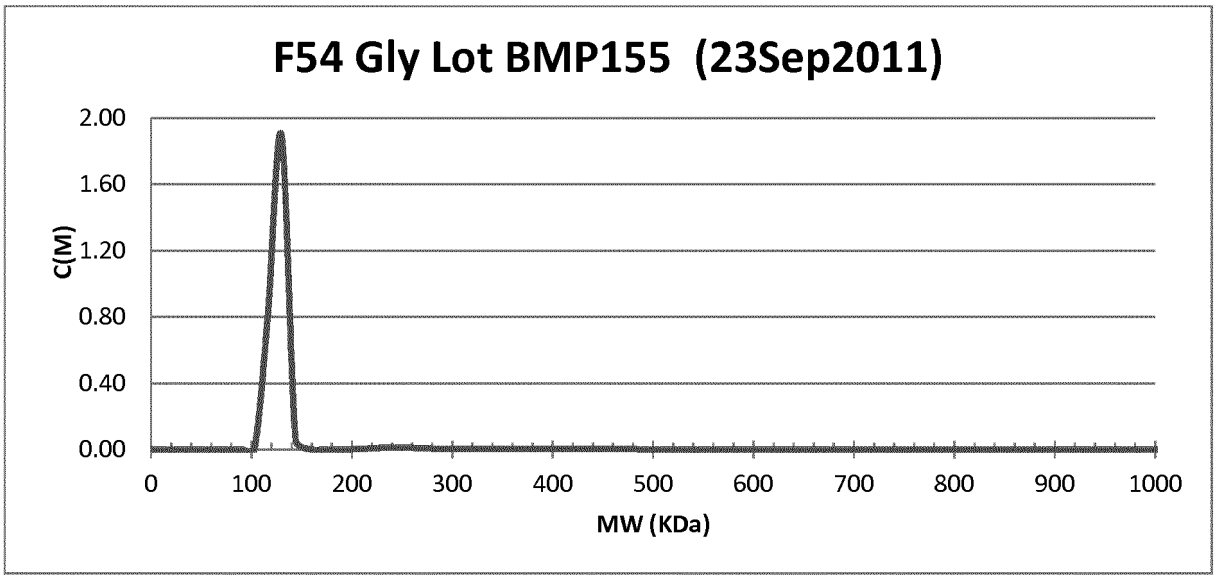

20100673 : Mice immunization with C. difficile ToxA-Cter, ToxB-Cter and fusion proteins 2d generation formulated in AS03B
10000
1000
100
10
1
20
320
40
160
160
320
80
20
640
80
320
160
320
80
20
10µg Ag/dose ToxA (aa 2387-2706)
10µg Ag/dose ToxB (aa 1750-2360)
10µg Ag/dose F1
10µg Ag/dose F2
10µg Ag/dose F3
10µg Ag/dose F4
10µg Ag/dose F5
3µg Ag/dose ToxA (aa 2387-2706)
3µg Ag/dose ToxB (aa 1750-2360)
3µg Ag/dose F1
3µg Ag/dose F2
3µg Ag/dose F3
3µg Ag/dose F4
3µg Ag/dose F5
ASO3B adjuvant only

FIGURE 15

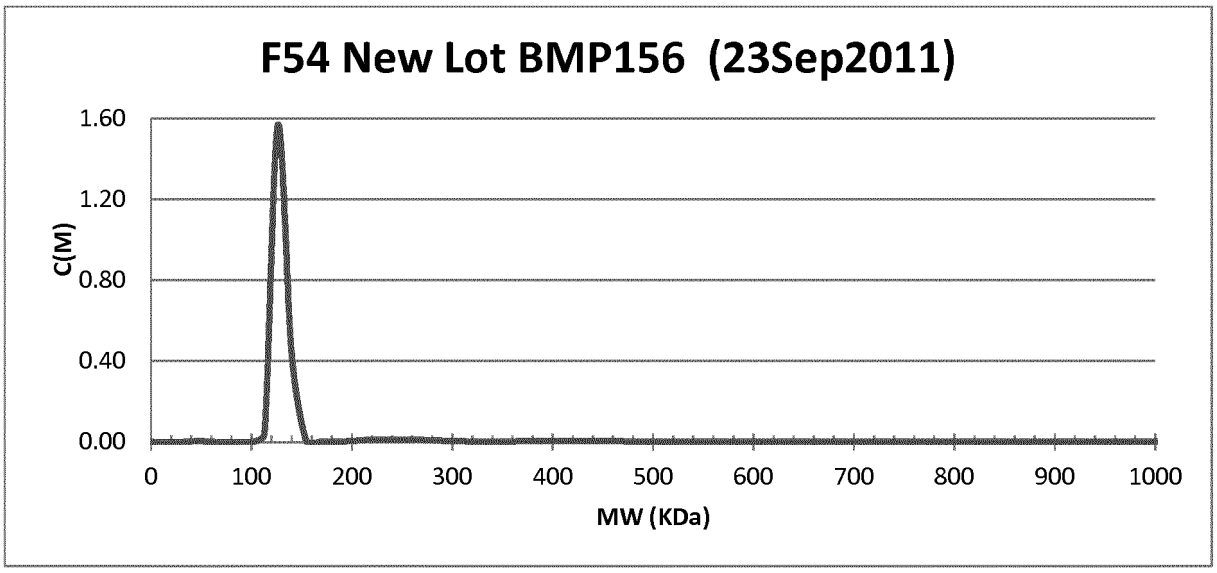
a)



b)



c)


F54 New Lot BMP156 (23Sep2011)
C(M)
1.60
1.20
0.80
0.40
0.00
0
100
200
300
400
500
600
700
800
900
1000
MW (KDa)

d)

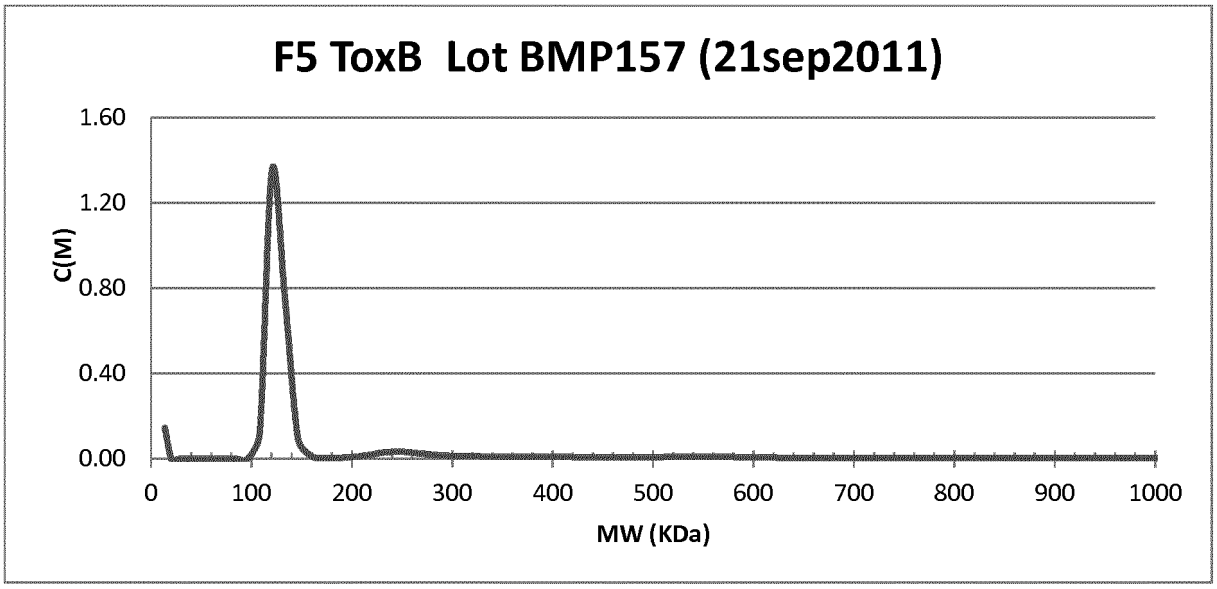

F5 ToxB Lot BMP157 (21sep2011)
C(M)
1.60
1.20
0.80
0.40
0.00
0
100
200
300
400
500
600
700
800
900
1000
MW (KDa)

FIGURE 16

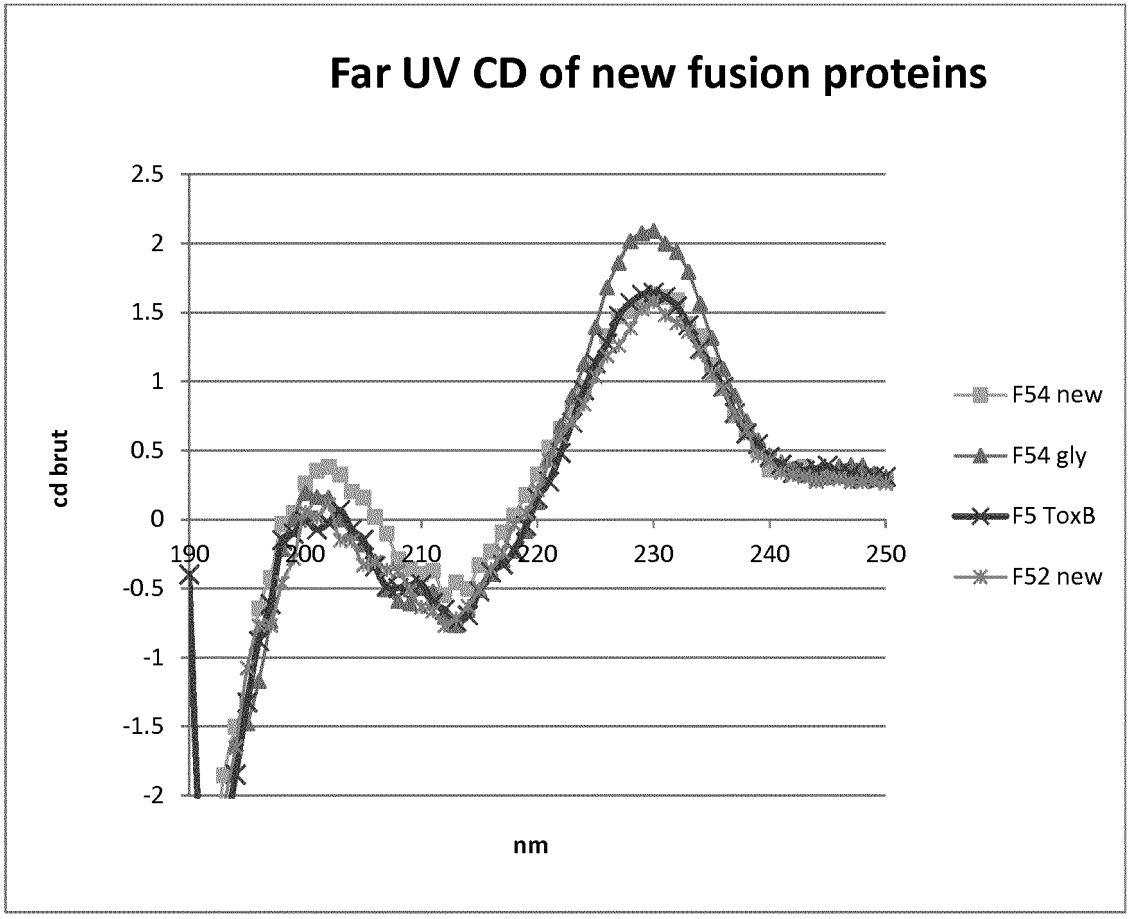

Far UV CD of new fusion proteins
cd brut
nm
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
190
200
210
220
230
240
250
F54 new
F54 gly
F5 ToxB
F52 new

FIGURE 17

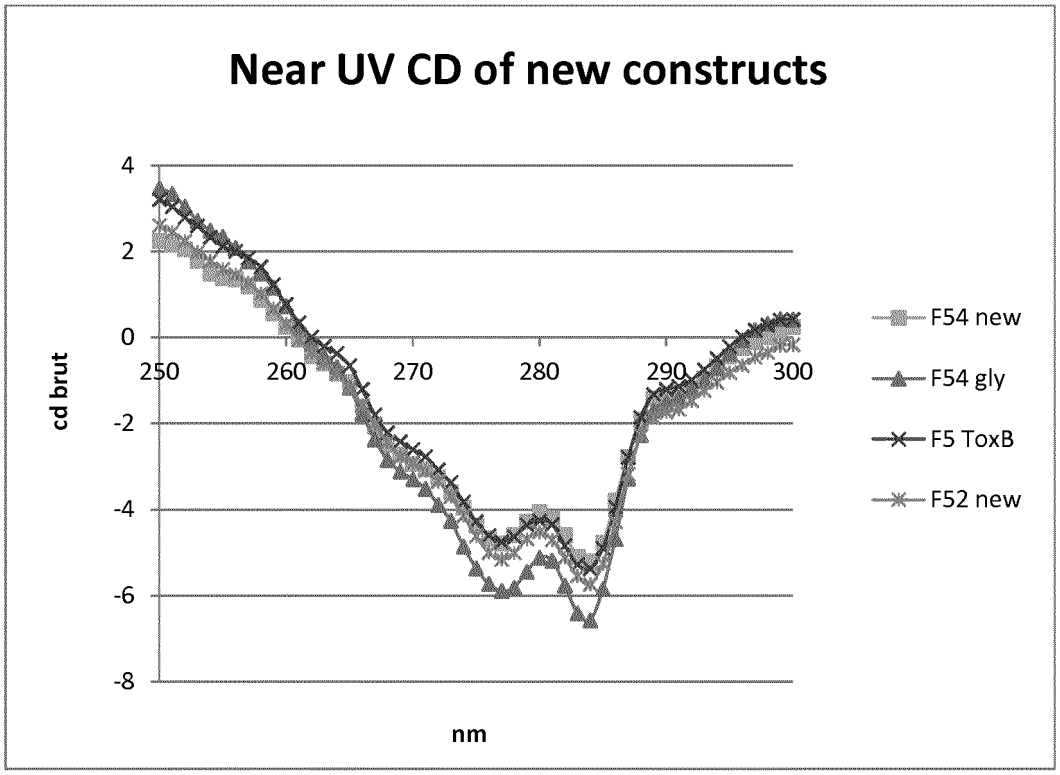

Near UV CD of new constructs
4
2
0
-2
-4
-6
-8
250
260
270
280
290
300
cd brut
nm
F54 new
F54 gly
F5 ToxB
F52 new

FIGURE 18

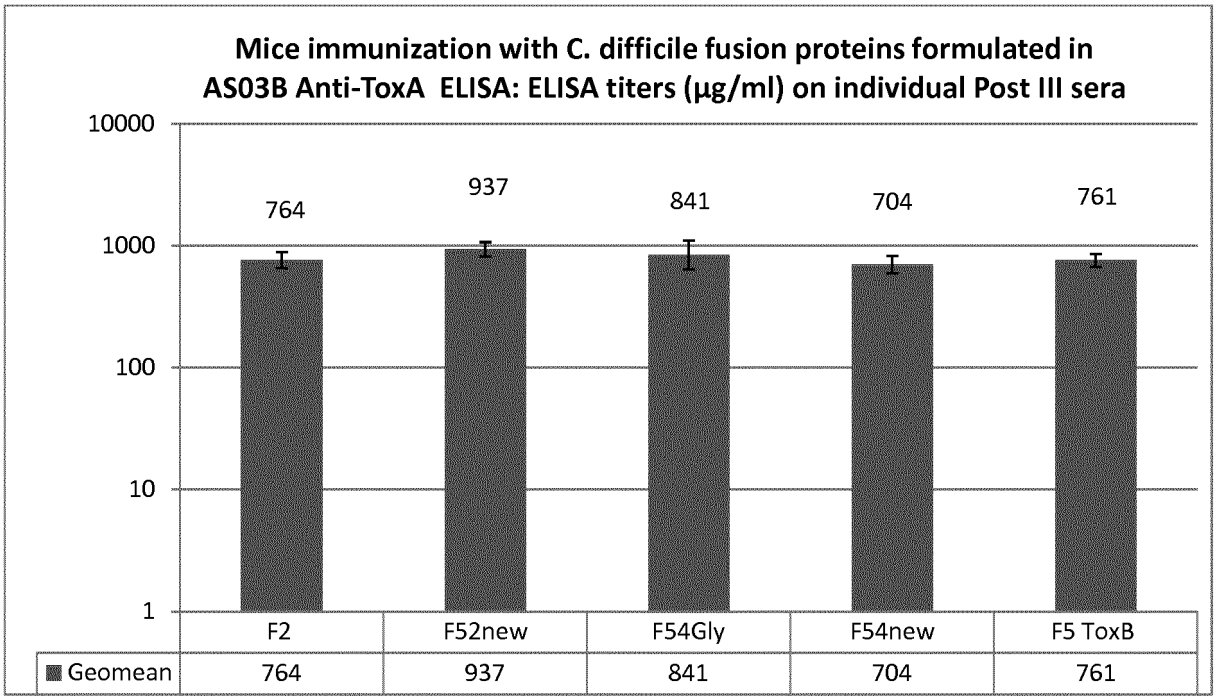

Mice immunization with C. difficile fusion proteins formulated in AS03B Anti-ToxA ELISA: ELISA titers (µg/ml) on individual Post III sera
10000
1000
100
10
1
764
937
841
704
761
F2
F52new
F54Gly
F54new
F5 ToxB
Geomean
764
937
841
704
761

FIGURE 19

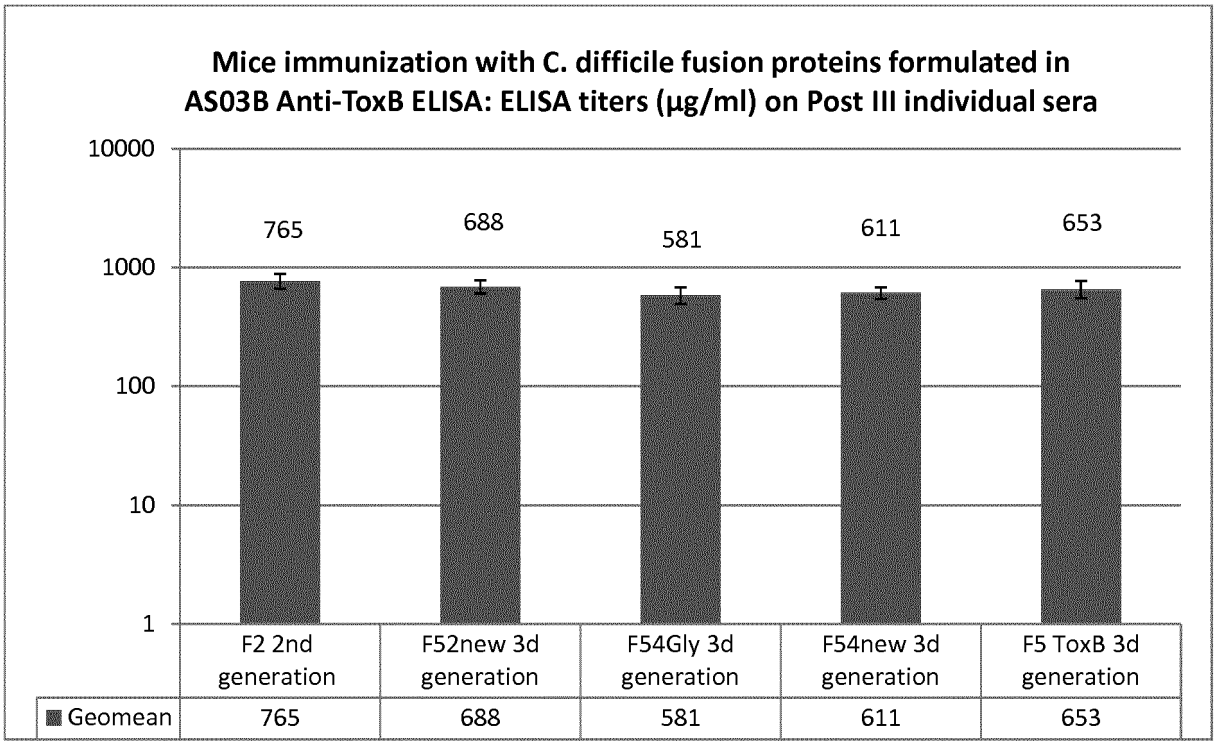

Mice immunization with C. difficile fusion proteins formulated in AS03B Anti-ToxB ELISA: ELISA titers (µg/ml) on Post III individual sera
10000
1000
100
10
1
765
688
581
611
653
F2 2nd generation
F52new 3d generation
F54Gly 3d generation
F54new 3d generation
F5 ToxB 3d generation
Geomean
765
688
581
611
653

FIGURE 20

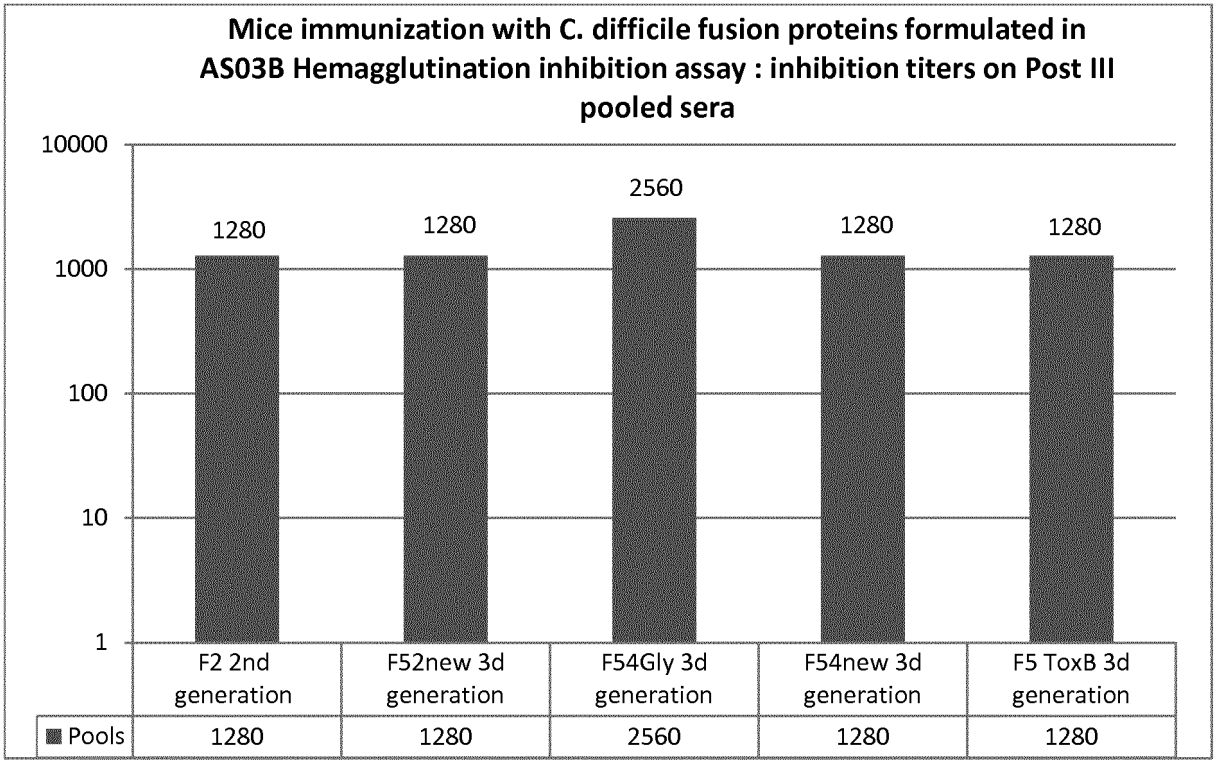

Mice immunization with C. difficile fusion proteins formulated in AS03B Hemagglutination inhibition assay : inhibition titers on Post III pooled sera
10000
1000
100
10
1
1280
1280
2560
1280
1280
F2 2nd generation
F52new 3d generation
F54Gly 3d generation
F54new 3d generation
F5 ToxB 3d generation
Pools
1280
1280
2560
1280
1280

FIGURE 21

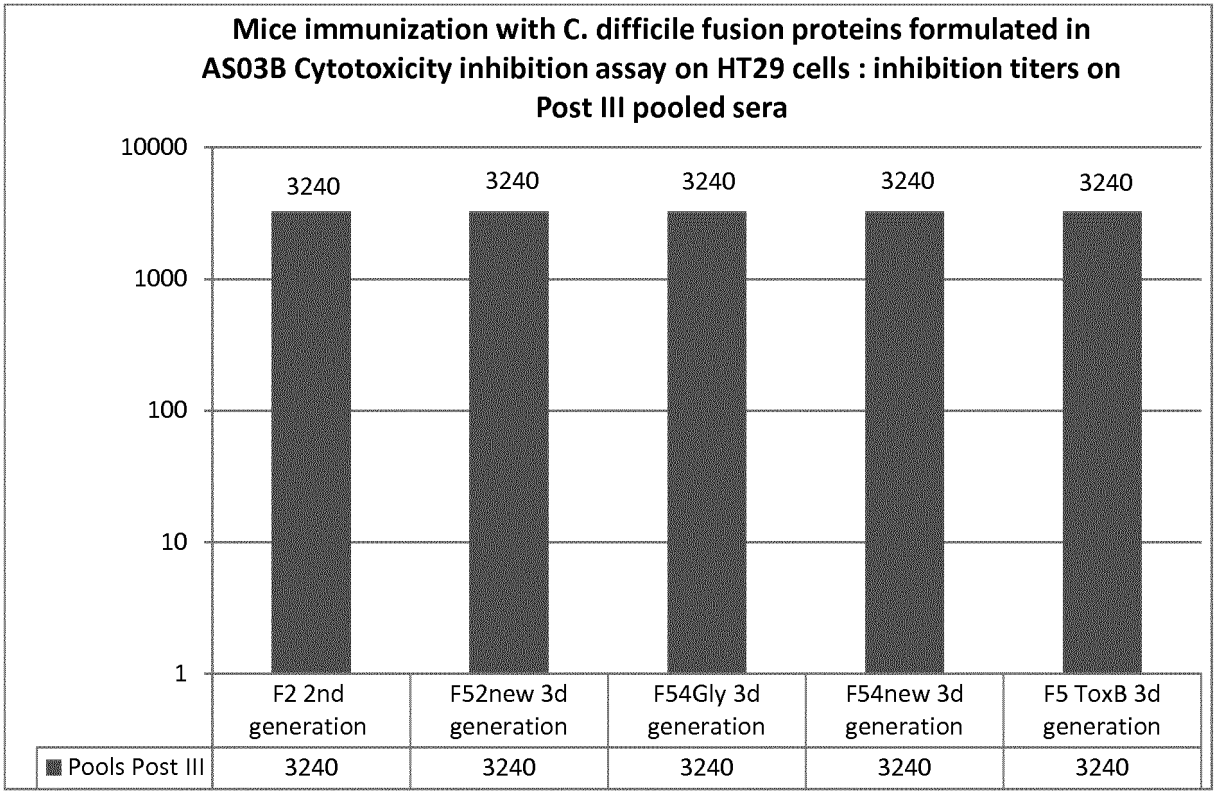
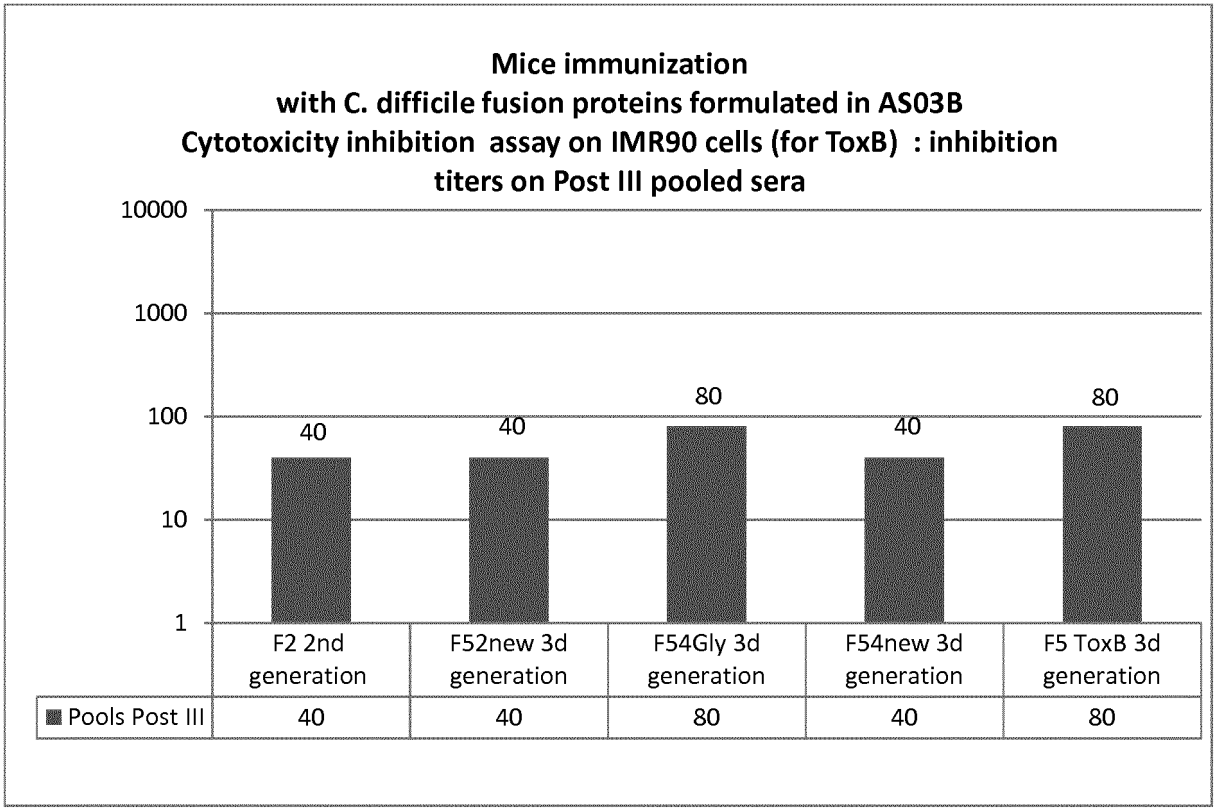

Mice immunization with C. difficile fusion proteins formulated in AS03B Cytotoxicity inhibition assay on HT29 cells : inhibition titers on Post III pooled sera
10000
1000
100
10
1
3240
3240
3240
3240
3240
F2 2nd generation
F52new 3d generation
F54Gly 3d generation
F54new 3d generation
F5 ToxB 3d generation
Pools Post III
3240
3240
3240
3240
3240

FIGURE 22


Mice immunization
with C. difficile fusion proteins formulated in AS03B
Cytotoxicity inhibition assay on IMR90 cells (for ToxB) : inhibition
titers on Post III pooled sera
10000
1000
100
10
1
40
40
80
40
80
F2 2nd generation
F52new 3d generation
F54Gly 3d generation
F54new 3d generation
F5 ToxB 3d generation
Pools Post III
40
40
80
40
80