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(54) **RECOMBINANT POXVIRUS BASED VACCINE AGAINST SARS-COV-2 VIRUS**

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(22) Filed: **Feb. 26, 2021**

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Publication Classification

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C12N 15/85	(2006.01)

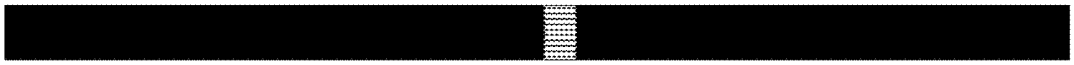
(52) **U.S. Cl.**

CPC ***A61K 39/215*** (2013.01); ***C12N 7/00*** (2013.01); *A61K 2039/70* (2013.01); *C12N 2710/24134* (2013.01); ***C12N 15/85*** (2013.01)

(57) **ABSTRACT**

The invention relates in various aspects to a recombinant poxvirus comprising a nucleic acid encoding a SARS-CoV-2 virus protein, methods for producing such viruses and the use of such viruses. The recombinant poxviruses are well suited, among others, as protective virus vaccines against SARS-CoV-2 virus.

Specification includes a Sequence Listing.



Genomic representation of HPXV
Accession # KY349117 (See also US 2018/0251736)

Thymidine Kinase (**TK**) Gene
Gene ID: HPXV095. Genome positions: 92077-92610

212811 bp

Genomic representation of VACV
Accession # MN974381 (See also WO 2019/213452)

Thymidine Kinase (**TK**) Gene
Gene ID: synVACV_105
Genome positions: 83823-84344

199617 bp

Figure 1

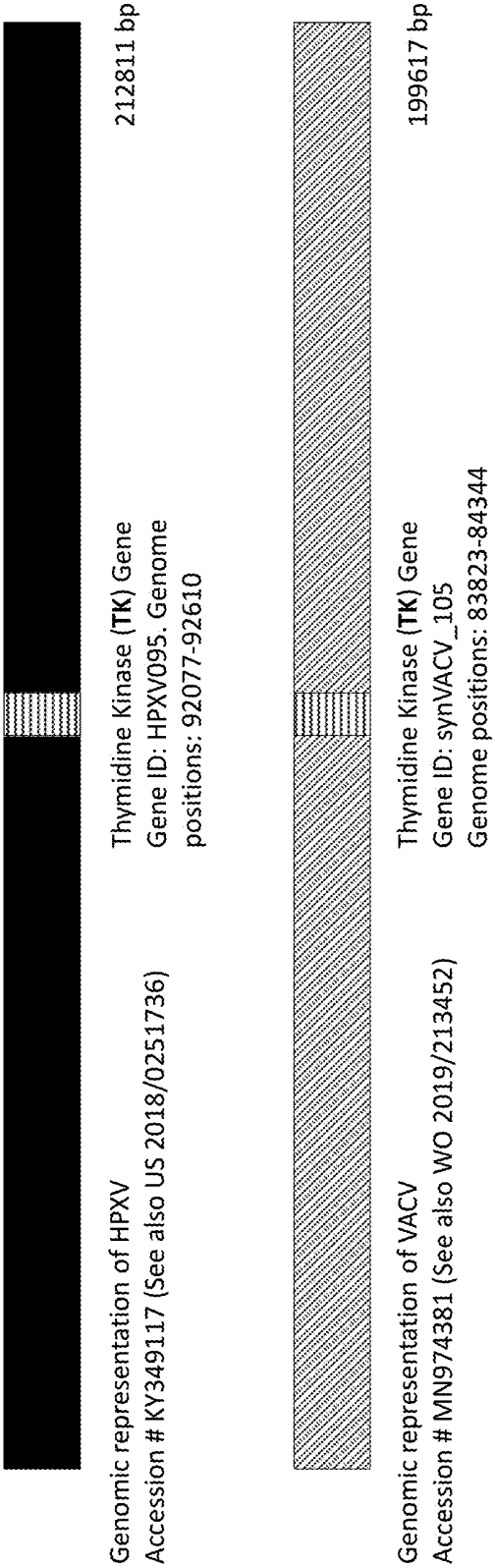

212811 bp
Thymidine Kinase (TK) Gene
Gene ID: HPXV095. Genome positions: 92077-92610
Genomic representation of HPXV
Accession # KY349117 (See also US 2018/0251736)
199617 bp
Thymidine Kinase (TK) Gene
Gene ID: synVACV_105
Genome positions: 83823-84344
Genomic representation of VACV
Accession # MN974381 (See also WO 2019/213452)

Figure 2

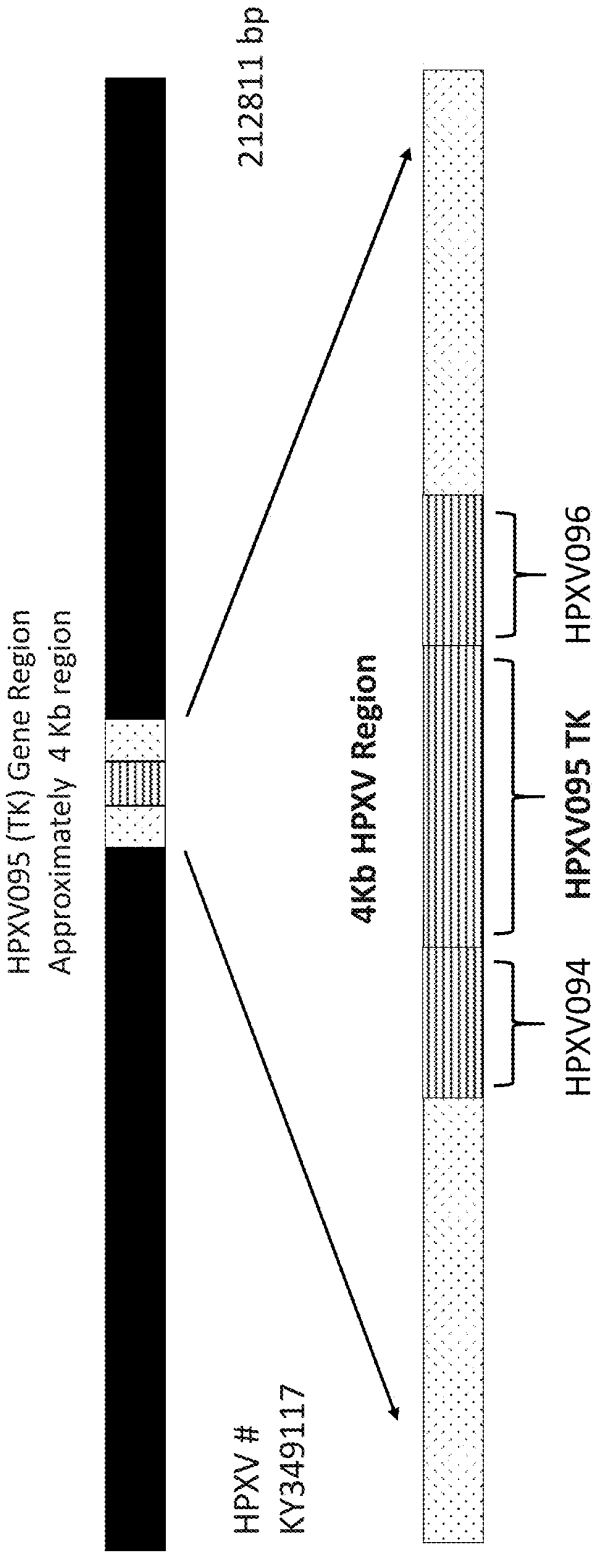

HPXV095 (TK) Gene Region
Approximately 4 Kb region
212811 bp
4Kb HPXV Region
HPXV094
HPXV095 TK
HPXV096
HPXV #
KY349117

Figure 3

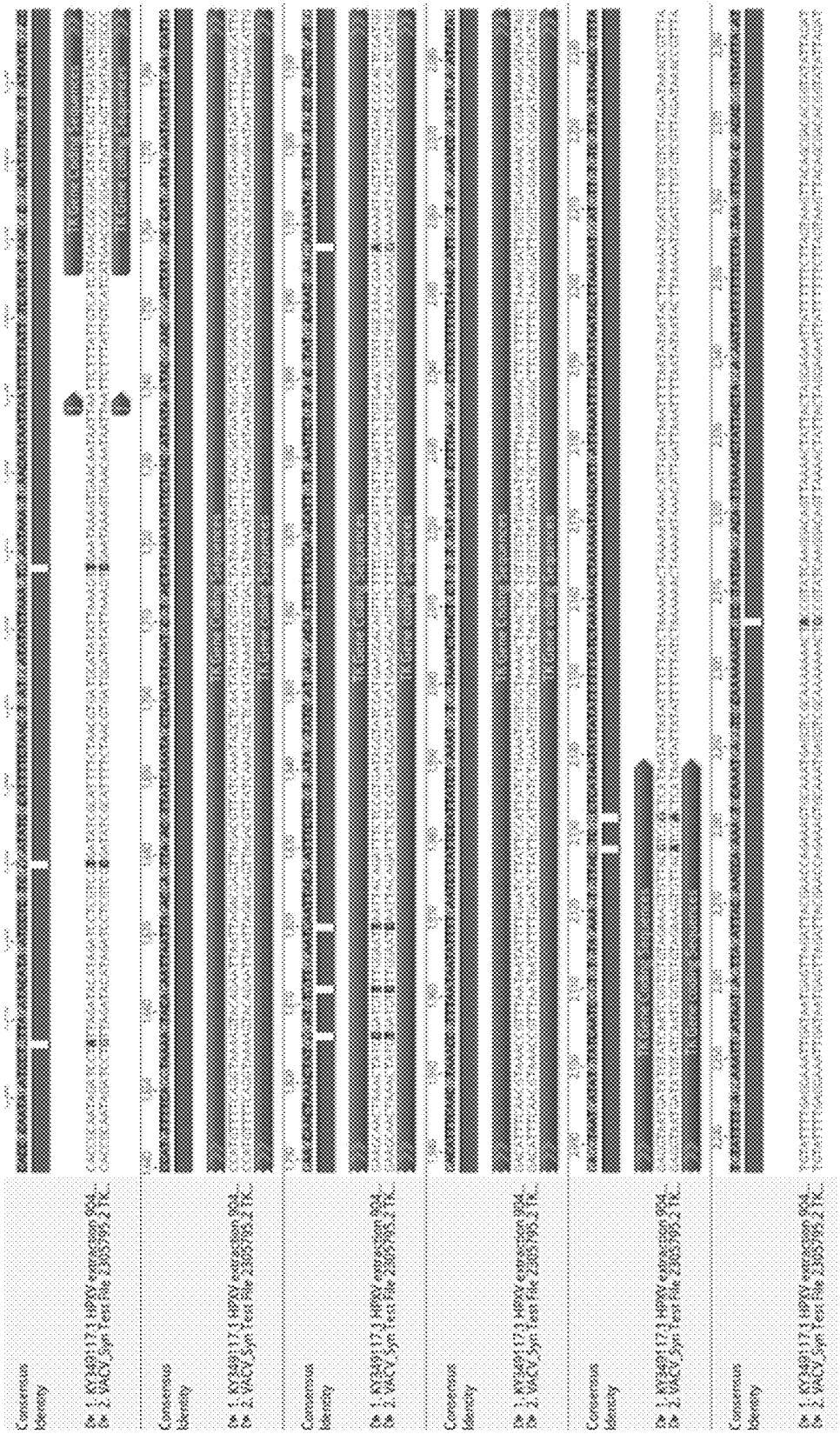
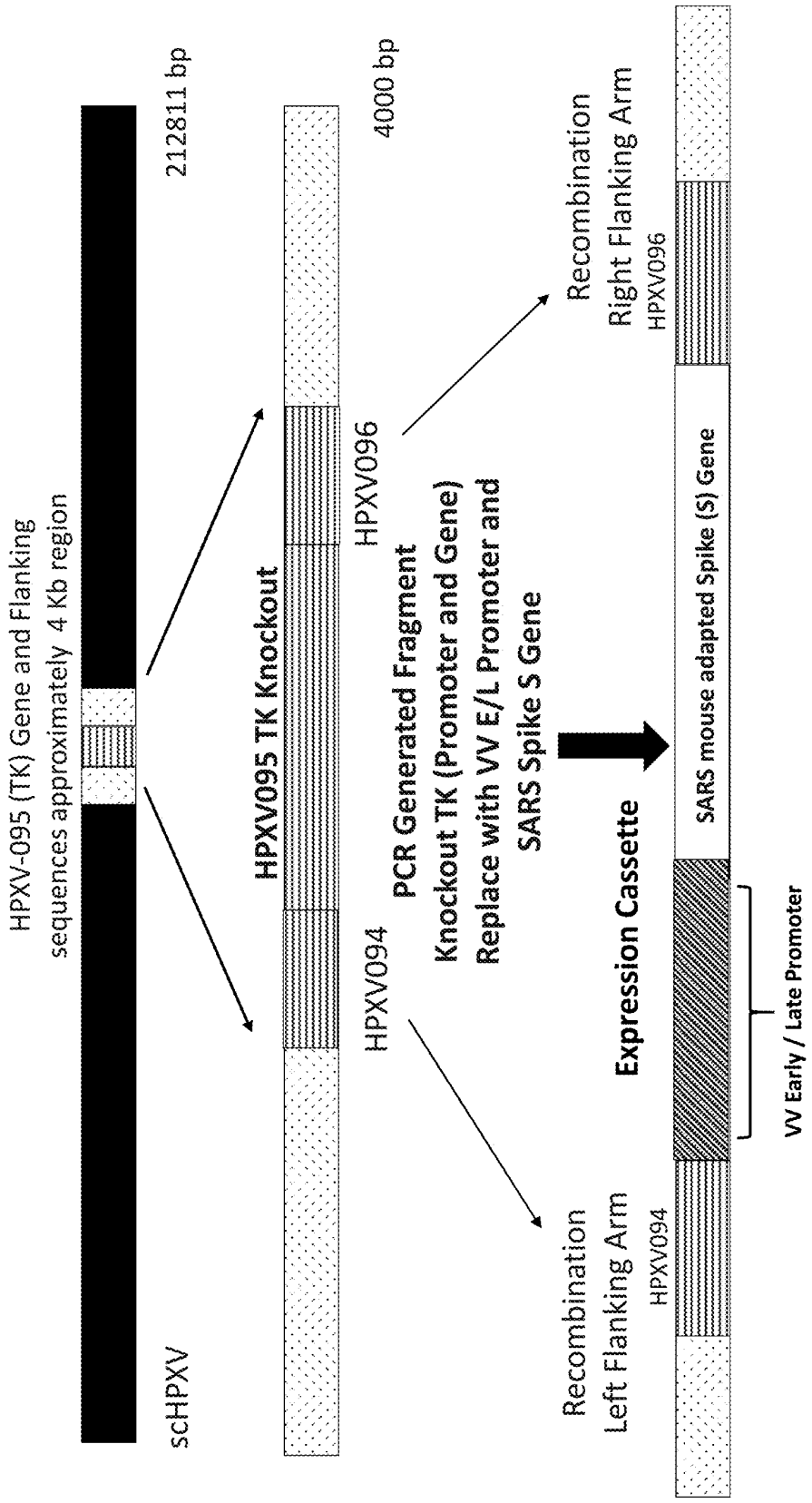


Figure 4


HPXV-095 (TK) Gene and Flanking sequences approximately 4 Kb region
212811 bp
scHPXV
HPXV095 TK Knockout
4000 bp
HPXV096
HPXV094
PCR Generated Fragment
Knockout TK (Promoter and Gene)
Replace with VV E/L Promoter and
SARS Spike S Gene
Recombination
Right Flanking Arm
HPXV096
Recombination
Left Flanking Arm
HPXV094
Expression Cassette
SARS mouse adapted Spike (S) Gene
VV Early / Late Promoter

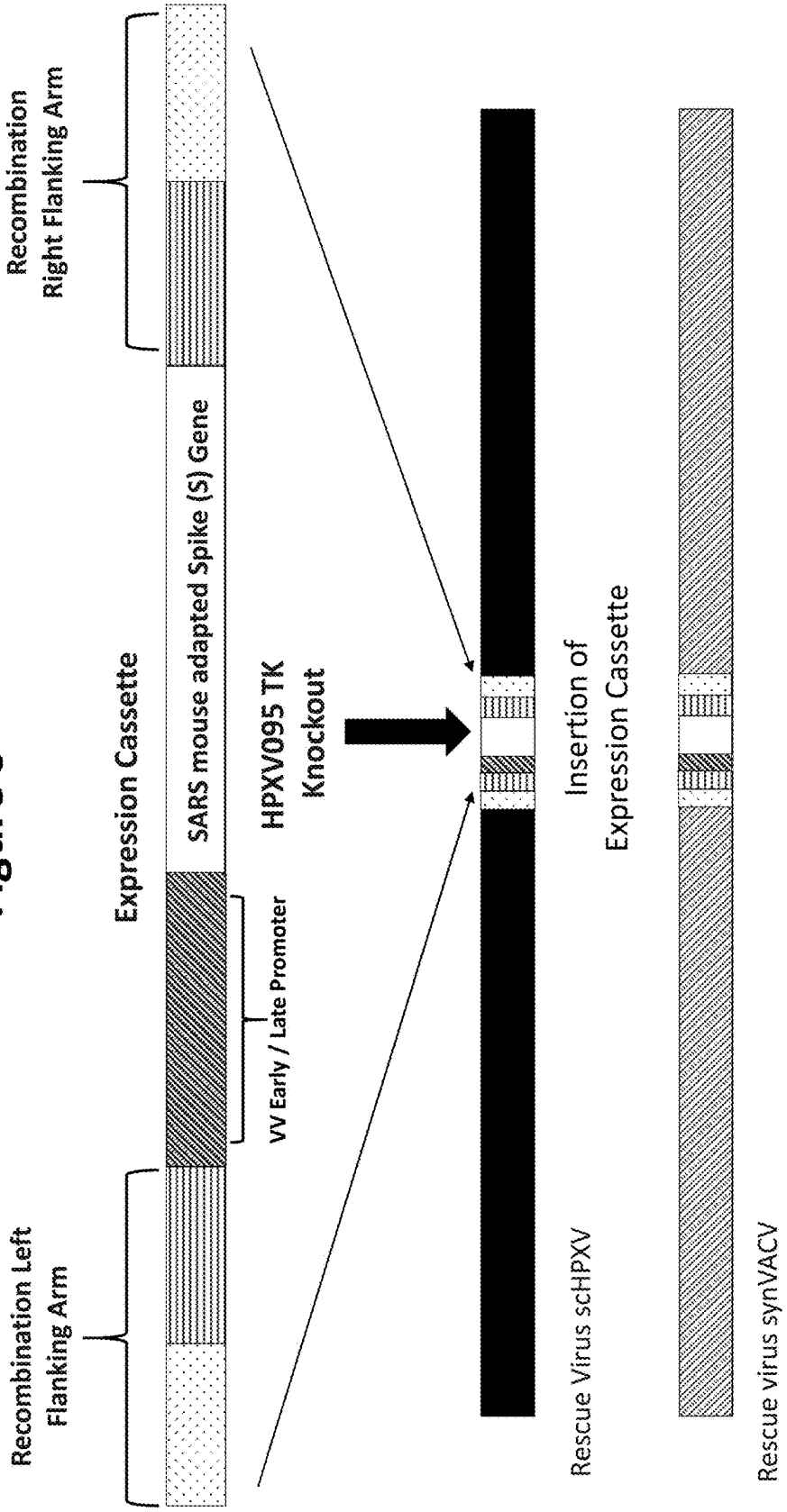

Recombination Right Flanking Arm
Expression Cassette
SARS mouse adapted Spike (S) Gene
VV Early / Late Promoter
HPXV095 TK Knockout
Recombination Left Flanking Arm
Insertion of Expression Cassette
Rescue Virus scHPXV
Rescue virus synVACV

Figure 5

Figure 6

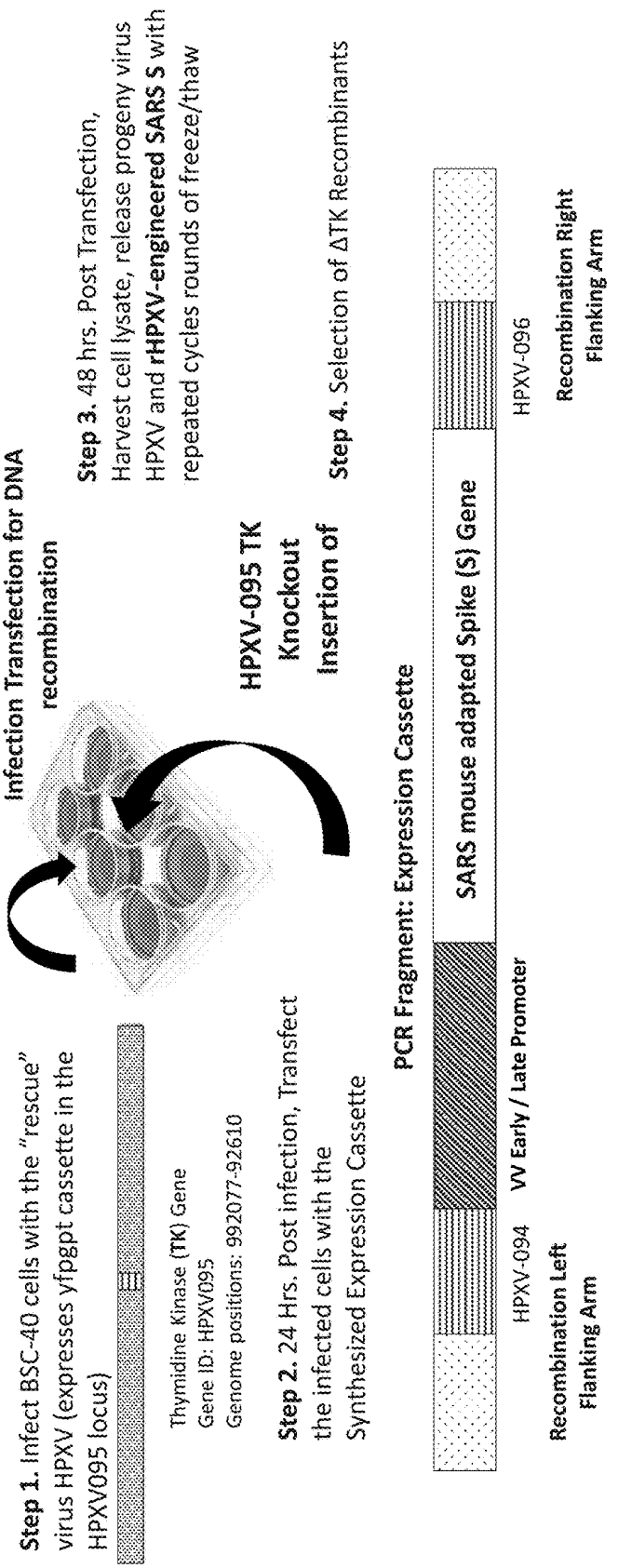

Step 1. Infect BSC-40 cells with the "rescue" virus HPXV (expresses yfpgpt cassette in the HPXV095 locus)
Thymidine Kinase (TK) Gene
Gene ID: HPXV095
Genome positions: 992077-92610
Step 2. 24 Hrs. Post infection, Transfect the infected cells with the Synthesized Expression Cassette
Infection Transfection for DNA recombination
HPXV-095 TK Knockout Insertion of
PCR Fragment: Expression Cassette
SARS mouse adapted Spike (S) Gene
HPXV-094
VV Early / Late Promoter
HPXV-096
Recombination Left Flanking Arm
Recombination Right Flanking Arm
Step 3. 48 hrs. Post Transfection, Harvest cell lysate, release progeny virus HPXV and rHPXV-engineered SARS S with repeated cycles rounds of freeze/thaw
Step 4. Selection of ΔTK Recombinants

Figure 7

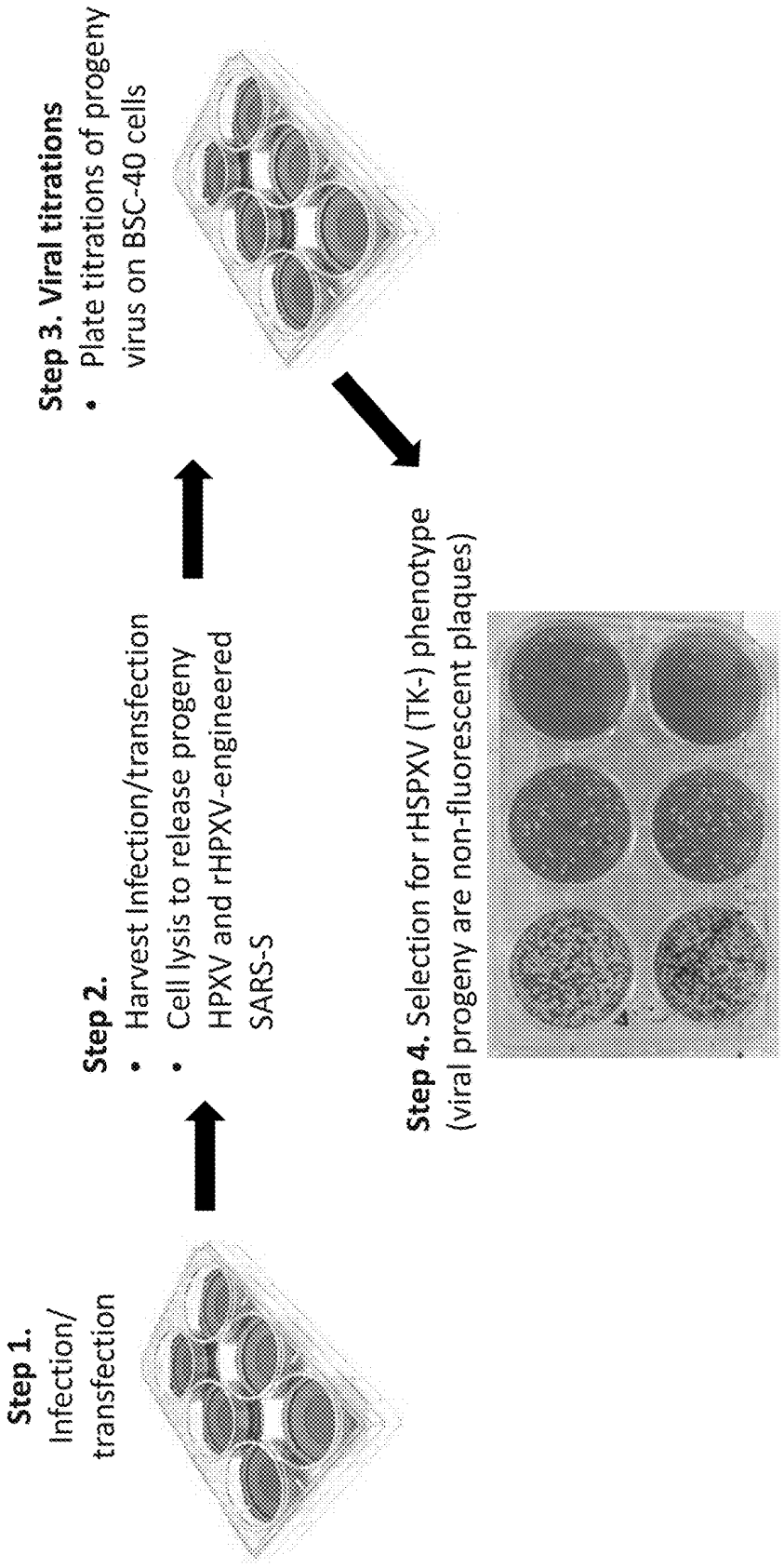

Step 1.
Infection/
transfection
Step 2.
• Harvest Infection/transfection
• Cell lysis to release progeny
HPXV and rHPXV-engineered
SARS-S
Step 3. Viral titrations
• Plate titrations of progeny
virus on BSC-40 cells
Step 4. Selection for rHSPXV (TK-) phenotype
(viral progeny are non-fluorescent plaques)

Figure 8

A. Optimized Early Promoter Elements

```
              - - - - - core - - - - - - -    - - spacer - -    - - init - - -
SEQ ID NO: 3:  AAAATTGAAANNNTANNNNNNNNNNNNNNNN
```

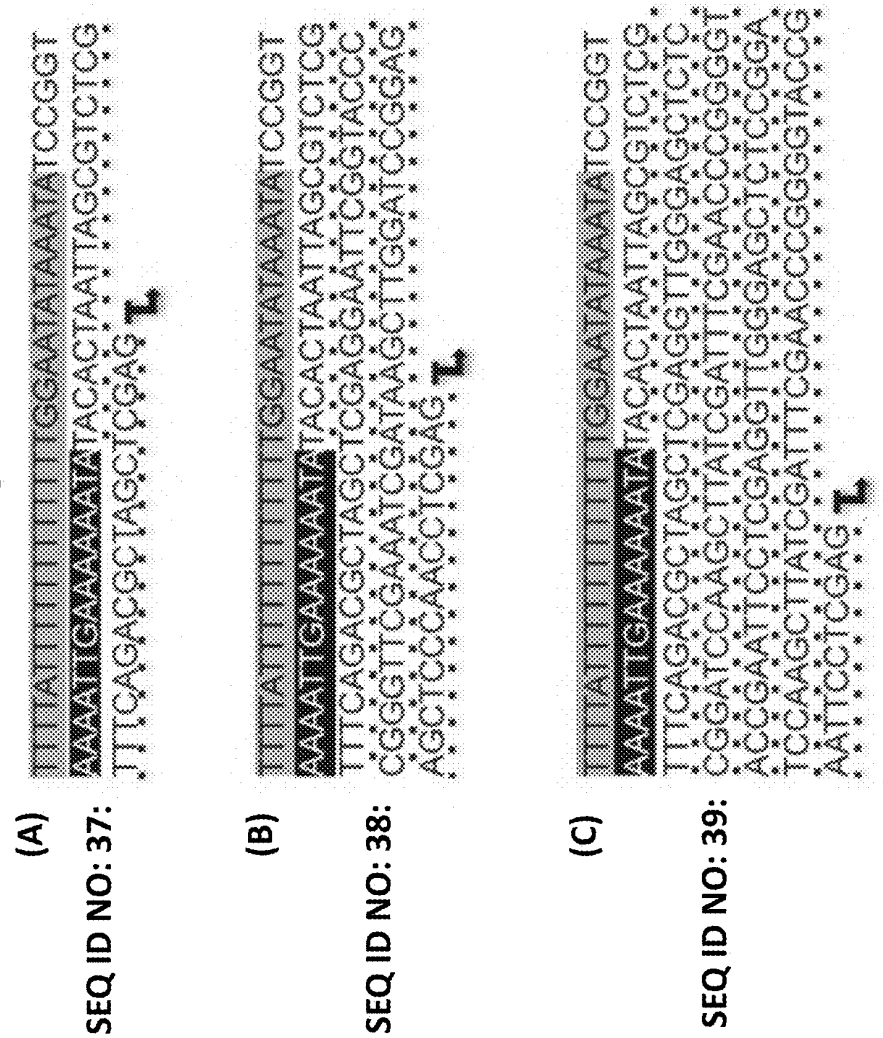
B. Synthetic Late Promoter Elements

```
               - - - - - - -T-run - - - - - - -   - spacer-   - - init - -
SEQ ID NO: 4:  TTTTTTTTTTTTTTTTTTTTNNNNNNTAAATG
```

C. Overlapping Early/Late Promoter

```
              - - - - - - core - - - - - - -     - - spacer - -    - -init - -
SEQ ID NO: 5: AAAAATTGAAATTTTATTTTTTTTTTTTGGAATATAAATA
                                - - - - - - T-run - - - - -  - spacer -   - - init - -
```

Figure 9



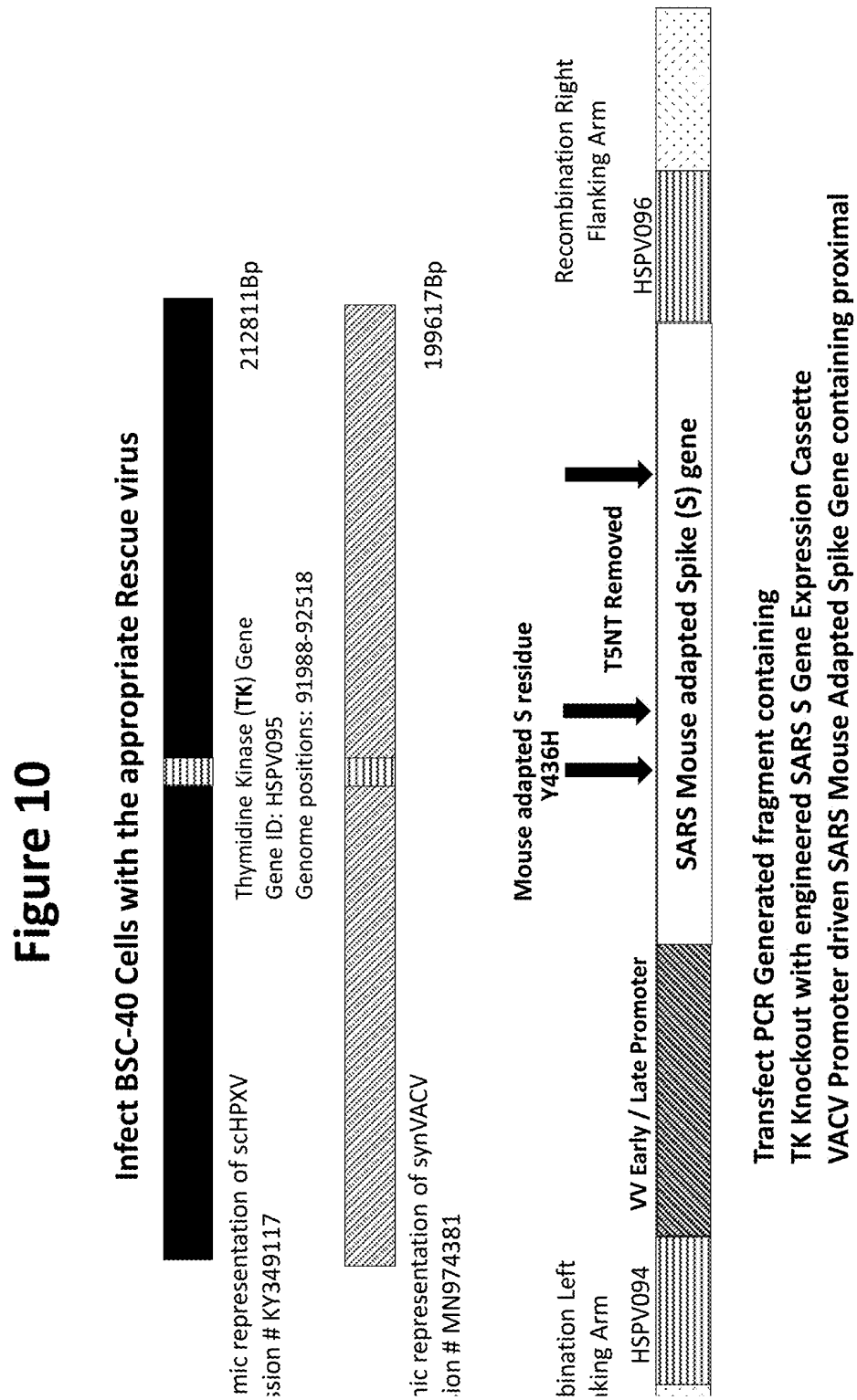


Figure 10
Infect BSC-40 Cells with the appropriate Rescue virus
mic representation of scHPXV
sion # KY349117
Thymidine Kinase (TK) Gene
Gene ID: HSPV095
Genome positions: 91988-92518
212811Bp
ic representation of synVACV
ion # MN974381
199617Bp
bination Left
king Arm
HSPV094
VV Early / Late Promoter
Mouse adapted S residue
Y436H
T5NT Removed
SARS Mouse adapted Spike (S) gene
Recombination Right
Flanking Arm
HSPV096
Transfect PCR Generated fragment containing
TK Knockout with engineered SARS S Gene Expression Cassette
VACV Promoter driven SARS Mouse Adapted Spike Gene containing proximal
Left and Right Flanking viral Sequences for Recombination

Figure 11

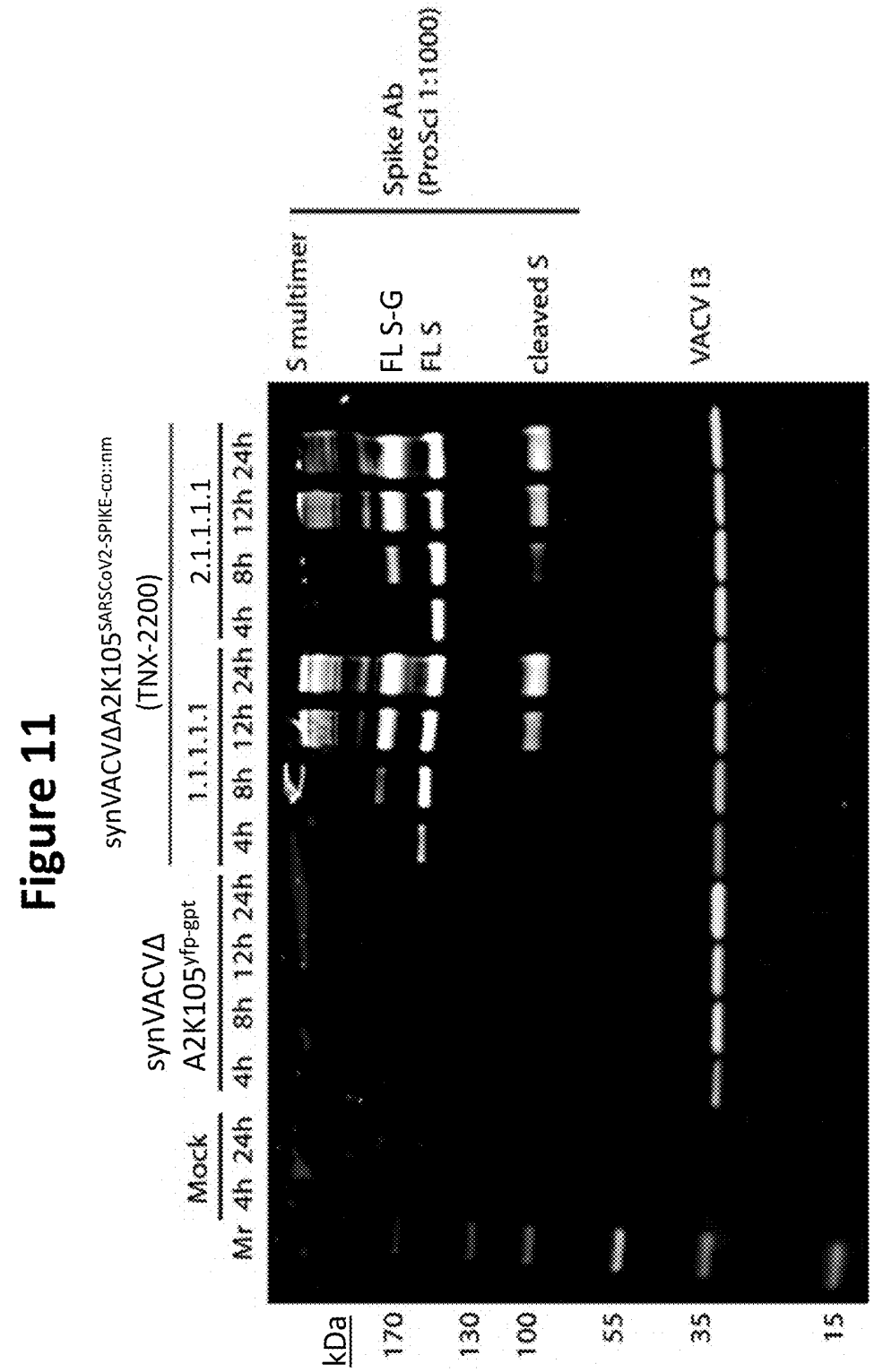

synVACVΔA2K105SARSCoV2-SPIKE-co::nm
(TNX-2200)
synVACVΔ A2K105yfp-gpt
1.1.1.1.1
2.1.1.1.1
Mock
Mr 4h 24h 4h 8h 12h 24h 4h 8h 12h 24h 4h 8h 12h 24h
kDa
170
130
100
55
35
15
S multimer
FL S-G
FL S
cleaved S
VACV I3
Spike Ab
(ProSci 1:1000)

Figure 12

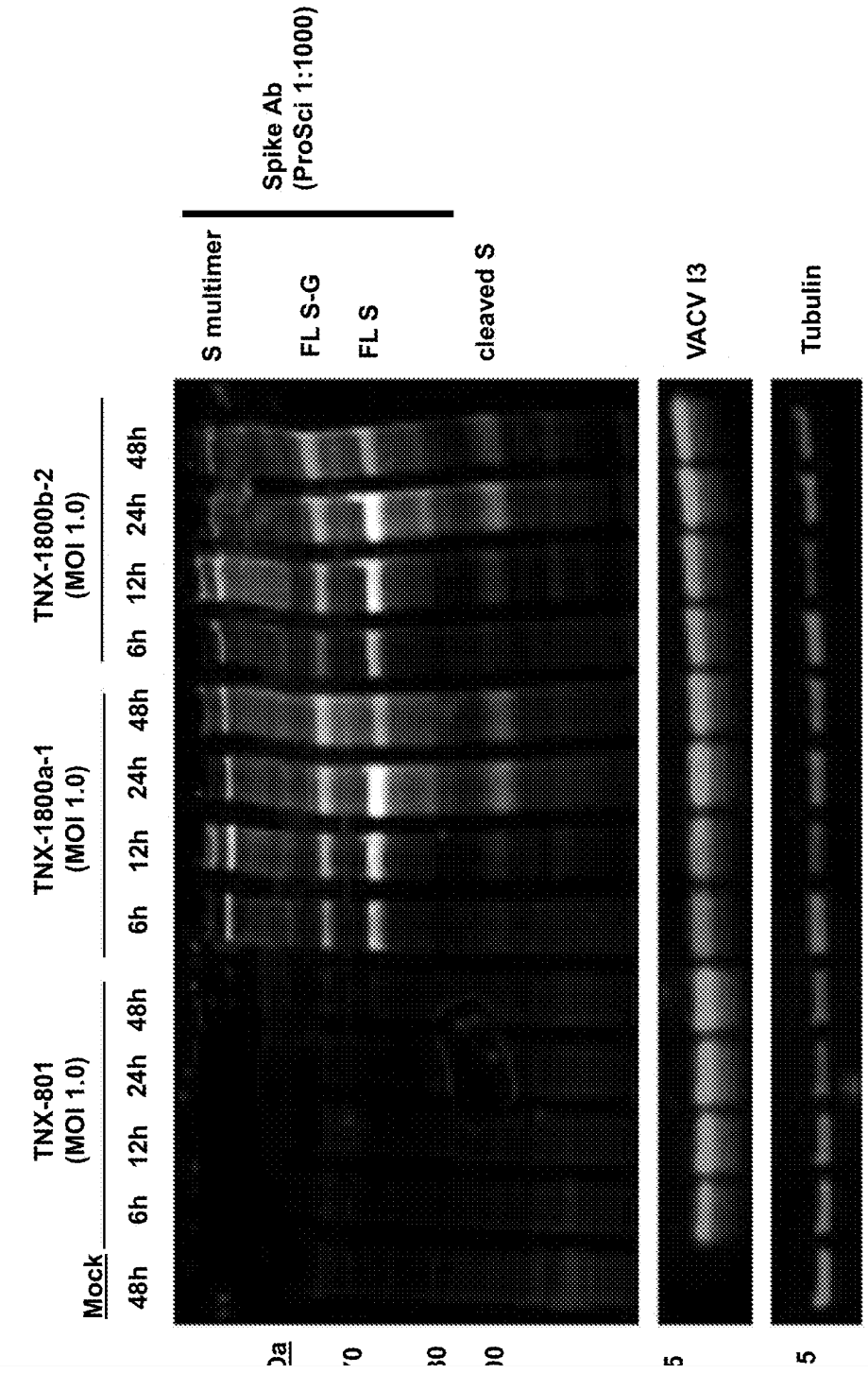

Mock
48h
TNX-801 (MOI 1.0)
6h
12h
24h
48h
TNX-1800a-1 (MOI 1.0)
6h
12h
24h
48h
TNX-1800b-2 (MOI 1.0)
6h
12h
24h
48h
Spike Ab (ProSci 1:1000)
S multimer
FL S-G
FL S
cleaved S
VACV I3
Tubulin

Figure 13

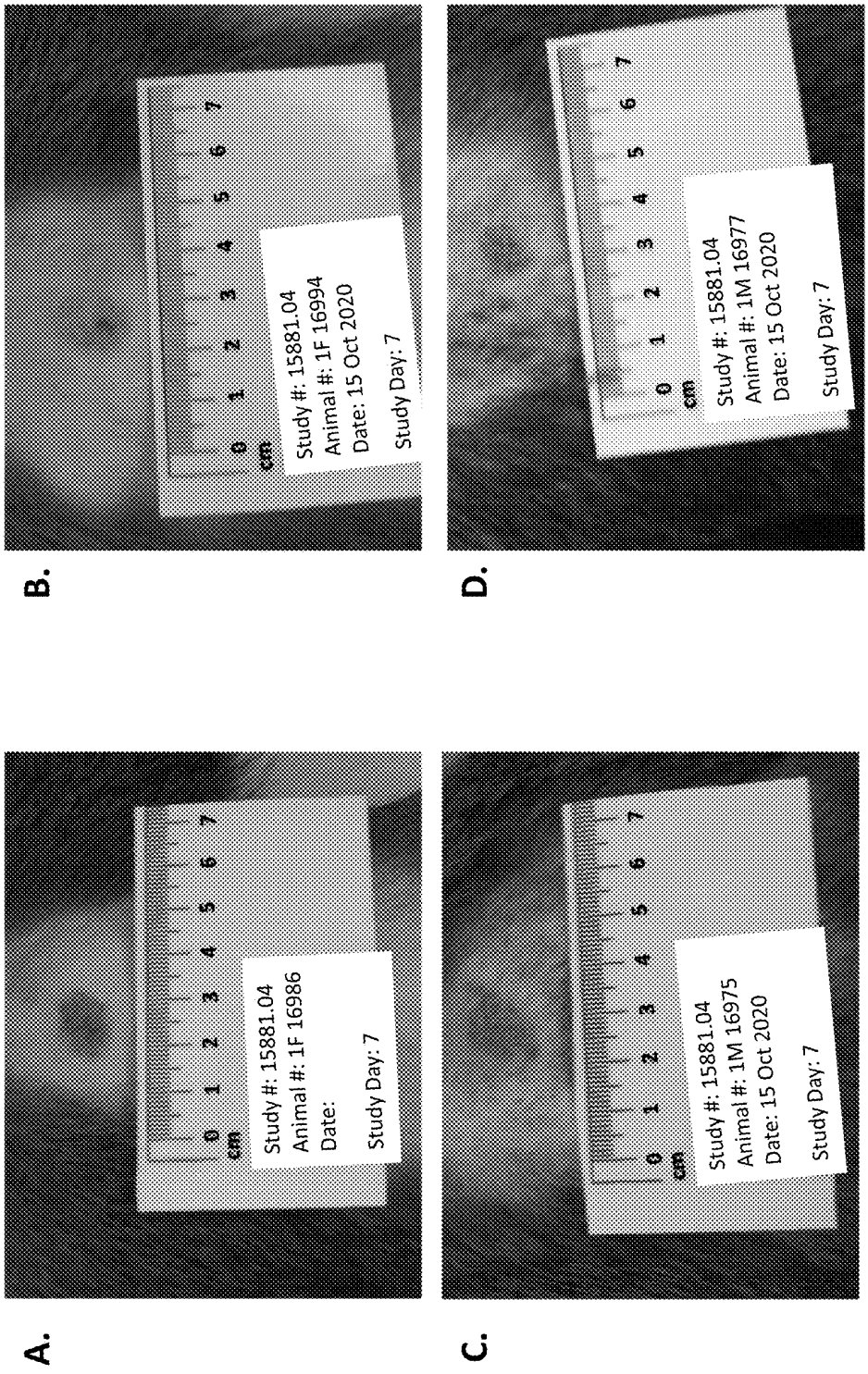

A.
Study #: 15881.04
Animal #: 1F 16986
Date:
Study Day: 7
B.
Study #: 15881.04
Animal #: 1F 16994
Date: 15 Oct 2020
Study Day: 7
C.
Study #: 15881.04
Animal #: 1M 16975
Date: 15 Oct 2020
Study Day: 7
D.
Study #: 15881.04
Animal #: 1M 16977
Date: 15 Oct 2020
Study Day: 7

Figure 15

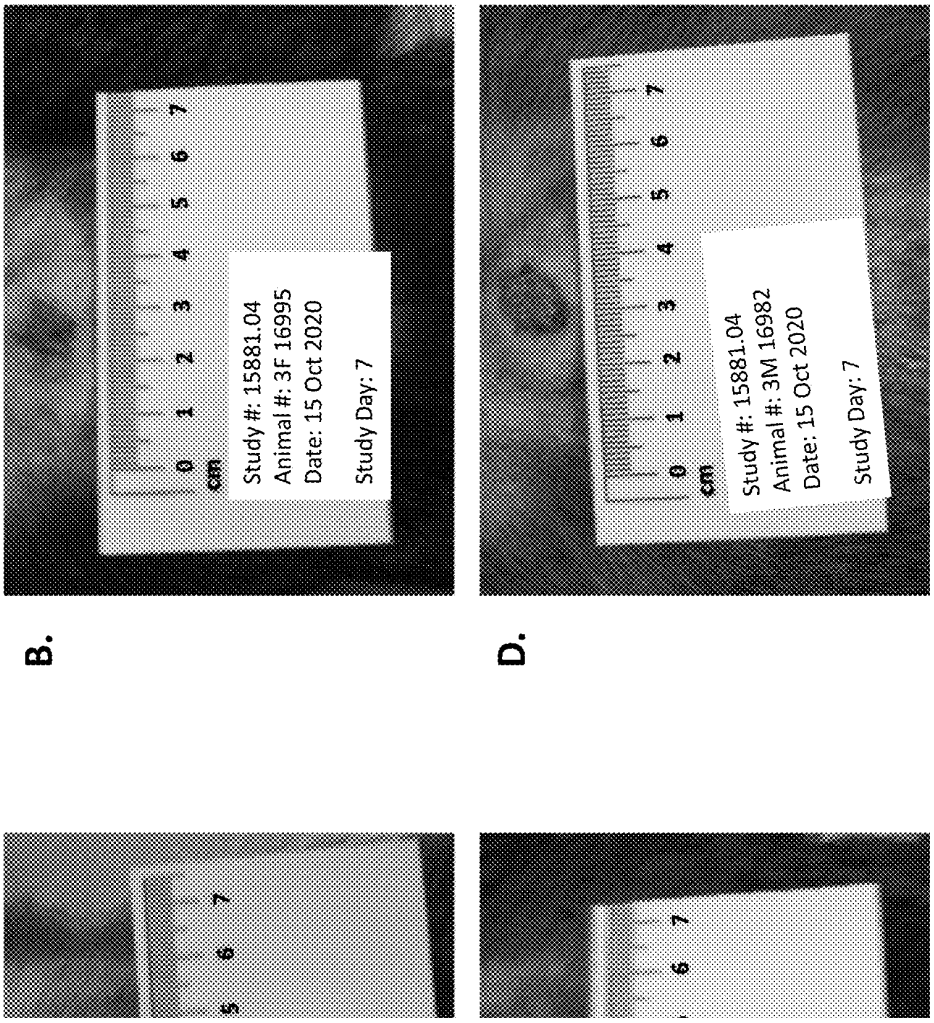

B.
Study #: 15881.04
Animal #: 3F 16995
Date: 15 Oct 2020
Study Day: 7
D.
Study #: 15881.04
Animal #: 3M 16982
Date: 15 Oct 2020
Study Day: 7

Figure 17

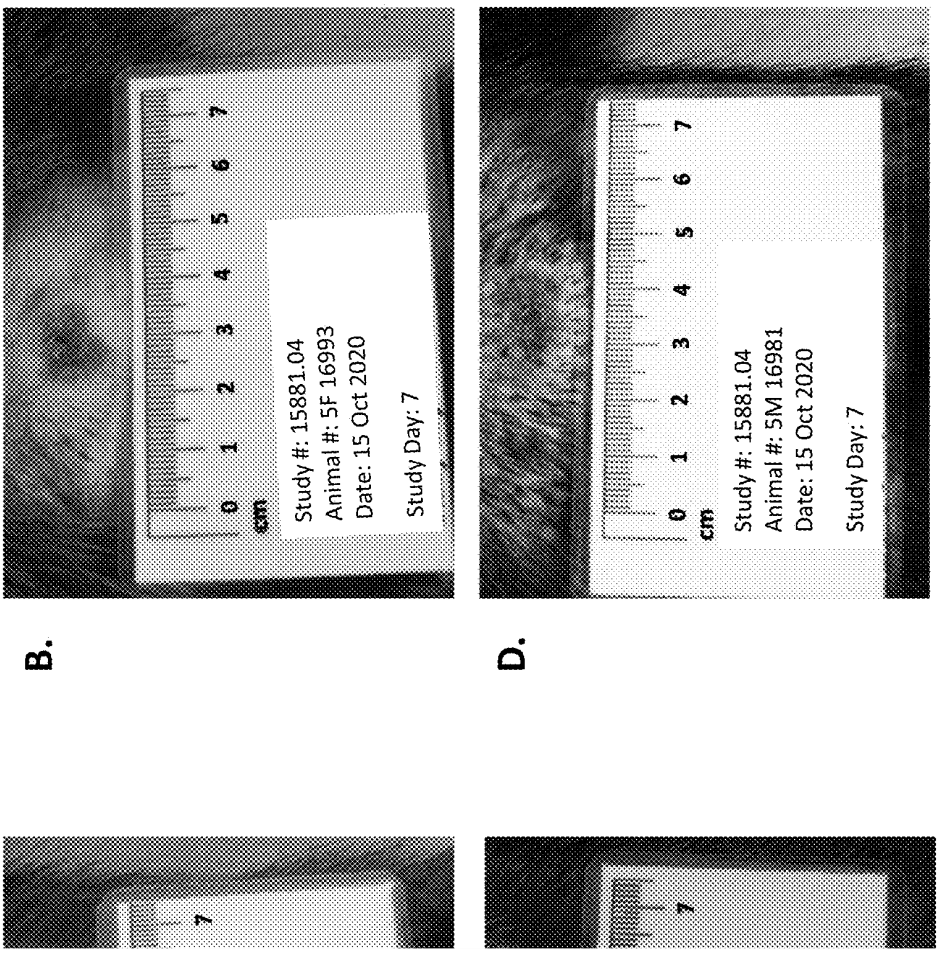

B.
D.
Study #: 15881.04
Animal #: 5F 16993
Date: 15 Oct 2020
Study Day: 7
Study #: 15881.04
Animal #: 5M 16981
Date: 15 Oct 2020
Study Day: 7
cm

Figure 19A

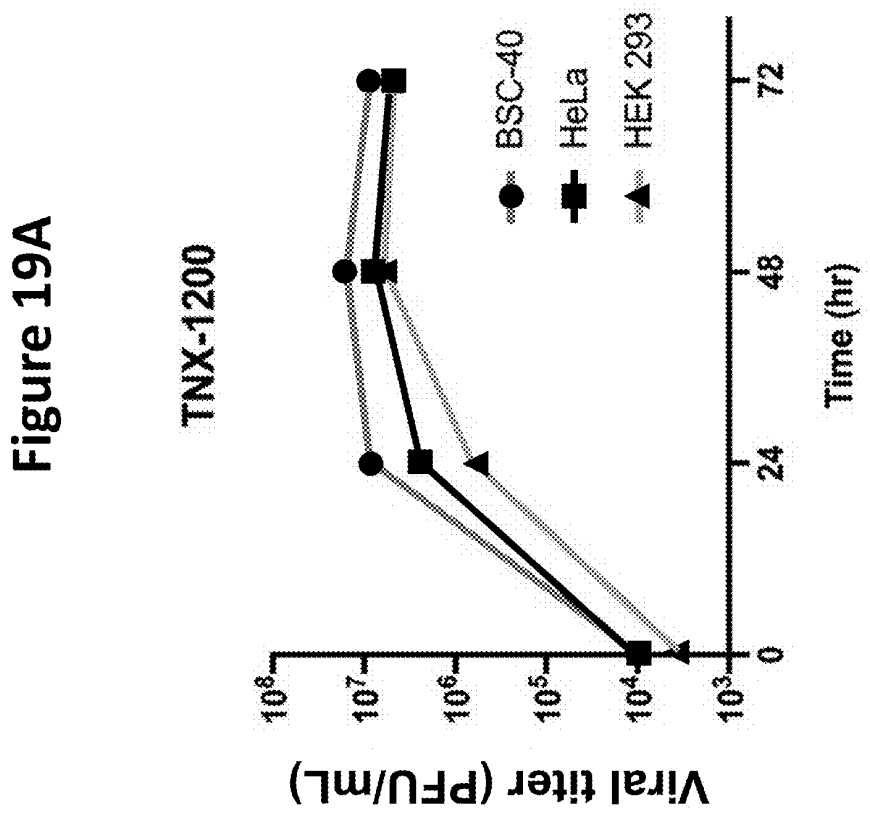

TNX-1200
BSC-40
HeLa
HEK 293
Viral titer (PFU/mL)
10^8
10^7
10^6
10^5
10^4
10^3
0
24
48
72
Time (hr)

Figure 19B

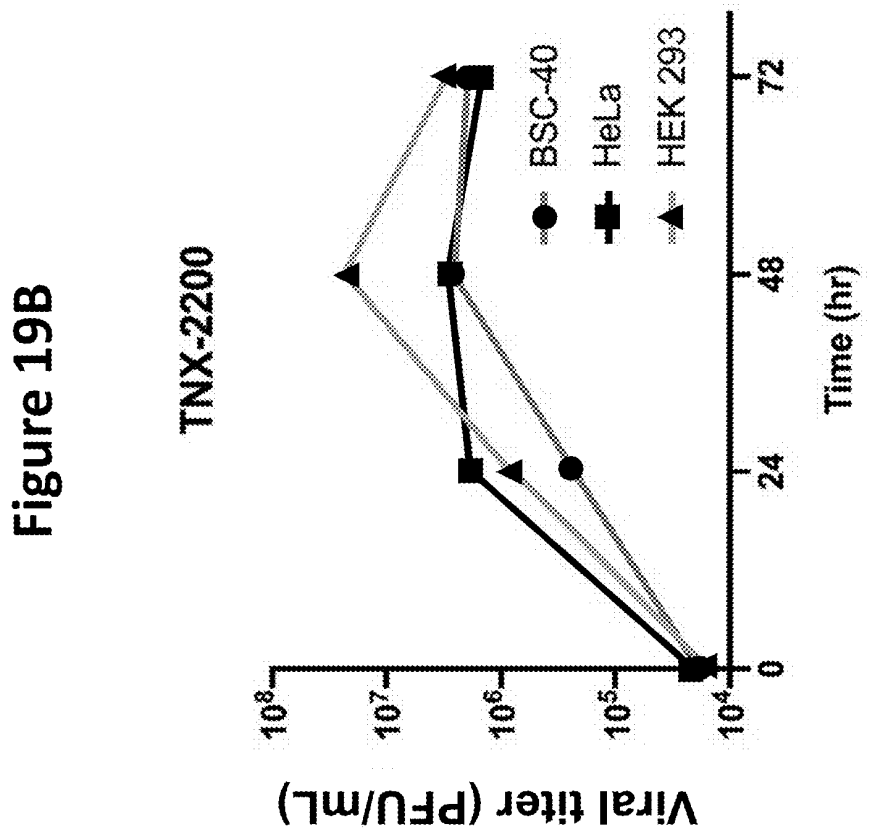

TNX-2200
Viral titer (PFU/mL)
10^8
10^7
10^6
10^5
10^4
0
24
48
72
Time (hr)
BSC-40
HeLa
HEK 293

Figure 19C

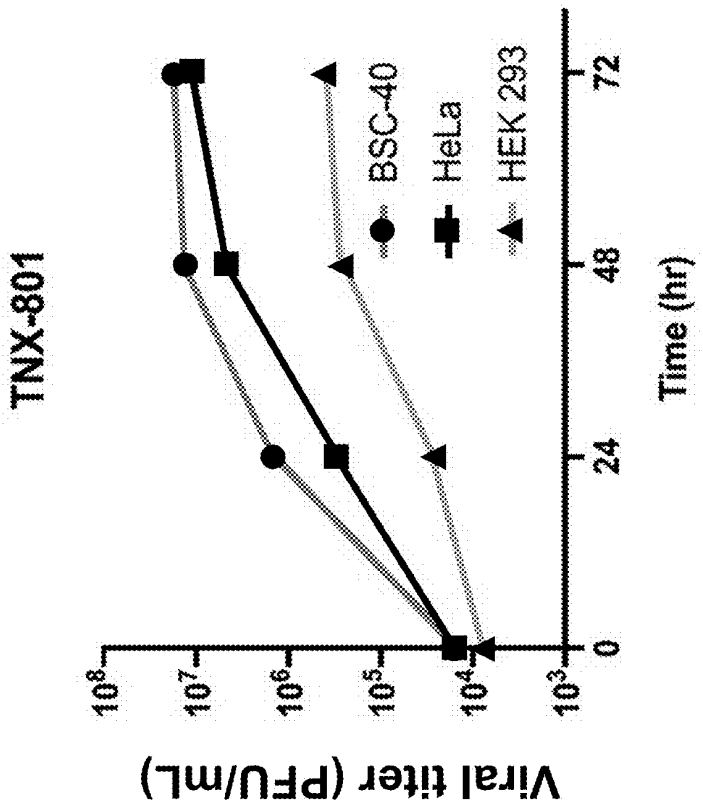

TNX-801
Viral titer (PFU/mL)
10^8
10^7
10^6
10^5
10^4
10^3
0
24
48
72
Time (hr)
BSC-40
HeLa
HEK 293

Figure 19D

TNX-1800b-2

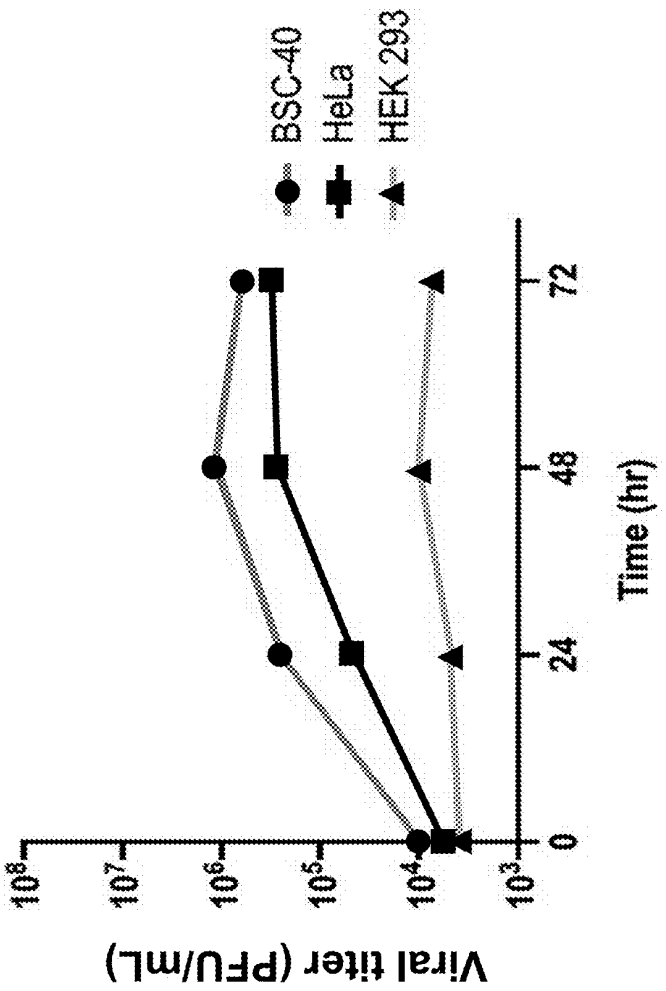


Figure 20A

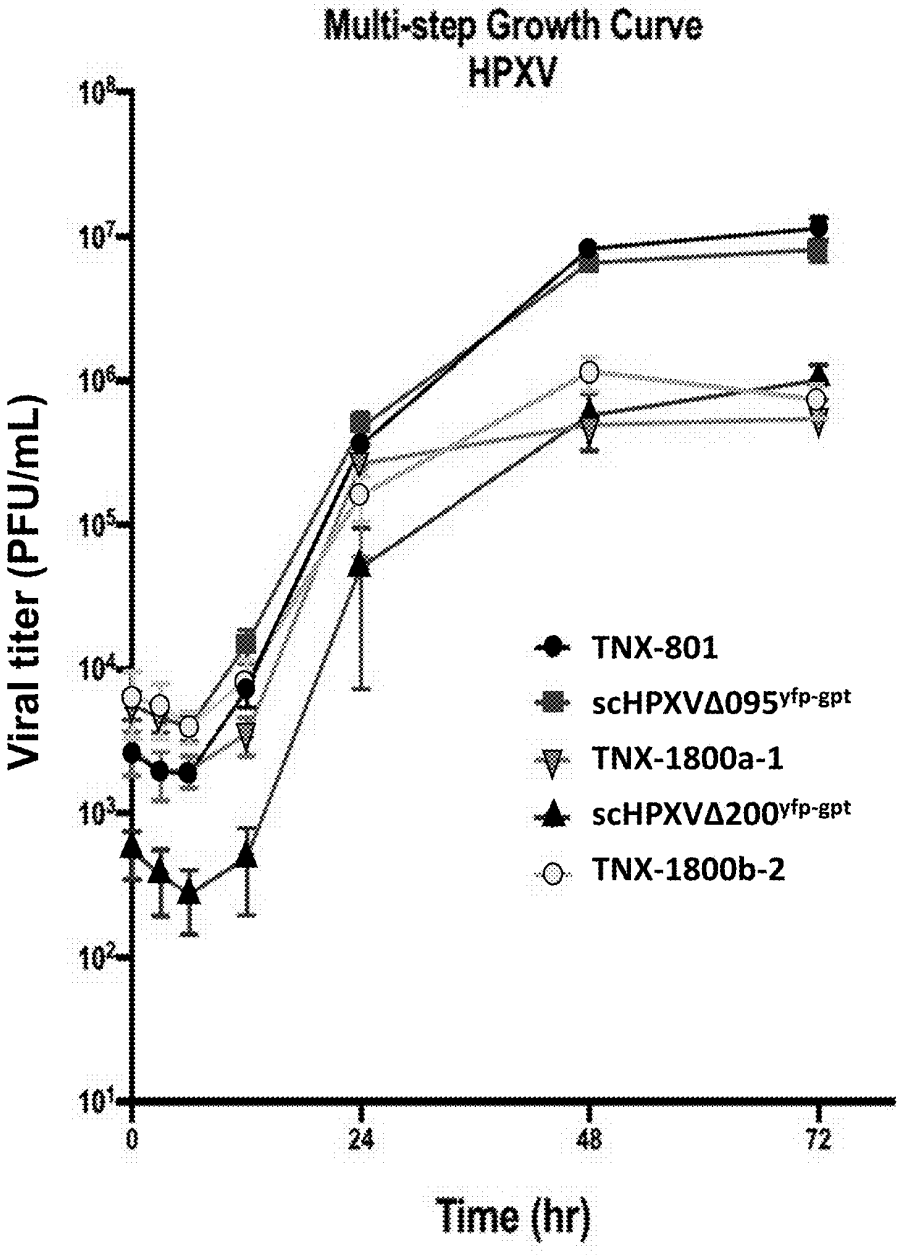

Multi-step Growth Curve
HPXV
Viral titer (PFU/mL)
10^8
10^7
10^6
10^5
10^4
10^3
10^2
10^1
0
24
48
72
Time (hr)
TNX-801
scHPXVΔ095yfp-gpt
TNX-1800a-1
scHPXVΔ200yfp-gpt
TNX-1800b-2

Figure 20B

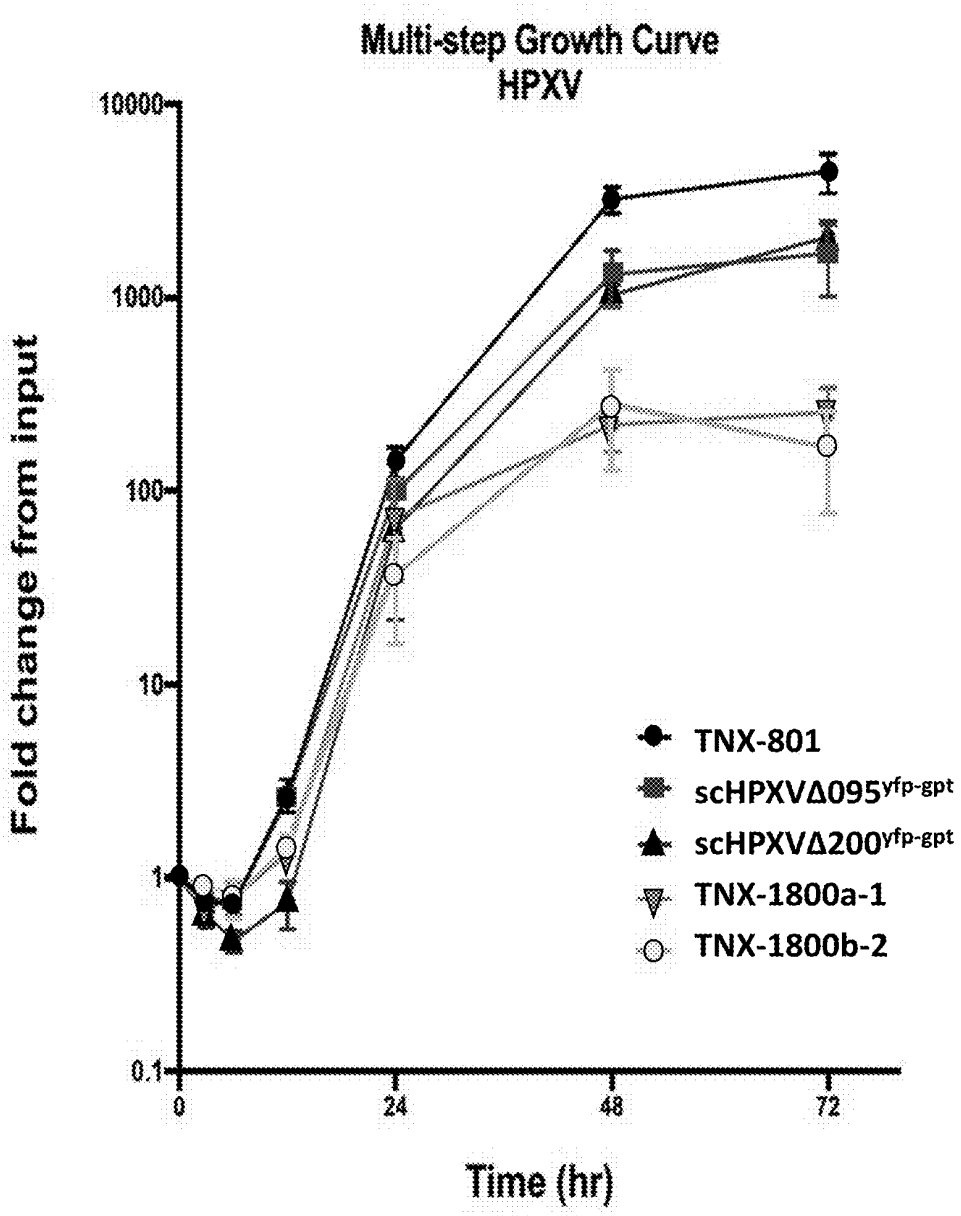

Multi-step Growth Curve
HPXV
Fold change from input
10000
1000
100
10
1
0.1
0
24
48
72
Time (hr)
TNX-801
scHPXVΔ095yfp-gpt
scHPXVΔ200yfp-gpt
TNX-1800a-1
TNX-1800b-2

Figure 21A

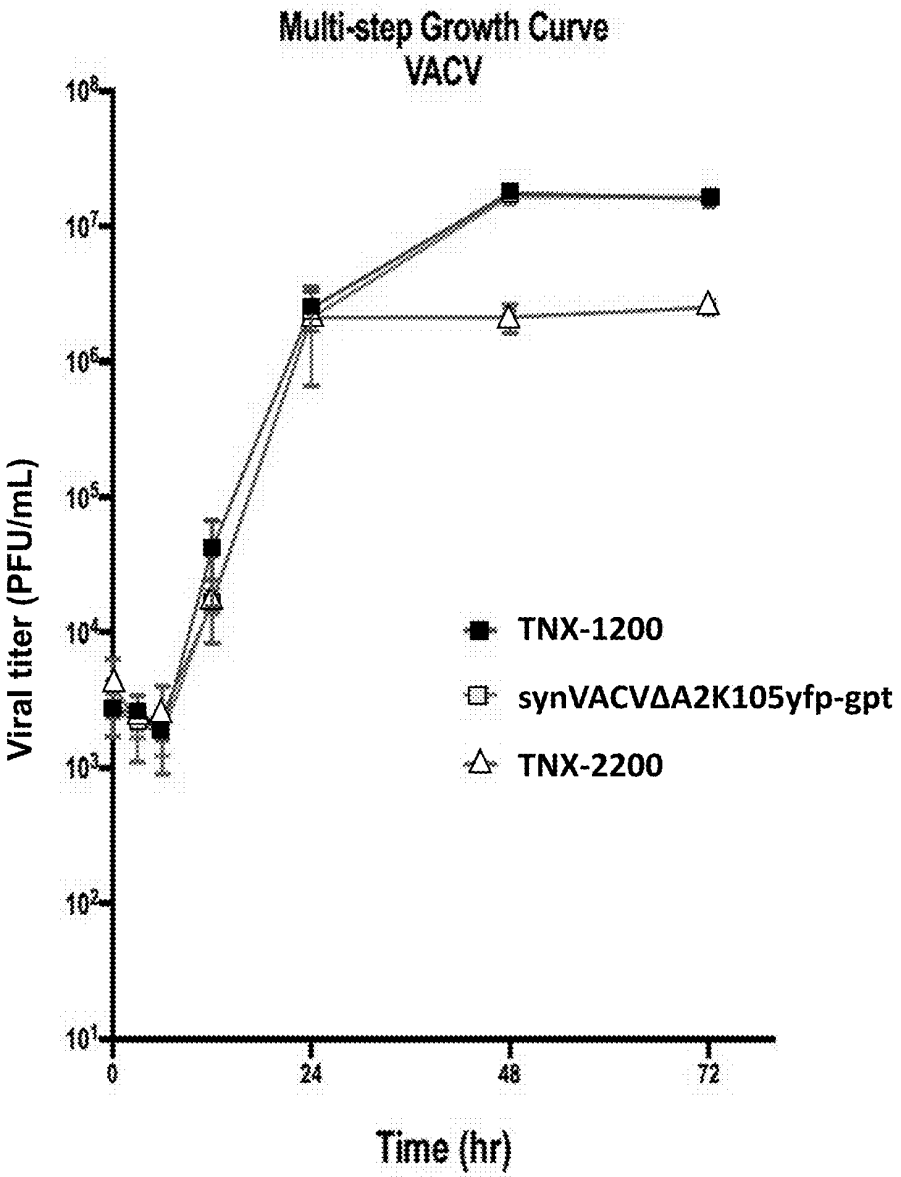

Multi-step Growth Curve
VACV
Viral titer (PFU/mL)
10^8
10^7
10^6
10^5
10^4
10^3
10^2
10^1
0
24
48
72
Time (hr)
TNX-1200
synVACVΔA2K105yfp-gpt
TNX-2200

Figure 21B

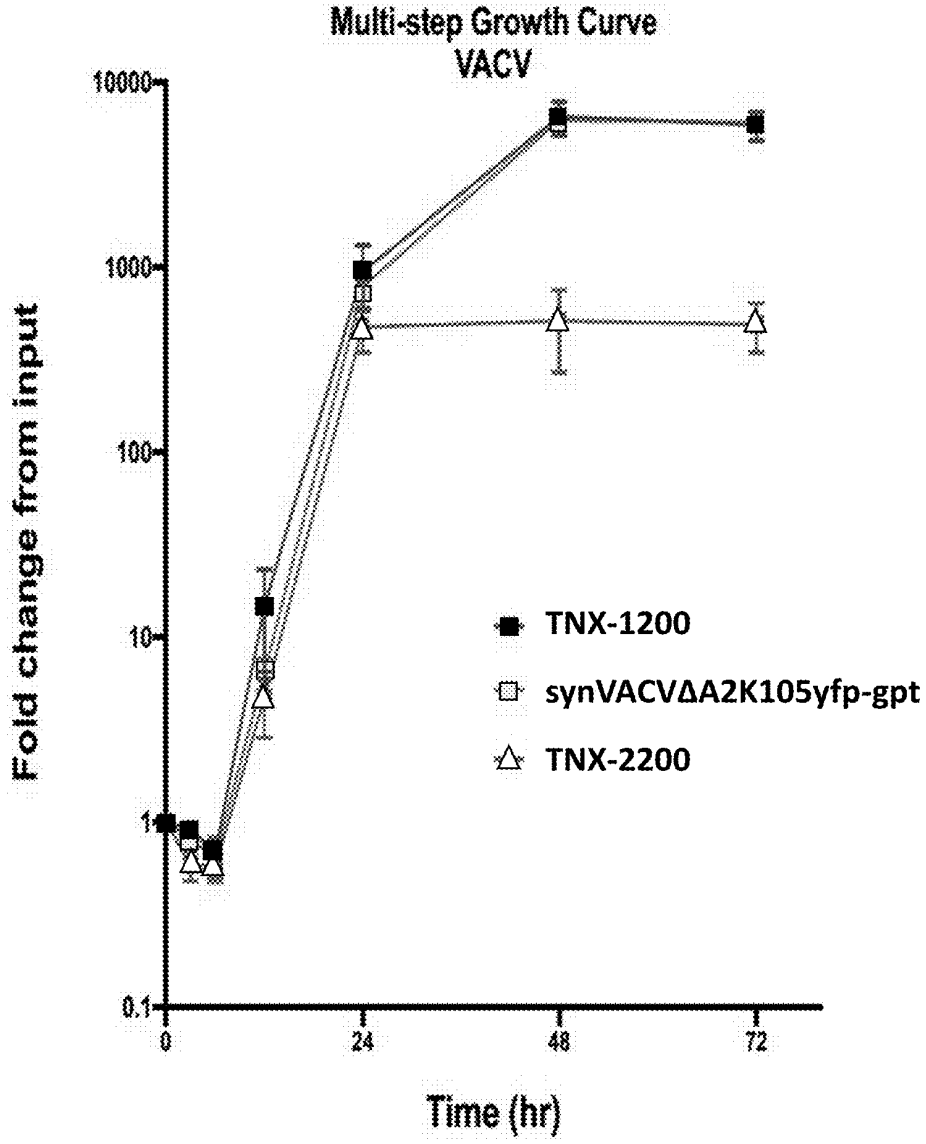
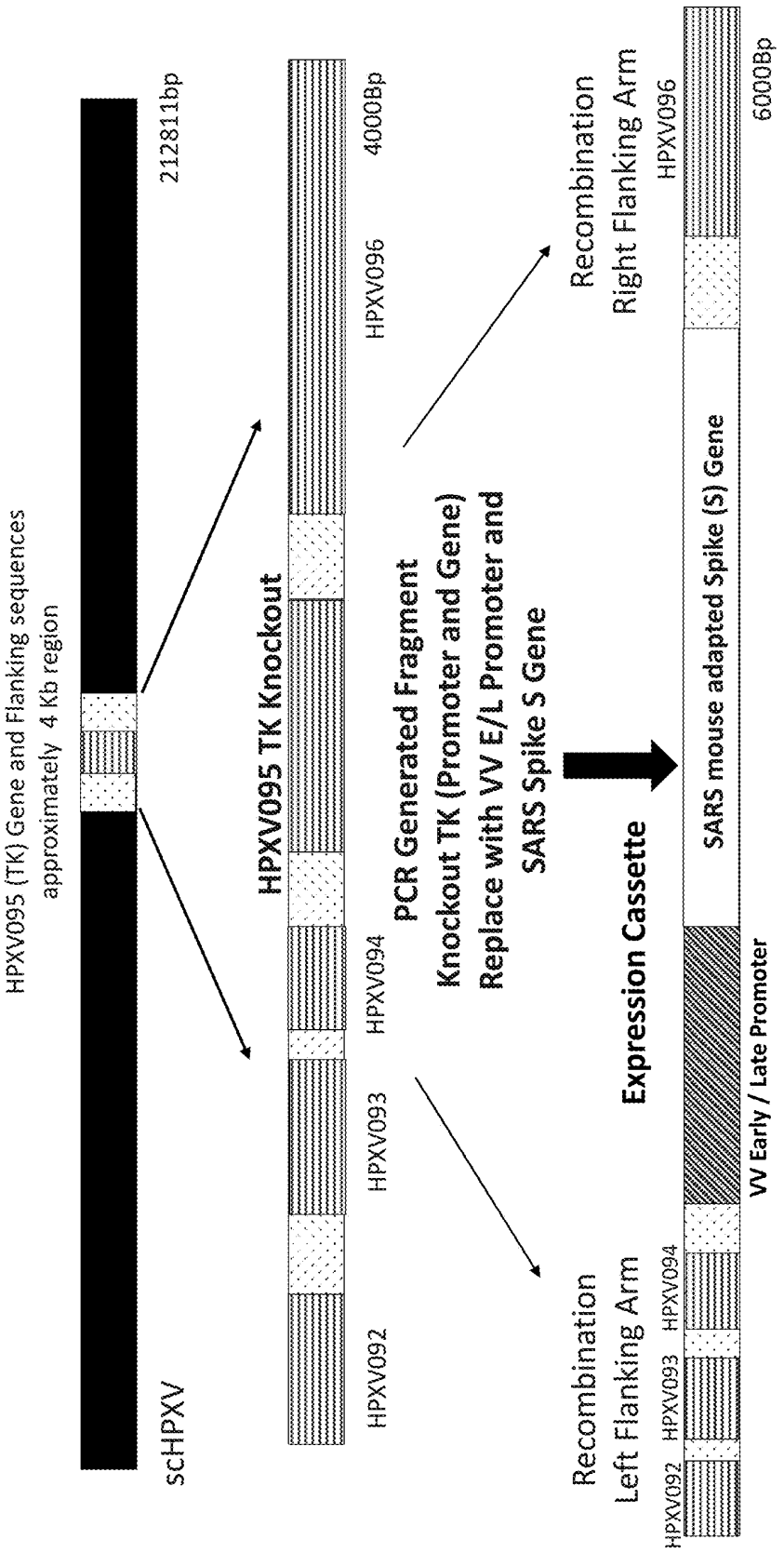

Multi-step Growth Curve
VACV
Fold change from input
10000
1000
100
10
1
0.1
0
24
48
72
Time (hr)
TNX-1200
synVACVΔA2K105yfp-gpt
TNX-2200

Figure 22


HPXV095 (TK) Gene and Flanking sequences
approximately 4 Kb region
212811bp
scHPXV
HPXV095 TK Knockout
4000Bp
HPXV096
HPXV094
HPXV093
HPXV092
PCR Generated Fragment
Knockout TK (Promoter and Gene)
Replace with VV E/L Promoter and
SARS Spike S Gene
Recombination
Right Flanking Arm
HPXV096
6000Bp
Expression Cassette
SARS mouse adapted Spike (S) Gene
VV Early / Late Promoter
Recombination
Left Flanking Arm
HPXV092
HPXV093
HPXV094

US 2021/0260182 A1 Aug. 26, 2021

RECOMBINANT POXVIRUS BASED VACCINE AGAINST SARS-COV-2 VIRUS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority and benefit from U.S. Provisional Application No. 62/981,997, filed Feb. 26, 2020 and U.S. Provisional Application No. 63/114,514, filed Nov. 16, 2020, the contents of which are hereby incorporated by reference in its entirety.

SEQUENCE LISTING

[0002] The instant application contains a Sequence Listing which has been submitted electronically in ASCII format and is hereby incorporated by reference in its entirety. Said ASCII copy, created on Feb. 26, 2021, is named 104545-0047-101-SL.txt and is 766,062 bytes in size.

BACKGROUND OF THE DISCLOSURE

[0003] On Dec. 31, 2019 the Wuhan Health Commission reported a cluster of atypical pneumonia cases in the city of Wuhan, China. The first patients began experiencing symptoms of illness in mid-December 2019. Clinical isolates were found to contain a novel coronavirus. As of Jan. 28, 2020, there are in excess of 4,500 laboratory-confirmed cases, with >100 known deaths. The novel coronavirus is currently referred to as SARS-CoV-2 or 2019-nCoV and is related to Severe Acute Respiratory Syndrome coronavirus (SARS-CoV), although with only approximately 80% similarity at the nucleotide level. Ralph et al. J Infect Dev Ctries. 2020 Jan. 31; 14(1):3-17.

[0004] Coronaviruses are enveloped single stranded RNA viruses with positive-sense RNA genomes ranging from 25.5 to ~32 kb in length. The spherical virus particles range from 70-120 nm in diameter with four structural proteins.

[0005] Despite the fact that a much effort is currently being invested into methods of providing vaccines and delivery vectors for SARS-CoV-2, there is still a need to provide additional and improved approaches against this coronavirus.

SUMMARY OF THE DISCLOSURE

[0006] An aspect of the present disclosure provides a recombinant poxvirus comprising a nucleic acid encoding a SARS-CoV-2 virus protein, methods for producing such viruses and the use of such viruses, for example, as immunogens, in immunogenic formulations against SARS-CoV-2 virus. Another aspect of the present disclosure provides a recombinant synthetic poxvirus comprising a nucleic acid encoding a SARS-CoV-2 virus protein, methods for producing such viruses and the use of such viruses, for example, as immunogens, in immunogenic formulations against SARS-CoV-2 virus. In some embodiments, the synthetic poxviruses are assembled and replicated from chemically synthesized DNA which are safe, reproducible and free of contaminants. Because chemical genome synthesis is not dependent on a natural template, a plethora of structural and functional modifications of the viral genome are possible. Chemical genome synthesis is particularly useful when a natural template is not available for genetic replication or modification by conventional molecular biology methods.

[0007] In one aspect, the disclosure relates to recombinant poxviruses comprising a nucleic acid encoding a SARS-CoV-2 virus protein, wherein the SARS-CoV-2 protein is selected from the group consisting of the spike protein (S), the membrane protein (M) and the nucleocapsid protein (N), or combinations of two or more of said proteins.

[0008] In another aspect, the disclosure relates to pharmaceutical compositions comprising the recombinant poxviruses of the disclosure.

[0009] In another aspect, the disclosure relates to cells infected with the recombinant poxviruses of the disclosure.

[0010] In another aspect, the disclosure relates to methods for selecting a cell that expresses a SARS-CoV-2 virus protein, comprising infecting said cell with the recombinant poxvirus of the disclosure and selecting the infected cell expressing said SARS-CoV-2 virus protein.

[0011] In another aspect, the disclosure relates to methods of inducing an immune response against a SARS-CoV-2 virus in a subject in need or at risk therefor, comprising administering to said subject an immunologically effective amount of a recombinant poxvirus of the disclosure.

[0012] In another aspect, the disclosure relates to methods of generating the recombinant poxviruses of the disclosure, the methods comprising: (a) infecting a host cell with a poxvirus; (b) transfecting the infected cell of step (a) with a nucleic acid encoding a SARS-CoV-2 virus protein to generate a recombinant poxvirus; and (c) selecting a recombinant poxvirus, wherein the nucleic acid encoding a SARS-CoV-2 virus protein is located, upon transfection, in a region of the poxvirus that is not essential for the replication of the poxvirus.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] For the purpose of illustrating the disclosure that are shown in the drawings and various embodiment(s) of this disclosure. It should be understood, however, that the disclosure is not limited to the precise arrangements and instrumentalities shown in the drawings.

[0014] FIG. **1**. Schematic representation of the linear dsDNA synthetic HPXV (GenBank accession Number KY349117) and synthetic VACV (synVACV) (GenBank accession Number MN974381) genomes. The Thymidine Kinase (TK) gene locus is depicted in orange. The TK gene locus in HPXV is located at genome positions: 92077-92610 with gene ID HPXV095 (SEQ ID NO: 1). The TK gene locus in VACV is located at genome positions: 83823-84344 with gene ID synVACV_105 (SEQ ID NO: 2).

[0015] FIG. **2**. Schematic representation of the TK gene locus (HPXV095) of HPXV of approximately 4 kb, located between the HPXV094 and HPXV096 flanking regions.

[0016] FIG. **3**. Sequence alignment of the TK gene locus of synthetic HPXV and synthetic VACV ACAM2000, where it is shown that the nucleotide similarity is around 99%. FIG. **3** refers to SEQ ID NOs: 34-36, respectively, in order of appearance.

[0017] FIG. **4**. Schematic representation of the linear dsDNA HPXV, showing the generation of the PCR fragment encoding the SARS-CoV-2 expression cassette. The expression cassette is introduced in the TK gene locus of the HPXV genome and comprises the SARS-CoV2 Spike S gene that is operatively linked to a vaccinia virus early and late promoter inserted upstream of the SARS-CoV-2 Spike S gene.

[0018] FIG. **5**. Schematic representation of the HPXV and VACV, ACAM 2000 rescue viruses and the insertion of the

[0033] FIGS. **20**A and **20**B. Viral growth curves in BSC-40 cells infected with a synthetic horsepox virus (HPXV) over time. FIG. **20**A shows viral titer (PFU/mL) measured in cells infected with TNX-801, scHPXVΔ095$^{vfp\text{-}gpt}$, TNX-1800a-1, scHPXVΔ200$^{vfp\text{-}gpt}$, or TNX-1800b-2; FIG. **20**B shows fold change from input in infected cells.

[0034] FIGS. **21**A and **21**B. Viral growth curves in BSC-40 cells infected with a synthetic vaccinia virus (VACV) over time. FIG. **21**A shows viral titer (PFU/mL) measured in cells infected with TNX-1200, TNX-2200 or synVACVΔA2K105$^{vfp\text{-}gpt}$; FIG. **21**B shows fold change from input in infected cells.

[0035] FIG. **22**. Schematic representation of a linear dsDNA HPXV, showing the generation of a PCR fragment encoding a SARS-CoV-2 expression cassette. The expression cassette is introduced into the TK gene locus of the HPXV genome and comprises a DNA encoding the SARS-CoV2 Spike S gene protein that is operatively linked to a vaccinia virus early and late promoter inserted upstream of the SARS-CoV-2 Spike S DNA. The expression cassette further comprises a 1 kb HPXV left flanking arm (e.g., HPXV092, HPXV093 and HPXV094) and a 1 kb HPXV right flanking arm (e.g., HPXV096).

ratory Manual, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, N.Y. (1998); Coligan et al., Short Protocols in Protein Science, John Wiley & Sons, N Y (2003); Short Protocols in Molecular Biology (Wiley and Sons, 1999).

[0038] Enzymatic reactions and purification techniques are performed according to manufacturer's specifications, as commonly accomplished in the art or as described herein. The nomenclatures used in connection with, and the laboratory procedures and techniques of, analytical chemistry, biochemistry, immunology, molecular biology, synthetic organic chemistry, and medicinal and pharmaceutical chemistry described herein are those well-known and commonly used in the art. Standard techniques are used for chemical syntheses, and chemical analyses.

[0039] Throughout this specification and embodiments, the word "comprise," or variations such as "comprises" or "comprising," will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

[0040] The term "including" is used to mean "including but not limited to." "Including" and "including but not limited to" are used interchangeably.

[0041] Any example(s) following the term "e.g." or "for

modified nucleotides or bases, and/or their analogs, or any substrate that can be incorporated into a chain by DNA or RNA polymerase. A polynucleotide may comprise modified nucleotides, such as methylated nucleotides and their analogs. If present, modification to the nucleotide structure may be imparted before or after assembly of the chain. The sequence of nucleotides may be interrupted by non-nucleotide components. A polynucleotide may be further modified after polymerization, such as by conjugation with a labeling component. Other types of modifications include, for example, "caps", substitution of one or more of the naturally occurring nucleotides with an analog; internucleotide modifications such as, for example, those with uncharged linkages (e.g., methyl phosphonates, phosphotriesters, phosphoamidates, carbamates, etc.) and with charged linkages (e.g., phosphorothioates, phosphorodithioates, etc.); those containing pendant moieties, such as, for example, proteins (e.g., nucleases, toxins, antibodies, signal peptides, poly-L-lysine, etc.); those with intercalators (e.g., acridine, psoralen, etc.); those containing chelators (e.g., metals, radioactive metals, boron, oxidative metals, etc.); those containing alkylators; those with modified linkages (e.g., alpha anomeric nucleic acids, etc.); as well as unmodified modifications known in the art. It is understood that the polypeptides can occur as single chains or associated chains.

[0060] "Percent (%) sequence identity" or "sequence % identical to" with respect to a reference polypeptide (or nucleotide) sequence is defined as the percentage of amino acid residues (or nucleic acids) in a candidate sequence that are identical with the amino acid residues (or nucleic acids) in the reference polypeptide (nucleotide) sequence, after aligning the sequences and introducing gaps, if necessary, to achieve the maximum percent sequence identity, and not considering any conservative substitutions as part of the sequence identity. Alignment for purposes of determining percent amino acid sequence identity can be achieved in various ways that are within the skill in the art, for instance, using publicly available computer software such as BLAST, BLAST-2, ALIGN or Megalign (DNASTAR) software. Those skilled in the art can determine appropriate parameters for aligning sequences, including any algorithms needed to achieve maximal alignment over the full length of the sequences being compared.

[0061] As outlined elsewhere herein, certain positions of the viral genome can be altered. By "position" as used herein is meant a location in the genome sequence. Corresponding

[0065] As used herein, the term "residue" in the context of a polypeptide refers to an amino-acid unit in the linear polypeptide chain. It is what remains of each amino acid, i.e. —NH—CHR—C—, after water is removed in the formation of the polypeptide from α-amino-acids, i.e. NH2-CHR—

known organism. The sequences can be incorporated in their native form or can be modified in any way to obtain a desired activity. For example, the sequences can comprise insertions, deletions or substitutions. A viral vector can also incorporate an insertion site for an exogenous polynucle-

[0077] In some embodiments, the poxvirus belongs to the Chordopoxvirinae subfamily. In some embodiments, the poxvirus belongs to a genus of Chordopoxvirinae subfamily selected from Avipoxvirus, Capripoxvirus, Cervidpoxvirus, Crocodylipoxvirus, Leporipoxvirus, Molluscipoxvirus, Orthopoxvirus, Parapoxvirus, Suipoxvirus, or Yatapoxvirus. In some embodiments, the recombinant poxvirus is an Orthopoxvirus. In some embodiments, the Orthopoxvirus is selected from the group consisting of camelpox virus (CMLV), cowpox virus (CPXV), ectromelia virus (ECTV, "mousepox agent"), horsepox virus (HPXV), monkeypox virus (MPXV), rabbitpox virus (RPXV), raccoonpox virus, skunkpox virus, Taterapox virus, Uasin Gishu disease virus, vaccinia virus (VACV), variola virus (VARV) and volepox virus (VPV). In some embodiments, the poxvirus is a Parapoxvirus. In some embodiments, the Parapoxvirus is selected from orf virus (ORFV), pseudocowpox virus (PCPV), bovine popular stomatitis virus (BPSV), squirrel parapoxvirus (SPPV), red deer parapoxvirus, Ausdyk virus, Chamois contagious ecythema virus, reindeer parapoxvirus, or sealpox virus. In some embodiments, the poxvirus is a Molluscipoxvirus. In some embodiments, the Molluscipoxvirus is molluscum contagiousum virus (MCV). In some etc.). In some embodiments, the modifications may include the attenuation or deletion of one or more virulence factors. In some embodiments, the modifications may include the addition or insertion of one or more virulence regulatory genes or gene-encoding regulatory factors.

[0079] Traditionally, the terminal hairpins of poxviruses have been difficult to clone and to sequence. As a result, some of the published genome sequences (e.g., VACV, ACAM 2000 and HPXV MNR-76) are incomplete. The published sequence of the HPXV genome is likewise incomplete, probably missing ~60 bp from the terminal ends. In an exemplary embodiment, 129 nt ssDNA fragments were chemically synthesized using the published sequence of the VACV terminal hairpins as a guide and ligated onto dsDNA fragments comprising left and right ends of the HPXV genome. In some embodiments, the terminal hairpins of the poxvirus of the disclosure are derived from VACV. In some embodiments, the terminal hairpins are derived from CMLV, CPXV, ECTV, HPXV, MPXV, RPXV, raccoonpox virus, skunkpox virus, Taterapox virus, Uasin Gishu disease virus or VPV. In some embodiments, the terminal hairpins are based on the terminal hairpins of any poxvirus whose genome has been completely sequenced or a natural isolate

Tsp45I, TspMI, TspRI, Tth111I, XbaI, XcmI, XhoI, XmaI, XmnI, or ZraI. It is understood that any desired restriction site(s) or combination of restriction sites may be inserted into the genome or mutated and/or eliminated from the genome. In some embodiments, one or more AarI sites are deleted from the viral genome. In some embodiments, one or more BsaI sites are deleted from the viral genome. In some embodiments, one or more restriction sites are completely eliminated from the genome (e.g. all the AarI sites in the viral genome may be eliminated). In some embodiments, one or more AvaI restriction sites are introduced into the viral genome. In some embodiments, one or more StuI sites are introduced into the viral genome. In some embodiments, the one or more modifications may include the incorporation of recombineering targets including but not limited to loxP or FRT sites.

[0081] In some embodiments, the poxvirus modifications may include the introduction of fluorescence markers such as but not limited to green fluorescent protein (GFP), enhanced GFP, yellow fluorescent protein (YFP), cyan/blue fluorescent protein (BFP), red fluorescent protein (RFP), or variants thereof, etc.; selectable markers such as but not limited to drug resistance markers (e.g. *E. coli* xanthine-guanine phosphoribosyl transferase gene (gpt), *Streptomy-*

about 90%, about 95%, about 96%, about 97%, about 98%, about 99%, over 99%, or 100% of the synthetic poxviral genome is derived from chemically synthesized DNA. In some embodiments, the poxviral genome is derived from a combination of chemically synthesized DNA and naturally occurring DNA.

[0084] The number of overlapping DNA fragments used to generate the synthetic poxvirus will depend on the size of the poxviral genome. Practical considerations such as reduction in recombination efficiency as the number of fragments increases on the one hand and difficulties in synthesizing very large DNA fragments as the number of fragments decreases on the other hand will also inform the number of overlapping fragments used. In some embodiments, the synthetic poxviral genome may be synthesized as a single fragment. In some embodiments, the synthetic poxviral genome is assembled from 2-14 overlapping DNA fragments. In some embodiments, the synthetic poxviral genome is assembled from 4-12 overlapping DNA fragments. In some embodiments, the synthetic poxviral genome is assembled from 6-10 overlapping DNA fragments. In some embodiments, the synthetic poxviral genome is assembled from 8-12 overlapping DNA fragments. In some embodiments, the synthetic poxviral genome is assembled from 10

fragments range in size is from about 4000 bp to 40000 bp. In some embodiments, the fragments range in size is from about 5000 bp to 35000 bp. In some embodiments, the largest fragments are about 20000 bp, 21000 bp, 22000 bp, 23000 bp, 24 000 bp, 25000 bp, 26000 bp, 27000 bp, 28000 bp, 29000 bp, 30000 bp, 31000 bp, 32000 bp, 33000 bp, 34000 bp, 35000 bp, 36000 bp, 37000 bp, 38000 bp, 39000 bp, 40000 bp, 41000 bp, 42000 bp, 43000 bp, 44000 bp, 45000 bp, 46000 bp, 47000 bp, 48000 bp, 49000 bp, or 50000 bp. In some embodiments, a scHPXV is reactivated from 10 chemically synthesized overlapping double-stranded DNA fragments ranging in size from about 8500 bp to about 32000 bp (Table 2).

[0087] The poxviruses of the present disclosure can be propagated in any substrate that allows the virus to grow to titers that permit the uses of the recombinant poxvirus described herein. The poxvirus of the present disclosure may be grown in cells (e.g. avian cells, bat cells, bovine cells, camel cells, canary cells, cat cells, deer cells, equine cells, fowl cells, gerbil cells, goat cells, human cells, monkey cells, pig cells, rabbit cells, raccoon cells, seal cells, sheep cells, skunk cells, vole cells, etc.) that are susceptible to infection by the poxviruses. In some embodiments, the

sizing overlapping DNA fragments that correspond to substantially all of the viral genome of the poxvirus and, optionally, chemically synthesizing the terminal hairpin loops from another virus or from another strain of virus; (ii) transfecting the overlapping DNA fragments into helper virus-infected cells; (iii) culturing said cells to produce a mixture of helper virus and synthetic poxvirus particles in said cells; and (iv) plating the mixture on host cells specific to the poxvirus to recover the synthetic poxvirus.

[0089] In some embodiments, the method of producing a synthetic horsepox virus comprises a step of (i) chemically synthesizing overlapping DNA fragments that correspond to substantially all of the viral genome of the horsepox virus and chemically synthesizing the terminal hairpin loops from another poxvirus (such as VACV, strain WB or NYCBH clone ACAM 2000); (ii) transfecting the overlapping DNA fragments into helper virus-infected cells; (iii) culturing said cells to produce a mixture of helper virus and synthetic horsepox virus particles in said cells; and (iv) plating the mixture on host cells specific to the horsepox virus to recover the synthetic horsepox virus.

[0090] In some embodiments, the poxvirus is a synthetic horsepox virus. In some embodiments, the synthetic horsepox virus genome is based on the published genome

(N), or combinations of two or more of said proteins. In some embodiments, the nucleotide sequence of the SARS-CoV-2 virus is any one of the published genome sequences.

[0097] In some embodiments, the nucleotide sequence encoding the S protein is modified with reference to a wild type nucleotide sequence. In some embodiments, the amino

protein (protein N of Wuhan-HU-1, Accession LC521925.1; SEQ ID NO: 11). In some embodiments, the amino acid sequence of the N protein is modified with reference to the wild type protein (protein N of Wuhan-HU-1, Accession MN988668.1; SEQ ID NO: 49).

[0100] In some embodiments, the nucleic acid sequence encoding the SARS-CoV-2 virus protein is modified with reference to the wild type protein. In some embodiments, the nucleic acid sequence encoding the SARS-CoV-2 virus protein is modified with reference to the wild type protein (SEQ ID NO: 9). In some embodiments, the nucleic acid sequence encoding the SARS-CoV-2 virus protein is modified with reference to the wild type protein (SEQ ID NO: 47). In some embodiments, the nucleic acid sequence encoding the SARS-CoV-2 virus protein is modified with reference to the wild type protein for efficient expression of transgenes in poxviruses. In some embodiments, the heterologous gene coding sequences containing the vaccinia Early Transcription Terminator Signal (ETTS) (TTTTTNT; also called T_5NT (SEQ ID NO: 14)) are removed. See Earl et al. Journal of Virology, 1990; 2448-2451; incorporated herein by reference in its entirety. In some embodiments, the poxvirus genome retains two overlapping endogenous ETTS. In some embodiments, the heterologous gene coding

start site and the ATG. In some embodiments, the spacer is 160 nucleotides long, resulting in enhanced levels of expression. See FIG. **9**. See Di Pilato et al. Journal of General Virology (2015), 96, 2360-2371; incorporated herein by reference in its entirety. In some embodiments, the vaccinia virus late promoter and the spacer comprises the sequence set forth in SEQ ID NO: 39. In some embodiments, the vaccinia virus late promoter and the spacer is the sequence set forth in SEQ ID NO: 39.

[0103] In some embodiments, the protein of the SARS-CoV-2 is inserted into a non-essential gene for replication. In some embodiments, the SARS-CoV-2 protein is inserted into the Thymidine Kinase (TK) locus (Gene ID HPXV095; positions 992077-92610; SEQ ID NO: 1) of the horsepox virus or the synthetic horsepox virus. In some embodiments, the SARS-CoV-2 protein is inserted into the Thymidine Kinase (TK) locus (Gene ID synVACV_105; positions 83823-84344; SEQ ID NO: 2) of the vaccinia virus or the synthetic vaccinia virus. The TK locus provides a stable insertion site for foreign genes of interest. The TK locus also provides a selection marker to identify those clones where the nucleic acid encoding a SARS-CoV-2 protein has been

Methods of the Disclosure

[0109] Any of the synthetic poxviruses disclosed in US 2018/0251736 and WO 2019/213452, may be used in any of the methods disclosed herein.

[0110] Any of the recombinant poxviruses comprising a nucleic acid encoding a SARS-CoV-2 virus protein described in the present disclosure may be used in any of the methods disclosed herein.

[0111] In one aspect, the disclosure relates to a method for selecting a cell that expresses a SARS-CoV-2 virus protein, comprising infecting said cell with the recombinant poxvirus of the disclosure and selecting the infected cell expressing said SARS-CoV-2 virus protein.

[0112] In another aspect, the disclosure relates to a method of inducing an immune response against a SARS-CoV-2 virus in a subject, comprising administering to said subject an immunologically effective amount of the recombinant poxvirus of the disclosure.

[0113] In another aspect, the disclosure relates to a method of generating a recombinant poxvirus of the disclosure, the method comprising:

(a) Infecting a host cell with a poxvirus;

(b) Transfecting the infected cell of step (a) with a nucleic acid encoding a SARS-CoV-2 virus protein to generate a recombinant poxvirus; and

virus. In some embodiments, the recombinant poxvirus is useful towards the method of inducing an immune response against a SARS-CoV-2 virus in a subject, wherein the immunologically effective amount of a recombinant poxvirus is capable of protecting the subject from SARS-CoV-2 virus. In some embodiments, the recombinant poxvirus is useful towards the method of inducing an immune response against a SARS-CoV-2 virus in a subject, wherein the immunologically effective amount of a recombinant poxvirus reduces or prevents the progression of the virus after SARS-CoV-2 infection in the subject. In some embodiments, the recombinant poxvirus is useful towards the method of inducing an immune response against a SARS-CoV-2 virus in a subject, wherein the immune response is a T-cell immune response.

[0116] In some embodiments, the recombinant poxvirus is useful towards the method of inducing an immune response against a SARS-CoV-2 virus and a poxvirus comprising administering to said subject an immunologically effective amount of a recombinant poxvirus or pharmaceutical composition. In some embodiments, the recombinant poxvirus is useful towards the method of inducing an immune response against the SARS-CoV-2 virus and the poxvirus, wherein said immunologically effective amount of the recombinant poxvirus is administered by scarification. In some embodi-

virus. In some embodiments, the recombinant poxvirus is useful towards the method of inducing T cell immunity against the SARS-CoV-2 virus, wherein the immunologically effective amount of a recombinant poxvirus reduces or prevents the progression of the virus after SARS-CoV-2 infection in the subject.

[0118] In some embodiments, the recombinant poxvirus is useful towards the method of inducing T cell immunity against a SARS-CoV-2 virus and a poxvirus comprising administering to a subject an immunologically effective amount of the recombinant poxvirus reduces or pharmaceutical composition. In some embodiments, the recombinant poxvirus is useful towards the method of inducing T cell immunity against the SARS-CoV-2 virus and the poxvirus, wherein said immunologically effective amount of the recombinant poxvirus is administered by scarification. In some embodiments, the recombinant poxvirus is useful towards the method of inducing T cell immunity against the SARS-CoV-2 virus and the poxvirus, wherein the immunologically effective amount of a recombinant poxvirus is capable of protecting the subject from the SARS-CoV-2 virus and the poxvirus. In some embodiments, the recombinant poxvirus is useful towards the method of inducing T cell immunity against the SARS-CoV-2 virus and the poxvirus, wherein the poxvirus is vaccinia virus, variola, horsepox virus or monkeypox virus.

[0119] In some embodiments, the recombinant poxvirus is useful towards the method of reducing or preventing the progression of a SARS-CoV-2 virus infection in a subject in need or at risk thereof comprising administering to said subject an immunologically effective amount of the recombinant poxvirus or pharmaceutical composition.

[0120] In some embodiments, the recombinant poxvirus is useful towards the method of reducing or preventing the progression of a SARS-CoV-2 virus and a poxvirus infection in a subject in risk thereof comprising administering to said subject an immunologically effective amount of the recombinant poxvirus or pharmaceutical composition. In some embodiments, the recombinant poxvirus is useful towards the method of reducing or preventing the progression of the SARS-CoV-2 virus and the poxvirus infection, wherein the poxvirus is vaccinia virus, variola, horsepox virus or monkeypox virus.

[0121] In some embodiments, the recombinant poxvirus is useful for a vaccine against a SARS-CoV-2 virus comprising a recombinant virus or a pharmaceutical composition.

[0122] In some embodiments, the recombinant poxvirus is useful for a bivalent vaccine against a SARS-CoV-2 virus

TABLE 1

Compilation of some of the sequences of the present disclosure.		
1	ATTTACGGATTCACCAATAAAAATAAACTAGAGAAACTTAGTACTAATAAGGAAC	55
56	TAGAATCGTATAGTTCTAGCCCTCTTCAAGAACCCATTAGGTTAAATGATTTTCT	110
111	GGGACTATTGGAATGTATTAAAAAGAATATTCCTCTAACAGATATTCCGACAAAG	165
166	GATTGATTACTATAAATGGAGAATGTTCCTAATGTATACTTTAATCCTGTGTTTA	220
221	TAGAGCCCACGTTTAAACATTCTTTATTAAGTGTTTATAAACACAGATTAATAGT	275
276	TTTATTTGAAGTATTCATTGTATTCATTCTAATATATGTATTTTTTAGATCTGAA	330
331	TTAAATATGTTCTTCATGCCTAAACGAAAAATACCCGATCCTATTGATAGATTAC	385
386	GACGTGCTAATCTAGCGTGTGAAGACGATAAGTTAATGATCTATGGATTACCATG	440
441	GATGACAACTCAAACATCTGCGTTATCAATAAATAGTAAACCGATAGTGTATAAA	495
496	GATTGTGCAAAGCTTTTGCGATCAATAAATGGATCACAACCAGTATCTCTTAACG	550
551	ATGTTCTTCGCAGATGATGATTCATTTTTTAAGTATTTGGCTAGTCAAGATGATG	605
606	AATCTTCATTATCTGATATATTGCAAATCACTCAATATCTAGACTTTCTGTTATT	660
661	ATTATTGATCCAATCAAAAAATAAATTAGAAGCCGTGGGTCATTGTTATGAATCT	715
716	CTTTCAGAGGAATACAGACAATTGACAAAATTCACAGACTTTCAAGATTTTAAAA	770
771	AACTGTTTAACAAGGTCCCTATTGTTACAGATGGAAGGGTCAAACTTAATAAAGG	825
826	ATATTTGTTCGACTTTGTGATTAGTTTGATGCGATTCAAAAAAGAATCCTCTCTA	880
881	GCTACCACCGCAATAGATCCTATTAGATACATAGATCCTCGTCGTGATATCGCAT	935
936	TTTCTAACGTGATGGATATATTAAAGTTGAATAAAGTGAACAATAATTAATTCTT	990
991	TATTGTCATCTTTTATTTTTTTTTTTTGGAATATAAATATCCGGTAAAATTGAAA	1045
1046	AAATATACACTAATTAGCGTCTCGTTTCAGACGCTAGCTCGAGGTTGGGAGCTCT	1100
1101	CCGGATCCAAGCTTATCGATTTCGAACCCGGGGTACCGAATTCCTCGAGGTTGGG	1155
1156	AGCTCTCCGGATCCAAGCTTATCGATTTCGAACCCGGGGTACCGAATTCCTCGAG	1210
1211	ATGTTTATTTTCTTATTATTTCTTACTCTCACTAGTGGTAGTGACCTTGACCGGT	1265
1266	GCACCACTTTTGATGATGTTCAAGCTCCTAATTACACTCAACATACTTCATCTAT	1320
1321	GAGGGGGGTTTACTATCCTGATGAAATTTTTAGATCAGACACTCTTTATTTAACT	1375
1376	CAGGATTTATTTCTTCCATTTTATTCTAATGTTACAGGGTTTCATACTATTAATC	1430
1431	ATACGTTTGGCAACCCTGTCATACCTTTTAAGGATGGTATTTATTTTGCTGCCAC	1485
1486	AGAGAAATCAAATGTTGTCCGTGGTTGGGTTTTTGGTTCTACCATGAACAACAAG	1540
1541	TCACAGTCGGTGATTATTATTAACAATTCTACTAATGTTGTTATACGAGCATGTA	1595
1596	ACTTTGAATTGTGTGACAACCCTTTCTTTGCTGTTTCTAAACCCATGGGTACACA	1650
1651	GACACATACTATGATATTCGATAATGCATTTAATTGCACTTTCGAGTACATATCT	1705
1706	GATGCCTTTTCGCTTGATGTTTCAGAAAAGTCAGGTAATTTTAAACACTTACGAG	1760
1761	AGTTTGTGTTTAAAAATAAAGATGGGTTTCTCTATGTTTATAAGGGCTATCAACC	1815
1816	TATAGATGTAGTTCGTGATCTACCTTCTGGTTTTAACACTTTGAAACCTATTTTT	1870
1871	AAGTTGCCTCTTGGTATTAACATTACAAATTTTAGAGCCATTCTTACAGCCTTTT	1925
1926	CACCTGCTCAAGACATTTGGGGCACGTCAGCTGCAGCCTATTTTGTTGGCTATTT	1980
1981	AAAGCCAACTACATTTATGCTCAAGTATGATGAAAATGGTACAATCACAGATGCT	2035
2036	GTTGATTGTTCTCAAAATCCACTTGCTGAACTCAAATGCTCTGTTAAGAGCTTTG	2090
2091	AGATTGACAAAGGAATTTACCAGACCTCTAATTTCAGGGTTGTTCCCTCAGGAGA	2145
2146	TGTTGTGAGATTCCCTAATATTACAAACTTGTGTCCTTTTGGAGAGGTTTTTAAT	2200
2201	GCTACTAAATTCCCTTCTGTCTATGCATGGGAGAGAAAAAAAATTTCTAATTGTG	2255
2256	TTGCTGATTACTCTGTGCTCTACAACTCAACATTCTTTTCAACCTTTAAGTGCTA	2310
2311	TGGCGTTTCTGCCACTAAGTTGAATGATCTTTGCTTCTCCAATGTCTATGCAGAT	2365
2366	TCTTTTGTAGTCAAGGGAGATGATGTAAGACAAATAGCGCCAGGACAAACTGGTG	2420
2421	TTATTGCTGATTATAATTATAAATTGCCAGATGATTTCATGGGTTGTGTCCTTGC	2475
2476	TTGGAATACTAGGAACATTGATGCTACTTCAACTGGTAATCATAATTATAAATAT	2530
2531	AGGTATCTTAGACATGGCAAGCTTAGGCCCTTTGAGAGAGACATATCTAATGTGC	2585
2586	CTTTCTCCCCTGATGGCAAACCTTGCACCCCACCTGCTCTTAATTGTTATTGGCC	2640
2641	ATTAAATGATTATGGTTTTTACACCACTACTGGCATTGGCTACCAACCTTACAGA	2695

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.		
2696	GTTGTAGTACTTTCTTTTGAACTTTTAAATGCACCGGCCACGGTTTGTGGACCAA	2750
2751	AATTATCCACTGACCTTATTAAGAACCAGTGTGTCAATTTTAATTTTAATGGACT	2805
2806	CACTGGTACTGGTGTGTTAACTCCTTCTTCAAAGAGATTTCAACCATTTCAACAA	2860
2861	TTTGGCCGTGATGTTTCTGATTTCACTGATTCCGTTCGAGATCCTAAAACATCTG	2915
2916	AAATATTAGACATTTCACCTTGCTCTTTTGGGGGTGTAAGTGTAATTACACCTGG	2970
2971	AACAAATGCTTCATCTGAAGTTGCTGTTCTATATCAAGATGTTAACTGCACTGAT	3025
3026	GTTTCTACAGCAATTCATGCAGATCAACTCACACCAGCTTGGCGCATATATTCTA	3080
3081	CTGGAAACAATGTATTCCAGACTCAAGCAGGCTGTCTTATAGGAGCTGAGCATGT	3135
3136	CGACACTTCTTATGAGTGCGACATTCCTATTGGAGCTGGCATTTGTGCTAGTTAC	3190
3191	CATACAGTTTCTTTATTACGTAGTACTAGCCAAAAATCTATTGTGGCTTATACTA	3245
3246	TGTCTTTAGGTGCTGATAGTTCAATTGCTTACTCTAATAACACCATTGCTATACC	3300
3301	TACTAACTTTTCAATTAGCATTACTACAGAAGTAATGCCTGTTTCTATGGCTAAA	3355
3356	ACCTCCGTAGATTGTAATATGTACATCTGCGGAGATTCTACTGAATGTGCTAATT	3410
3411	TGCTTCTCCAATATGGTAGCTTTTGCACACAACTAAATCGTGCACTCTCAGGTAT	3465
3466	TGCTGCTGAACAGGATCGCAACACACGTGAAGTGTTCGCTCAAGTCAAACAAATG	3520
3521	TACAAAACCCCAACTTTGAAATATTTTGGTGGTTTTAATTTTTCACAAATATTAC	3575
3576	CTGACCCTCTAAAGCCAACTAAGAGGTCTTTTATTGAGGACTTGCTCTTTAATAA	3630
3631	GGTGACACTCGCTGATGCTGGCTTCATGAAGCAATATGGCGAATGCCTAGGTGAT	3685
3686	ATTAATGCTAGAGATCTCATTTGTGCGCAGAAGTTCAATGGACTTACAGTGTTGC	3740
3741	CACCTCTGCTCACTGATGATATGATTGCTGCCTACACTGCTGCTCTAGTTAGTGG	3795
3796	TACTGCCACTGCTGGATGGACATTTGGTGCTGGCGCTGCTCTTCAAATACCTTTT	3850
3851	GCTATGCAAATGGCATATAGGTTCAATGGCATTGGAGTTACCCAAAATGTTCTCT	3905
3906	ATGAGAACCAAAAACAAATCGCCAACCAATTTAACAAGGCGATTAGTCAAATTCA	3960
3961	AGAATCACTTACAACAACATCAACTGCATTGGGCAAGCTGCAAGACGTTGTTAAC	4015
4016	CAGAATGCTCAAGCATTAAACACACTTGTTAAACAACTTAGCTCTAATTTTGGTG	4070
4071	CAATTTCAAGTGTGCTAAATGATATCCTTTCGCGACTTGATAAAGTCGAGGCGGA	4125
4126	GGTACAAATTGACAGGTTAATTACAGGCAGACTTCAAAGCCTTCAAACCTATGTA	4180
4181	ACACAACAACTAATCAGGGCTGCTGAAATCAGGGCTTCTGCTAATCTTGCTGCTA	4235
4236	CTAAAATGTCTGAGTGTGTTCTTGGACAATCAAAAAGAGTTGACTTTTGTGGAAA	4290
4291	GGGCTACCACCTTATGTCCTTCCCACAAGCAGCCCCGCATGGTGTTGTCTTCCTA	4345
4346	CATGTCACGTATGTGCCATCCCAGGAGAGGAACTTCACCACAGCGCCAGCAATTT	4400
4401	GTCATGAAGGCAAAGCATACTTCCCTCGTGAAGGTGTTTTCGTGTTTAATGGCAC	4455
4456	TTCTTGGTTTATTACACAGAGGAACTTCTTTTCTCCACAAATAATTACTACAGAC	4510
4511	AATACATTTGTCTCAGGAAATTGTGATGTCGTTATTGGCATCATTAACAACACAG	4565
4566	TTTATGATCCTCTGCAACCTGAGCTCGACTCATTCAAAGAAGAGCTGGACAAGTA	4620
4621	CTTCAAAAATCATACATCACCAGATGTTGATCTTGGCGACATTTCAGGCATTAAC	4675
4676	GCTTCTGTCGTCAACATTCAAAAAGAAATTGACCGCCTCAATGAGGTCGCTAAAA	4730
4731	ATTTAAATGAATCACTCATTGACCTTCAAGAATTGGGAAAATATGAGCAATATAT	4785
4786	TAAATGGCCTTGGTATGTTTGGCTCGGCTTCATTGCTGGACTAATTGCCATCGTC	4840
4841	ATGGTTACAATCTTGCTTTGTTGCATGACTAGTTGTTGCAGTTGCCTCAAGGGTG	4895
4896	CATGCTCTTGTGGTTCTTGCTGCAAGTTTGATGAGGATGACTCTGAGCCAGTTCT	4950
4951	CAAGGGTGTCAAATTACATTACACATAATATTATATTTTTTATCTAAAAAACTAA	5005
5006	AAATAAACATTGATTAAATTTTAATATAATACTTAAAAATGGATGTTGTGTCGTT	5060
5061	AGATAAACCGTTTATGTATTTTGAGGAAATTGATAATGAGTTAGATTACGAACCA	5115
5116	GAAAGTGCAAATGAGGTCGCAAAAAAACTACCGTATCAAGGACAGTTAAAACTAT	5170
5171	TACTAGGAGAATTATTTTTTCTTAGTAAGTTACAGCGACACGGTATATTAGATGG	5225
5226	TGCCACCGTAGTGTATATAGGATCGGCTCCTGGTACACATATACGTTATTTGAGA	5280
5281	GATCATTTCTATAATTTAGGAATGATTATCAAATGGATGCTAATTGACGGACGCC	5335
5336	ATCATGATCCTATTCTAAATGGATTGCGTGATGTGACTCTAGTGACTCGGTTCGT	5390
5391	TGATGAGGAATATCTACGATCCATCAAAAAACAACTGCATCCTTCTAAGATTATT	5445
5446	TTAATTTCTGATGTAAGATCCAAACGAGGAGGAAATGAACCTAGTACGGCGGATT	5500

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.		
501	TACTAAGTAATTACGCTCTACAAAATGTCATGATTAGTATTTTAAACCCCGTGGC	5555
556	ATCTAGTCTTAAATGGAGATGCCCGTTTCCAGATCAATGGATCAAGGACTTTTAT	5610
611	ATCCCACACGGTAATAAAATGTTACAACCTTTTGCTCCTTCATATTCAGCTGAAA	5665
666	TGAGATTATTAAGTATTTATACCGGTGAGAACATGAGACTGACTCGAGTTACCAA	5720
721	ATTAGACGCTGTAAATTATGAAAAAAAGATGTACTACCTTAATAAGATCGTCCGT	5775
776	AACAAAGTAGTTGTTAACTTTGATTATCCTAATCAGGAATATGACTATTTTCACA	5830
831	TGTACTTTATGCTGAGGACCGTATACTGCAATAAAACATTTCCTACTACTAAAGC	5885
886	AAAGGTACTATTTCTACAACAATCTATATTTCGTTTCTTAAATATTCCAACAACA	5940
941	TCAACTGAAAAAGTTAGTCATGAACCAATACAACGTAA	5978
1	ATTTACGGATTCACCAATAAAAATAAACTAGAGAAACTTAGTACTAATAAGGAAC	55
56	TAGAATCGTATAGTTCTAGCCCTCTTCAAGAACCCATTAGGTTAAATGATTTTCT	110
111	GGGACTATTGGAATGTGTTAAAAAGAATATTCCTCTAACAGATATTCCGACAAAG	165
166	GATTGATTACTATAAATGGAGAATGTTCCTAATGTATACTTTAATCCTGTGTTTA	220
221	TAGAGCCCACGTTTAAACATTCTTTATTAAGTGTTTATAAACACAGATTAATAGT	275
276	TTTATTTGAAGTATTCGTTGTATTCATTCTAATATATGTATTTTTTAGATCTGAA	330
331	TTAAATATGTTCTTCATGCCTAAACGAAAAATACCCGATCCTATTGATAGATTAC	385
386	GACGTGCTAATCTAGCGTGTGAAGACGATAAATTAATGATCTATGGATTACCATG	440
441	GATGACAACTCAAACATCTGCGTTATCAATAAATAGTAAACCGATAGTGTATAAA	495
496	GATTGTGCAAAGCTTTTGCGATCAATAAATGGATCACAACCAGTATCTCTTAACG	550
551	ATGTTCTTCGCAGATGATGATTCATTTTTTAAGTATTTGGCTAGTCAAGATGATG	605
606	AATCTTCATTATCTGATATATTGCAAATCACTCAATATCTAGACTTTCTGTTATT	660
661	ATTATTGATCCAATCAAAAAATAAATTAGAAGCCGTGGGTCATTGTTATGAATCT	715
716	CTTTCAGAGGAATACAGACAATTGACAAAATTCACAGACTCTCAAGATTTTAAAA	770
771	AACTGTTTAACAAGGTCCCTATTGTTACAGATGGAAGGGTCAAACTTAATAAAGG	825
826	ATATTTGTTCGACTTTGTGATTAGTTTGATGCGATTCAAAAAAGAATCAGCTCTA	880
881	GCTACCACCGCAATAGATCCTGTTAGATACATAGATCCTCGTCGCGATATCGCAT	935
936	TTTCTAACGTGATGGATATATTAAAGTCGAATAAAGTGAACAATAATTAATTCTT	990
991	TATTGTCATCTTTTATTTTTTTTTTTTGGAATATAAATATCCGGTAAAATTGAAA	1045
046	AAATATACACTAATTAGCGTCTCGTTTCAGACGCTAGCTCGAGGTTGGGAGCTCT	1100
101	CCGGATCCAAGCTTATCGATTTCGAACCCGGGGTACCGAATTCCTCGAGGTTGGG	1155
156	AGCTCTCCGGATCCAAGCTTATCGATTTCGAACCCGGGGTACCGAATTCCTCGAG	1210
211	ATGTTTATTTTCTTATTATTTCTTACTCTCACTAGTGGTAGTGACCTTGACCGGT	1265
266	GCACCACTTTTGATGATGTTCAAGCTCCTAATTACACTCAACATACTTCATCTAT	1320
321	GAGGGGGGTTTACTATCCTGATGAAATTTTTAGATCAGACACTCTTTATTTAACT	1375
376	CAGGATTTATTTCTTCCATTTTATTCTAATGTTACAGGGTTTCATACTATTAATC	1430
431	ATACGTTTGGCAACCCTGTCATACCTTTTAAGGATGGTATTTATTTTGCTGCCAC	1485
486	AGAGAAATCAAATGTTGTCCGTGGTTGGGTTTTTGGTTCTACCATGAACAACAAG	1540
541	TCACAGTCGGTGATTATTATTAACAATTCTACTAATGTTGTTATACGAGCATGTA	1595
596	ACTTTGAATTGTGTGACAACCCTTTCTTTGCTGTTTCTAAACCCATGGGTACACA	1650
651	GACACATACTATGATATTCGATAATGCATTTAATTGCACTTTCGAGTACATATCT	1705
706	GATGCCTTTTCGCTTGATGTTTCAGAAAAGTCAGGTAATTTTAAACACTTACGAG	1760
761	AGTTTGTGTTTAAAAATAAAGATGGGTTTCTCTATGTTTATAAGGGCTATCAACC	1815
816	TATAGATGTAGTTCGTGATCTACCTTCTGGTTTTAACACTTTGAAACCTATTTTT	1870
871	AAGTTGCCTCTTGGTATTAACATTACAAATTTTAGAGCCATTCTTACAGCCTTTT	1925
926	CACCTGCTCAAGACATTTGGGGCACGTCAGCTGCAGCCTATTTTGTTGGCTATTT	1980
981	AAAGCCAACTACATTTATGCTCAAGTATGATGAAAATGGTACAATCACAGATGCT	2035
036	GTTGATTGTTCTCAAAATCCACTTGCTGAACTCAAATGCTCTGTTAAGAGCTTTG	2090
091	AGATTGACAAAGGAATTTACCAGACCTCTAATTTCAGGGTTGTTCCCTCAGGAGA	2145
146	TGTTGTGAGATTCCCTAATATTACAAACTTGTGTCCTTTTGGAGAGGTTTTTAAT	2200
201	GCTACTAAATTCCCTTCTGTCTATGCATGGGAGAGAAAAAAAATTTCTAATTGTG	2255

TABLE 1-continued

ompilation of some of the sequences of the present disclosure.		
6	TTGCTGATTACTCTGTGCTCTACAACTCAACATTCTTTTCAACCTTTAAGTGCTA	2310
1	TGGCGTTTCTGCCACTAAGTTGAATGATCTTTGCTTCTCCAATGTCTATGCAGAT	2365
6	TCTTTTGTAGTCAAGGGAGATGATGTAAGACAAATAGCGCCAGGACAAACTGGTG	2420
1	TTATTGCTGATTATAATTATAAATTGCCAGATGATTTCATGGGTTGTGTCCTTGC	2475
6	TTGGAATACTAGGAACATTGATGCTACTTCAACTGGTAATCATAATTATAAATAT	2530
1	AGGTATCTTAGACATGGCAAGCTTAGGCCCTTTGAGAGAGACATATCTAATGTGC	2585
6	CTTTCTCCCCTGATGGCAAACCTTGCACCCCACCTGCTCTTAATTGTTATTGGCC	2640
1	ATTAAATGATTATGGTTTTTACACCACTACTGGCATTGGCTACCAACCTTACAGA	2695
6	GTTGTAGTACTTTCTTTTGAACTTTTAAATGCACCGGCCACGGTTTGTGGACCAA	2750
1	AATTATCCACTGACCTTATTAAGAACCAGTGTGTCAATTTTAATTTTAATGGACT	2805
6	CACTGGTACTGGTGTGTTAACTCCTTCTTCAAAGAGATTTCAACCATTTCAACAA	2860
1	TTTGGCCGTGATGTTTCTGATTTCACTGATTCCGTTCGAGATCCTAAAACATCTG	2915
6	AAATATTAGACATTTCACCTTGCTCTTTTGGGGGTGTAAGTGTAATTACACCTGG	2970
1	AACAAATGCTTCATCTGAAGTTGCTGTTCTATATCAAGATGTTAACTGCACTGAT	3025
6	GTTTCTACAGCAATTCATGCAGATCAACTCACACCAGCTTGGCGCATATATTCTA	3080
1	CTGGAAACAATGTATTCCAGACTCAAGCAGGCTGTCTTATAGGAGCTGAGCATGT	3135
6	CGACACTTCTTATGAGTGCGACATTCCTATTGGAGCTGGCATTTGTGCTAGTTAC	3190
1	CATACAGTTTCTTTATTACGTAGTACTAGCCAAAAATCTATTGTGGCTTATACTA	3245
6	TGTCTTTAGGTGCTGATAGTTCAATTGCTTACTCTAATAACACCATTGCTATACC	3300
1	TACTAACTTTTCAATTAGCATTACTACAGAAGTAATGCCTGTTTCTATGGCTAAA	3355
6	ACCTCCGTAGATTGTAATATGTACATCTGCGGAGATTCTACTGAATGTGCTAATT	3410
1	TGCTTCTCCAATATGGTAGCTTTTGCACACAACTAAATCGTGCACTCTCAGGTAT	3465
6	TGCTGCTGAACAGGATCGCAACACACGTGAAGTGTTCGCTCAAGTCAAACAAATG	3520
1	TACAAAACCCCAACTTTGAAATATTTTGGTGGTTTTAATTTTTCACAAATATTAC	3575
6	CTGACCCTCTAAAGCCAACTAAGAGGTCTTTTATTGAGGACTTGCTCTTTAATAA	3630
1	GGTGACACTCGCTGATGCTGGCTTCATGAAGCAATATGGCGAATGCCTAGGTGAT	3685
6	ATTAATGCTAGAGATCTCATTTGTGCGCAGAAGTTCAATGGACTTACAGTGTTGC	3740
1	CACCTCTGCTCACTGATGATATGATTGCTGCCTACACTGCTGCTCTAGTTAGTGG	3795
6	TACTGCCACTGCTGGATGGACATTTGGTGCTGGCGCTGCTCTTCAAATACCTTTT	3850
1	GCTATGCAAATGGCATATAGGTTCAATGGCATTGGAGTTACCCAAAATGTTCTCT	3905
6	ATGAGAACCAAAAACAAATCGCCAACCAATTTAACAAGGCGATTAGTCAAATTCA	3960
1	AGAATCACTTACAACAACATCAACTGCATTGGGCAAGCTGCAAGACGTTGTTAAC	4015
6	CAGAATGCTCAAGCATTAAACACACTTGTTAAACAACTTAGCTCTAATTTTGGTG	4070
1	CAATTTCAAGTGTGCTAAATGATATCCTTTCGCGACTTGATAAAGTCGAGGCGGA	4125
6	GGTACAAATTGACAGGTTAATTACAGGCAGACTTCAAAGCCTTCAAACCTATGTA	4180
1	ACACAACAACTAATCAGGGCTGCTGAAATCAGGGCTTCTGCTAATCTTGCTGCTA	4235
6	CTAAAATGTCTGAGTGTGTTCTTGGACAATCAAAAAGAGTTGACTTTTGTGGAAA	4290
1	GGGCTACCACCTTATGTCCTTCCCACAAGCAGCCCCGCATGGTGTTGTCTTCCTA	4345
6	CATGTCACGTATGTGCCATCCCAGGAGAGGAACTTCACCACAGCGCCAGCAATTT	4400
1	GTCATGAAGGCAAAGCATACTTCCCTCGTGAAGGTGTTTTCGTGTTTAATGGCAC	4455
6	TTCTTGGTTTATTACACAGAGGAACTTCTTTTCTCCACAAATAATTACTACAGAC	4510
1	AATACATTTGTCTCAGGAAATTGTGATGTCGTTATTGGCATCATTAACAACACAG	4565
6	TTTATGATCCTCTGCAACCTGAGCTCGACTCATTCAAAGAAGAGCTGGACAAGTA	4620
1	CTTCAAAAATCATACATCACCAGATGTTGATCTTGGCGACATTTCAGGCATTAAC	4675
6	GCTTCTGTCGTCAACATTCAAAAAGAAATTGACCGCCTCAATGAGGTCGCTAAAA	4730
1	ATTTAAATGAATCACTCATTGACCTTCAAGAATTGGGAAAATATGAGCAATATAT	4785
6	TAAATGGCCTTGGTATGTTTGGCTCGGCTTCATTGCTGGACTAATTGCCATCGTC	4840
1	ATGGTTACAATCTTGCTTTGTTGCATGACTAGTTGTTGCAGTTGCCTCAAGGGTG	4895
6	CATGCTCTTGTGGTTCTTGCTGCAAGTTTGATGAGGATGACTCTGAGCCAGTTCT	4950
1	CAAGGGTGTCAAATTACATTACACATAATATTATATTTTTATCTAAAAAACTAA	5005
6	AAATAAACATTGATTAAATTTTAATATAATACTTAAAAATGGATGTTGTGTCGTT	5060

TABLE 1-continued

n of some of the sequences of the present disclosure.	
GATAAACCGTTTATGTATTTTGAGGAAATTGATAATGAGTTAGATTACGAACCA	5115
AAAGTGCAAATGAGGTCGCAAAAAAACTGCCGTATCAAGGACAGTTAAAACTAT	5170
ACTAGGAGAATTATTTTTTCTTAGTAAGTTACAGCGACACGGTATATTAGATGG	5225
GCCACCGTAGTGTATATAGGATCTGCTCCCGGTACACATATACGTTATTTGAGA	5280
ATCATTTCTATAATTTAGGAGTGATCATCAAATGGATGCTAATTGACGGCCGCC	5335
TCATGATCCTATTTTAAATGGATTGCGTGATGTGACTCTAGTGACTCGGTTCGT	5390
GATGAGGAATATCTACGATCCATCAAAAAACAACTGCATCCTTCTAAGATTATT	5445
TAATTTCTGATGTGAGATCCAAACGAGGAGGAAATGAACCTAGTACGGCGGATT	5500
ACTAAGTAATTACGCTCTACAAAATGTCATGATTAGTATTTTAAACCCCGTGGC	5555
TCTAGTCTTAAATGGAGATGCCCGTTTCCAGATCAATGGATCAAGGACTTTTAT	5610
TCCCACACGGTAATAAAATGTTACAACCTTTTGCTCCTTCATATTCAGCTGAAA	5665
GAGATTATTAAGTATTTATACCGGTGAGAACATGAGACTGACTCGAGTTACCAA	5720
TTAGACGCTGTAAATTATGAAAAAAAGATGTACTACCTTAATAAGATCGTCCGT	5775
ACAAAGTAGTTGTTAACTTTGATTATCCTAATCAGGAATATGACTATTTTCACA	5830
GTACTTTATGCTGAGGACCGTGTACTGCAATAAAACATTTCCTACTACTAAAGC	5885
AAGGTACTATTTCTACAACAATCTATATTTCGTTTCTTAAATATTCCAACAACA	5940
CAACTGAAAAAGTTAGTCATGAACCAATACAACGTAA	5978
cgtttgtt tttcttgttt tattgccact agtctctagt	
agtgtgtta atcttacaac cagaactcaa ttaccccctg catacactaa ttctttcaca	
gtggtgttt attaccctga caaagttttc agatcctcag ttttacattc aactcaggac	
cgttcttac ctttcttttc caatgttact tggttccatg ctatacatgt ctctgggacc	
atggtacta agaggtttga taaccctgtc ctaccattta atgatggtgt ttattttgct	
ccactgaga agtctaacat aataagaggc tggatttttg gtactacttt agattcgaag	
cccagtccc tacttattgt taataacgct actaatgttg ttattaaagt ctgtgaattt	
aattttgta atgatccatt tttgggtgtt tattaccaca aaaacaacaa aagttggatg	
aaagtgagt tcagagttta ttctagtgcg aataattgca cttttgaata tgtctctcag	
cttttctta tggaccttga aggaaaacag ggtaatttca aaaatcttag ggaatttgtg	
ctaagaata ttgatggtta ttttaaaata tattctaagc acacgcctat taatttagtg	
gtgatctcc ctcagggttt ttcggcttta gaaccattgg tagatttgcc aataggtatt	
acatcacta ggtttcaaac tttacttgct ttacatagaa gttatttgac tcctggtgat	
cttcttcag gttggacagc tggtgctgca gcttattatg tgggttatct tcaacctagg	
cttttctat taaaatataa tgaaaatgga accattacag atgctgtaga ctgtgcactt	
accctctct cagaaacaaa gtgtacgttg aaatccttca ctgtagaaaa aggaatctat	
aaacttcta actttagagt ccaaccaaca gaatctattg ttagatttcc taatattaca	
acttgtgcc cttttggtga agtttttaac gccaccagat ttgcatctgt ttatgcttgg	
acaggaaga gaatcagcaa ctgtgttgct gattattctg tcctatataa ttccgcatca	
cttccactt ttaagtgtta tggagtgtct cctactaaat taaatgatct ctgctttact	
atgtctatg cagattcatt tgtaattaga ggtgatgaag tcagacaaat cgctccaggg	
aaactggaa agattgctga ttataattat aaattaccag atgattttac aggctgcgtt	
cagcttgga attctaacaa tcttgattct aaggttggtg gtaattataa ttacctgtat	
gattgttta ggaagtctaa tctcaaacct tttgagagag atatttcaac tgaaatctat	
aggccggta gcacaccttg taatggtgtt gaaggtttta attgttactt tcctttacaa	
catatggtt tccaacccac taatggtgtt ggttaccaac catacagagt agtagtactt	
cttttgaac ttctacatgc accagcaact gtttgtggac ctaaaaagtc tactaatttg	
ctaaaaaca aatgtgtcaa tttcaacttc aatggtttaa caggcacagg tgttcttact	
agtctaaca aaaagtttct gcctttccaa caatttggca gagacattgc tgacactact	
atgctgtcc gtgatccaca gacacttgag attcttgaca ttacaccatg ttcttttggt	
gtgtcagtg ttataacacc aggaacaaat acttctaacc aggttgctgt tctttatcag	
atgttaact gcacagaagt ccctgttgct attcatgcag atcaacttac tcctacttgg	
gtgtttatt ctacaggttc taatgttttt caaacacgtg caggctgttt aatagggggct	

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
23521	gaacatgtca acaactcata tgagtgtgac atacccattg gtgcaggtat atgcgctagt
23581	tatcagactc agactaattc tcctcggcgg gcacgtagtg tagctagtca atccatcatt
23641	gcctacacta tgtcacttgg tgcagaaaat tcagttgctt actctaataa ctctattgcc
23701	atacccacaa attttactat tagtgttacc acagaaattc taccagtgtc tatgaccaag
23761	acatcagtag attgtacaat gtacatttgt ggtgattcaa ctgaatgcag caatcttttg
23821	ttgcaatatg gcagtttttg tacacaatta aaccgtgctt taactggaat agctgttgaa
23881	caagacaaaa acacccaaga agtttttgca caagtcaaac aaatttacaa aacaccacca
23941	attaaagatt ttggtggttt taatttttca caaatattac cagatccatc aaaaccaagc
24001	aagaggtcat ttattgaaga tctacttttc aacaaagtga cacttgcaga tgctggcttc
24061	atcaaacaat atggtgattg ccttggtgat attgctgcta gagacctcat ttgtgcacaa
24121	aagtttaacg gccttactgt tttgccacct ttgctcacag atgaaatgat tgctcaatac
24181	acttctgcac tgttagcggg tacaatcact tctggttgga cctttggtgc aggtgctgca
24241	ttacaaatac catttgctat gcaaatggct tataggttta atggtattgg agttacacag
24301	aatgttctct atgagaacca aaaattgatt gccaaccaat ttaatagtgc tattggcaaa
24361	attcaagact cactttcttc cacagcaagt gcacttggaa aacttcaaga tgtggtcaac
24421	caaaatgcac aagctttaaa cacgcttgtt aaacaactta gctccaattt tggtgcaatt
24481	tcaagtgttt taaatgatat cctttcacgt cttgacaaag ttgaggctga agtgcaaatt
24541	gataggttga tcacaggcag acttcaaagt ttgcagacat atgtgactca acaattaatt
24601	agagctgcag aaatcagagc ttctgctaat cttgctgcta ctaaaatgtc agagtgtgta
24661	cttggacaat caaaaagagt tgatttttgt ggaaagggct atcatcttat gtccttccct
24721	cagtcagcac ctcatggtgt agtcttcttg catgtgactt atgtccctgc acaagaaaag
24781	aacttcacaa ctgctcctgc catttgtcat gatggaaaag cacactttcc tcgtgaaggt
24841	gtctttgttt caaatggcac acactggttt gtaacacaaa ggaattttta tgaaccacaa
24901	atcattacta cagacaacac atttgtgtct ggtaactgtg atgttgtaat aggaattgtc
24961	aacaacacag tttatgatcc tttgcaacct gaattagact cattcaagga ggagttagat
25021	aaatatttta agaatcatac atcaccagat gttgatttag gtgacatctc tggcattaat
25081	gcttcagttg taaacattca aaaagaaatt gaccgcctca atgaggttgc caagaattta
25141	aatgaatctc tcatcgatct ccaagaactt ggaaagtatg agcagtatat aaaatggcca
25201	tggtacattt ggctaggttt tatagctggc ttgattgcca tagtaatggt gacaattatg
25261	ctttgctgta tgaccagttg ctgtagttgt ctcaagggct gttgttcttg tggatcctgc
25321	tgcaaatttg atgaagacga ctctgagcca gtgctcaaag gagtcaaatt acattacaca
25381	taa
1	ttaaaggttt ataccttccc aggtaacaaa ccaaccaact ttcgatctct tgtagatctg
61	ttctctaaac gaactttaaa atctgtgtgg ctgtcactcg gctgcatgct tagtgcactc
121	acgcagtata attaataact aattactgtc gttgacagga cacgagtaac tcgtctatct
181	tctgcaggct gcttacggtt tcgtccgtgt tgcagccgat catcagcaca tctaggtttc
241	gtccgggtgt gaccgaaagg taagatggag agccttgtcc ctggtttcaa cgagaaaaca
301	cacgtccaac tcagtttgcc tgttttacag gttcgcgacg tgctcgtacg tggctttgga
361	gactccgtgg aggaggtctt atcagaggca cgtcaacatc ttaaagatgg cacttgtggc
421	ttagtagaag ttgaaaaagg cgttttgcct caacttgaac agccctatgt gttcatcaaa
481	cgttcggatg ctcgaactgc acctcatggt catgttatgg ttgagctggt agcagaactc
541	gaaggcattc agtacggtcg tagtggtgag acacttggtg tccttgtccc tcatgtgggc
601	gaaataccag tggcttaccg caaggttctt cttcgtaaga acggtaataa aggagctggt
661	ggccatagtt acggcgccga tctaaagtca tttgacttag gcgacgagct tggcactgat
721	ccttatgaag attttcaaga aaactggaac actaaacata gcagtggtgt tacccgtgaa
781	ctcatgcgtg agcttaacgg aggggcatac actcgctatg tcgataacaa cttctgtggc
841	cctgatggct accctcttga gtgcattaaa gaccttctag cacgtgctgg taaagcttca
901	tgcactttgt ccgaacaact ggactttatt gacactaaga ggggtgtata ctgctgccgt
961	gaacatgagc atgaaattgc ttggtacacg gaacgttctg aaaagagcta tgaattgcag
1021	acaccttttg aaattaaatt ggcaaagaaa tttgacacct tcaatgggga atgtccaaat

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
1081	tttgtatttc ccttaaattc cataatcaag actattcaac caagggttga aaagaaaaag
1141	cttgatggct ttatgggtag aattcgatct gtctatccag ttgcgtcacc aaatgaatgc
1201	aaccaaatgt gcctttcaac tctcatgaag tgtgatcatt gtggtgaaac ttcatggcag
1261	acgggcgatt ttgttaaagc cacttgcgaa ttttgtggca ctgagaattt gactaaagaa
1321	ggtgccacta cttgtggtta cttaccccaa aatgctgttg ttaaaattta ttgtccagca
1381	tgtcacaatt cagaagtagg acctgagcat agtcttgccg aataccataa tgaatctggc
1441	ttgaaaacca ttcttcgtaa gggtggtcgc actattgcct ttggaggctg tgtgttctct
1501	tatgttggtt gccataacaa gtgtgcctat tgggttccac gtgctagcgc taacataggt
1561	tgtaaccata caggtgttgt tggagaaggt tccgaaggtc ttaatgacaa ccttcttgaa
1621	atactccaaa aagagaaagt caacatcaat attgttggtg actttaaact taatgaagag
1681	atcgccatta ttttggcatc tttttctgct tccacaagtg cttttgtgga aactgtgaaa
1741	ggtttggatt ataaagcatt caaacaaatt gttgaatcct gtggtaattt taaagttaca
1801	aaaggaaaag ctaaaaaagg tgcctggaat attggtgaac agaaatcaat actgagtcct
1861	ctttatgcat ttgcatcaga ggctgctcgt gttgtacgat caattttctc ccgcactctt
1921	gaaactgctc aaaattctgt gcgtgtttta cagaaggccg ctataacaat actagatgga
1981	atttcacagt attcactgag actcattgat gctatgatgt tcacatctga tttggctact
2041	aacaatctag ttgtaatggc ctacattaca ggtggtgttg ttcagttgac ttcgcagtgg
2101	ctaactaaca tctttggcac tgtttatgaa aaactcaaac ccgtccttga ttggcttgaa
2161	gagaagttta aggaaggtgt agagtttctt agagacggtt gggaaattgt taaatttatc
2221	tcaacctgtg cttgtgaaat tgtcggtgga caaattgtca cctgtgcaaa ggaaattaag
2281	gagagtgttc agacattctt taagcttgta aataaatttt tggctttgtg tgctgactct
2341	atcattattg gtggagctaa acttaaagcc ttgaatttag gtgaaacatt tgtcacgcac
2401	tcaaagggat tgtacagaaa gtgtgttaaa tccagagaag aaactggcct actcatgcct
2461	ctaaaagccc caaaagaaat tatcttctta gagggagaaa cacttcccac agaagtgtta
2521	acagaggaag ttgtcttgaa aactggtgat ttacaaccat tagaacaacc tactagtgaa
2581	gctgttgaag ctccattggt tggtacacca gtttgtatta acgggcttat gttgctcgaa
2641	atcaaagaca cagaaaagta ctgtgccctt gcacctaata tgatggtaac aaacaatacc
2701	ttcacactca aaggcggtgc accaacaaag gttacttttg gtgatgacac tgtgatagaa
2761	gtgcaaggtt acaagagtgt gaatatcact tttgaacttg atgaaaggat tgataaagta
2821	cttaatgaga agtgctctgc ctatacagtt gaactcggta cagaagtaaa tgagttcgcc
2881	tgtgttgtgg cagatgctgt cataaaaact ttgcaaccag tatctgaatt acttacacca
2941	ctgggcattg atttagatga gtggagtatg gctacatact acttatttga tgagtctggt
3001	gagtttaaat tggcttcaca tatgtattgt tctttctacc ctccagatga ggatgaagaa
3061	gaaggtgatt gtgaagaaga agagtttgag ccatcaactc aatatgagta tggtactgaa
3121	gatgattacc aaggtaaacc tttggaattt ggtgccactt ctgctgctct tcaacctgaa
3181	gaagagcaag aagaagattg gttagatgat gatagtcaac aaactgttgg tcaacaagac
3241	ggcagtgagg acaatcagac aactactatt caaacaattg ttgaggttca acctcaatta
3301	gagatggaac ttacaccagt tgttcagact attgaagtga atagttttag tggttattta
3361	aaacttactg acaatgtata cattaaaaat gcagacattg tggaagaagc taaaaaggta
3421	aaaccaacag tggttgttaa tgcagccaat gtttacctta aacatggagg aggtgttgca
3481	ggagccttaa ataaggctac taacaatgcc atgcaagttg aatctgatga ttacatagct
3541	actaatggac cacttaaagt gggtggtagt tgtgttttaa gcggacacaa tcttgctaaa
3601	cactgtcttc atgttgtcgg cccaaatgtt aacaaaggtg aagacattca acttcttaag
3661	agtgcttatg aaaattttaa tcagcacgaa gttctacttg caccattatt atcagctggt
3721	atttttggtg ctgaccctat acattcttta agagtttgtg tagatactgt tcgcacaaat
3781	gtctacttag ctgtctttga taaaaatctc tatgacaaac ttgtttcaag ctttttggaa
3841	atgaagagtg aaaagcaagt tgaacaaaag atcgctgaga ttcctaaaga ggaagttaag
3901	ccatttataa ctgaaagtaa accttcagtt gaacagagaa aacaagatga taagaaaatc
3961	aaagcttgtg ttgaagaagt tacaacaact ctggaagaaa ctaagttcct cacagaaaac
4021	ttgttacttt atattgacat taatggcaat cttcatccag attctgccac tcttgttagt
4081	gacattgaca tcactttctt aaagaaagat gctccatata tagtgggtga tgttgttcaa

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
4141	gagggtgttt taactgctgt ggttatacct actaaaaagg ctggtggcac tactgaaatg
4201	ctagcgaaag ctttgagaaa agtgccaaca gacaattata taaccactta cccgggtcag
4261	ggtttaaatg gttacactgt agaggaggca aagacagtgc ttaaaaagtg taaaagtgcc
4321	ttttacattc taccatctat tatctctaat gagaagcaag aaattcttgg aactgtttct
4381	tggaatttgc gagaaatgct tgcacatgca gaagaaacac gcaaattaat gcctgtctgt
4441	gtggaaacta aagccatagt ttcaactata cagcgtaaat ataagggtat taaaatacaa
4501	gagggtgtgg ttgattatgg tgctagattt tacttttaca ccagtaaaac aactgtagcg
4561	tcacttatca acacacttaa cgatctaaat gaaactcttg ttacaatgcc acttggctat
4621	gtaacacatg gcttaaattt ggaagaagct gctcggtata tgagatctct caaagtgcca
4681	gctacagttt ctgtttcttc acctgatgct gttacagcgt ataatggtta tcttacttct
4741	tcttctaaaa cacctgaaga acattttatt gaaaccatct cacttgctgg ttcctataaa
4801	gattggtcct attctggaca atctacacaa ctaggtatag aatttcttaa gagaggtgat
4861	aaaagtgtat attacactag taatcctacc acattccacc tagatggtga agttatcacc
4921	tttgacaatc ttaagacact tctttctttg agagaagtga ggactattaa ggtgtttaca
4981	acagtagaca acattaacct ccacacgcaa gttgtggaca tgtcaatgac atatggacaa
5041	cagtttggtc caacttattt ggatggagct gatgttacta aaataaaacc tcataattca
5101	catgaaggta aaacatttta tgttttacct aatgatgaca ctctacgtgt tgaggctttt
5161	gagtactacc acacaactga tcctagtttt ctgggtaggt acatgtcagc attaaatcac
5221	actaaaaagt ggaaataccc acaagttaat ggtttaactt ctattaaatg ggcagataac
5281	aactgttatc ttgccactgc attgttaaca ctccaacaaa tagagttgaa gtttaatcca
5341	cctgctctac aagatgctta ttacagagca agggctggtg aagctgctaa cttttgtgca
5401	cttatcttag cctactgtaa taagacagta ggtgagttag gtgatgttag agaaacaatg
5461	agttacttgt ttcaacatgc caatttagat tcttgcaaaa gagtcttgaa cgtggtgtgt
5521	aaaacttgtg gacaacagca gacaaccctt aagggtgtag aagctgttat gtacatgggc
5581	acactttctt atgaacaatt taagaaaggt gttcagatac cttgtacgtg tggtaaacaa
5641	gctacaaaat atctagtaca acaggagtca ccttttgtta tgatgtcagc accacctgct
5701	cagtatgaac ttaagcatgg tacatttact tgtgctagtg agtacactgg taattaccag
5761	tgtggtcact ataaacatat aacttctaaa gaaactttgt attgcataga cggtgcttta
5821	cttacaaagt cctcagaata caaaggtcct attacggatg ttttctacaa agaaaacagt
5881	tacacaacaa ccataaaacc agttacttat aaattggatg gtgttgtttg tacagaaatt
5941	gaccctaagt tggacaatta ttataagaaa gacaattctt atttcacaga gcaaccaatt
6001	gatcttgtac caaaccaacc atatccaaac gcaagcttcg ataattttaa gtttgtatgt
6061	gataatatca aatttgctga tgatttaaac cagttaactg gttataagaa acctgcttca
6121	agagagctta aagttacatt tttccctgac ttaaatggtg atgtggtggc tattgattat
6181	aaacactaca caccctcttt taagaaagga gctaaattgt tacataaacc tattgtttgg
6241	catgttaaca atgcaactaa taaagccacg tataaaccaa atacctggtg tatacgttgt
6301	ctttggagca caaaaccagt tgaaacatca aattcgtttg atgtactgaa gtcagaggac
6361	gcgcagggaa tggataatct tgcctgcgaa gatctaaaac cagtctctga agaagtagtg
6421	gaaaatccta ccatacagaa agacgttctt gagtgtaatg tgaaaactac cgaagttgta
6481	ggagacatta tacttaaacc agcaaataat agtttaaaaa ttacagaaga ggttggccac
6541	acagatctaa tggctgctta tgtagacaat tctagtctta ctattaagaa acctaatgaa
6601	ttatctagag tattaggttt gaaaaccctt gctactcatg gtttagctgc tgttaatagt
6661	gtcccttggg atactatagc taattatgct aagccttttc ttaacaaagt tgttagtaca
6721	actactaaca tagttacacg gtgtttaaac cgtgtttgta ctaattatat gccttatttc
6781	tttactttat tgctacaatt gtgtactttt actagaagta caaattctag aattaaagca
6841	tctatgccga ctactatagc aaagaatact gttaagagtg tcggtaaatt ttgtctagag
6901	gcttcattta attatttgaa gtcacctaat ttttctaaac tgataaatat tataatttgg
6961	tttttactat taagtgtttg cctaggttct ttaatctact caaccgctgc tttaggtgtt
7021	ttaatgtcta atttaggcat gccttcttac tgtactggtt acagagaagg ctatttgaac
7081	tctactaatg tcactattgc aacctactgt actggttcta taccttgtag tgtttgtctt
7141	agtggtttag attctttaga cacctatcct tctttagaaa ctatacaaat taccatttca

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.

10261	gctggtaatg	ttcaactcag	ggttattgga	cattctatgc	aaaattgtgt	acttaagctt
10321	aaggttgata	cagccaatcc	taagacacct	aagtataagt	ttgttcgcat	tcaaccagga
10381	cagacttttt	cagtgttagc	ttgttacaat	ggttcaccat	ctggtgttta	ccaatgtgct
10441	atgaggccca	atttcactat	taagggttca	ttccttaatg	gttcatgtgg	tagtgttggt
10501	tttaacatag	attatgactg	tgtctctttt	tgttacatgc	accatatgga	attaccaact
10561	ggagttcatg	ctggcacaga	cttagaaggt	aacttttatg	gaccttttgt	tgacaggcaa
10621	acagcacaag	cagctggtac	ggacacaact	attacagtta	atgttttagc	ttggttgtac
10681	gctgctgtta	taaatggaga	caggtggttt	ctcaatcgat	ttaccacaac	tcttaatgac
10741	tttaaccttg	tggctatgaa	gtacaattat	gaacctctaa	cacaagacca	tgttgacata
10801	ctaggacctc	tttctgctca	aactggaatt	gccgttttag	atatgtgtgc	ttcattaaaa
10861	gaattactgc	aaaatggtat	gaatggacgt	accatattgg	gtagtgcttt	attagaagat
10921	gaatttacac	cttttgatgt	tgttagacaa	tgctcaggtg	ttactttcca	aagtgcagtg
10981	aaaagaacaa	tcaagggtac	acaccactgg	ttgttactca	caattttgac	ttcactttta
11041	gttttagtcc	agagtactca	atggtctttg	ttcttttttt	tgtatgaaaa	tgccttttta
11101	ccttttgcta	tgggtattat	tgctatgtct	gcttttgcaa	tgatgtttgt	caaacataag
11161	catgcatttc	tctgtttgtt	tttgttacct	tctcttgcca	ctgtagctta	ttttaatatg
11221	gtctatatgc	ctgctagttg	ggtgatgcgt	attatgacat	ggttggatat	ggttgatact
11281	agtttgtctg	gttttaagct	aaaagactgt	gttatgtatg	catcagctgt	agtgttacta
11341	atccttatga	cagcaagaac	tgtgtatgat	gatggtgcta	ggagagtgtg	gacacttatg
11401	aatgtcttga	cactcgttta	taaagtttat	tatggtaatg	ctttagatca	agccatttcc
11461	atgtgggctc	ttataatctc	tgttacttct	aactactcag	gtgtagttac	aactgtcatg
11521	tttttggcca	gaggtattgt	ttttatgtgt	gttgagtatt	gccctatttt	cttcataact
11581	ggtaatacac	ttcagtgtat	aatgctagtt	tattgtttct	taggctattt	ttgtacttgt
11641	tactttggcc	tcttttgttt	actcaaccgc	tactttagac	tgactcttgg	tgtttatgat
11701	tacttagttt	ctacacagga	gtttagatat	atgaattcac	agggactact	cccacccaag
11761	aatagcatag	atgccttcaa	actcaacatt	aaattgttgg	gtgttggtgg	caaaccttgt
11821	atcaaagtag	ccactgtaca	gtctaaaatg	tcagatgtaa	agtgcacatc	agtagtctta
11881	ctctcagttt	tgcaacaact	cagagtagaa	tcatcatcta	aattgtgggc	tcaatgtgtc
11941	cagttacaca	atgacattct	cttagctaaa	gatactactg	aagcctttga	aaaaatggtt
12001	tcactacttt	ctgttttgct	ttccatgcag	ggtgctgtag	acataaacaa	gctttgtgaa
12061	gaaatgctgg	acaacagggc	aaccttacaa	gctatagcct	cagagtttag	ttcccttcca
12121	tcatatgcag	cttttgctac	tgctcaagaa	gcttatgagc	aggctgttgc	taatggtgat
12181	tctgaagttg	ttcttaaaaa	gttgaagaag	tctttgaatg	tggctaaatc	tgaatttgac
12241	cgtgatgcag	ccatgcaacg	taagttggaa	aagatggctg	atcaagctat	gacccaaatg
12301	tataaacagg	ctagatctga	ggacaagagg	gcaaaagtta	ctagtgctat	gcagacaatg
12361	cttttcacta	tgcttagaaa	gttggataat	gatgcactca	acaacattat	caacaatgca
12421	agagatggtt	gtgttccctt	gaacataata	cctcttacaa	cagcagccaa	actaatggtt
12481	gtcataccag	actataacac	atataaaaat	acgtgtgatg	gtacaacatt	tacttatgca
12541	tcagcattgt	gggaaatcca	acaggttgta	gatgcagata	gtaaaattgt	tcaacttagt
12601	gaaattagta	tggacaattc	acctaattta	gcatggcctc	ttattgtaac	agctttaagg
12661	gccaattctg	ctgtcaaatt	acagaataat	gagcttagtc	ctgttgcact	acgacagatg
12721	tcttgtgctg	ccggtactac	acaaactgct	tgcactgatg	acaatgcgtt	agcttactac
12781	aacacaacaa	agggaggtag	gtttgtactt	gcactgttat	ccgatttaca	ggatttgaaa
12841	tgggctagat	tccctaagag	tgatggaact	ggtactatct	atacagaact	ggaaccacct
12901	tgtaggtttg	ttacagacac	acctaaaggt	cctaaagtga	agtatttata	ctttattaaa
12961	ggattaaaca	acctaaatag	aggtatggta	cttggtagtt	tagctgccac	agtacgtcta
13021	caagctggta	atgcaacaga	agtgcctgcc	aattcaactg	tattatcttt	ctgtgctttt
13081	gctgtagatg	ctgctaaagc	ttacaaagat	tatctagcta	gtgggggaca	accaatcact
13141	aattgtgtta	agatgttgtg	tacacacact	ggtactggtc	aggcaataac	agttacaccg
13201	gaagccaata	tggatcaaga	atcctttggt	ggtgcatcgt	gttgtctgta	ctgccgttgc
13261	cacatagatc	atccaaatcc	taaaggattt	tgtgacttaa	aaggtaagta	tgtacaaata

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
13321	cctacaactt gtgctaatga ccctgtgggt tttacactta aaaacacagt ctgtaccgtc
13381	tgcggtatgt ggaaaggtta tggctgtagt tgtgatcaac tccgcgaacc catgcttcag
13441	tcagctgatg cacaatcgtt tttaaacggg tttgcggtgt aagtgcagcc cgtcttacac
13501	cgtgcggcac aggcactagt actgatgtcg tatacagggc ttttgacatc tacaatgata
13561	aagtagctgg ttttgctaaa ttcctaaaaa ctaattgttg tcgcttccaa gaaaaggacg
13621	aagatgacaa tttaattgat tcttactttg tagttaagag acacactttc tctaactacc
13681	aacatgaaga aacaatttat aatttactta aggattgtcc agctgttgct aaacatgact
13741	tctttaagtt tagaatagac ggtgacatgg taccacatat atcacgtcaa cgtcttacta
13801	aatacacaat ggcagacctc gtctatgctt taaggcattt tgatgaaggt aattgtgaca
13861	cattaaaaga aatacttgtc acatacaatt gttgtgatga tgattatttc aataaaaagg
13921	actggtatga ttttgtagaa aacccagata tattacgcgt atacgccaac ttaggtgaac
13981	gtgtacgcca agctttgtta aaaacagtac aattctgtga tgccatgcga aatgctggta
14041	ttgttggtgt actgacatta gataatcaag atctcaatgg taactggtat gatttcggtg
14101	atttcataca aaccacgcca ggtagtggag ttcctgttgt agattcttat tattcattgt
14161	taatgcctat attaaccttg accagggctt taactgcaga gtcacatgtt gacactgact
14221	taacaaagcc ttacattaag tgggatttgt taaaatatga cttcacggaa gagaggttaa
14281	aactctttga ccgttatttt aaatattggg atcagacata ccacccaaat tgtgttaact
14341	gtttggatga cagatgcatt ctgcattgtg caaactttaa tgttttattc tctacagtgt
14401	tcccacctac aagttttgga ccactagtga gaaaaatatt tgttgatggt gttccatttg
14461	tagtttcaac tggataccac ttcagagagc taggtgttgt acataatcag gatgtaaact
14521	tacatagctc tagacttagt tttaaggaat tacttgtgta tgctgctgac cctgctatgc
14581	acgctgcttc tggtaatcta ttactagata aacgcactac gtgcttttca gtagctgcac
14641	ttactaacaa tgttgctttt caaactgtca aacccggtaa ttttaacaaa gacttctatg
14701	actttgctgt gtctaagggt ttctttaagg aaggaagttc tgttgaatta aaacacttct
14761	tctttgctca ggatggtaat gctgctatca gcgattatga ctactatcgt tataatctac
14821	caacaatgtg tgatatcaga caactactat ttgtagttga agttgttgat aagtactttg
14881	attgttacga tggtggctgt attaatgcta accaagtcat cgtcaacaac ctagacaaat
14941	cagctggttt tccatttaat aaatggggta aggctagact ttattatgat tcaatgagtt
15001	atgaggatca agatgcactt ttcgcatata caaaacgtaa tgtcatccct actataactc
15061	aaatgaatct taagtatgcc attagtgcaa agaatagagc tcgcaccgta gctggtgtct
15121	ctatctgtag tactatgacc aatagacagt ttcatcaaaa attattgaaa tcaatagccg
15181	ccactagagg agctactgta gtaattggaa caagcaaatt ctatggtggt tggcacaaca
15241	tgttaaaaac tgtttatagt gatgtagaaa accctcacct tatgggttgg gattatccta
15301	aatgtgatag agccatgcct aacatgctta gaattatggc ctcacttgtt cttgctcgca
15361	aacatacaac gtgttgtagc ttgtcacacc gtttctatag attagctaat gagtgtgctc
15421	aagtattgag tgaaatggtc atgtgtggcg gttcactata tgttaaacca ggtggaacct
15481	catcaggaga tgccacaact gcttatgcta atagtgtttt taacatttgt caagctgtca
15541	cggccaatgt taatgcactt ttatctactg atggtaacaa aattgccgat aagtatgtcc
15601	gcaatttaca acacagactt tatgagtgtc tctatagaaa tagagatgtt gacacagact
15661	ttgtgaatga gttttacgca tatttgcgta aacatttctc aatgatgata ctctctgacg
15721	atgctgttgt gtgtttcaat agcacttatg catctcaagg tctagtggct agcataaaga
15781	actttaagtc agttctttat tatcaaaaca atgtttttat gtctgaagca aaatgttgga
15841	ctgagactga ccttactaaa ggacctcatg aattttgctc tcaacataca atgctagtta
15901	aacagggtga tgattatgtg taccttcctt acccagatcc atcaagaatc ctaggggccg
15961	gctgttttgt agatgatatc gtaaaaacag atggtacact tatgattgaa cggttcgtgt
16021	ctttagctat agatgcttac ccacttacta aacatcctaa tcaggagtat gctgatgtct
16081	ttcatttgta cttacaatac ataagaaagc tacatgatga gttaacagga cacatgttag
16141	acatgtattc tgttatgctt actaatgata acacttcaag gtattgggaa cctgagtttt
16201	atgaggctat gtacacaccg catacagtct tacaggctgt tggggcttgt gttctttgca
16261	attcacagac ttcattaaga tgtggtgctt gcatacgtag accattctta tgttgtaaat
16321	gctgttacga ccatgtcata tcaacatcac ataaattagt cttgtctgtt aatccgtatg

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
6381	tttgcaatgc tccaggttgt gatgtcacag atgtgactca actttactta ggaggtatga
6441	gctattattg taaatcacat aaaccaccca ttagttttcc attgtgtgct aatggacaag
6501	tttttggttt atataaaaat acatgtgttg gtagcgataa tgttactgac tttaatgcaa
6561	ttgcaacatg tgactggaca aatgctggtg attacatttt agctaacacc tgtactgaaa
6621	gactcaagct ttttgcagca gaaacgctca aagctactga ggagacattt aaactgtctt
6681	atggtattgc tactgtacgt gaagtgctgt ctgacagaga attacatctt tcatgggaag
6741	ttggtaaacc tagaccacca cttaaccgaa attatgtctt tactggttat cgtgtaacta
6801	aaaacagtaa agtacaaata ggagagtaca cctttgaaaa aggtgactat ggtgatgctg
6861	ttgtttaccg aggtacaaca acttacaaat taaatgttgg tgattatttt gtgctgacat
6921	cacatacagt aatgccatta agtgcaccta cactagtgcc acaagagcac tatgttagaa
6981	ttactggctt atacccaaca ctcaatatct cagatgagtt ttctagcaat gttgcaaatt
7041	atcaaaaggt tggtatgcaa aagtattcta cactccaggg accacctggt actggtaaga
7101	gtcattttgc tattggccta gctctctact acccttctgc tcgcatagtg tatacagctt
7161	gctctcatgc cgctgttgat gcactatgtg agaaggcatt aaaatatttg cctatagata
7221	aatgtagtag aattatacct gcacgtgctc gtgtagagtg ttttgataaa ttcaaagtga
7281	attcaacatt agaacagtat gtcttttgta ctgtaaatgc attgcctgag acgacagcag
7341	atatagttgt ctttgatgaa atttcaatgg ccacaaatta tgatttgagt gttgtcaatg
7401	ccagattacg tgctaagcac tatgtgtaca ttggcgaccc tgctcaatta cctgcaccac
7461	gcacattgct aactaagggc acactagaac cagaatattt caattcagtg tgtagactta
7521	tgaaaactat aggtccagac atgttcctcg gaacttgtcg gcgttgtcct gctgaaattg
7581	ttgacactgt gagtgctttg gtttatgata ataagcttaa agcacataaa gacaaatcag
7641	ctcaatgctt taaaatgttt tataagggtg ttatcacgca tgatgtttca tctgcaatta
7701	acaggccaca aataggcgtg gtaagagaat tccttacacg taaccctgct tggagaaaag
7761	ctgtctttat ttcaccttat aattcacaga atgctgtagc ctcaaagatt ttgggactac
7821	caactcaaac tgttgattca tcacagggct cagaatatga ctatgtcata ttcactcaaa
7881	ccactgaaac agctcactct tgtaatgtaa acagatttaa tgttgctatt accagagcaa
7941	aagtaggcat actttgcata atgtctgata gagaccttta tgacaagttg caatttacaa
8001	gtcttgaaat tccacgtagg aatgtggcaa ctttacaagc tgaaaatgta acaggactct
8061	ttaaagattg tagtaaggta atcactgggt tacatcctac acaggcacct acacacctca
8121	gtgttgacac taaattcaaa actgaaggtt tatgtgttga catacctggc atacctaagg
8181	acatgaccta tagaagactc atctctatga tgggttttaa aatgaattat caagttaatg
8241	gttaccctaa catgtttatc acccgcgaag aagctataag acatgtacgt gcatggattg
8301	gcttcgatgt cgagggggtgt catgctacta gagaagctgt tggtaccaat ttacctttac
8361	agctaggttt ttctacaggt gttaacctag ttgctgtacc tacaggttat gttgatacac
8421	ctaataatac agattttccc agagttagtg ctaaaccacc gcctggagat caatttaaac
8481	acctcatacc acttatgtac aaaggacttc cttggaatgt agtgcgtata aagattgtac
8541	aaatgttaag tgacacactt aaaaatctct ctgacagagt cgtatttgtc ttatgggcac
8601	atggctttga gttgacatct atgaagtatt ttgtgaaaat aggacctgag cgcacctgtt
8661	gtctatgtga tagacgtgcc acatgctttt ccactgcttc agacacttat gcctgttggc
8721	atcattctat tggatttgat tacgtctata atccgtttat gattgatgtt caacaatggg
8781	gttttacagg taacctacaa agcaaccatg atctgtattg tcaagtccat ggtaatgcac
8841	atgtagctag ttgtgatgca atcatgacta ggtgtctagc tgtccacgag tgctttgtta
8901	agcgtgttga ctggactatt gaatatccta taattggtga tgaactgaag attaatgcgg
8961	cttgtagaaa ggttcaacac atggttgtta aagctgcatt attagcagac aaattcccag
9021	ttcttcacga cattggtaac cctaaagcta ttaagtgtgt acctcaagct gatgtagaat
9081	ggaagttcta tgatgcacag ccttgtagtg acaaagctta taaaatagaa gaattattct
9141	attcttatgc cacacattct gacaaattca cagatggtgt atgcctattt tggaattgca
9201	atgtcgatag atatcctgct aattccattg tttgtagatt tgacactaga gtgctatcta
9261	accttaactt gcctggttgt gatggtggca gtttgtatgt aaataaacat gcattccaca
9321	caccagcttt tgataaaagt gcttttgtta atttaaaaca attaccattt ttctattact
9381	ctgacagtcc atgtgagtct catggaaaac aagtagtgtc agatatagat tatgtaccac

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
19441	taaagtctgc tacgtgtata acacgttgca atttaggtgg tgctgtctgt agacatcatg
19501	ctaatgagta cagattgtat ctcgatgctt ataacatgat gatctcagct ggctttagct
19561	tgtgggttta caaacaattt gatacttata acctctggaa cacttttaca agacttcaga
19621	gtttagaaaa tgtggctttt aatgttgtaa ataagggaca ctttgatgga caacagggtg
19681	aagtaccagt ttctatcatt aataacactg tttacacaaa agttgatggt gttgatgtag
19741	aattgtttga aaataaaaca acattacctg ttaatgtagc atttgagctt tgggctaagc
19801	gcaacattaa accagtacca gaggtgaaaa tactcaataa tttgggtgtg gacattgctg
19861	ctaatactgt gatctgggac tacaaaagag atgctccagc acatatatct actattggtg
19921	tttgttctat gactgacata gccaagaaac caactgaaac gatttgtgca ccactcactg
19981	tctttttga tggtagagtt gatggtcaag tagacttatt tagaaatgcc cgtaatggtg
20041	ttcttattac agaaggtagt gttaaaggtt tacaaccatc tgtaggtccc aaacaagcta
20101	gtcttaatgg agtcacatta attggagaag ccgtaaaaac acagttcaat tattataaga
20161	aagttgatgg tgttgtccaa caattacctg aaacttactt tactcagagt agaaatttac
20221	aagaatttaa acccaggagt caaatggaaa ttgatttctt agaattagct atggatgaat
20281	tcattgaacg gtataaatta gaaggctatg ccttcgaaca tatcgtttat ggagatttta
20341	gtcatagtca gttaggtggt ttacatctac tgattggact agctaaacgt tttaaggaat
20401	caccttttga attagaagat tttattccta tggacagtac agttaaaaac tatttcataa
20461	cagatgcgca aacaggttca tctaagtgtg tgtgttctgt tattgattta ttacttgatg
20521	attttgttga aataataaaa tcccaagatt tatctgtagt ttctaaggtt gtcaaagtga
20581	ctattgacta tacagaaatt tcatttatgc tttggtgtaa agatggccat gtagaaacat
20641	tttacccaaa attacaatct agtcaagcgt ggcaaccggg tgttgctatg cctaatcttt
20701	acaaaatgca aagaatgcta ttagaaaagt gtgaccttca aaattatggt gatagtgcaa
20761	cattacctaa aggcataatg atgaatgtcg caaaatatac tcaactgtgt caatatttaa
20821	acacattaac attagctgta ccctataata tgagagttat acattttggt gctggttctg
20881	ataaaggagt tgcaccaggt acagctgttt taagacagtg gttgcctacg ggtacgctgc
20941	ttgtcgattc agatcttaat gactttgtct ctgatgcaga ttcaactttg attggtgatt
21001	gtgcaactgt acatacagct aataaatggg atctcattat tagtgatatg tacgacccta
21061	agactaaaaa tgttacaaaa gaaaatgact ctaaagaggg ttttttcact tacatttgtg
21121	ggtttataca acaaaagcta gctcttggag gttccgtggc tataaagata acagaacatt
21181	cttggaatgc tgatctttat aagctcatgg gacacttcgc atggtggaca gcctttgtta
21241	ctaatgtgaa tgcgtcatca tctgaagcat ttttaattgg atgtaattat cttggcaaac
21301	cacgcgaaca aatagatggt tatgtcatgc atgcaaatta catattttgg aggaatacaa
21361	atccaattca gttgtcttcc tattctttat ttgacatgag taaatttccc cttaaattaa
21421	ggggtactgc tgttatgtct ttaaaagaag gtcaaatcaa tgatatgatt ttatctcttc
21481	ttagtaaagg tagacttata attagagaaa acaacagagt tgttatttct agtgatgttc
21541	ttgttaacaa ctaaacgaac aatgtttgtt tttcttgttt tattgccact agtctctagt
21601	cagtgtgtta atcttacaac cagaactcaa ttaccccctg catacactaa ttctttcaca
21661	cgtggtgttt attaccctga caaagttttc agatcctcag ttttacattc aactcaggac
21721	ttgttcttac ctttcttttc caatgttact tggttccatg ctatacatgt ctctgggacc
21781	aatggtacta agaggtttga taaccctgtc ctaccattta atgatggtgt ttattttgct
21841	tccactgaga agtctaacat aataagaggc tggatttttg gtactacttt agattcgaag
21901	acccagtccc tacttattgt taataacgct actaatgttg ttattaaagt ctgtgaattt
21961	caattttgta atgatccatt tttgggtgtt tattaccaca aaaacaacaa aagttggatg
22021	gaaagtgagt tcagagttta ttctagtgcg aataattgca cttttgaata tgtctctcag
22081	ccttttctta tggaccttga aggaaaacag ggtaatttca aaaatcttag ggaatttgtg
22141	tttaagaata ttgatggtta ttttaaaata tattctaagc acacgcctat taatttagtg
22201	cgtgatctcc ctcagggttt ttcggcttta gaaccattgg tagatttgcc aataggtatt
22261	aacatcacta ggtttcaaac tttacttgct ttacatagaa gttatttgac tcctggtgat
22321	tcttcttcag gttggacagc tggtgctgca gcttattatg tgggttatct tcaacctagg
22381	acttttctat taaaatataa tgaaaatgga accattacag atgctgtaga ctgtgcactt
22441	gaccctctct cagaaacaaa gtgtacgttg aaatccttca ctgtagaaaa aggaatctat

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
2501	caaacttcta actttagagt ccaaccaaca gaatctattg ttagatttcc taatattaca
2561	aacttgtgcc cttttggtga agtttttaac gccaccagat ttgcatctgt ttatgcttgg
2621	aacaggaaga gaatcagcaa ctgtgttgct gattattctg tcctatataa ttccgcatca
2681	ttttccactt ttaagtgtta tggagtgtct cctactaaat taaatgatct ctgctttact
2741	aatgtctatg cagattcatt tgtaattaga ggtgatgaag tcagacaaat cgctccaggg
2801	caaactggaa agattgctga ttataattat aaattaccag atgattttac aggctgcgtt
2861	atagcttgga attctaacaa tcttgattct aaggttggtg gtaattataa ttacctgtat
2921	agattgttta ggaagtctaa tctcaaacct tttgagagag atatttcaac tgaaatctat
2981	caggccggta gcacaccttg taatggtgtt gaaggtttta attgttactt tcctttacaa
3041	tcatatggtt tccaacccac taatggtgtt ggttaccaac catacagagt agtagtactt
3101	tcttttgaac ttctacatgc accagcaact gtttgtggac ctaaaaagtc tactaatttg
3161	gttaaaaaca aatgtgtcaa tttcaacttc aatggtttaa caggcacagg tgttcttact
3221	gagtctaaca aaaagtttct gcctttccaa caatttggca gagacattgc tgacactact
3281	gatgctgtcc gtgatccaca gacacttgag attcttgaca ttacaccatg ttcttttggt
3341	ggtgtcagtg ttataacacc aggaacaaat acttctaacc aggttgctgt tctttatcag
3401	gatgttaact gcacagaagt ccctgttgct attcatgcag atcaacttac tcctacttgg
3461	cgtgtttatt ctacaggttc taatgttttt caaacacgtg caggctgttt aataggggct
3521	gaacatgtca acaactcata tgagtgtgac atacccattg gtgcaggtat atgcgctagt
3581	tatcagactc agactaattc tcctcggcgg gcacgtagtg tagctagtca atccatcatt
3641	gcctacacta tgtcacttgg tgcagaaaat tcagttgctt actctaataa ctctattgcc
3701	atacccacaa attttactat tagtgttacc acagaaattc taccagtgtc tatgaccaag
3761	acatcagtag attgtacaat gtacatttgt ggtgattcaa ctgaatgcag caatcttttg
3821	ttgcaatatg gcagtttttg tacacaatta aaccgtgctt taactggaat agctgttgaa
3881	caagacaaaa acacccaaga agtttttgca caagtcaaac aaatttacaa aacaccacca
3941	attaaagatt ttggtggttt taatttttca caaatattac cagatccatc aaaaccaagc
4001	aagaggtcat ttattgaaga tctacttttc aacaaagtga cacttgcaga tgctggcttc
4061	atcaaacaat atggtgattg ccttggtgat attgctgcta gagacctcat ttgtgcacaa
4121	aagtttaacg gccttactgt tttgccacct ttgctcacag atgaaatgat tgctcaatac
4181	acttctgcac tgttagcggg tacaatcact tctggttgga cctttggtgc aggtgctgca
4241	ttacaaatac catttgctat gcaaatggct tataggttta atggtattgg agttacacag
4301	aatgttctct atgagaacca aaaattgatt gccaaccaat ttaatagtgc tattggcaaa
4361	attcaagact cactttcttc cacagcaagt gcacttggaa aacttcaaga tgtggtcaac
4421	caaaatgcac aagctttaaa cacgcttgtt aaacaactta gctccaattt tggtgcaatt
4481	tcaagtgttt taaatgatat cctttcacgt cttgacaaag ttgaggctga agtgcaaatt
4541	gataggttga tcacaggcag acttcaaagt ttgcagacat atgtgactca acaattaatt
4601	agagctgcag aaatcagagc ttctgctaat cttgctgcta ctaaaatgtc agagtgtgta
4661	cttggacaat caaaaagagt tgatttttgt ggaaagggct atcatcttat gtccttccct
4721	cagtcagcac ctcatggtgt agtcttcttg catgtgactt atgtccctgc acaagaaaag
4781	aacttcacaa ctgctcctgc catttgtcat gatggaaaag cacactttcc tcgtgaaggt
4841	gtctttgttt caaatggcac acactggttt gtaacacaaa ggaattttta tgaaccacaa
4901	atcattacta cagacaacac atttgtgtct ggtaactgtg atgttgtaat aggaattgtc
4961	aacaacacag tttatgatcc tttgcaacct gaattagact cattcaagga ggagttagat
5021	aaatatttta agaatcatac atcaccagat gttgatttag gtgacatctc tggcattaat
5081	gcttcagttg taaacattca aaaagaaatt gaccgcctca atgaggttgc caagaattta
5141	aatgaatctc tcatcgatct ccaagaactt ggaaagtatg agcagtatat aaaatggcca
5201	tggtacattt ggctaggttt tatagctggc ttgattgcca tagtaatggt gacaattatg
5261	ctttgctgta tgaccagttg ctgtagttgt ctcaagggct gttgttcttg tggatcctgc
5321	tgcaaatttg atgaagacga ctctgagcca gtgctcaaag gagtcaaatt acattacaca
5381	taaacgaact tatggatttg tttatgagaa tcttcacaat tggaactgta actttgaagc
5441	aaggtgaaat caaggatgct actccttcag attttgttcg cgctactgca acgataccga
5501	tacaagcctc actccctttc ggatggctta ttgttggcgt tgcacttctt gctgtttttc

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
5561	agagcgcttc caaaatcata accctcaaaa agagatggca actagcactc tccaagggtg
5621	ttcactttgt ttgcaacttg ctgttgttgt ttgtaacagt ttactcacac cttttgctcg
5681	ttgctgctgg ccttgaagcc ccttttctct atctttatgc tttagtctac ttcttgcaga
5741	gtataaactt tgtaagaata ataatgaggc tttggctttg ctggaaatgc cgttccaaaa
5801	acccattact ttatgatgcc aactattttc tttgctggca tactaattgt tacgactatt
5861	gtatacctta caatagtgta acttcttcaa ttgtcattac ttcaggtgat ggcacaacaa
5921	gtcctatttc tgaacatgac taccagattg gtggttatac tgaaaaatgg gaatctggag
5981	taaaagactg tgttgtatta cacagttact tcacttcaga ctattaccag ctgtactcaa
6041	ctcaattgag tacagacact ggtgttgaac atgttacctt cttcatctac aataaaattg
6101	ttgatgagcc tgaagaacat gtccaaattc acacaatcga cggttcatcc ggagttgtta
6161	atccagtaat ggaaccaatt tatgatgaac cgacgacgac tactagcgtg cctttgtaag
6221	cacaagctga tgagtacgaa cttatgtact cattcgtttc ggaagagaca ggtacgttaa
6281	tagttaatag cgtacttctt tttcttgctt tcgtggtatt cttgctagtt acactagcca
6341	tccttactgc gcttcgattg tgtgcgtact gctgcaatat tgttaacgtg agtcttgtaa
6401	aaccttcttt ttacgtttac tctcgtgtta aaaatctgaa ttcttctaga gttcctgatc
6461	ttctggtcta aacgaactaa atattatatt agtttttctg tttggaactt taattttagc
6521	catggcagat tccaacggta ctattaccgt tgaagagctt aaaaagctcc ttgaacaatg
6581	gaacctagta ataggtttcc tattccttac atggatttgt cttctacaat ttgcctatgc
6641	caacaggaat aggtttttgt atataattaa gttaattttc ctctggctgt tatggccagt
6701	aactttagct tgttttgtgc ttgctgctgt ttacagaata aattggatca ccggtggaat
6761	tgctatcgca atggcttgtc ttgtaggctt gatgtggctc agctacttca ttgcttcttt
6821	cagactgttt gcgcgtacgc gttccatgtg gtcattcaat ccagaaacta acattcttct
6881	caacgtgcca ctccatggca ctattctgac cagaccgctt ctagaaagtg aactcgtaat
6941	cggagctgtg atccttcgtg gacatcttcg tattgctgga caccatctag gacgctgtga
7001	catcaaggac ctgcctaaag aaatcactgt tgctacatca cgaacgcttt cttattacaa
7061	attgggagct tcgcagcgtg tagcaggtga ctcaggtttt gctgcataca gtcgctacag
7121	gattggcaac tataaattaa acacagacca ttccagtagc agtgacaata ttgctttgct
7181	tgtacagtaa gtgacaacag atgtttcatc tcgttgactt tcaggttact atagcagaga
7241	tattactaat tattatgagg acttttaaag tttccatttg gaatcttgat tacatcataa
7301	acctcataat taaaaattta tctaagtcac taactgagaa taaatattct caattagatg
7361	aagagcaacc aatggagatt gattaaacga acatgaaaat tattcttttc ttggcactga
7421	taacactcgc tacttgtgag ctttatcact accaagagtg tgttagaggt acaacagtac
7481	ttttaaaaga accttgctct tctggaacat acgagggcaa ttcaccattt catcctctag
7541	ctgataacaa atttgcactg acttgcttta gcactcaatt tgcttttgct tgtcctgacg
7601	gcgtaaaaca cgtctatcag ttacgtgcca gatcagtttc acctaaactg ttcatcagac
7661	aagaggaagt tcaagaactt tactctccaa tttttcttat tgttgcggca atagtgttta
7721	taacactttg cttcacactc aaaagaaaga cagaatgatt gaactttcat taattgactt
7781	ctatttgtgc tttttagcct ttctgctatt ccttgtttta attatgctta ttatcttttg
7841	gttctcactt gaactgcaag atcataatga aacttgtcac gcctaaacga acatgaaatt
7901	tcttgttttc ttaggaatca tcacaactgt agctgcattt caccaagaat gtagtttaca
7961	gtcatgtact caacatcaac catatgtagt tgatgacccg tgtcctattc acttctattc
8021	taaatggtat attagagtag gagctagaaa atcagcacct ttaattgaat tgtgcgtgga
8081	tgaggctggt tctaaatcac ccattcagta catcgatatc ggtaattata cagtttcctg
8141	tttacctttt acaattaatt gccaggaacc taaattgggt agtcttgtag tgcgttgttc
8201	gttctatgaa gactttttag agtatcatga cgttcgtgtt gttttagatt tcatctaaac
8261	gaacaaacta aaatgtctga taatggaccc caaaatcagc gaaatgcacc ccgcattacg
8321	tttggtggac cctcagattc aactggcagt aaccagaatg gagaacgcag tggggcgcga
8381	tcaaaacaac gtcggcccca aggtttaccc aataatactg cgtcttggtt caccgctctc
8441	actcaacatg gcaaggaaga ccttaaattc cctcgaggac aaggcgttcc aattaacacc
8501	aatagcagtc cagatgacca aattggctac taccgaagag ctaccagacg aattcgtggt
8561	ggtgacggta aaatgaaaga tctcagtcca agatggtatt tctactacct aggaactggg

'ABLE 1-continued

' the sequences of the present disclosure.

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cttcccta tggtgctaac aaagacggca tcatatgggt tgcaactgag
acaccaaa agatcacatt ggcacccgca atcctgctaa caatgctgca
cttcctca aggaacaaca ttgccaaaag gcttctacgc agaagggagc
caagcctc ttctcgttcc tcatcacgta gtcgcaacag ttcaagaaat
agcagtag gggaacttct cctgctagaa tggctggcaa tggcggtgat
ttgctgct gcttgacaga ttgaaccagc ttgagagcaa aatgtctggt
caacaagg ccaaactgtc actaagaaat ctgctgctga ggcttctaag
aaacgtac tgccactaaa gcatacaatg taacacaagc tttcggcaga
caaaccca aggaaatttt ggggaccagg aactaatcag acaaggaact
tggccgca aattgcacaa tttgccccca gcgcttcagc gttcttcgga
ggcatgga agtcacacct tcgggaacgt ggttgaccta cacaggtgcc
gacaaaga tccaaatttc aaagatcaag tcattttgct gaataagcat
aaaacatt cccaccaaca gagcctaaaa aggacaaaaa gaagaaggct
gccttacc gcagagacag aagaaacagc aaactgtgac tcttcttcct
gatgattt ctccaaacaa ttgcaacaat ccatgagcag tgctgactca
actcatgc agaccacaca aggcagatgg gctatataaa cgttttcgct
atatatag tctactcttg tgcagaatga attctcgtaa ctacatagca
gttaactt taatctcaca tagcaatctt taatcagtgt gtaacattag
agagccac cacattttca ccgaggccac gcggagtacg atcgagtgta
ctagggag agctgcctat atggaagagc cctaatgtgt aaaattaatt
tccccatg tgattttaat agcttcttag gagaatgaca aaaaaaaaaa
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SQCVNLTT RTQLPPAYTN SFTRGVYYPD KVFRSSVLHS TQDLFLPFFS NVTWFHAIHV SGTNGTKRFD
ASTEKSNI IRGWIFGTTL DSKTQSLLIV NNATNVVIKV CEFQFCNDPF LGVYYHKNNK SWMESEFRVY
QPFLMDLE GKQGNFKNLR EFVFKNIDGY FKIYSKHTPI NLVRDLPQGF SALEPLVDLP IGINITRFQT
DSSSGWTA GAAAYYVGYL QPRTFLLKYN ENGTITDAVD CALDPLSETK CTLKSFTVEK GIYQTSNFRV
TNLCPFGE VFNATRFASV YAWNRKRISN CVADYSVLYN SASFSTFKCY GVSPTKLNDL CFTNVYADSF
GQTGKIAD YNYKLPDDFT GCVIAWNSNN LDSKVGGNYN YLYRLFRKSN LKPFERDIST EIYQAGSTPC
QSYGFQPT NGVGYQPYRV VVLSFELLHA PATVCGPKKS TNLVKNKCVN FNFNGLTGTG VLTESNKKFL
TDAVRDPQ TLEILDITPC SFGGVSVITP GTNTSNQVAV LYQDVNCTEV PVAIHADQLT PTWRVYSTGS
AEHVNNSY ECDIPIGAGI CASYQTQTNS PRRARSVASQ SIIAYTMSLG AENSVAYSNN SIAIPTNFTI
KTSVDCTM YICGDSTECS NLLLQYGSFC TQLNRALTGI AVEQDKNTQE VFAQVKQIYK TPPIKDFGGF
SKRSFIED LLFNKVTLAD AGFIKQYGDC LGDIAARDLI CAQKFNGLTV LPPLLTDEMI AQYTSALLAG
ALQIPFAM QMAYRFNGIG VTQNVLYENQ KLIANQFNSA IGKIQDSLSS TASALGKLQD VVNQNAQALN
ISSVLNDI LSRLDKVEAE VQIDRLITGR LQSLQTYVTQ QLIRAAEIRA SANLAATKMS ECVLGQSKRV
PQSAPHGV VFLHVTYVPA QEKNFTTAPA ICHDGKAHFP REGVFVSNGT HWFVTQRNFY EPQIITTDNT
VNNTVYDP LQPELDSFKE ELDKYFKNHT SPDVDLGDIS GINASVVNIQ KEIDRLNEVA KNLNESLIDL
PWYIWLGF IAGLIAIVMV TIMLCCMTSC CSCLKGCCSC GSCCKFDEDD SEPVLKGVKL HYT
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TWICLLQFAYANRNR
NWITGGIAIAMACLVGLMWLSYFIASFRL
PLLESELVIGAVILRGHLRIAGHHLGRCD
DSGFAAYSRYRIGNYKLNTDHSSSSDNIA
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GERSGARSKQRRPQG
INTNSSPDDQIGYYRRATRRIRGGDGKMK
VVATEGALNTPKDHIGTRNPANNAAIVLQ
GRNSSRNSTPGSSRGTSPARMAGNGGDAA
KKSAAEASKKPRQKRTATKAYNVTQAFGR
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TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
	RGPEQTQGNFGDQELIRQGTDYKHWPQIAQFAPSASAFFGMSRIGMEVTPSGTWLTYT GAIKLDDKDPNFKDQVILLNKHIDAYKTFPPTEPKKDKKKKADETQALPQRQKKQQTV TLLPAADLDDFSKQLQQSMSSADSTQA
Nucleotide sequence of SARS-CoV-2-Spike-co (codon-optimized for VACV expression). SEQ ID NO: 50	aGCGGCCGCaaaattgaaattttatttttttttttttggaatataaataATGTTCGTGTT CCTAGTCCTACTACCGCTAGT CTCTTCCCAGTGTGTAAACCTAACAACGAGAACACAACTACCACCGGCGTACACCAATT CTTTCACAAGAGGAGTATATT ACCCGGACAAGGTGTTCAGATCCTCCGTACTACATTCTACCCAGGACCTATTCCTACCG TTCTTCTCTAACGTAACATGG TTCCACGCGATCCATGTCTCTGGAACAAACGGAACGAAGAGATTCGATAACCCGGTCTT GCCGTTCAACGATGGTGTATA CTTTGCGTCCACCGAGAAGTCCAACATCATCAGAGGATGGATCTTCGGAACCACCTTGG ATTCTAAGACCCAGTCCTTGC TAATCGTCAACAACGCGACCAACGTCGTCATCAAAGTCTGCGAATTCCAGTTCTGTAAC GACCCGTTTTTGGGAGTCTAC TACCACAAGAACAACAAGTCCTGGATGGAATCCGAGTTCAGAGTCTACTCTTCCGCGAA CAACTGCACCTTCGAATATGT ATCTCAGCCGTTCCTAATGGACCTAGAGGGAAAGCAGGGAAACTTCAAGAACCTAAGAG AGTTCGTATTCAAGAACATCG ACGGATACTTCAAGATCTACTCCAAGCACACCCCGATCAACCTAGTTAGAGATCTACCG CAAGGATTCTCTGCGCTAGAA CCGTTAGTAGATTTGCCGATCGGAATCAACATCACCAGATTCCAGACACTACTAGCGCT ACACAGATCTTACCTAACGCC GGGAGATTCTTCTTCTGGATGGACTGCTGGTGCTGCGGCTTATTATGTAGGATACCTAC AGCCGAGAACCTTCCTATTGA AGTACAACGAAAACGGAACCATCACCGATGCCGTAGATTGTGCTCTAGATCCGCTATCC GAAACGAAGTGCACCCTAAAG TCTTTCACCGTCGAGAAGGGAATCTACCAGACCTCCAACTTTAGAGTACAGCCGACCGA ATCCATCGTCAGATTTCCGAA CATCACGAACCTATGTCCGTTCGGAGAAGTGTTCAACGCGACAAGATTTGCGTCTGTCT ATGCGTGGAACAGAAAAAGAA TCAGTAACTGCGTCGCGGACTACTCCGTCCTATACAACTCTGCCTCTTTCTCCACGTTC AAATGCTACGGTGTATCCCCG ACAAAGCTAAACGATCTATGCTTCACCAACGTCTACGCGGACTCCTTCGTAATCAGAGG AGATGAAGTTAGACAGATTGC GCCGGGACAAACTGGAAAGATCGCGGATTATAACTACAAGCTACCGGACGACTTCACCG GATGTGTAATTGCGTGGAATT CGAACAACCTAGACTCCAAAGTCGGAGGAAACTACAACTACTTGTACAGACTATTCAGA AAGTCCAACCTAAAGCCGTTC GAGAGAGACATCTCCACCGAAATCTATCAGGCTGGATCTACACCGTGTAATGGTGTCGA AGGATTCAACTGCTACTTCCC GCTACAGTCTTACGGATTTCAACCGACAAACGGTGTAGGATATCAGCCGTACAGAGTCG TCGTACTATCCTTCGAACTAC TACATGCTCCGGCGACAGTATGTGGACCGAAAAAGTCTACCAACCTAGTCAAGAACAAA TGCGTCAACTTTAACTTCAAC GGACTAACCGGAACCGGTGTCCTAACCGAATCTAACAAGAAGTTTCTACCGTTCCAGCA GTTCGGAAGAGATATCGCGGA TACAACAGACGCTGTCAGAGATCCGCAAACCTTGGAGATCCTAGATATCACCCCGTGTT CTTTCGGTGGTGTCTCTGTAA TTACTCCGGGAACGAACACCTCCAATCAAGTAGCGGTACTATACCAGGACGTGAACTGT

TABLE 1-continued

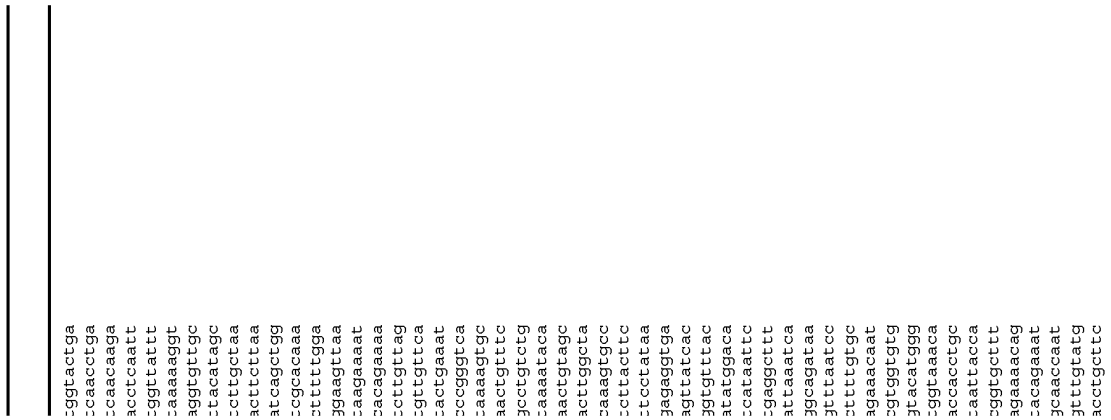
Compilation of some of the sequences of the present disclosure.
ACAGAAGTACCGGTAGCTATT
CACGCGGATCAACTAACACCAACTTGGAGAGTGTACTCCACCGGATCTAACGTATTCCA
AACAAGAGCGGGATGTCTAAT
CGGAGCGGAACACGTAAACAACTCCTACGAATGTGATATCCCGATTGGAGCGGGAATCT
GTGCGTCTTACCAAACACAAA
CAAACTCCCCGAGAAGAGCGAGATCTGTAGCCTCTCAATCTATTATCGCCTACACCATG
TCCTTGGGAGCCGAAAATTCT
GTCGCGTACTCCAACAATTCTATCGCGATCCCGACAAACTTCACCATCTCTGTAACAAC
CGAGATCCTACCGGTGTCTAT
GACCAAGACATCTGTCGATTGCACCATGTACATCTGCGGAGATTCCACCGAGTGCTCCA
ACCTACTACTACAGTACGGAT
CTTTCTGTACCCAGCTAAACAGAGCGTTGACTGGAATCGCTGTAGAGCAGGATAAGAAC
ACCCAAGAGGTATTCGCGCAA
GTCAAGCAGATCTATAAGACTCCGCCGATCAAGGACTTCGGAGGTTTTAACTTCTCTCA
GATCTTGCCGGATCCGTCCAA
ACCGTCTAAGAGATCTTTCATCGAGGACCTACTATTCAACAAAGTCACCCTAGCTGACG
CGGGATTCATCAAACAATACG
GAGATTGCTTGGGAGACATTGCGGCGAGAGATCTAATTTGCGCGCAGAAGTTTAACGGA
TTGACAGTACTACCGCCGCTA
CTAACCGATGAGATGATTGCGCAGTACACGTCTGCTCTATTGGCGGGAACAATTACAAG
TGGATGGACATTTGGAGCCGG
TGCCGCTCTACAAATTCCGTTTGCTATGCAAATGGCGTACAGATTCAACGGAATCGGAG
TAACCCAGAACGTCTTGTACG
AGAACCAGAAGCTAATCGCGAACCAGTTCAATTCCGCGATCGGAAAGATCCAGGACAGT
CTATCTTCTACTGCTTCGGCG
TTGGGAAAGCTACAGGATGTAGTAAATCAAAACGCGCAGGCGCTAAACACCTTGGTCAA
GCAACTATCCTCTAACTTCGG
AGCGATCTCGTCCGTCCTAAACGACATCTTATCCAGACTAGATAAGGTCGAAGCGGAGG
TCCAGATCGATAGACTAATCA
CTGGAAGATTGCAGTCCCTACAGACCTACGTAACACAGCAACTAATTAGAGCGGCGGAG
ATTAGAGCCTCTGCTAATCTA
GCTGCGACCAAGATGTCCGAATGTGTCTTGGGACAATCCAAGAGAGTCGACTTTTGCGG
AAAGGGATACCACCTAATGTC
TTTTCCACAATCTGCGCCGCATGGTGTCGTATTCCTACATGTAACATATGTGCCGGCGC
AAGAAAAGAACTTTACAACAG
CTCCAGCGATCTGCCATGATGGAAAAGCTCATTTTCCGAGAGAGGGAGTCTTTGTCTCT
AACGGAACTCATTGGTTCGTC
ACCCAGAGAAACTTTTACGAGCCGCAGATCATCACCACCGACAACACATTTGTTTCGGG
AAACTGCGACGTGGTCATCGG
AATCGTAAACAATACCGTCTACGATCCGTTGCAGCCGGAACTAGACTCCTTCAAAGAAG
AGTTGGACAAGTACTTTAAGA
ACCACACCTCTCCGGATGTCGACTTGGGAGATATTTCTGGAATCAACGCGTCCGTCGTC
AACATCCAGAAAGAAATCGAT
AGATTGAACGAGGTCGCGAAGAACTTGAACGAGTCCCTAATCGACCTACAAGAGCTAGG
AAAATACGAGCAGTACATCAA
GTGGCCGTGGTACATTTGGCTAGGATTCATTGCTGGACTAATTGCGATCGTCATGGTCA
CCATCATGCTATGCTGTATGA
CCTCCTGTTGCTCCTGTCTAAAGGGATGTTGTTCCTGCGGATCCTGTTGCAAGTTCGAT
GAAGATGATAGTGAACCGGTC
CTAAAGGGTGTCAAGCTACACTACACATAAAAGCTT

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
Nucleotide sequence of HPXV095 gene locus target for SARS-CoV-2 Spike insertion. SEQ ID NO: 51	tttggctagtcaagatgatgaatcttcattatctgatatattgcaaatcactcaatatc tagactttctgttattattat tgatccaatcaaaaaataaattagaagccgtgggtcattgttatgaatctctttcagag gaatacagacaattgacaaaa ttcacagactttcaagattttaaaaaactgtttaacaaggtccctattgttacagatgg aagggtcaaacttaataaagg atatttgttcgactttgtgattagtttgatgcgattcaaaaaagaatcctctctagcta ccaccgcaatagatcctatta gatacatagatcctcgtcgtgatatcgcattttctaacgtgatggatatattaaagttg aataaagtgaacaataattaa ttctttattgtcatcGGATCCCACgatGTGctaGACtctctcGTCtacGCGGCCGCaAc tgagagaccAAGCTTGTCGAC tattatatttttatctaaaaaactaaaaataaacattgattaaattttaatataatac ttaaaaatggatgttgtgtcg ttagataaaccgtttatgtattttgaggaaattgataatgagttagattacgaaccaga aagtgcaaatgaggtcgcaaa aaaactaccgtatcaaggacagttaaaactattactaggagaattatttttcttagta agttacagcgacacggtatat tagatggtgccaccgtagtgtatataggatcggctcctggtacacatatacgttatttg agagatcatttctataattta ggaatgattatcaaatggatgctaattgacggacgccatcatgatcctattctaaatgg attgcgtgatgtgactctagt
Nucleotide sequence of HPXV200 gene locus target for SARS-COV-2 Spike insertion. SEQ ID NO: 52	gagtattctaggtgtttctatagaatgtaagaagtcAtcgacattacttactttttga ccgtgcgtaaaatgacCgag tatttaatagatttccagatatggcttattatcgaggagactgtttaaaagccgtttat gtaacaatgacttataaaaat actaaaactggagagactgattacacgtacctctctaatgggggttgcctgcatactat cgtaatggggtcgatggttga ttattgattagtatattccttattctttttattcacacaaaaagaacatttttataaac atgaaaccactgtctaaatgt aattatgatcttgatttatagatgaagatcagcctttagaggattttaaccagtatgtt taatatgaaaaaaataaacat aacatattttgagattaagcgctattgtgcttaattattttgctctataaactgaatat atagccacaattattgacggg cttgtttatgaccggcaatcGGATCCCACgatGTGctaGACtctctcGTCtacGCGGCC GCaActgagagaccAAGCTTG TCGACtaaaatagtttaactcttttaaaaccagtttggtactggaatttcagttcatta ctcgttgagaaattgatgatt tttttaaaatgatattacttttatatgcttgcatcgcagaatgatattcacaagtatta ttaaaaatgagtatcggtagt tacattaccatatcatccatgctcatatggatctccatccattatataatcaatgatac atgtattaaaatactttccga ataagtcttttaaatattgtattaattatgaaaaactatgctatgcgagtatgatgcaa agatgtttaatgatacgatac tagattttatctctagcgagagatgtcgttagaatcatttatcataactacgtttaata ataattcatcaacgaatatcg ataacatgtgtcatttatactttaaatacgttaaagtctgtccgtcttctctattgttt agactgtttgtagaatgctgt gatataaacaaactagtagaaggta

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
1	attaaaggtt tataccttcc caggtaacaa accaaccaac tttcgatctc ttgtagatct
61	gttctctaaa cgaactttaa aatctgtgtg gctgtcactc ggctgcatgc ttagtgcact
121	cacgcagtat aattaataac taattactgt cgttgacagg acacgagtaa ctcgtctatc
181	ttctgcaggc tgcttacggt ttcgtccgtg ttgcagccga tcatcagcac atctaggttt
241	cgtccgggtg tgaccgaaag gtaagatgga gagccttgtc cctggtttca acgagaaaac
301	acacgtccaa ctcagtttgc ctgttttaca ggttcgcgac gtgctcgtac gtggctttgg
361	agactccgtg gaggaggtct tatcagaggc acgtcaacat cttaaagatg gcacttgtgg
421	cttagtagaa gttgaaaaag gcgttttgcc tcaacttgaa cagccctatg tgttcatcaa
481	acgttcggat gctcgaactg cacctcatgg tcatgttatg gttgagctgg tagcagaact
541	cgaaggcatt cagtacggtc gtagtggtga gacacttggt gtccttgtcc ctcatgtggg
601	cgaaatacca gtggcttacc gcaaggttct tcttcgtaag aacggtaata aaggagctgg
661	tggccatagt tacggcgccg atctaaagtc atttgactta ggcgacgagc ttggcactga
721	tccttatgaa gattttcaag aaaactggaa cactaaacat agcagtggtg ttacccgtga
781	actcatgcgt gagcttaacg gaggggcata cactcgctat gtcgataaca acttctgtgg
841	ccctgatggc taccctcttg agtgcattaa agaccttcta gcacgtgctg gtaaagcttc
901	atgcactttg tccgaacaac tggactttat tgacactaag aggggtgtat actgctgccg
961	tgaacatgag catgaaattg cttggtacac ggaacgttct gaaaagagct atgaattgca
1021	gacacctttt gaaattaaat tggcaaagaa atttgacacc ttcaatgggg aatgtccaaa
1081	ttttgtattt cccttaaatt ccataatcaa gactattcaa ccaagggttg aaaagaaaaa
1141	gcttgatggc tttatgggta gaattcgatc tgtctatcca gttgcgtcac caaatgaatg
1201	caaccaaatg tgcctttcaa ctctcatgaa gtgtgatcat tgtggtgaaa cttcatggca
1261	gacgggcgat tttgttaaag ccacttgcga attttgtggc actgagaatt tgactaaaga
1321	aggtgccact acttgtggtt acttacccca aaatgctgtt gttaaaattt attgtccagc
1381	atgtcacaat tcagaagtag gacctgagca tagtcttgcc gaataccata atgaatctgg
1441	cttgaaaacc attcttcgta agggtggtcg cactattgcc tttggaggct gtgtgttctc
1501	ttatgttggt tgccataaca agtgtgccta ttgggttcca cgtgctagcg ctaacatagg
1561	ttgtaaccat acaggtgttg ttggagaagg ttccgaaggt cttaatgaca accttcttga
1621	aatactccaa aaagagaaag tcaacatcaa tattgttggt gactttaaac ttaatgaaga
1681	gatcgccatt attttggcat ctttttctgc ttccacaagt gcttttgtgg aaactgtgaa
1741	aggtttggat tataaagcat tcaaacaaat tgttgaatcc tgtggtaatt ttaaagttac
1801	aaaaggaaaa gctaaaaaag gtgcctggaa tattggtgaa cagaaatcaa tactgagtcc
1861	tctttatgca tttgcatcag aggctgctcg tgttgtacga tcaattttct cccgcactct
1921	tgaaactgct caaaattctg tgcgtgtttt acagaaggcc gctataacaa tactagatgg
1981	aatttcacag tattcactga gactcattga tgctatgatg ttcacatctg atttggctac
2041	taacaatcta gttgtaatgg cctacattac aggtggtgtt gttcagttga cttcgcagtg
2101	gctaactaac atctttggca ctgtttatga aaaactcaaa cccgtccttg attggcttga
2161	agagaagttt aaggaaggtg tagagtttct tagagacggt tgggaaattg ttaaatttat
2221	ctcaacctgt gcttgtgaaa ttgtcggtgg acaaattgtc acctgtgcaa aggaaattaa
2281	ggagagtgtt cagacattct ttaagcttgt aaataaattt ttggctttgt gtgctgactc
2341	tatcattatt ggtggagcta aacttaaagc cttgaattta ggtgaaacat ttgtcacgca
2401	ctcaaaggga ttgtacagaa agtgtgttaa atccagagaa gaaactggcc tactcatgcc
2461	tctaaaagcc ccaaaagaaa ttatcttctt agagggagaa acacttccca cagaagtgtt
2521	aacagaggaa gttgtcttga aaactggtga tttacaacca ttagaacaac ctactagtga
2581	agctgttgaa gctccattgg ttggtacacc agtttgtatt aacgggctta tgttgctcga
2641	aatcaaagac acagaaaagt actgtgccct tgcacctaat atgatggtaa caaacaatac
2701	cttcacactc aaaggcggtg caccaacaaa ggttactttt ggtgatgaca ctgtgataga
2761	agtgcaaggt tacaagagtg tgaatatcac ttttgaactt gatgaaagga ttgataaagt
2821	acttaatgag aagtgctctg cctatacagt tgaactcggt acagaagtaa atgagttcgc
2881	ctgtgttgtg gcagatgctg tcataaaaac tttgcaacca gtatctgaat tacttacacc
2941	actgggcatt gatttagatg agtggagtat ggctacatac tacttatttg atgagtctgg
3001	tgagtttaaa ttggcttcac atatgtattg ttctttctac cctccagatg aggatgaaga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ctttttgga
ggaagttaa
caagaaaat
cacagaaaa
cttgttag
cgttgttca
cactgaaat
ccgggtca
caaaagtgc
aactgtttc
gcctgtctg
caaaataca
aactgtagc
acttggcta
caaagtgcc
cttacttc
ctcctataa
gagaggtga
agttatcac
ggtgtttac
atatggaca
ccataattc
cgaggcttt
attaaatca
ggcagataa
gtttaatcc
ctttttgtgc
agaaacaat
cgtggtgtg
gtacatggg
cggtaaaca
acacctgc
caattacca
cggtgcttt
agaaaacag
cacagaaat
gcaaccaat
gtttgtatg
acctgcttc

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
6121	aagagagctt aaagttacat ttttccctga cttaaatggt gatgtggtgg ctattgatta
6181	taaacactac acaccctctt ttaagaaagg agctaaattg ttacataaac ctattgtttg
6241	gcatgttaac aatgcaacta ataaagccac gtataaacca aatacctggt gtatacgttg
6301	tctttggagc acaaaaccag ttgaaacatc aaattcgttt gatgtactga agtcagagga
6361	cgcgcaggga atggataatc ttgcctgcga agatctaaaa ccagtctctg aagaagtagt
6421	ggaaaatcct accatacaga aagacgttct tgagtgtaat gtgaaaacta ccgaagttgt
6481	aggagacatt atacttaaac cagcaaataa tagtttaaaa attacagaag aggttggcca
6541	cacagatcta atggctgctt atgtagacaa ttctagtctt actattaaga aacctaatga
6601	attatctaga gtattaggtt tgaaaaccct tgctactcat ggtttagctg ctgttaatag
6661	tgtcccttgg gatactatag ctaattatgc taagcctttt cttaacaaag ttgttagtac
6721	aactactaac atagttacac ggtgtttaaa ccgtgtttgt actaattata tgccttattt
6781	ctttacttta ttgctacaat tgtgtacttt tactagaagt acaaattcta gaattaaagc
6841	atctatgccg actactatag caaagaatac tgttaagagt gtcggtaaat tttgtctaga
6901	ggcttcattt aattatttga agtcacctaa tttttctaaa ctgataaata ttataatttg
6961	gtttttacta ttaagtgttt gcctaggttc tttaatctac tcaaccgctg ctttaggtgt
7021	tttaatgtct aatttaggca tgccttctta ctgtactggt tacagagaag gctatttgaa
7081	ctctactaat gtcactattg caacctactg tactggttct ataccttgta gtgtttgtct
7141	tagtggttta gattctttag acacctatcc ttctttagaa actatacaaa ttaccatttc
7201	atcttttaaa tgggatttaa ctgcttttgg cttagttgca gagtggtttt tggcatatat
7261	tcttttcact aggtttttct atgtacttgg attggctgca atcatgcaat tgtttttcag
7321	ctattttgca gtacatttta ttagtaattc ttggcttatg tggttaataa ttaatcttgt
7381	acaaatggcc ccgatttcag ctatggttag aatgtacatc ttctttgcat cattttatta
7441	tgtatggaaa agttatgtgc atgttgtaga cggttgtaat tcatcaactt gtatgatgtg
7501	ttacaaacgt aatagagcaa caagagtcga atgtacaact attgttaatg gtgttagaag
7561	gtccttttat gtctatgcta atggaggtaa aggcttttgc aaactacaca attggaattg
7621	tgttaattgt gatacattct gtgctggtag tacatttatt agtgatgaag ttgcgagaga
7681	cttgtcacta cagtttaaaa gaccaataaa tcctactgac cagtcttctt acatcgttga
7741	tagtgttaca gtgaagaatg gttccatcca tctttacttt gataaagctg gtcaaaagac
7801	ttatgaaaga cattctctct ctcattttgt taacttagac aacctgagag ctaataacac
7861	taaaggttca ttgcctatta atgttatagt tttgatggt aaatcaaaat gtgaagaatc
7921	atctgcaaaa tcagcgtctg tttactacag tcagcttatg tgtcaaccta tactgttact
7981	agatcaggca ttagtgtctg atgttggtga tagtgcggaa gttgcagtta aaatgtttga
8041	tgcttacgtt aatacgtttt catcaacttt taacgtacca atggaaaaac tcaaaacact
8101	agttgcaact gcagaagctg aacttgcaaa gaatgtgtcc ttagacaatg tcttatctac
8161	ttttatttca gcagctcggc aagggtttgt tgattcagat gtagaaacta aagatgttgt
8221	tgaatgtctt aaattgtcac atcaatctga catagaagtt actggcgata gttgtaataa
8281	ctatatgctc acctataaca aagttgaaaa catgacaccc cgtgaccttg gtgcttgtat
8341	tgactgtagt gcgcgtcata ttaatgcgca ggtagcaaaa agtcacaaca ttgctttgat
8401	atggaacgtt aaagatttca tgtcattgtc tgaacaacta cgaaaacaaa tacgtagtgc
8461	tgctaaaaag aataacttac cttttaagtt gacatgtgca actactagac aagttgttaa
8521	tgttgtaaca acaaagatag cacttaaggg tggtaaaatt gttaataatt ggttgaagca
8581	gttaattaaa gttacacttg tgttcctttt tgttgctgct attttctatt taataacacc
8641	tgttcatgtc atgtctaaac atactgactt ttcaagtgaa atcataggat acaaggctat
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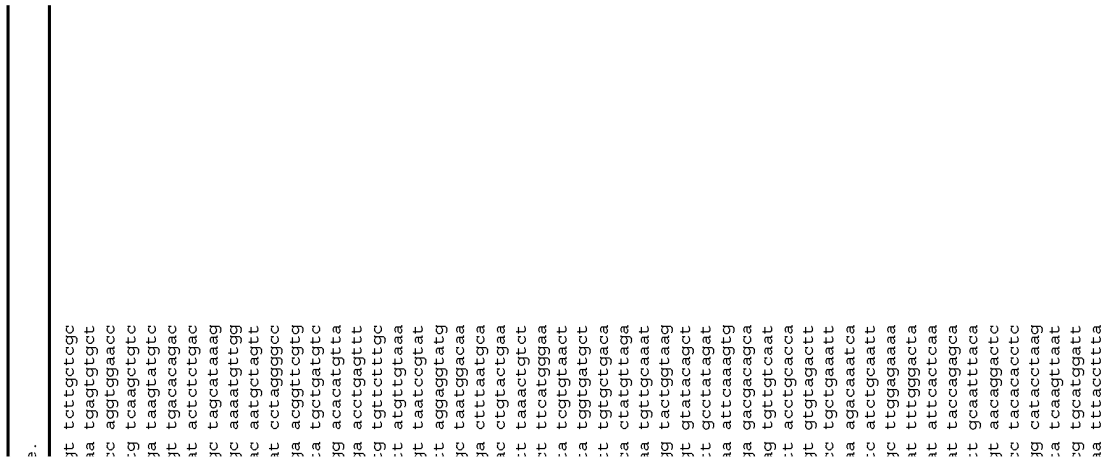
8821	attgattgct gcagtcataa caagagaagt gggttttgtc gtgcctggtt tgcctggcac
8881	gatattacgc acaactaatg gtgacttttt gcatttctta cctagagttt ttagtgcagt
8941	tggtaacatc tgttacacac catcaaaact tatagagtac actgactttg caacatcagc
9001	ttgtgttttg gctgctgaat gtacaatttt taaagatgct tctggtaagc cagtaccata
9061	ttgttatgat accaatgtac tagaaggttc tgttgcttat gaaagtttac gccctgacac
9121	acgttatgtg ctcatggatg gctctattat tcaatttcct aacacctacc ttgaaggttc

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
9181	tgttagagtg gtaacaactt ttgattctga gtactgtagg cacggcactt gtgaaagatc
9241	agaagctggt gtttgtgtat ctactagtgg tagatgggta cttaacaatg attattacag
9301	atctttacca ggagttttct gtggtgtaga tgctgtaaat ttacttacta atatgtttac
9361	accactaatt caacctattg gtgctttgga catatcagca tctatagtag ctggtggtat
9421	tgtagctatc gtagtaacat gccttgccta ctattttatg aggtttagaa gagcttttgg
9481	tgaatacagt catgtagttg cctttaatac tttactattc cttatgtcat tcactgtact
9541	ctgtttaaca ccagtttact cattcttacc tggtgtttat tctgttattt acttgtactt
9601	gacattttat cttactaatg atgtttcttt tttagcacat attcagtgga tggttatgtt
9661	cacaccttta gtacctttct ggataacaat tgcttatatc atttgtattt ccacaaagca
9721	tttctattgg ttctttagta attacctaaa gagacgtgta gtctttaatg gtgtttcctt
9781	tagtactttt gaagaagctg cgctgtgcac ctttttgtta aataaagaaa tgtatctaaa
9841	gttgcgtagt gatgtgctat tacctcttac gcaatataat agatacttag ctctttataa
9901	taagtacaag tattttagtg gagcaatgga tacaactagc tacagagaag ctgcttgttg
9961	tcatctcgca aaggctctca atgacttcag taactcaggt tctgatgttc tttaccaacc
10021	accacaaacc tctatcacct cagctgtttt gcagagtggt tttagaaaaa tggcattccc
10081	atctggtaaa gttgagggtt gtatggtaca agtaacttgt ggtacaacta cacttaacgg
10141	tctttggctt gatgacgtag tttactgtcc aagacatgtg atctgcacct ctgaagacat
10201	gcttaaccct aattatgaag atttactcat tcgtaagtct aatcataatt tcttggtaca
10261	ggctggtaat gttcaactca gggttattgg acattctatg caaaattgtg tacttaagct
10321	taaggttgat acagccaatc ctaagacacc taagtataag tttgttcgca ttcaaccagg
10381	acagactttt tcagtgttag cttgttacaa tggttcacca tctggtgttt accaatgtgc
10441	tatgaggccc aatttcacta ttaagggttc attccttaat ggttcatgtg gtagtgttgg
10501	ttttaacata gattatgact gtgtctcttt ttgttacatg caccatatgg aattaccaac
10561	tggagttcat gctggcacag acttagaagg taacttttat ggaccttttg ttgacaggca
10621	aacagcacaa gcagctggta cggacacaac tattacagtt aatgttttag cttggttgta
10681	cgctgctgtt ataaatggag acaggtggtt tctcaatcga tttaccacaa ctcttaatga
10741	ctttaacctt gtggctatga agtacaatta tgaacctcta acacaagacc atgttgacat
10801	actaggacct ctttctgctc aaactggaat tgccgtttta gatatgtgtg cttcattaaa
10861	agaattactg caaaatggta tgaatggacg taccatattg ggtagtgctt tattagaaga
10921	tgaatttaca ccttttgatg ttgttagaca atgctcaggt gttactttcc aaagtgcagt
10981	gaaaagaaca atcaagggta cacaccactg gttgttactc acaattttga cttcactttt
11041	agttttagtc cagagtactc aatggtcttt gttctttttt ttgtatgaaa atgccttttt
11101	acctttgct atgggtatta ttgctatgtc tgcttttgca atgatgtttg tcaaacataa
11161	gcatgcattt ctctgtttgt ttttgttacc ttctcttgcc actgtagctt attttaatat
11221	ggtctatatg cctgctagtt gggtgatgcg tattatgaca tggttggata tggttgatac
11281	tagtttgtct ggttttaagc taaaagactg tgttatgtat gcatcagctg tagtgttact
11341	aatccttatg acagcaagaa ctgtgtatga tgatggtgct aggagagtgt ggacacttat
11401	gaatgtcttg acactcgttt ataaagttta ttatggtaat gctttagatc aagccatttc
11461	catgtgggct cttataatct ctgttacttc taactactca ggtgtagtta caactgtcat
11521	gtttttggcc agaggtattg tttttatgtg tgttgagtat tgccctattt tcttcataac
11581	tggtaataca cttcagtgta taatgctagt ttattgtttc ttaggctatt tttgtacttg
11641	ttactttggc ctcttttgtt tactcaaccg ctactttaga ctgactcttg gtgtttatga
11701	ttacttagtt tctacacagg agtttagata tatgaattca cagggactac tcccacccaa
11761	gaatagcata gatgccttca aactcaacat taaattgttg ggtgttggtg gcaaaccttg
11821	tatcaaagta gccactgtac agtctaaaat gtcagatgta aagtgcacat cagtagtctt
11881	actctcagtt ttgcaacaac tcagagtaga atcatcatct aaattgtggg ctcaatgtgt
11941	ccagttacac aatgacattc tcttagctaa agatactact gaagcctttg aaaaaatggt
12001	ttcactactt tctgttttgc tttccatgca gggtgctgta gacataaaca agctttgtga
12061	agaaatgctg gacaacaggg caaccttaca agctatagcc tcagagttta gttcccttcc
12121	atcatatgca gcttttgcta ctgctcaaga agcttatgag caggctgttg ctaatggtga
12181	ttctgaagtt gttcttaaaa agttgaagaa gtctttgaat gtggctaaat ctgaatttga

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.						
2241	ccgtgatgca	gccatgcaac	gtaagttgga	aaagatggct	gatcaagcta	tgacccaaat
2301	gtataaacag	gctagatctg	aggacaagag	ggcaaaagtt	actagtgcta	tgcagacaat
2361	gcttttcact	atgcttagaa	agttggataa	tgatgcactc	aacaacatta	tcaacaatgc
2421	aagagatggt	tgtgttccct	tgaacataat	acctcttaca	acagcagcca	aactaatggt
2481	tgtcatacca	gactataaca	catataaaaa	tacgtgtgat	ggtacaacat	ttacttatgc
2541	atcagcattg	tgggaaatcc	aacaggttgt	agatgcagat	agtaaaattg	ttcaacttag
2601	tgaaattagt	atggacaatt	cacctaattt	agcatggcct	cttattgtaa	cagctttaag
2661	ggccaattct	gctgtcaaat	tacagaataa	tgagcttagt	cctgttgcac	tacgacagat
2721	gtcttgtgct	gccggtacta	cacaaactgc	ttgcactgat	gacaatgcgt	tagcttacta
2781	caacacaaca	aagggaggta	ggtttgtact	tgcactgtta	tccgatttac	aggatttgaa
2841	atgggctaga	ttccctaaga	gtgatggaac	tggtactatc	tatacagaac	tggaaccacc
2901	ttgtaggttt	gttacagaca	cacctaaagg	tcctaaagtg	aagtatttat	actttattaa
2961	aggattaaac	aacctaaata	gaggtatggt	acttggtagt	ttagctgcca	cagtacgtct
3021	acaagctggt	aatgcaacag	aagtgcctgc	caattcaact	gtattatctt	tctgtgcttt
3081	tgctgtagat	gctgctaaag	cttacaaaga	ttatctagct	agtgggggac	aaccaatcac
3141	taattgtgtt	aagatgttgt	gtacacacac	tggtactggt	caggcaataa	cagttacacc
3201	ggaagccaat	atggatcaag	aatcctttgg	tggtgcatcg	tgttgtctgt	actgccgttg
3261	ccacatagat	catccaaatc	ctaaaggatt	ttgtgactta	aaaggtaagt	atgtacaaat
3321	acctacaact	tgtgctaatg	accctgtggg	ttttacactt	aaaaacacag	tctgtaccgt
3381	ctgcggtatg	tggaaaggtt	atggctgtag	ttgtgatcaa	ctccgcgaac	ccatgcttca
3441	gtcagctgat	gcacaatcgt	tttaaacgg	gtttgcggtg	taagtgcagc	ccgtcttaca
3501	ccgtgcggca	caggcactag	tactgatgtc	gtatacaggg	cttttgacat	ctacaatgat
3561	aaagtagctg	gttttgctaa	attcctaaaa	actaattgtt	gtcgcttcca	agaaaaggac
3621	gaagatgaca	atttaattga	ttcttacttt	gtagttaaga	gacacacttt	ctctaactac
3681	caacatgaag	aaacaattta	taatttactt	aaggattgtc	cagctgttgc	taaacatgac
3741	ttctttaagt	ttagaataga	cggtgacatg	gtaccacata	tatcacgtca	acgtcttact
3801	aaatacacaa	tggcagacct	cgtctatgct	ttaaggcatt	ttgatgaagg	taattgtgac
3861	acattaaaag	aaatacttgt	cacatacaat	tgttgtgatg	atgattattt	caataaaaag
3921	gactggtatg	attttgtaga	aaacccagat	atattacgcg	tatacgccaa	cttaggtgaa
3981	cgtgtacgcc	aagctttgtt	aaaaacagta	caattctgtg	atgccatgcg	aaatgctggt
4041	attgttggtg	tactgacatt	agataatcaa	gatctcaatg	gtaactggta	tgatttcggt
4101	gatttcatac	aaaccacgcc	aggtagtgga	gttcctgttg	tagattctta	ttattcattg
4161	ttaatgccta	tattaacctt	gaccagggct	ttaactgcag	agtcacatgt	tgacactgac
4221	ttaacaaagc	cttacattaa	gtgggatttg	ttaaaatatg	acttcacgga	agagaggtta
4281	aaactctttg	accgttattt	taaatattgg	gatcagacat	accacccaaa	ttgtgttaac
4341	tgtttggatg	acagatgcat	tctgcattgt	gcaaacttta	atgttttatt	ctctacagtg
4401	ttcccaccta	caagttttgg	accactagtg	agaaaaatat	ttgttgatgg	tgttccattt
4461	gtagtttcaa	ctggatacca	cttcagagag	ctaggtgttg	tacataatca	ggatgtaaac
4521	ttacatagct	ctagacttag	ttttaaggaa	ttacttgtgt	atgctgctga	ccctgctatg
4581	cacgctgctt	ctggtaatct	attactagat	aaacgcacta	cgtgcttttc	agtagctgca
4641	cttactaaca	atgttgcttt	tcaaactgtc	aaacccggta	attttaacaa	agacttctat
4701	gactttgctg	tgtctaaggg	tttctttaag	gaaggaagtt	ctgttgaatt	aaaacacttc
4761	ttctttgctc	aggatggtaa	tgctgctatc	agcgattatg	actactatcg	ttataatcta
4821	ccaacaatgt	gtgatatcag	acaactacta	tttgtagttg	aagttgttga	taagtacttt
4881	gattgttacg	atggtggctg	tattaatgct	aaccaagtca	tcgtcaacaa	cctagacaaa
4941	tcagctggtt	ttccatttaa	taaatggggt	aaggctagac	tttattatga	ttcaatgagt
5001	tatgaggatc	aagatgcact	tttcgcatat	acaaaacgta	atgtcatccc	tactataact
5061	caaatgaatc	ttaagtatgc	cattagtgca	aagaatagag	ctcgcaccgt	agctggtgtc
5121	tctatctgta	gtactatgac	caatagacag	tttcatcaaa	aattattgaa	atcaatagcc
5181	gccactagag	gagctactgt	agtaattgga	acaagcaaat	tctatggtgg	ttggcacaac
5241	atgttaaaaa	ctgtttatag	tgatgtagaa	aaccctcacc	ttatgggttg	ggattatcct



e.

```
gt tcttgctcgc
aa tgagtgtgct
cc aggtggaacc
cg tcaagctgtc
ga taagtatgtc
gt tgacacagac
at actctctgac
gc tagcataaag
gc aaaatgttgg
ac aatgctagtt
at cctaggggcc
ga acggttcgtg
ca tgctgatgtc
gg acacatgtta
ga acctgagttt
cg tgttctttgc
ct atgttgtaaa
gt taatccgtat
ct aggaggtatg
gc taatggacaa
ga ctttaatgca
ac ctgtactgaa
ct taaactgtct
ct ttcatgggaa
ca tcgtgtaact
ca tggtgatgct
ct tgtgctgaca
ca ctatgttaga
aa tgttgcaaat
gg tactggtaag
gt gtatacagct
ct gcctatagat
aa attcaaagtg
ga gacgacagca
ag tgttgtcaat
ct acctgcacca
gt gtgtagactt
cc tgctgaaatt
aa agacaaatca
cc atctgcaatt
gc ttggagaaaa
at tttgggacta
at attcactcaa
at taccagagca
ct gcaatttaca
gt aacaggactc
cc tacacacctc
gg catacctaag
ca tcaagttaat
cg tgcatggatt
aa tttaccttta
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TABLE 1-continued

Compilation of some of the sequences of the present disclosure.

.8361	cagctaggtt tttctacagg tgttaaccta gttgctgtac ctacaggtta tgttgataca
.8421	cctaataata cagatttttc cagagttagt gctaaaccac cgcctggaga tcaatttaaa
.8481	cacctcatac cacttatgta caaaggactt ccttggaatg tagtgcgtat aaagattgta
.8541	caaatgttaa gtgacacact taaaaatctc tctgacagag tcgtatttgt cttatgggca
.8601	catggctttg agttgacatc tatgaagtat tttgtgaaaa taggacctga gcgcacctgt
.8661	tgtctatgtg atagacgtgc cacatgcttt tccactgctt cagacactta tgcctgttgg
.8721	catcattcta ttggatttga ttacgtctat aatccgttta tgattgatgt tcaacaatgg
.8781	ggttttacag gtaacctaca aagcaaccat gatctgtatt gtcaagtcca tggtaatgca
.8841	catgtagcta gttgtgatgc aatcatgact aggtgtctag ctgtccacga gtgctttgtt
.8901	aagcgtgttg actggactat tgaatatcct ataattggtg atgaactgaa gattaatgcg
.8961	gcttgtagaa aggttcaaca catggttgtt aaagctgcat tattagcaga caaattccca
.9021	gttcttcacg acattggtaa ccctaaagct attaagtgtg tacctcaagc tgatgtagaa
.9081	tggaagttct atgatgcaca gccttgtagt gacaaagctt ataaaataga agaattattc
.9141	tattcttatg ccacacattc tgacaaattc acagatggtg tatgcctatt ttggaattgc
.9201	aatgtcgata gatatcctgc taattccatt gtttgtagat ttgacactag agtgctatct
.9261	aaccttaact tgcctggttg tgatggtggc agtttgtatg taaataaaca tgcattccac
.9321	acaccagctt ttgataaaag tgcttttgtt aatttaaaac aattaccatt tttctattac
.9381	tctgacagtc catgtgagtc tcatggaaaa caagtagtgt cagatataga ttatgtacca
.9441	ctaaagtctg ctacgtgtat aacacgttgc aatttaggtg gtgctgtctg tagacatcat
.9501	gctaatgagt acagattgta tctcgatgct tataacatga tgatctcagc tggctttagc
.9561	ttgtgggttt acaaacaatt tgatacttat aacctctgga acacttttac aagacttcag
.9621	agtttagaaa atgtggcttt taatgttgta aataagggac actttgatgg acaacagggt
.9681	gaagtaccag tttctatcat taataacact gtttacacaa aagttgatgg tgttgatgta
.9741	gaattgtttg aaaataaaac aacattacct gttaatgtag catttgagct ttgggctaag
.9801	cgcaacatta aaccagtacc agaggtgaaa atactcaata atttgggtgt ggacattgct
.9861	gctaatactg tgatctggga ctacaaaaga gatgctccag cacatatatc tactattggt
.9921	gtttgttcta tgactgacat agccaagaaa ccaactgaaa cgatttgtgc accactcact
.9981	gtctttttg atggtagagt tgatggtcaa gtagacttat ttagaaatgc ccgtaatggt
20041	gttcttatta cagaaggtag tgttaaaggt ttacaaccat ctgtaggtcc caaacaagct
20101	agtcttaatg gagtcacatt aattggagaa gccgtaaaaa cacagttcaa ttattataag
20161	aaagttgatg gtgttgtcca acaattacct gaaacttact ttactcagag tagaaattta
20221	caagaattta aacccaggag tcaaatggaa attgatttct tagaattagc tatggatgaa
20281	ttcattgaac ggtataaatt agaaggctat gccttcgaac atatcgttta tggagatttt
20341	agtcatagtc agttaggtgg tttacatcta ctgattggac tagctaaacg ttttaaggaa
20401	tcaccttttg aattagaaga ttttattcct atggacagta cagttaaaaa ctatttcata
20461	acagatgcgc aaacaggttc atctaagtgt gtgtgttctg ttattgattt attacttgat
20521	gattttgttg aaataataaa atcccaagat ttatctgtag tttctaaggt tgtcaaagtg
20581	actattgact atacagaaat ttcatttatg ctttggtgta aagatggcca tgtagaaaca
20641	ttttacccaa aattacaatc tagtcaagcg tggcaaccgg gtgttgctat gcctaatctt
20701	tacaaaatgc aaagaatgct attagaaaag tgtgaccttc aaaattatgg tgatagtgca
20761	acattaccta aaggcataat gatgaatgtc gcaaaatata ctcaactgtg tcaatattta
20821	aacacattaa cattagctgt accctataat atgagagtta tacattttgg tgctggttct
20881	gataaaggag ttgcaccagg tacagctgtt ttaagacagt ggttgcctac gggtacgctg
20941	cttgtcgatt cagatcttaa tgactttgtc tctgatgcag attcaacttt gattggtgat
21001	tgtgcaactg tacatacagc taataaatgg gatctcatta ttagtgatat gtacgaccct
21061	aagactaaaa atgttacaaa agaaaatgac tctaaagagg gtttttcac ttacatttgt
21121	gggtttatac aacaaaagct agctcttgga ggttccgtgg ctataaagat aacagaacat
21181	tcttggaatg ctgatcttta taagctcatg ggacacttcg catggtggac agcctttgtt
21241	actaatgtga atgcgtcatc atctgaagca tttttaattg gatgtaatta tcttggcaaa
21301	ccacgcgaac aaatagatgg ttatgtcatg catgcaaatt acatattttg gaggaataca
21361	aatccaattc agttgtcttc ctattcttta tttgacatga gtaaatttcc ccttaaatta

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.

24481	ttcaagtgtt ttaaatgata tcctttcacg tcttgacaaa gttgaggctg aagtgcaaat
24541	tgataggttg atcacaggca gacttcaaag tttgcagaca tatgtgactc aacaattaat
24601	tagagctgca gaaatcagag cttctgctaa tcttgctgct actaaaatgt cagagtgtgt
24661	acttggacaa tcaaaaagag ttgatttttg tggaaagggc tatcatctta tgtccttccc
24721	tcagtcagca cctcatggtg tagtcttctt gcatgtgact tatgtccctg cacaagaaaa
24781	gaacttcaca actgctcctg ccatttgtca tgatggaaaa gcacactttc ctcgtgaagg
24841	tgtctttgtt tcaaatggca cacactggtt tgtaacacaa aggaattttt atgaaccaca
24901	aatcattact acagacaaca catttgtgtc tggtaactgt gatgttgtaa taggaattgt
24961	caacaacaca gtttatgatc ctttgcaacc tgaattagac tcattcaagg aggagttaga
25021	taaatatttt aagaatcata catcaccaga tgttgattta ggtgacatct ctggcattaa
25081	tgcttcagtt gtaaacattc aaaaagaaat tgaccgcctc aatgaggttg ccaagaattt
25141	aaatgaatct ctcatcgatc tccaagaact tggaaagtat gagcagtata taaaatggcc
25201	atggtacatt tggctaggtt ttatagctgg cttgattgcc atagtaatgg tgacaattat
25261	gctttgctgt atgaccagtt gctgtagttg tctcaagggc tgttgttctt gtggatcctg
25321	ctgcaaattt gatgaagacg actctgagcc agtgctcaaa ggagtcaaat tacattacac
25381	ataaacgaac ttatggattt gtttatgaga atcttcacaa ttggaactgt aactttgaag
25441	caaggtgaaa tcaaggatgc tactccttca gattttgttc gcgctactgc aacgataccg
25501	atacaagcct cactcccttt cggatggctt attgttggcg ttgcacttct tgctgttttt
25561	cagagcgctt ccaaaatcat aaccctcaaa aagagatggc aactagcact ctccaagggt
25621	gttcactttg tttgcaactt gctgttgttg tttgtaacag tttactcaca ccttttgctc
25681	gttgctgctg gccttgaagc cccttttctc tatctttatg ctttagtcta cttcttgcag
25741	agtataaact ttgtaagaat aataatgagg ctttggcttt gctggaaatg ccgttccaaa
25801	aacccattac tttatgatgc caactatttt ctttgctggc atactaattg ttacgactat
25861	tgtatacctt acaatagtgt aacttcttca attgtcatta cttcaggtga tggcacaaca
25921	agtcctattt ctgaacatga ctaccagatt ggtggttata ctgaaaaatg ggaatctgga
25981	gtaaaagact gtgttgtatt acacagttac ttcacttcag actattacca gctgtactca
26041	actcaattga gtacagacac tggtgttgaa catgttacct tcttcatcta caataaaatt
26101	gttgatgagc ctgaagaaca tgtccaaatt cacacaatcg acggttcatc cggagttgtt
26161	aatccagtaa tggaaccaat ttatgatgaa ccgacgacga ctactagcgt gcctttgtaa
26221	gcacaagctg atgagtacga acttatgtac tcattcgttt cggaagagac aggtacgtta
26281	atagttaata gcgtacttct ttttcttgct ttcgtggtat tcttgctagt tacactagcc
26341	atccttactg cgcttcgatt gtgtgcgtac tgctgcaata ttgttaacgt gagtcttgta
26401	aaaccttctt tttacgttta ctctcgtgtt aaaaatctga attcttctag agttcctgat
26461	cttctggtct aaacgaacta aatattatat tagtttttct gtttggaact ttaattttag
26521	ccatggcaga ttccaacggt actattaccg ttgaagagct taaaaagctc cttgaacaat
26581	ggaacctagt aataggtttc ctattcctta catggatttg tcttctacaa tttgcctatg
26641	ccaacaggaa taggtttttg tatataatta agttaatttt cctctggctg ttatggccag
26701	taactttagc ttgttttgtg cttgctgctg tttacagaat aaattggatc accggtggaa
26761	ttgctatcgc aatggcttgt cttgtaggct tgatgtggct cagctacttc attgcttctt
26821	tcagactgtt tgcgcgtacg cgttccatgt ggtcattcaa tccagaaact aacattcttc
26881	tcaacgtgcc actccatggc actattctga ccagaccgct tctagaaagt gaactcgtaa
26941	tcggagctgt gatccttcgt ggacatcttc gtattgctgg acaccatcta ggacgctgtg
27001	acatcaagga cctgcctaaa gaaatcactg ttgctacatc acgaacgctt tcttattaca
27061	aattgggagc ttcgcagcgt gtagcaggtg actcaggttt tgctgcatac agtcgctaca
27121	ggattggcaa ctataaatta aacacagacc attccagtag cagtgacaat attgctttgc
27181	ttgtacagta agtgacaaca gatgtttcat ctcgttgact ttcaggttac tatagcagag
27241	atattactaa ttattatgag gacttttaaa gtttccattt ggaatcttga ttacatcata
27301	aacctcataa ttaaaaattt atctaagtca ctaactgaga ataaatattc tcaattagat
27361	gaagagcaac caatggagat tgattaaacg aacatgaaaa ttattctttt cttggcactg
27421	ataacactcg ctacttgtga gctttatcac taccaagagt gtgttagagg tacaacagta
27481	cttttaaaag aaccttgctc ttctggaaca tacgagggca attcaccatt tcatcctcta

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
:7541	gctgataaca aatttgcact gacttgcttt agcactcaat ttgcttttgc ttgtcctgac
:7601	ggcgtaaaac acgtctatca gttacgtgcc agatcagttt cacctaaact gttcatcaga
:7661	caagaggaag ttcaagaact ttactctcca atttttctta ttgttgcggc aatagtgttt
:7721	ataacacttt gcttcacact caaaagaaag acagaatgat tgaactttca ttaattgact
:7781	tctatttgtg ctttttagcc tttctgctat tccttgtttt aattatgctt attatctttt
:7841	ggttctcact tgaactgcaa gatcataatg aaacttgtca cgcctaaacg aacatgaaat
:7901	ttcttgtttt cttaggaatc atcacaactg tagctgcatt tcaccaagaa tgtagtttac
:7961	agtcatgtac tcaacatcaa ccatatgtag ttgatgaccc gtgtcctatt cacttctatt
:8021	ctaaatggta tattagagta ggagctagaa aatcagcacc tttaattgaa ttgtgcgtgg
:8081	atgaggctgg ttctaaatca cccattcagt acatcgatat cggtaattat acagtttcct
:8141	gtttaccttt tacaattaat tgccaggaac ctaaattggg tagtcttgta gtgcgttgtt
:8201	cgttctatga agactttta gagtatcatg acgttcgtgt tgttttagat ttcatctaaa
:8261	cgaacaaact aaaatgtctg ataatggacc ccaaaatcag cgaaatgcac cccgcattac
:8321	gtttggtgga ccctcagatt caactggcag taaccagaat ggagaacgca gtggggcgcg
:8381	atcaaaacaa cgtcggcccc aaggtttacc caataatact gcgtcttggt tcaccgctct
:8441	cactcaacat ggcaaggaag accttaaatt ccctcgagga caaggcgttc caattaacac
:8501	caatagcagt ccagatgacc aaattggcta ctaccgaaga gctaccagac gaattcgtgg
:8561	tggtgacggt aaaatgaaag atctcagtcc aagatggtat ttctactacc taggaactgg
:8621	gccagaagct ggacttccct atggtgctaa caaagacggc atcatatggg ttgcaactga
:8681	gggagccttg aatacaccaa aagatcacat tggcacccgc aatcctgcta acaatgctgc
:8741	aatcgtgcta caacttcctc aaggaacaac attgccaaaa ggcttctacg cagaagggag
:8801	cagaggcggc agtcaagcct cttctcgttc ctcatcacgt agtcgcaaca gttcaagaaa
:8861	ttcaactcca ggcagcagta ggggaacttc tcctgctaga atggctggca atggcggtga
:8921	tgctgctctt gctttgctgc tgcttgacag attgaaccag cttgagagca aaatgtctgg
:8981	taaaggccaa caacaacaag gccaaactgt cactaagaaa tctgctgctg aggcttctaa
:9041	gaagcctcgg caaaaacgta ctgccactaa agcatacaat gtaacacaag ctttcggcag
:9101	acgtggtcca gaacaaaccc aaggaaattt tggggaccag gaactaatca gacaaggaac
:9161	tgattacaaa cattggccgc aaattgcaca atttgccccc agcgcttcag cgttcttcgg
:9221	aatgtcgcgc attggcatgg aagtcacacc ttcgggaacg tggttgacct acacaggtgc
:9281	catcaaattg gatgacaaag atccaaattt caaagatcaa gtcattttgc tgaataagca
:9341	tattgacgca tacaaaacat tcccaccaac agagcctaaa aaggacaaaa agaagaaggc
:9401	tgatgaaact caagccttac cgcagagaca gaagaaacag caaactgtga ctcttcttcc
:9461	tgctgcagat ttggatgatt tctccaaaca attgcaacaa tccatgagca gtgctgactc
:9521	aactcaggcc taaactcatg cagaccacac aaggcagatg ggctatataa acgttttcgc
:9581	ttttccgttt acgatatata gtctactctt gtgcagaatg aattctcgta actacatagc
:9641	acaagtagat gtagttaact ttaatctcac atagcaatct ttaatcagtg tgtaacatta
:9701	gggaggactt gaaagagcca ccacattttc accgaggcca cgcggagtac gatcgagtgt
:9761	acagtgaaca atgctaggga gagctgccta tatggaagag ccctaatgtg taaaattaat
:9821	tttagtagtg ctatccccat gtgattttaa tagcttctta ggagaatgac aaaaaaaaaa
:9881	aaaaaaaaaa aaaaaaaaaa aaa
1	ttggctagtc aagatgatga atcttcatta tctgatatat tgcaaatcac tcaatatcta
61	gactttctgt tattattatt gatccaatca aaaaataaat tagaagccgt gggtcattgt
121	tatgaatctc tttcagagga atacagacaa ttgacaaaat tcacagactt tcaagatttt
181	aaaaaactgt ttaacaaggt ccctattgtt acagatggaa gggtcaaact taataaagga
241	tatttgttcg actttgtgat tagtttgatg cgattcaaaa aagaatcctc tctagctacc
301	accgcaatag atcctattag atacatagat cctcgtcgtg atatcgcatt ttctaacgtg
361	atggatatat taaagttgaa taaagtgaac aataattaat tctttattgt catcggatcc
421	cacgatgtgc tagactctct cgtctacgcg gccgcaaaaa ttgaaatttt attttttttt
481	tttggaatat aaataatgtt cgtgttccta gtcctactac cgctagtctc ttcccagtgt
541	gtaaacctaa caacgagaac acaactacca ccggcgtaca ccaattcttt cacaagagga

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
601	gtatattacc cggacaaggt gttcagatcc tccgtactac attctaccca ggacctattc
661	ctaccgttct tctctaacgt aacatggttc cacgcgatcc atgtctctgg aacaaacgga
721	acgaagagat tcgataaccc ggtcttgccg ttcaacgatg gtgtatactt tgcgtccacc
781	gagaagtcca acatcatcag aggatggatc ttcggaacca ccttggattc taagacccag
841	tccttgctaa tcgtcaacaa cgcgaccaac gtcgtcatca aagtctgcga attccagttc
901	tgtaacgacc cgtttttggg agtctactac cacaagaaca acaagtcctg gatggaatcc
961	gagttcagag tctactcttc cgcgaacaac tgcaccttcg aatatgtatc tcagccgttc
1021	ctaatggacc tagagggaaa gcagggaaac ttcaagaacc taagagagtt cgtattcaag
1081	aacatcgacg gatacttcaa gatctactcc aagcacaccc cgatcaacct agttagagat
1141	ctaccgcaag gattctctgc gctagaaccg ttagtagatt tgccgatcgg aatcaacatc
1201	accagattcc agacactact agcgctacac agatcttacc taacgccggg agattcttct
1261	tctggatgga ctgctggtgc tgcggcttat tatgtaggat acctacagcc gagaaccttc
1321	ctattgaagt acaacgaaaa cggaaccatc accgatgccg tagattgtgc tctagatccg
1381	ctatccgaaa cgaagtgcac cctaaagtct ttcaccgtcg agaagggaat ctaccagacc
1441	tccaacttta gagtacagcc gaccgaatcc atcgtcagat ttccgaacat cacgaaccta
1501	tgtccgttcg gagaagtgtt caacgcgaca agatttgcgt ctgtctatgc gtggaacaga
1561	aaaagaatca gtaactgcgt cgcggactac tccgtcctat acaactctgc ctctttctcc
1621	acgttcaaat gctacggtgt atccccgaca aagctaaacg atctatgctt caccaacgtc
1681	tacgcggact ccttcgtaat cagaggagat gaagttagac agattgcgcc gggacaaact
1741	ggaaagatcg cggattataa ctacaagcta ccggacgact tcaccggatg tgtaattgcg
1801	tggaattcga acaacctaga ctccaaagtc ggaggaaact acaactactt gtacagacta
1861	ttcagaaagt ccaacctaaa gccgttcgag agagacatct ccaccgaaat ctatcaggct
1921	ggatctacac cgtgtaatgg tgtcgaagga ttcaactgct acttcccgct acagtcttac
1981	ggatttcaac cgacaaacgg tgtaggatat cagccgtaca gagtcgtcgt actatccttc
2041	gaactactac atgctccggc gacagtatgt ggaccgaaaa agtctaccaa cctagtcaag
2101	aacaaatgcg tcaactttaa cttcaacgga ctaaccggaa ccggtgtcct aaccgaatct
2161	aacaagaagt ttctaccgtt ccagcagttc ggaagagata tcgcggatac aacagacgct
2221	gtcagagatc cgcaaacctt ggagatccta gatatcaccc cgtgttcttt cggtggtgtc
2281	tctgtaatta ctccgggaac gaacacctcc aatcaagtag cggtactata ccaggacgtg
2341	aactgtacag aagtaccggt agctattcac gcggatcaac taacaccaac ttggagagtg
2401	tactccaccg gatctaacgt attccaaaca agagcgggat gtctaatcgg agcggaacac
2461	gtaaacaact cctacgaatg tgatatcccg attggagcgg gaatctgtgc gtcttaccaa
2521	acacaaacaa actccccgag aagagcgaga tctgtagcct ctcaatctat tatcgcctac
2581	accatgtcct tgggagccga aaattctgtc gcgtactcca acaattctat cgcgatcccg
2641	acaaacttca ccatctctgt aacaaccgag atcctaccgg tgtctatgac caagacatct
2701	gtcgattgca ccatgtacat ctgcggagat tccaccgagt gctccaacct actactacag
2761	tacggatctt tctgtaccca gctaaacaga gcgttgactg gaatcgctgt agagcaggat
2821	aagaacaccc aagaggtatt cgcgcaagtc aagcagatct ataagactcc gccgatcaag
2881	gacttcggag gttttaactt ctctcagatc ttgccggatc cgtccaaacc gtctaagaga
2941	tctttcatcg aggacctact attcaacaaa gtcaccctag ctgacgcggg attcatcaaa
3001	caatacggag attgcttggg agacattgcg gcgagagatc taatttgcgc gcagaagttt
3061	aacggattga cagtactacc gccgctacta accgatgaga tgattgcgca gtacacgtct
3121	gctctattgg cgggaacaat tacaagtgga tggacatttg gagccggtgc cgctctacaa
3181	attccgtttg ctatgcaaat ggcgtacaga ttcaacggaa tcggagtaac ccagaacgtc
3241	ttgtacgaga accagaagct aatcgcgaac cagttcaatt ccgcgatcgg aaagatccag
3301	gacagtctat cttctactgc ttcggcgttg ggaaagctac aggatgtagt aaatcaaaac
3361	gcgcaggcgc taaacacctt ggtcaagcaa ctatcctcta acttcggagc gatctcgtcc
3421	gtcctaaacg acatcttatc cagactagat aaggtcgaag cggaggtcca gatcgataga
3481	ctaatcactg gaagattgca gtccctacag acctacgtaa cacagcaact aattagagcg
3541	gcggagatta gagcctctgc taatctagct gcgaccaaga tgtccgaatg tgtcttggga
3601	caatccaaga gagtcgactt ttgcggaaag ggataccacc taatgtcttt tccacaatct

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
3661	gcgccgcatg gtgtcgtatt cctacatgta acatatgtgc cggcgcaaga aaagaacttt
3721	acaacagctc cagcgatctg ccatgatgga aaagctcatt ttccgagaga gggagtcttt
3781	gtctctaacg gaactcattg gttcgtcacc cagagaaact tttacgagcc gcagatcatc
3841	accaccgaca acacatttgt ttcgggaaac tgcgacgtgg tcatcggaat cgtaaacaat
3901	accgtctacg atccgttgca gccggaacta gactccttca aagaagagtt ggacaagtac
3961	tttaagaacc acacctctcc ggatgtcgac ttgggagata tttctggaat caacgcgtcc
4021	gtcgtcaaca tccagaaaga aatcgataga ttgaacgagg tcgcgaagaa cttgaacgag
4081	tccctaatcg acctacaaga gctaggaaaa tacgagcagt acatcaagtg gccgtggtac
4141	atttggctag gattcattgc tggactaatt gcgatcgtca tggtcaccat catgctatgc
4201	tgtatgacct cctgttgctc ctgtctaaag ggatgttgtt cctgcggatc ctgttgcaag
4261	ttcgatgaag atgatagtga accggtccta aagggtgtca agctacacta cacataaaag
4321	cttgtcgact attatatttt ttatctaaaa aactaaaaat aaacattgat taaattttaa
4381	tataatactt aaaaatggat gttgtgtcgt tagataaacc gtttatgtat tttgaggaaa
4441	ttgataatga gttagattac gaaccagaaa gtgcaaatga ggtcgcaaaa aaactaccgt
4501	atcaaggaca gttaaaacta ttactaggag aattattttt tcttagtaag ttacagcgac
4561	acggtatatt agatggtgcc accgtagtgt atataggatc ggctcctggt acacatatac
4621	gttatttgag agatcatttc tataatttag gaatgattat caaatggatg ctaattgacg
4681	gacgccatca tgatcctatt ctaaatggat tgcgtgatgt gactctagta tggtcatag
1	gagtattcta ggtgtttcta tagaatgtaa gaagtcatcg acattactta ctttttttgac
61	cgtgcgtaaa atgacccgag tatttaatag atttccagat atggcttatt atcgaggaga
121	ctgtttaaaa gccgtttatg taacaatgac ttataaaaat actaaaactg gagagactga
181	ttacacgtac ctctctaatg gggttgcct gcatactatc gtaatggggt cgatggttga
241	ttattgatta gtatattcct tattcttttt attcacacaa aaagaacatt tttataaaca
301	tgaaaccact gtctaaatgt aattatgatc ttgatttata gatgaagatc agcctttaga
361	ggattttaac cagtatgttt aatatgaaaa aaataaacat aacatatttt gagattaagc
421	gctattgtgc ttaattattt tgctctataa actgaatata tagccacaat tattgacggg
481	cttgtttatg accggcaatc ggatcccacg atgtgctaga ctctctcgtc tacgcggccg
541	caaaaattga aattttattt tttttttttg gaatataaat aatgttcgtg ttcctagtcc
601	tactaccgct agtctcttcc cagtgtgtaa acctaacaac gagaacacaa ctaccaccgg
661	cgtacaccaa ttctttcaca agaggagtat attacccgga caaggtgttc agatcctccg
721	tactacattc tacccaggac ctattcctac cgttcttctc taacgtaaca tggttccacg
781	cgatccatgt ctctggaaca aacggaacga agagattcga taacccggtc ttgccgttca
841	acgatggtgt atactttgcg tccaccgaga agtccaacat catcagagga tggatcttcg
901	gaaccacctt ggattctaag acccagtcct tgctaatcgt caacaacgcg accaacgtcg
961	tcatcaaagt ctgcgaattc cagttctgta acgacccgtt tttgggagtc tactaccaca
1021	agaacaacaa gtcctggatg gaatccgagt tcagagtcta ctcttccgcg aacaactgca
1081	ccttcgaata tgtatctcag ccgttcctaa tggacctaga gggaaagcag ggaaacttca
1141	agaacctaag agagttcgta ttcaagaaca tcgacggata cttcaagatc tactccaagc
1201	acaccccgat caacctagtt agagatctac cgcaaggatt ctctgcgcta gaaccgttag
1261	tagatttgcc gatcggaatc aacatcacca gattccagac actactagcg ctacacagat
1321	cttacctaac gccgggagat tcttcttctg gatggactgc tggtgctgcg gcttattatg
1381	taggatacct acagccgaga accttcctat tgaagtacaa cgaaaacgga accatcaccg
1441	atgccgtaga ttgtgctcta gatccgctat ccgaaacgaa gtgcacccta aagtctttca
1501	ccgtcgagaa gggaatctac cagacctcca actttagagt acagccgacc gaatccatcg
1561	tcagatttcc gaacatcacg aacctatgtc cgttcggaga agtgttcaac gcgacaagat
1621	ttgcgtctgt ctatgcgtgg aacagaaaaa gaatcagtaa ctgcgtcgcg gactactccg
1681	tcctatacaa ctctgcctct ttctccacgt tcaaatgcta cggtgtatcc ccgacaaagc
1741	taaacgatct atgcttcacc aacgtctacg cggactcctt cgtaatcaga ggagatgaag
1801	ttagacagat tgcgccggga caaactggaa agatcgcgga ttataactac aagctaccgg
1861	acgacttcac cggatgtgta attgcgtgga attcgaacaa cctagactcc aaagtcggag

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
1921	gaaactacaa ctacttgtac agactattca gaaagtccaa cctaaagccg ttcgagagag
1981	acatctccac cgaaatctat caggctggat ctacaccgtg taatggtgtc gaaggattca
2041	actgctactt cccgctacag tcttacggat ttcaaccgac aaacggtgta ggatatcagc
2101	cgtacagagt cgtcgtacta tccttcgaac tactacatgc tccggcgaca gtatgtggac
2161	cgaaaaagtc taccaaccta gtcaagaaca aatgcgtcaa ctttaacttc aacggactaa
2221	ccggaaccgg tgtcctaacc gaatctaaca agaagtttct accgttccag cagttcggaa
2281	gagatatcgc ggatacaaca gacgctgtca gagatccgca aaccttggag atcctagata
2341	tcaccccgtg ttctttcggt ggtgtctctg taattactcc gggaacgaac acctccaatc
2401	aagtagcggt actataccag gacgtgaact gtacagaagt accggtagct attcacgcgg
2461	atcaactaac accaacttgg agagtgtact ccaccggatc taacgtattc caaacaagag
2521	cgggatgtct aatcggagcg gaacacgtaa acaactccta cgaatgtgat atcccgattg
2581	gagcgggaat ctgtgcgtct taccaaacac aaacaaactc cccgagaaga gcgagatctg
2641	tagcctctca atctattatc gcctacacca tgtccttggg agccgaaaat tctgtcgcgt
2701	actccaacaa ttctatcgcg atcccgacaa acttcaccat ctctgtaaca accgagatcc
2761	taccggtgtc tatgaccaag acatctgtcg attgcaccat gtacatctgc ggagattcca
2821	ccgagtgctc caacctacta ctacagtacg gatctttctg tacccagcta aacagagcgt
2881	tgactggaat cgctgtagag caggataaga acacccaaga ggtattcgcg caagtcaagc
2941	agatctataa gactccgccg atcaaggact tcggaggttt taacttctct cagatcttgc
3001	cggatccgtc caaaccgtct aagagatctt tcatcgagga cctactattc aacaaagtca
3061	ccctagctga cgcgggattc atcaaacaat acggagattg cttgggagac attgcggcga
3121	gagatctaat ttgcgcgcag aagtttaacg gattgacagt actaccgccg ctactaaccg
3181	atgagatgat tgcgcagtac acgtctgctc tattggcggg aacaattaca agtggatgga
3241	catttggagc cggtgccgct ctacaaattc cgtttgctat gcaaatggcg tacagattca
3301	acggaatcgg agtaacccag aacgtcttgt acgagaacca gaagctaatc gcgaaccagt
3361	tcaattccgc gatcggaaag atccaggaca gtctatcttc tactgcttcg gcgttgggaa
3421	agctacagga tgtagtaaat caaaacgcgc aggcgctaaa caccttggtc aagcaactat
3481	cctctaactt cggagcgatc tcgtccgtcc taaacgacat cttatccaga ctagataagg
3541	tcgaagcgga ggtccagatc gatagactaa tcactggaag attgcagtcc ctacagacct
3601	acgtaacaca gcaactaatt agagcggcgg agattagagc ctctgctaat ctagctgcga
3661	ccaagatgtc cgaatgtgtc ttgggacaat ccaagagagt cgacttttgc ggaaagggat
3721	accacctaat gtcttttcca caatctgcgc cgcatggtgt cgtattccta catgtaacat
3781	atgtgccggc gcaagaaaag aactttacaa cagctccagc gatctgccat gatggaaaag
3841	ctcattttcc gagagaggga gtctttgtct ctaacggaac tcattggttc gtcacccaga
3901	gaaactttta cgagccgcag atcatcacca ccgacaacac atttgtttcg ggaaactgcg
3961	acgtggtcat cggaatcgta aacaataccg tctacgatcc gttgcagccg gaactagact
4021	ccttcaaaga agagttggac aagtacttta agaaccacac ctctccggat gtcgacttgg
4081	gagatatttc tggaatcaac gcgtccgtcg tcaacatcca gaaagaaatc gatagattga
4141	acgaggtcgc gaagaacttg aacgagtccc taatcgacct acaagagcta ggaaaatacg
4201	agcagtacat caagtggccg tggtacattt ggctaggatt cattgctgga ctaattgcga
4261	tcgtcatggt caccatcatg ctatgctgta tgacctcctg ttgctcctgt ctaaagggat
4321	gttgttcctg cggatcctgt tgcaagttcg atgaagatga tagtgaaccg gtcctaaagg
4381	gtgtcaagct acactacaca taaaagcttg tcgactaaaa tagtttaact cttttaaaac
4441	cagtttggta ctggaatttc agttcattac tcgttgagaa attgatgatt tttttaaaat
4501	gatattactt ttatatgctt gcatcgcaga atgatattca caagtattat taaaaatgag
4561	tatcggtagt tacattacca tatcatccat gctcatatgg atctccatcc attatataat
4621	caatgataca tgtattaaaa tactttccga ataagtcttt taaatattgt attaattatg
4681	aaaaactatg ctatgcgagt atgatgcaaa gatgtttaat gatacgatac tagattttat
4741	ctctagcgag agatgtcgtt agaatcattt atcataacta cgtttaataa taattcatca
4801	acgaatatcg ataacatgtg tcatttatac tttaaatacg ttaaagtctg tccgtcttct
4861	ctattgttta gactgtttgt agaatgctgt gatataaaca aactagtaga aggta

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he present disclosure.

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gagaaactta gtactaataa ggaactagaa
attaggttaa atgattttct gggactattg
gatattccga caaaggattg attactataa
cctgtgttta tagagcccac gtttaaacat
atagttttat ttgaagtatt cattgtattc
ttaaatatgt tcttcatgcc taaacgaaaa
gctaatctag cgtgtgaaga cgataagtta
caaacatctg cgttatcaat aaatagtaaa
ttgcgatcaa taaatggatc acaaccagta
ttcatttttt aagtatttgg ctagtcaaga
aatcactcaa tatctagact ttctgttatt
agccgtgggt cattgttatg aatctctttc
agactttcaa gattttaaaa aactgtttaa
caaacttaat aaaggatatt tgttcgactt
atcctctcta gctaccaccg caatagatcc
cgcattttct aacgtgatgg atatattaaa
tattgtcatc tattatattt tttatctaaa
atataatact taaaaatgga tgttgtgtcg
attgataatg agttagatta cgaaccagaa
tatcaaggac agttaaaact attactagga
cacggtatat tagatggtgc caccgtagtg
cgttatttga gagatcattt ctataattta
ggacgccatc atgatcctat tctaaatgga
gttgatgagg aatatctacg atccatcaaa
atttctgatg taagatccaa acgaggagga
aattacgctc tacaaaatgt catgattagt
tggagatgcc cgtttccaga tcaatggatc
atgttacaac cttttgctcc ttcatattca
ggtgagaaca tgagactgac tcgagttacc
atgtactacc ttaataagat cgtccgtaac
caggaatatg actattttca catgtacttt
tttcctacta ctaaagcaaa ggtactattt
attccaacaa catcaactga aaaagttagt

gagaaactta gtactaataa ggaactagaa
attaggttaa atgattttct gggactattg
gatattccga caaaggattg attactataa
cctgtgttta tagagcccac gtttaaacat
atagttttat ttgaagtatt cattgtattc
ttaaatatgt tcttcatgcc taaacgaaaa
gctaatctag cgtgtgaaga cgataagtta
caaacatctg cgttatcaat aaatagtaaa
ttgcgatcaa taaatggatc acaaccagta
ttcatttttt aagtatttgg ctagtcaaga
aatcactcaa tatctagact ttctgttatt
agccgtgggt cattgttatg aatctctttc
agactttcaa gattttaaaa aactgtttaa
caaacttaat aaaggatatt tgttcgactt
atcctctcta gctaccaccg caatagatcc
cgcattttct aacgtgatgg atatattaaa
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TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
961	gttgaataaa gtgaacaata attaattctt tattgtcatc ttttattttt tttttttgga
1021	atataaatat ccggtaaaat tgaaaaaata tacactaatt agcgtctcgt ttcagacgct
1081	agctcgaggt tgggagctct ccggatccaa gcttatcgat ttcgaacccg gggtaccgaa
1141	ttcctcgagg ttgggagctc tccggatcca agcttatcga tttcgaaccc ggggtaccga
1201	attcctcgag atgtttgttt tccttgtttt attgccacta gtctctagtc agtgtgttaa
1261	tcttacaacc agaactcaat taccccctgc atacactaat tctttcacac gtggtgttta
1321	ttaccctgac aaagttttca gatcctcagt tttacattca actcaggact tgttcttacc
1381	tttcttttcc aatgttactt ggttccatgc tatacatgtc tctgggacca atggtactaa
1441	gaggtttgat aaccctgtcc taccatttaa tgatggtgtt tattttgctt ccactgagaa
1501	gtctaacata ataagaggct ggatttttgg tactacttta gattcgaaga cccagtccct
1561	acttattgtt aataacgcta ctaatgttgt tattaaagtc tgtgaatttc aattttgtaa
1621	tgatccattt ttgggtgttt attaccacaa aaacaacaaa agttggatgg aaagtgagtt
1681	cagagtttat tctagtgcga ataattgcac ttttgaatat gtctctcagc cttttcttat
1741	ggaccttgaa ggaaaacagg gtaatttcaa aaatcttagg gaatttgtgt ttaagaatat
1801	tgatggttat tttaaaatat attctaagca cacgcctatt aatttagtgc gtgatctccc
1861	tcagggtttt tcggctttag aaccattggt agatttgcca ataggtatta acatcactag
1921	gtttcaaact ttacttgctt tacatagaag ttatttgact cctggtgatt cttcttcagg
1981	ttggacagct ggtgctgcag cttattatgt gggttatctt caacctagga cttttctatt
2041	aaaatataat gaaaatggaa ccattacaga tgctgtagac tgtgcacttg accctctctc
2101	agaaacaaag tgtacgttga aatccttcac tgtagaaaaa ggaatctatc aaacttctaa
2161	ctttagagtc caaccaacag aatctattgt tagatttcct aatattacaa acttgtgccc
2221	ttttggtgaa gtttttaacg ccaccagatt tgcatctgtt tatgcttgga acaggaagag
2281	aatcagcaac tgtgttgctg attattctgt cctatataat tccgcatcat tttccacttt
2341	taagtgttat ggagtgtctc ctactaaatt aaatgatctc tgctttacta atgtctatgc
2401	agattcattt gtaattagag gtgatgaagt cagacaaatc gctccagggc aaactggaaa
2461	gattgctgat tataattata aattaccaga tgattttaca ggctgcgtta tagcttggaa
2521	ttctaacaat cttgattcta aggttggtgg taattataat tacctgtata gattgtttag
2581	gaagtctaat ctcaaacctt ttgagagaga tatttcaact gaaatctatc aggccggtag
2641	cacaccttgt aatggtgttg aaggttttaa ttgttacttt cctttacaat catatggttt
2701	ccaacccact aatggtgttg gttaccaacc atacagagta gtagtacttt cttttgaact
2761	tctacatgca ccagcaactg tttgtggacc taaaaagtct actaatttgg ttaaaaacaa
2821	atgtgtcaat ttcaacttca atggtttaac aggcacaggt gttcttactg agtctaacaa
2881	aaagtttctg cctttccaac aatttggcag agacattgct gacactactg atgctgtccg
2941	tgatccacag acacttgaga ttcttgacat tacaccatgt tcttttggtg gtgtcagtgt
3001	tataacacca ggaacaaata cttctaacca ggttgctgtt ctttatcagg atgttaactg
3061	cacagaagtc cctgttgcta ttcatgcaga tcaacttact cctacttggc gtgtttattc
3121	tacaggttct aatgtttttc aaacacgtgc aggctgttta ataggggctg aacatgtcaa
3181	caactcatat gagtgtgaca tacccattgg tgcaggtata tgcgctagtt atcagactca
3241	gactaattct cctcggcggg cacgtagtgt agctagtcaa tccatcattg cctacactat
3301	gtcacttggt gcagaaaatt cagttgctta ctctaataac tctattgcca tacccacaaa
3361	ttttactatt agtgttacca cagaaattct accagtgtct atgaccaaga catcagtaga
3421	ttgtacaatg tacatttgtg gtgattcaac tgaatgcagc aatcttttgt tgcaatatgg
3481	cagtttctgt acacaattaa accgtgcttt aactggaata gctgttgaac aagacaaaaa
3541	cacccaagaa gtttttgcac aagtcaaaca aatttacaaa acaccaccaa ttaaagattt
3601	tggtggtttt aatttttcac aaatattacc agatccatca aaaccaagca agaggtcatt
3661	tattgaagat ctacttttca acaaagtgac acttgcagat gctggcttca tcaaacaata
3721	tggtgattgc cttggtgata ttgctgctag agacctcatt tgtgcacaaa agtttaacgg
3781	ccttactgtt ttgccacctt tgctcacaga tgaaatgatt gctcaataca cttctgcact
3841	gttagcgggt acaatcactt ctggttggac ctttggtgca ggtgctgcat tacaaatacc
3901	atttgctatg caaatggctt ataggtttaa tggtattgga gttacacaga atgttctcta
3961	tgagaaccaa aaattgattg ccaaccaatt taatagtgct attggcaaaa ttcaagactc

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.		
	4021	actttcttcc acagcaagtg cacttggaaa acttcaagat gtggtcaacc aaaatgcaca
	4081	agctttaaac acgcttgtta aacaacttag ctccaatttt ggtgcaattt caagtgtttt
	4141	aaatgatatc ctttcacgtc ttgacaaagt tgaggctgaa gtgcaaattg ataggttgat
	4201	cacaggcaga cttcaaagtt tgcagacata tgtgactcaa caattaatta gagctgcaga
	4261	aatcagagct tctgctaatc ttgctgctac taaaatgtca gagtgtgtac ttggacaatc
	4321	aaaaagagtt gatttctgtg gaaagggcta tcatcttatg tccttccctc agtcagcacc
	4381	tcatggtgta gtcttcttgc atgtgactta tgtccctgca caagaaaaga acttcacaac
	4441	tgctcctgcc atttgtcatg atggaaaagc acactttcct cgtgaaggtg tctttgtttc
	4501	aaatggcaca cactggtttg taacacaaag gaacttttat gaaccacaaa tcattactac
	4561	agacaacaca tttgtgtctg gtaactgtga tgttgtaata ggaattgtca acaacacagt
	4621	ttatgatcct ttgcaacctg aattagactc attcaaggag gagttagata aatattttaa
	4681	gaatcataca tcaccagatg ttgatttagg tgacatctct ggcattaatg cttcagttgt
	4741	aaacattcaa aaagaaattg accgcctcaa tgaggttgcc aagaatttaa atgaatctct
	4801	catcgatctc caagaacttg gaaagtatga gcagtatata aaatggccat ggtacatttg
	4861	gctaggtttt atagctggct tgattgccat agtaatggtg acaattatgc tttgctgtat
	4921	gaccagttgc tgtagttgtc tcaagggctg ttgttcttgt ggatcctgct gcaaatttga
	4981	tgaagacgac tctgagccag tgctcaaagg agtcaaatta cattacacat aatattatat
	5041	tttttatcta aaaaactaaa aataaacatt gattaaattt taatataata cttaaaaatg
	5101	gatgttgtgt cgttagataa accgtttatg tattttgagg aaattgataa tgagttagat
	5161	tacgaaccag aaagtgcaaa tgaggtcgca aaaaaactac cgtatcaagg acagttaaaa
	5221	ctattactag gagaattatt ttttcttagt aagttacagc gacacggtat attagatggt
	5281	gccaccgtag tgtatatagg atcggctcct ggtacacata tacgttattt gagagatcat
	5341	ttctataatt taggaatgat tatcaaatgg atgctaattg acggacgcca tcatgatcct
	5401	attctaaatg gattgcgtga tgtgactcta gtgactcggt tcgttgatga ggaatatcta
	5461	cgatccatca aaaaacaact gcatccttct aagattattt taatttctga tgtaagatcc
	5521	aaacgaggag gaaatgaacc tagtacggcg gatttactaa gtaattacgc tctacaaaat
	5581	gtcatgatta gtattttaaa ccccgtggca tctagtctta aatggagatg cccgtttcca
	5641	gatcaatgga tcaaggactt ttatatccca cacggtaata aaatgttaca accttttgct
	5701	ccttcatatt cagctgaaat gagattatta agtatttata ccggtgagaa catgagactg
	5761	actcgagtta ccaaattaga cgctgtaaat tatgaaaaaa agatgtacta ccttaataag
	5821	atcgtccgta acaaagtagt tgttaacttt gattatccta atcaggaata tgactatttt
	5881	cacatgtact ttatgctgag gaccgtatac tgcaataaaa catttcctac tactaaagca
	5941	aaggtactat ttctacaaca atctatattt cgtttcttaa atattccaac aacatcaact
	6001	gaaaaagtta gtcatgaacc aatacaacgt aa
of	1	atttacggat tcaccaataa aaataaacta gagaaactta gtactaataa ggaactagaa
Delta_T5NT	61	tcgtatagtt ctagccctct tcaagaaccc attaggttaa atgattttct gggactattg
	121	gaatgtatta aaaagaatat tcctctaaca gatattccga caaaggattg attactataa
	181	atggagaatg ttcctaatgt atactttaat cctgtgttta tagagcccac gtttaaacat
	241	tctttattaa gtgtttataa acacagatta atagttttat ttgaagtatt cattgtattc
	301	attctaatat atgtattttt tagatctgaa ttaaatatgt tcttcatgcc taaacgaaaa
	361	atacccgatc ctattgatag attacgacgt gctaatctag cgtgtgaaga cgataagtta
	421	atgatctatg gattaccatg gatgacaact caaacatctg cgttatcaat aaatagtaaa
	481	ccgatagtgt ataaagattg tgcaaagctt ttgcgatcaa taaatggatc acaaccagta
	541	tctcttaacg atgttcttcg cagatgatga ttcatttttt aagtatttgg ctagtcaaga
	601	tgatgaatct tcattatctg atatattgca aatcactcaa tatctagact ttctgttatt
	661	attattgatc caatcaaaaa ataaattaga agccgtgggt cattgttatg aatctctttc
	721	agaggaatac agacaattga caaaattcac agactttcaa gattttaaaa aactgtttaa
	781	caaggtccct attgttacag atggaagggt caaacttaat aaaggatatt tgttcgactt
	841	tgtgattagt ttgatgcgat tcaaaaaaga atcctctcta gctaccaccg caatagatcc
	901	tattagatac atagatcctc gtcgtgatat cgcattttct aacgtgatgg atatattaaa

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.

961	gttgaataaa gtgaacaata attaattctt tattgtcatc ttttattttt tttttttgga
1021	atataaatat ccggtaaaat tgaaaaaata tacactaatt agcgtctcgt ttcagacgct
1081	agctcgaggt tgggagctct ccggatccaa gcttatcgat ttcgaacccg gggtaccgaa
1141	ttcctcgagg ttgggagctc tccggatcca agcttatcga tttcgaaccc ggggtaccga
1201	attcctcgag atgtttattt tcttattatt tcttactctc actagtggta gtgaccttga
1261	ccggtgcacc acttttgatg atgttcaagc tcctaattac actcaacata cttcatctat
1321	gaggggggtt tactatcctg atgaaatttt tagatcagac actctttatt taactcagga
1381	tttatttctt ccattttatt ctaatgttac agggtttcat actattaatc atacgtttgg
1441	caaccctgtc ataccttta aggatggtat ttattttgct gccacagaga aatcaaatgt
1501	tgtccgtggt tgggtttttg gttctaccat gaacaacaag tcacagtcgg tgattattat
1561	taacaattct actaatgttg ttatacgagc atgtaacttt gaattgtgtg acaacccttt
1621	ctttgctgtt tctaaaccca tgggtacaca gacacatact atgatattcg ataatgcatt
1681	taattgcact ttcgagtaca tatctgatgc cttttcgctt gatgtttcag aaaagtcagg
1741	taattttaaa cacttacgag agtttgtgtt taaaaataaa gatgggtttc tctatgttta
1801	taagggctat caacctatag atgtagttcg tgatctacct tctggtttta acactttgaa
1861	acctattttt aagttgcctc ttggtattaa cattacaaat tttagagcca ttcttacagc
1921	cttttcacct gctcaagaca tttggggcac gtcagctgca gcctattttg ttggctattt
1981	aaagccaact acatttatgc tcaagtatga tgaaaatggt acaatcacag atgctgttga
2041	ttgttctcaa aatccacttg ctgaactcaa atgctctgtt aagagctttg agattgacaa
2101	aggaatttac cagacctcta atttcagggt tgttccctca ggagatgttg tgagattccc
2161	taatattaca aacttgtgtc cttttggaga ggtttttaat gctactaaat tcccttctgt
2221	ctatgcatgg gagagaaaaa aaatttctaa ttgtgttgct gattactctg tgctctacaa
2281	ctcaacattc ttttcaacct ttaagtgcta tggcgtttct gccactaagt tgaatgatct
2341	ttgcttctcc aatgtctatg cagattcttt tgtagtcaag ggagatgatg taagacaaat
2401	agcgccagga caaactggtg ttattgctga ttataattat aaattgccag atgatttcat
2461	gggttgtgtc cttgcttgga atactaggaa cattgatgct acttcaactg gtaatcataa
2521	ttataaatat aggtatctta gacatggcaa gcttaggccc tttgagagag acatatctaa
2581	tgtgcctttc tcccctgatg gcaaaccttg caccccacct gctcttaatt gttattggcc
2641	attaaatgat tatggttttt acaccactac tggcattggc taccaacctt acagagttgt
2701	agtactttct tttgaacttt taaatgcacc ggccacggtt tgtggaccaa aattatccac
2761	tgaccttatt aagaaccagt gtgtcaattt taattttaat ggactcactg gtactggtgt
2821	gttaactcct tcttcaaaga gatttcaacc atttcaacaa tttggccgtg atgtttctga
2881	tttcactgat tccgttcgag atcctaaaac atctgaaata ttagacattt caccttgctc
2941	ttttgggggt gtaagtgtaa ttacacctgg aacaaatgct tcatctgaag ttgctgttct
3001	atatcaagat gttaactgca ctgatgtttc tacagcaatt catgcagatc aactcacacc
3061	agcttggcgc atatattcta ctggaaacaa tgtattccag actcaagcag gctgtcttat
3121	aggagctgag catgtcgaca cttcttatga gtgcgacatt cctattggag ctggcatttg
3181	tgctagttac catacagttt ctttattacg tagtactagc caaaaatcta ttgtggctta
3241	tactatgtct ttaggtgctg atagttcaat tgcttactct aataacacca ttgctatacc
3301	tactaacttt tcaattagca ttactacaga agtaatgcct gtttctatgg ctaaaacctc
3361	cgtagattgt aatatgtaca tctgcggaga ttctactgaa tgtgctaatt tgcttctcca
3421	atatggtagc ttttgcacac aactaaatcg tgcactctca ggtattgctg ctgaacagga
3481	tcgcaacaca cgtgaagtgt tcgctcaagt caaacaaatg tacaaaaccc caactttgaa
3541	atattttggt ggttttaatt tttcacaaat attacctgac cctctaaagc caactaagag
3601	gtcttttatt gaggacttgc tctttaataa ggtgacactc gctgatgctg gcttcatgaa
3661	gcaatatggc gaatgcctag gtgatattaa tgctagagat ctcatttgtg cgcagaagtt
3721	caatggactt acagtgttgc cacctctgct cactgatgat atgattgctg cctacactgc
3781	tgctctagtt agtggtactg ccactgctgg atggacattt ggtgctggcg ctgctcttca
3841	aataccttt gctatgcaaa tggcatatag gttcaatggc attggagtta cccaaaatgt
3901	tctctatgag aaccaaaaac aaatcgccaa ccaatttaac aaggcgatta gtcaaattca
3961	agaatcactt acaacaacat caactgcatt gggcaagctg caagacgttg ttaaccagaa

TABLE 1-continued

	Compilation of some of the sequences of the present disclosure.	
	4021	tgctcaagca ttaaacacac ttgttaaaca acttagctct aattttggtg caatttcaag
	4081	tgtgctaaat gatatccttt cgcgacttga taaagtcgag gcggaggtac aaattgacag
	4141	gttaattaca ggcagacttc aaagccttca aacctatgta acacaacaac taatcagggc
	4201	tgctgaaatc agggcttctg ctaatcttgc tgctactaaa atgtctgagt gtgttcttgg
	4261	acaatcaaaa agagttgact tttgtggaaa gggctaccac cttatgtcct tcccacaagc
	4321	agccccgcat ggtgttgtct tcctacatgt cacgtatgtg ccatcccagg agaggaactt
	4381	caccacagcg ccagcaattt gtcatgaagg caaagcatac ttccctcgtg aaggtgtttt
	4441	cgtgtttaat ggcacttctt ggtttattac acagaggaac ttcttttctc cacaaataat
	4501	tactacagac aatacatttg tctcaggaaa ttgtgatgtc gttattggca tcattaacaa
	4561	cacagtttat gatcctctgc aacctgagct cgactcattc aaagaagagc tggacaagta
	4621	cttcaaaaat catacatcac cagatgttga tcttggcgac atttcaggca ttaacgcttc
	4681	tgtcgtcaac attcaaaaag aaattgaccg cctcaatgag gtcgctaaaa atttaaatga
	4741	atcactcatt gaccttcaag aattgggaaa atatgagcaa tatattaaat ggccttggta
	4801	tgtttggctc ggcttcattg ctggactaat tgccatcgtc atggttacaa tcttgctttg
	4861	ttgcatgact agttgttgca gttgcctcaa gggtgcatgc tcttgtggtt cttgctgcaa
	4921	gtttgatgag gatgactctg agccagttct caagggtgtc aaattacatt acacataata
	4981	ttatattttt tatctaaaaa actaaaaata aacattgatt aaattttaat ataatactta
	5041	aaaatggatg ttgtgtcgtt agataaaccg tttatgtatt ttgaggaaat tgataatgag
	5101	ttagattacg aaccagaaag tgcaaatgag gtcgcaaaaa aactaccgta tcaaggacag
	5161	ttaaaactat tactaggaga attatttttt cttagtaagt tacagcgaca cggtatatta
	5221	gatggtgcca ccgtagtgta tataggatcg gctcctggta cacatatacg ttatttgaga
	5281	gatcatttct ataatttagg aatgattatc aaatggatgc taattgacgg acgccatcat
	5341	gatcctattc taaatggatt gcgtgatgtg actctagtga ctcggttcgt tgatgaggaa
	5401	tatctacgat ccatcaaaaa acaactgcat ccttctaaga ttattttaat ttctgatgta
	5461	agatccaaac gaggaggaaa tgaacctagt acggcggatt tactaagtaa ttacgctcta
	5521	caaaatgtca tgattagtat tttaaacccc gtggcatcta gtcttaaatg gagatgcccg
	5581	tttccagatc aatggatcaa ggacttttat atcccacacg gtaataaaat gttacaacct
	5641	tttgctcctt catattcagc tgaaatgaga ttattaagta tttataccgg tgagaacatg
	5701	agactgactc gagttaccaa attagacgct gtaaattatg aaaaaaagat gtactacctt
	5761	aataagatcg tccgtaacaa agtagttgtt aactttgatt atcctaatca ggaatatgac
	5821	tattttcaca tgtactttat gctgaggacc gtatactgca ataaaacatt tcctactact
	5881	aaagcaaagg tactatttct acaacaatct atatttcgtt tcttaaatat tccaacaaca
	5941	tcaactgaaa aagttagtca tgaaccaata caacgtaa
	1	atttacggat tcaccaataa aaataaacta gagaaactta gtactaataa ggaactagaa
NT	61	tcgtatagtt ctagccctct tcaagaaccc attaggttaa atgattttct gggactattg
	121	gaatgtgtta aaaagaatat tcctctaaca gatattccga caaaggattg attactataa
	181	atggagaatg ttcctaatgt atactttaat cctgtgttta tagagcccac gtttaaacat
	241	tctttattaa gtgtttataa acacagatta atagttttat ttgaagtatt cgttgtattc
	301	attctaatat atgtattttt tagatctgaa ttaaatatgt tcttcatgcc taaacgaaaa
	361	atacccgatc ctattgatag attacgacgt gctaatctag cgtgtgaaga cgataaatta
	421	atgatctatg gattaccatg gatgacaact caaacatctg cgttatcaat aaatagtaaa
	481	ccgatagtgt ataaagattg tgcaaagctt ttgcgatcaa taaatggatc acaaccagta
	541	tctcttaacg atgttcttcg cagatgatga ttcatttttt aagtatttgg ctagtcaaga
	601	tgatgaatct tcattatctg atatattgca aatcactcaa tatctagact ttctgttatt
	661	attattgatc caatcaaaaa ataaattaga agccgtgggt cattgttatg aatctctttc
	721	agaggaatac agacaattga caaaattcac agactctcaa gattttaaaa aactgtttaa
	781	caaggtccct attgttacag atggaagggt caaacttaat aaaggatatt tgttcgactt
	841	tgtgattagt ttgatgcgat tcaaaaaaga atcagctcta gctaccaccg caatagatcc
	901	tgttagatac atagatcctc gtcgcgatat cgcattttct aacgtgatgg atatattaaa
	961	gtcgaataaa gtgaacaata attaattctt tattgtcatc ttttattttt tttttttgga

TABLE 1-continued

Compilation of some of the sequences of the present disclosure.	
1021	atataaatat ccggtaaaat tgaaaaaata tacactaatt agcgtctcgt ttcagacgct
1081	agctcgaggt tgggagctct ccggatccaa gcttatcgat ttcgaacccg gggtaccgaa
1141	ttcctcgagg ttgggagctc tccggatcca agcttatcga tttcgaaccc ggggtaccga
1201	attcctcgag atgtttattt tcttattatt tcttactctc actagtggta gtgaccttga
1261	ccggtgcacc acttttgatg atgttcaagc tcctaattac actcaacata cttcatctat
1321	gaggggggtt tactatcctg atgaaatttt tagatcagac actctttatt taactcagga
1381	tttatttctt ccattttatt ctaatgttac agggtttcat actattaatc atacgtttgg
1441	caaccctgtc ataccttttta aggatggtat ttattttgct gccacagaga aatcaaatgt
1501	tgtccgtggt tgggtttttg gttctaccat gaacaacaag tcacagtcgg tgattattat
1561	taacaattct actaatgttg ttatacgagc atgtaacttt gaattgtgtg acaacccttt
1621	ctttgctgtt tctaaaccca tgggtacaca gacacatact atgatattcg ataatgcatt
1681	taattgcact ttcgagtaca tatctgatgc cttttcgctt gatgtttcag aaaagtcagg
1741	taattttaaa cacttacgag agtttgtgtt taaaaataaa gatgggtttc tctatgttta
1801	taagggctat caacctatag atgtagttcg tgatctacct tctggtttta acactttgaa
1861	acctattttt aagttgcctc ttggtattaa cattacaaat tttagagcca ttcttacagc
1921	cttttcacct gctcaagaca tttggggcac gtcagctgca gcctattttg ttggctattt
1981	aaagccaact acatttatgc tcaagtatga tgaaaatggt acaatcacag atgctgttga
2041	ttgttctcaa aatccacttg ctgaactcaa atgctctgtt aagagctttg agattgacaa
2101	aggaatttac cagacctcta atttcagggt tgttccctca ggagatgttg tgagattccc
2161	taatattaca aacttgtgtc cttttggaga ggtttttaat gctactaaat tcccttctgt
2221	ctatgcatgg gagagaaaaa aaatttctaa ttgtgttgct gattactctg tgctctacaa
2281	ctcaacattc ttttcaacct ttaagtgcta tggcgtttct gccactaagt tgaatgatct
2341	ttgcttctcc aatgtctatg cagattcttt tgtagtcaag ggagatgatg taagacaaat
2401	agcgccagga caaactggtg ttattgctga ttataattat aaattgccag atgatttcat
2461	gggttgtgtc cttgcttgga atactaggaa cattgatgct acttcaactg gtaatcataa
2521	ttataaatat aggtatctta gacatggcaa gcttaggccc tttgagagag acatatctaa
2581	tgtgcctttc tcccctgatg gcaaaccttg caccccacct gctcttaatt gttattggcc
2641	attaaatgat tatggttttt acaccactac tggcattggc taccaacctt acagagttgt
2701	agtactttct tttgaacttt taaatgcacc ggccacggtt tgtggaccaa aattatccac
2761	tgaccttatt aagaaccagt gtgtcaattt taattttaat ggactcactg gtactggtgt
2821	gttaactcct tcttcaaaga gatttcaacc atttcaacaa tttggccgtg atgtttctga
2881	tttcactgat tccgttcgag atcctaaaac atctgaaata ttagacattt caccttgctc
2941	ttttgggggt gtaagtgtaa ttacacctgg aacaaatgct tcatctgaag ttgctgttct
3001	atatcaagat gttaactgca ctgatgtttc tacagcaatt catgcagatc aactcacacc
3061	agcttggcgc atatattcta ctggaaacaa tgtattccag actcaagcag gctgtcttat
3121	aggagctgag catgtcgaca cttcttatga gtgcgacatt cctattggag ctggcatttg
3181	tgctagttac catacagttt ctttattacg tagtactagc caaaaatcta ttgtggctta
3241	tactatgtct ttaggtgctg atagttcaat tgcttactct aataacacca ttgctatacc
3301	tactaacttt tcaattagca ttactacaga agtaatgcct gtttctatgg ctaaaacctc
3361	cgtagattgt aatatgtaca tctgcggaga ttctactgaa tgtgctaatt tgcttctcca
3421	atatggtagc ttttgcacac aactaaatcg tgcactctca ggtattgctg ctgaacagga
3481	tcgcaacaca cgtgaagtgt tcgctcaagt caaacaaatg tacaaaaccc caactttgaa
3541	atattttggt ggttttaatt tttcacaaat attacctgac cctctaaagc caactaagag
3601	gtcttttatt gaggacttgc tctttaataa ggtgacactc gctgatgctg gcttcatgaa
3661	gcaatatggc gaatgcctag gtgatattaa tgctagagat ctcatttgtg cgcagaagtt
3721	caatggactt acagtgttgc cacctctgct cactgatgat atgattgctg cctacactgc
3781	tgctctagtt agtggtactg ccactgctgg atggacattt ggtgctggcg ctgctcttca
3841	aataccttt gctatgcaaa tggcatatag gttcaatggc attggagtta cccaaaatgt
3901	tctctatgag aaccaaaaac aaatcgccaa ccaatttaac aaggcgatta gtcaaattca
3961	agaatcactt acaacaacat caactgcatt gggcaagctg caagacgttg ttaaccagaa
4021	tgctcaagca ttaaacacac ttgttaaaca acttagctct aattttggtg caatttcaag

Examples

Example 1. Generation of the Synthetic Horsepox Virus

[0123] The synthetic horsepox virus (scHPXV) is generated following the methods disclosed in US 2018/0251736, incorporated herein by reference in its entirety.

[0124] The design of the synthetic HPXV genome is based on the previously described genome sequence for HPXV (strain MNR-76; GenBank accession DQ792504) (Tulman E R, Delhon G, Afonso C L, Lu Z, Zsak L, Sandybaev N T, et al. Genome of horsepox virus. Journal of virology. 2006; 80(18):9244-58). The 212,633 bp genome is divided into 10 overlapping fragments. These fragments are designed so that they shared at least 1.0 kbp of overlapping sequence (i.e. homology) with each adjacent fragment, to provide sites where homologous recombination will drive the assembly of full-length genomes. The fragments generated are shown in Table 2. These overlapping sequences will provide sufficient homology to accurately carry out recombination between the co-transfected fragments

TABLE 2

HPXV genome fragments for use to generate the

other helper viruses (such as, but not limited to, fowlpox virus) may be used. In some embodiments, different cell combinations may be used.

[0127] BGMK cells are infected with SFV at a MOI of 0.5 and then transfected with 5 μg of digested GA_HPXV fragments 2 h later. Five days post transfection, all of the infectious particles are recovered by cell lysis and re-plated on BSC-40 cells, which only efficiently support growth of HPXV. The resulting reactivated scHPXV YFP-gpt::095 plaques are visualized under a fluorescence microscope. The visualization is enabled by the yfp/gpt selectable marker in the HPXV095/J2R locus within Frag_3. Virus plaques are detected in BSC-40 monolayers within 48 h of transfection. The efficiency of recovering scHPXV YFP-gpt::095 is dependent on a number of factors, including DNA transfection efficiency, but ranges up to a few PFU/μg of DNA transfected.

[0128] A yfp/gpt cassette under the control of a poxvirus early late promoter is also introduced into the HPXV200 locus within GA_Fragment_7, so that reactivation of HPXV (scHPXV YFP-gpt::200) will be easy to visualize under a fluorescence microscope. SFV-catalyzed recombination and reactivation of poxvirus DNA to assemble recombinant poxviruses has previously been described (Yao X D et al. Journal of virology. 2003; 77(13):7281-90; and Yao X D et

[0139] For efficient expression of transgenes from poxvirus vectors, heterologous gene coding sequences containing the vaccinia Early Transcription Terminator Signal (ETTS) should be removed, in one embodiment of this disclosure, through coding silent mutagenesis to generate full length transcripts during the early phase of the infection. These sequences have the following sequence: TTTTTNT (T5NT); SEQ ID NO: 14. Removing the ETTS in the S protein coding sequence can positively impact the generation of robust immune responses. See Earl P L et al. J Virol. 1990 May; 64(5):2448-51.

[0140] Examples of other mutations introduced in the S protein (SEQ ID NO: 47) in other embodiments of this disclosure are the following: D614G, S943P, K986P and V987P. One or more of these mutations can be introduced in the S protein in those embodiments.

[0141] Poxvirus replication occurs in the cytoplasm of the infected cell. The viruses do not enter the nucleus of the infected cell during the replication cycle, and therefore do not utilize the host cell transcriptional apparatus. Because of the cytoplasmic location of replication, poxviruses encode their own transcriptional machinery including the viral RNA polymerase and their own regulatory promoter recognition signals. Therefore, for efficient high-level expression from

SARS-CoV-2 S gene expression cassette" is performed 24 hours post-infection. Recombination of the expression cassette occurs through the left and right flanking arms and the expression cassette is inserted into the TK gene locus. Accordingly, HPXV-095 TK locus is knocked-out and the expression cassette is inserted in the TK gene locus. After 30 min at 25° C., 7.2 ml of Eagle medium containing 8% fetal bovine serum was added and the monolayer was incubated for 3.5 hr at 37° C. The culture medium was then removed and replaced by 8 ml fresh Eagle medium containing 8% fetal bovine serum and the incubation was continued at 37° C. for two days. Cells were scraped from the bottles, pelleted by centrifugation (2,000×g, 5 min) and resuspended in 0.5 ml of Eagle medium containing 2.5% fetal bovine serum.

[0146] (c) The transfected cells are harvested 48 hours post-infection and the progeny virus of recombinant synthetic horsepoxvirus comprising the engineered SARS-CoV-2 S gene and the synthetic VACV is released of with repeated cycles of freeze/thaw.

[0147] (d) Selection of recombinant viruses. Thymidine kinase negative poxvirus recombinants are selected by plaque assay in TK^- cells (e.g., TK^- Vero cells or TK^-

SARS-CoV2 Spike (ProSci) or anti-VACV 13 antibodies. Primary antibody binding was detected by blotting the membrane with IRDye secondary antibodies detectable at 800 nm or 680 nm channels (LI-COR). The SARS CoV2 Spike antibody detected different forms of the SARS-CoV-2 Spike protein including the full-length, glycosylated full-length, cleaved, and multimeric forms.

[0160] Viral genomic DNA from synVACVΔA2K105$^{SARSCoV2\text{-}SPIKE\text{-}co::nm}$ (TNX-2200) clones 1.1.1.1.1 and 2.1.1.1.1 was isolated and the DNA was sequenced using Next Generation Sequencing (NGS) with the Illumina MiSeq platform. The sequencing data were analyzed by de novo assembly and mapped to reference software using the CLC Genomics Workbench software (Qiagen).

Example 9. Generation of Synthetic Horsepox Virus TNX-1800a

[0161] The YFP-GPT selectable marker in the scHPXV (see Example 7) thymidine kinase (TK) locus (also referred to as the HPXV095 gene locus) was replaced using, for example, homologous recombination with a codon-optimized SARS-CoV-2 Spike (SARS-CoV-2-co) nucleotide sequence to generate the synthetic vaccinia virus TNX-1800a. One exemplary procedure is as follows.

Reverse Primer 5'-3': CCTCATTTGCACTTTCTGGTTC (SEQ ID NO: 59)) that amplify the HPXV095 gene locus was performed to confirm that the SARS-Spike-co gene was inserted into the HPXV095 locus. The viral genomic DNA was subsequently isolated from a preparation of sucrose-purified virus particles and used in Next Generation Sequencing with the Illumina MiSeq platform. The sequence data was analyzed by de novo assembly and mapped to reference software using the CLC Genomics Workbench software (Qiagen).

Example 10. Generation of Synthetic Horsepox Virus TNX-1800b

[0165] The YFP-GPT selectable marker in the scHPXV (see Example 7) HPXV200 gene locus (also referred to as the Variola virus B22R homolog locus) was replaced using, for example, homologous recombination with a codon-optimized SARS-CoV-2 Spike (SARS-CoV-2-co) nucleotide sequence to generate the synthetic vaccinia virus TNX-1800b. One exemplary procedure is as follows.

[0166] Approximately 20 μgrams of plasmid containing SARS-CoV-2-Spike-co flanked by approximately 400 nucleotides homologous to the HPXV200 gene was linearized using the restriction enzyme, SacI. Following restriction enzyme digestion, the linearized plasmid was further

7-9) and cell controls (CC; columns 10-12). At least two QC plate were used per assay. Test and QC plates were incubated at 37° C. for 2-2.5 hours in a 5% CO_2 incubator. After incubation, aliquots of mixtures (sera and virus) for both test and QC plates (including controls) were transferred onto the 96-well plates pre-seeded with Vero E6 cell and incubated for 72±4 hours. Following incubation, plates were removed from the incubator and allowed to rest at room temperature for 20-40 minutes. 100 uL of Cell Titer-Glo (Promega) was added to all wells in the plates, gently mixed and incubated at room temperature for 10-30 minutes. Luminescence was read using an appropriate photometer. Plate cut-off values were calculated using the following formula:

(Average of VC wells+Average of CC wells)/2

Samples with luminescence above or below the plate cut-off are positive and negative for neutralizing antibody, respectively. The individual replicate is assigned a titer that is the reciprocal of the dilution of the last positive dilution (i.e., 1:80=is reported as a titer of 80). Titers are reported as median and geometric mean titers of the accepted replicate titers.

[0174] Table 6 shows the level of anti-SARS-CoV-2 neutralizing titers measured in vaccinated AGMs after 14 days of a single vaccination. The AGMs vaccinated with TNX-1800b-2 and TNX1800a-1 generated neutralizing titers (≥1:40 titer) of antibodies against SARS-CoV-2. The TNX-801 (an scHPXV not carrying the S protein expression cassette) vaccinated control animals and the placebo group did not generate anti-SARS-CoV-2 neutralizing titers (≤1:10 titer). Both the 2.9×10^6 PFU and 1.06×10^6 PFU doses of TNX-801 and TNX-1800 were well-tolerated.

TABLE 6,

Anti-SARS-CoV-2 neutralizing titers in vaccinated African Green Monkeys

Animal Number	HPXV strain	Dose	Titer 1	Titer 2	Median	Geometric Mean Titer (GMT)
3M 16982 D15	TNX-1800b-2	2.9×10^6	640	20	NQ	NQ
3M 16976 D15	TNX-1800b-2	2.9×10^6	640	320	480	452.55

Example 13. Viral Growth Curves Measured in Cells Infected with Recombinant Poxvirus Engineered SARS-CoV-2 S Protein

[0175] BSC-40, HeLa and HEK 293 cells were seeded into a 6-well plate and subsequently infected with TNX-801, TNX-1800, TNX-1200, or TNX-2200 at a MOI of 0.01. After 48 hours of infection, cells were fixed and stained with 5% formaldehyde containing crystal violet. BSC-40 cells infected with TNX-801 and TNX-1800 had a significant cytopathic effect, while HeLa and HEK 293 cells showed minor and no cytopathic effect, respectively (FIG. **18**). BSC-40 HeLa and HEK293 cells infected with TNX-1200 and TNX-2200 had a significant cytopathic effect in all infected cell lines (FIG. **18**). Viral titer (PFU/mL) in BSC-40, HeLa and HEK 293 cells was measured over time after 24, 48 and 72 hours of infection with TNX-801, TNX-1800, TNX-1200, or TNX-2200 (FIGS. **19**A-D), which corresponds to the cytopathic effect of the viruses as represented in FIG. **18**.

[0176] BSC-40 cells were infected with HPXV clones (e.g., _TNX-801, scHPXVΔ095$^{yfp\text{-}gpt}$, TNX-1800a-1, scHPXVΔ200$^{yfp\text{-}gpt}$, or TNX-1800b-2; (FIGS. **20**A-B)) or VACV clones (e.g., TNX-1200, TNX-2200 or synVACVΔA2K105$^{yfp\text{-}gpt}$; (FIGS. **21**A-B)) at a MOI of 0.01. Viral titer (PFU/mL) was measured at 0, 3, 6, 12, 24, 48 and 72 hours to determine viral growth in infected cells. The presence of SARS-CoV-2 Spike protein slows HPXV clone viral growth by approximately 0.5 log, while it slows VACV clone viral growth by approximately 1 log.

[0177] The cytopathic effect seen in Vero cells and BSC-40 cells infected with the various HPXV and VACV clones shows that these cell lines can be used to manufacture the viruses (e.g., TNX-1800 and TNX-801).

[0184] At day 41, the vaccinated AGMs were anesthetized and challenged (also referred to as inoculated) with approximately 2×10^6 $TCID_{50}$/animal wild-type SARS-CoV-2 via the 1. intranasal and 2. intratracheal route. The volume of virus was split evenly between each of the two routes (1 mL per route with a 1×106 $TCID_{50}$/mL virus stock). For the intranasal route, AGMs were anesthetized and inoculated by slowly pipetting 500 μL into each are followed by inhalation. For the intratracheal route, AGMs were anesthetized, and a tube was inserted into the trachea. After the end of the tube was situated approximately at the mid-point of the trachea, a syringe containing the inoculate with the virus was attached to the tube and the inoculate was slowly instilled into the trachea followed by an equal volume of PBS to flush the tube. After the AGMs were inoculated, the animal was returned to its home cage and monitored for recovery from the anesthesia.

[0185] An oropharyngeal swab specimen and a tracheal lavage specimen were collected on Day 41 and Day 47 from the inoculated AGMs. The specimens were processed by RT-qPCR methods to measure SARS-CoV-2 copy number. Table 8 shows the SARS-CoV-2 copy number from oropharyngeal swab specimens. Table 9 shows the SARS-CoV-2 copy number from tracheal lavage specimens. At Day 47, AGMs vaccinated with TNX-1800b-2 and TNX-1800a-1 developed protective immunity against SARS-CoV-2.

TABLE 8

RT-qPCR of SARS-CoV-2 Copy Number per Swab from Oropharyngeal Swab

HPXV strain	Dose (PFU)	Animal Number	Day 41 (Copy number per swab)	Day 47 (Copy number per swab)
TNX-801	2.9×10^6	1M 16977	0.00E+00	2.59E+06

TABLE 9-continued

RT-qPCR of SARS-CoV-2 Copy Number per ml. from Tracheal Lavage

HPXV strain	Dose (PFU)	Animal Number	Day 41 (Copy number per mL)	Day 47 (Copy number per mL)
TNX-801	1.06×10^6	2M 16980	0.00E+00	4.50E+04
		2M 16983	0.00E+00	0.00E+00
		2F 16985	0.00E+00	3.95E+05
		2F 16991	0.00E+00	1.72E+04
TNX-1800b-2	2.9×10^6	3M 16982	0.00E+00	0.00E+00
		3M 16976	0.00E+00	0.00E+00
		3F 16988	0.00E+00	0.00E+00
		3F 16995	0.00E+00	0.00E+00
TNX-1800b-2	1.06×10^6	4M 16973	0.00E+00	8.42E+02
		4M 16972	0.00E+00	0.00E+00
		4F 16989	0.00E+00	0.00E+00
		4F 16990	0.00E+00	0.00E+00
TNX-1800a-1	0.6×10^6	5M 16979	0.00E+00	0.00E+00
		5M 16981	0.00E+00	9.34E+03
		5F 16993	0.00E+00	0.00E+00
		5F 16992	0.00E+00	6.82E+02
Vehicle Control	Not applicable	6M 16978	0.00E+00	1.91E+03
		6M 16974	0.00E+00	8.13E+03
		6F16987	0.00E+00	1.43E+04
		6F16984	0.00E+00	1.17E+03

Exemplary Embodiments

[0186] 1. A recombinant poxvirus comprising a nucleic acid encoding a SARS-CoV-2 virus protein, wherein the SARS-CoV-2 protein is selected from the group consisting of the spike protein (S), the membrane protein (M) and the nucleocapsid protein (N), or com-

ONC1, Lister GL-ONC2, Lister GL-ONC3, Lister GL-ONC4, Lister CTC1, Lister IMG2 (Turbo FP635), IHD-W, LC16m18, Lederle, Tashkent clone TKT3, Tashkent clone TKT4, USSR, Evans, Praha, L-IVP (synVACVΔA2K105$^{SARS\text{-}CoV2\text{-}Spike\text{-}co}$), TNX-2200 clone 1.1.1.1.1, TNX-2200 clone 2.1.1.1.1, TNX-1800 (scHPXVΔ200$^{SARS\text{-}COV2\text{-}Spike\text{-}co}$), TNX-1800a, TNX-1800a-1, TNX-1800b, and TNX-1800b-2

(synVACVΔA2K105$^{SARS\text{-}CoV2\text{-}Spike\text{-}co}$), TNX-2200 clone 1.1.1.1.1, TNX-2200 clone 2.1.1.1.1, TNX-1800 (scHPXVΔ200$^{SARS\text{-}COV2\text{-}Spike\text{-}co}$), TNX-1800a, TNX-1800a-1, TNX-1800b, and TNX-1800b-2.

[0226] 41. The method for selecting a cell that expresses a SARS-CoV-2 virus protein according to embodiment 39, wherein the recombinant poxvirus comprises any one of SEQ ID Nos: 63, 64 or 65.

[0227] 42. The method for selecting a cell that expresses a SARS-CoV-2 virus protein according to embodiment 40, wherein the recombinant poxvirus is TNX-1800b-2.

[0228] 43. The method for selecting a cell that expresses a SARS-CoV-2 virus protein according to embodiment 40, wherein the recombinant poxvirus is TNX-1800a-1.

[0229] 44. A method of inducing an immune response against a SARS-CoV-2 virus in a subject, comprising administering to said subject an immunologically effective amount of the recombinant poxvirus according to any one of embodiments 1-24 or the pharmaceutical composition according to any one of embodiments 25-29.

[0230] 45. The method of inducing an immune response against a SARS-CoV-2 virus in a subject according to embodiment 44, wherein said immunologically effective amount of the recombinant poxvirus is administered by scarification.

[0238] 53. The method of inducing an immune response against the SARS-CoV-2 virus and the poxvirus according to embodiment 50, wherein the immunologically effective amount of a recombinant poxvirus is capable of protecting the subject from the SARS-CoV-2 virus and the poxvirus.

[0239] 54. The method of inducing an immune response against the SARS-CoV-2 virus and the poxvirus according to embodiment 50, wherein the immunologically effective amount of a recombinant poxvirus reduces or prevents the progression of the SARS-CoV-2 virus infection and/or the poxvirus infection in the subject.

[0240] 55. The method of inducing an immune response against the SARS-CoV-2 virus and the poxvirus according to embodiment 50, wherein the immune response is a T-cell immune response.

[0241] 56. The method of inducing an immune response against the SARS-CoV-2 virus and the poxvirus according to any one of embodiments 50-55, wherein the poxvirus is vaccinia virus, variola, horsepox virus or monkeypox virus.

[0242] 57. A method of inducing T cell immunity against a SARS-CoV-2 virus comprising administering to said subject an immunologically effective amount of a recombinant poxvirus according to any one of embodiments 1-24 or the pharmaceutical composition

cally effective amount of a recombinant poxvirus reduces or prevents the progression of the SARS-CoV-2 infection and/or poxvirus infection in the subject.

[0250] 65. The method of inducing T cell immunity against the SARS-CoV-2 virus and the poxvirus according to any one of embodiments 61-64, wherein the poxvirus is vaccinia virus, variola, horsepox virus or monkeypox virus.

[0251] 66. A method of generating a recombinant poxvirus according to any one of embodiments 1-65, the method comprising:

[0252] (a) Infecting a host cell with a poxvirus;

[0253] (b) Transfecting the infected cell of step (a) with a nucleic acid encoding a SARS-CoV-2 virus protein to generate a recombinant poxvirus; and

[0254] (c) Selecting a recombinant poxvirus, wherein the nucleic acid encoding a SARS-CoV-2 virus protein is located, upon transfection, in a region of the poxvirus that is not essential for the replication of the poxvirus.

[0255] 67. The method according to any one of embodiments 39-66, wherein the SARS-CoV-2 protein is selected from the group consisting of the S spike protein, the M protein and the N protein, or combinations of two or more of said proteins.

[0256] 68. The method according to any one of embodiments 39-67, wherein the poxvirus is an orthopoxvirus.

[0257] 69. The method according to embodiment 68, wherein the orthopoxvirus is selected from the group consisting of camelpox (CMLV) virus, cowpox virus (CPXV), ectromelia virus (ECTV), horsepox virus (HPXV), monkeypox virus (MPXV), vaccinia virus (VACV), variola virus (VARV), rabbitpox virus (RPXV), raccoon poxvirus, skunkpox virus, Taterapox virus, Uasin Gishu disease virus and volepox virus.

[0258] 70. The method according to embodiment 68, wherein the orthopoxvirus is a horsepox virus.

[0259] 71. The method according to embodiment 70, wherein the horsepox virus is strain MNR-76.

[0260] 72. The method according to embodiment 68, wherein the orthopoxvirus is a vaccinia virus.

[0261] 73. The method according to embodiment 72, wherein the vaccinia virus is selected from the group of strains consisting of: Western Reserve, Western Reserve Clone 3, Tian Tian, Tian Tian clone TP5, Tian Tian clone TP3, NYCBH, NYCBH clone Acambis 2000, Wyeth, Copenhagen, Lister, Lister 107, Lister-LO, Lister GL-ONC1, Lister GL-ONC2, Lister GL-ONC3, Lister GL-ONC4, Lister CTC1, Lister IMG2 (Turbo FP635), IHD-W, LC16m18, Lederle, Tashkent clone TKT3, Tashkent clone TKT4, USSR, Evans, Praha, L-IVP, V-VET1 or LIVP 6.1.1, Ikeda, EM-63, Malbran, Duke, 3737, CV-1, Connaught Laboratories, Serro 2, CM-01, NYCBH Dryvax clone DPP13, NYCBH Dryvax clone DPP15, NYCBH Dryvax clone DPP20, NYCBH Dryvax clone DPP17, NYCBH Dryvax clone DPP21, VACV-IOC, Chorioallantoid Vaccinia virus Ankara (CVA), Modified vaccinia Ankara (MVA), and MVA-BN.

[0262] 74. The method according to any one of embodiments 39-73, wherein the nucleic acid encoding a SARS-CoV-2 virus protein is located in a region of the poxvirus that is not essential for replication of the poxvirus.

[0263] 75. The method according to embodiment 74, wherein the nucleic acid encoding a SARS-CoV-2 virus protein is located in the thymidine kinase (TK) gene locus of the poxvirus.

[0264] 76. The method according to embodiment 74, wherein the nucleic acid encoding a SARS-CoV-2 virus protein is located in the B22R homolog gene locus of the poxvirus.

[0265] 77. The method according to any one of embodiments 39-76, wherein the nucleic acid encoding a SARS-CoV-2 virus protein is operatively linked to a promoter.

[0266] 78. The method according to embodiment 77, wherein the promoter is a poxvirus specific promoter.

[0267] 79. The method according to embodiment 78, wherein the poxvirus specific promoter is a vaccinia virus early promoter.

[0268] 80. The method according to embodiment 78, wherein the poxvirus specific promoter is a vaccinia virus late promoter.

[0269] 81. The method according to embodiment 78, wherein the poxvirus specific promoter is a tandem of a vaccinia virus early and late promoter.

[0270] 82. The method according to any one of embodiments 39-81, wherein the poxvirus is a synthetic poxvirus.

[0271] 83. A method of reducing or preventing the progression of a SARS-CoV-2 virus infection in a subject in need or at risk thereof comprising administering to said subject an immunologically effective amount of the recombinant poxvirus according to any one of embodiments 1-24 or the pharmaceutical composition according to any one of embodiments 25-29.

[0272] 84. A method of reducing or preventing the progression of a SARS-CoV-2 virus and a poxvirus infection in a subject in need or at risk thereof comprising administering to said subject an immunologically effective amount of the recombinant poxvirus according to any one of embodiments 1-24 or the pharmaceutical composition of any one of embodiments 25-29.

[0273] 85. The method of reducing or preventing the progression of a SARS-CoV-2 virus and a poxvirus, wherein the poxvirus is vaccinia virus, variola, horsepox virus or monkeypox virus.

[0274] 86. A vaccine against a SARS-CoV-2 virus comprising a recombinant virus according to embodiments 1-24 or a pharmaceutical composition according to embodiments 25-29.

[0275] 87. A bivalent vaccine against a SARS-CoV-2 virus and a poxvirus comprising a recombinant virus according to embodiments 1-24 or a pharmaceutical composition according to embodiments 25-29.

[0276] 88. A bivalent vaccine against a SARS-CoV-2 virus and a poxvirus, wherein the poxvirus is a vaccinia virus, variola, horsepox virus or monkeypox.

SEQUENCE LISTING

The patent application contains a lengthy "Sequence Listing" section. A copy of the "Sequence Listing" is available in electronic form from the USPTO web site (https://seqdata.uspto.gov/?pageRequest=docDetail&DocID=US20210260182A1). An electronic copy of the "Sequence Listing" will also be available from the USPTO upon request and payment of the fee set forth in 37 CFR 1.19(b)(3).

1. A recombinant poxvirus comprising a nucleic acid encoding a SARS-CoV-2 virus protein, wherein the SARS-CoV-2 protein is selected from the group consisting of the spike protein (S), the membrane protein (M) and the nucleocapsid protein (N), or combinations of two or more of said proteins.

2. The recombinant poxvirus according to claim **1**, wherein the poxvirus is an orthopoxvirus.

3. The recombinant poxvirus according to claim **2**, wherein the orthopoxvirus is selected from the group consisting of camelpox (CMLV) virus, cowpox virus (CPXV), ectromelia virus (ECTV), horsepox virus (HPXV), monkeypox virus (MPXV), vaccinia virus (VACV), variola virus (VARV), rabbitpox virus (RPXV), raccoon poxvirus, skunkpox virus, Taterapox virus, Uasin Gishu disease virus and volepox virus.

4. The recombinant poxvirus according to claim **2**, wherein the orthopoxvirus is a horsepox virus or a vaccinia virus.

5. The recombinant poxvirus according to claim **4**, wherein the horsepox virus is strain MNR-76 and wherein the vaccinia virus is selected from the group of strains consisting of: Western Reserve, Western Reserve Clone 3, Tian Tian, Tian Tian clone TP5, Tian Tian clone TP3, NYCBH, NYCBH clone Acambis 2000 (ACAM 2000), Wyeth, Copenhagen, Lister, Lister 107, Lister-LO, Lister GL-ONC1, Lister GL-ONC2, Lister GL-ONC3, Lister GL-ONC4, Lister CTC1, Lister IMG2 (Turbo FP635), IHD-W, LC16m18, Lederle, Tashkent clone TKT3, Tashkent clone TKT4, USSR, Evans, Praha, L-IVP, V-VET1 or LIVP 6.1.1, Ikeda, EM-63, Malbran, Duke, 3737, CV-1, Connaught Laboratories, Serro 2, CM-01, NYCBH Dryvax clone DPP13, NYCBH Dryvax clone DPP15, NYCBH Dryvax clone DPP20, NYCBH Dryvax clone DPP17, NYCBH Dryvax clone DPP21, VACV-IOC, Mulford 1902, Chorioallantoid Vaccinia virus Ankara (CVA), Modified vaccinia Ankara (MVA), and MVA-BN.

6-7. (canceled)

8. The recombinant poxvirus according to claim **1**, wherein the SARS-CoV-2 protein is the S protein.

9. The recombinant poxvirus according to claim **1**, wherein the amino acid sequence of the SARS-CoV-2 virus protein is modified with reference to a wild type protein or modified to infect mice.

10. (canceled)

11. The recombinant poxvirus according to claim **8**, wherein the amino acid sequence of the SARS-CoV-2 virus S protein comprises one or more substitutions selected from Y459H, D614G, S943P, K986P and V987P, with reference to a wild type S protein (SEQ ID NO: 47).

12. The recombinant poxvirus according to claim **1**, wherein the nucleic acid encoding the SARS-CoV-2 virus protein is located in a region of the poxvirus that is not essential for replication of the poxvirus.

13. The recombinant poxvirus according to claim **12**, wherein the nucleic acid encoding a SARS-CoV-2 virus protein is located in the thymidine kinase (TK) gene locus of the poxvirus or in the B22R homolog gene locus of the poxvirus.

14. (canceled)

15. The recombinant poxvirus according to claim **1**, wherein the nucleic acid encoding the SARS-CoV-2 virus protein is operatively linked to a promoter.

16. The recombinant poxvirus according to claim **15**, wherein the promoter is a poxvirus-specific promoter.

17. The recombinant poxvirus according to claim **16**, wherein the poxvirus specific promoter is a vaccinia virus early promoter, a vaccinia virus late promoter, or a tandem of a vaccinia virus early and late promoter.

18-19. (canceled)

20. The recombinant poxvirus according to claim **1**, wherein the poxvirus is a synthetic poxvirus.

21. The recombinant poxvirus according to claim **20**, wherein the synthetic poxvirus is selected from the group consisting of TNX-2200 (synVACVΔA2K105$^{SARS\text{-}CoV2\text{-}Spike\text{-}co}$), TNX-2200 clone 1.1.1.1.1, TNX-2200 clone 2.1.1.1.1, TNX-1800 (scHPXVΔ200$^{SARS\text{-}COV2\text{-}Spike\text{-}co}$), TNX-1800a, TNX-1800a-1, TNX-1800b, and TNX-1800b-2.

22. The recombinant poxvirus according to claim **21**, wherein the recombinant poxvirus is TNX-1800b-2 or TNX-1800a-1.

23. (canceled)

24. The recombinant poxvirus according to claim **20**, wherein the synthetic poxvirus comprises any one of SEQ ID NOs: 63, 64 or 65.

25. A pharmaceutical composition comprising a recombinant poxvirus according to claim **1** and a pharmaceutically acceptable carrier.

26-29. (canceled)

30. A cell infected with a recombinant poxvirus according to claim **1**, wherein the cell is an adherent cell or a suspension cell.

31. The cell according to claim **30**, wherein the cell is a mammalian cell or an avian cell.

32. The cell according to claim **31**, wherein the mammalian cell is a Vero cell, a Vero E6 cell, a BSC-40 cell, a Vero adherent cell, a Vero suspension cell, a BHK-21 cell, an ACE2 Knockout Vero cell, or an MRC-5 cell, and wherein the avian cell is a chicken embryo fibroblast, a duck embryo-derived cell, an EB66® cell, an AGE1.CRpIX® cell, or a DF-1 cell.

33-38. (canceled)

39. A method for selecting a cell that expresses a SARS-CoV-2 virus protein, comprising infecting a cell with a recombinant poxvirus according to claim **1** and selecting the infected cell expressing said SARS-CoV-2 virus protein.

40-43. (canceled)

44. A method of inducing an immune response against a SARS-CoV-2 virus or a SARS-CoV-2 virus and a poxvirus in a subject, comprising administering to said subject an immunologically effective amount of the recombinant poxvirus according to claim **1**.

45. The method of inducing an immune response against a SARS-CoV-2 virus or a SARS-CoV-2 virus and a poxvirus in a subject according to claim **44**, wherein said immunologically effective amount of the recombinant poxvirus is administered by scarification.

46. The method of inducing an immune response against a SARS-CoV-2 virus or a SARS-CoV-2 virus and a poxvirus in a subject according to claim **44**, wherein said immune response comprises antibodies that are capable of neutralizing the SARS-CoV-2 virus or a SARS-CoV-2 virus and a poxvirus.

47. The method of inducing an immune response against a SARS-CoV-2 virus or a SARS-CoV-2 virus and a poxvirus in a subject according to claim **44**, wherein the immunologically effective amount of a recombinant poxvirus is capable of protecting the subject from SARS-CoV-2 virus or a SARS-CoV-2 virus and a poxvirus, or reducing or preventing the progression of a SARS-CoV-2 virus or a SARS-COV-2 and poxvirus infection in the subject.

48. (canceled)

49. The method of inducing an immune response against a SARS-CoV-2 virus or a SARS-CoV-2 virus and a poxvirus in a subject according to claim **44**, wherein the immune response is a T-cell immune response.

50-55. (canceled)

56. The method of inducing an immune response against a SARS-CoV-2 virus or a SARS-CoV-2 virus and a poxvirus according to claim **44**, wherein the poxvirus is vaccinia virus, variola, horsepox virus or monkeypox virus.

57. A method of inducing T cell immunity against a SARS-CoV-2 virus or a SARS-CoV-2 virus and a poxvirus comprising administering to said subject an immunologically effective amount of a recombinant poxvirus according to claim **1**.

58. The method of inducing T cell immunity against a SARS-CoV-2 virus or a SARS-CoV-2 virus and a poxvirus according to claim **57**, wherein said immunologically effective amount of the recombinant poxvirus is administered by scarification.

59. The method of inducing T cell immunity against a SARS-CoV-2 virus or a SARS-CoV-2 virus and a poxvirus according to claim **57**, wherein the immunologically effective amount of a recombinant poxvirus is capable of protecting the subject from SARS-CoV-2 virus or a SARS-CoV-2 virus and a poxvirus, or reduces or prevents the progression of a SARS-CoV-2 virus or a SARS-CoV-2 and a poxvirus infection in the subject.

60-64. (canceled)

65. The method of inducing T cell immunity against a SARS-CoV-2 virus or SARS-CoV-2 virus and a poxvirus according to claim **57**, wherein the poxvirus is vaccinia virus, variola, horsepox virus or monkeypox virus.

66. A method of generating a recombinant poxvirus according to claim **1**, the method comprising:

(a) Infecting a host cell with a poxvirus;

(b) Transfecting the infected cell of step (a) with a nucleic acid encoding a SARS-CoV-2 virus protein to generate a recombinant poxvirus; and

(c) Selecting a recombinant poxvirus, wherein the nucleic acid encoding a SARS-CoV-2 virus protein is located, upon transfection, in a region of the poxvirus that is not essential for the replication of the poxvirus.

67-82. (canceled)

83. A method of reducing or preventing the progression of a SARS-CoV-2 virus infection or a SARS-CoV-2 and poxvirus infection in a subject in need or at risk thereof comprising administering to said subject an immunologically effective amount of the recombinant poxvirus according to claim **1**.

84-85. (canceled)

86. A vaccine against a SARS-CoV-2 virus comprising a recombinant virus according to claim **1**.

87. A bivalent vaccine against a SARS-CoV-2 virus and a poxvirus comprising a recombinant virus according to claim **1**.

88. (canceled)

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