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(54) **COMPOSITIONS AND METHODS FOR TREATING ACUTE MYELOID LEUKEMIA**

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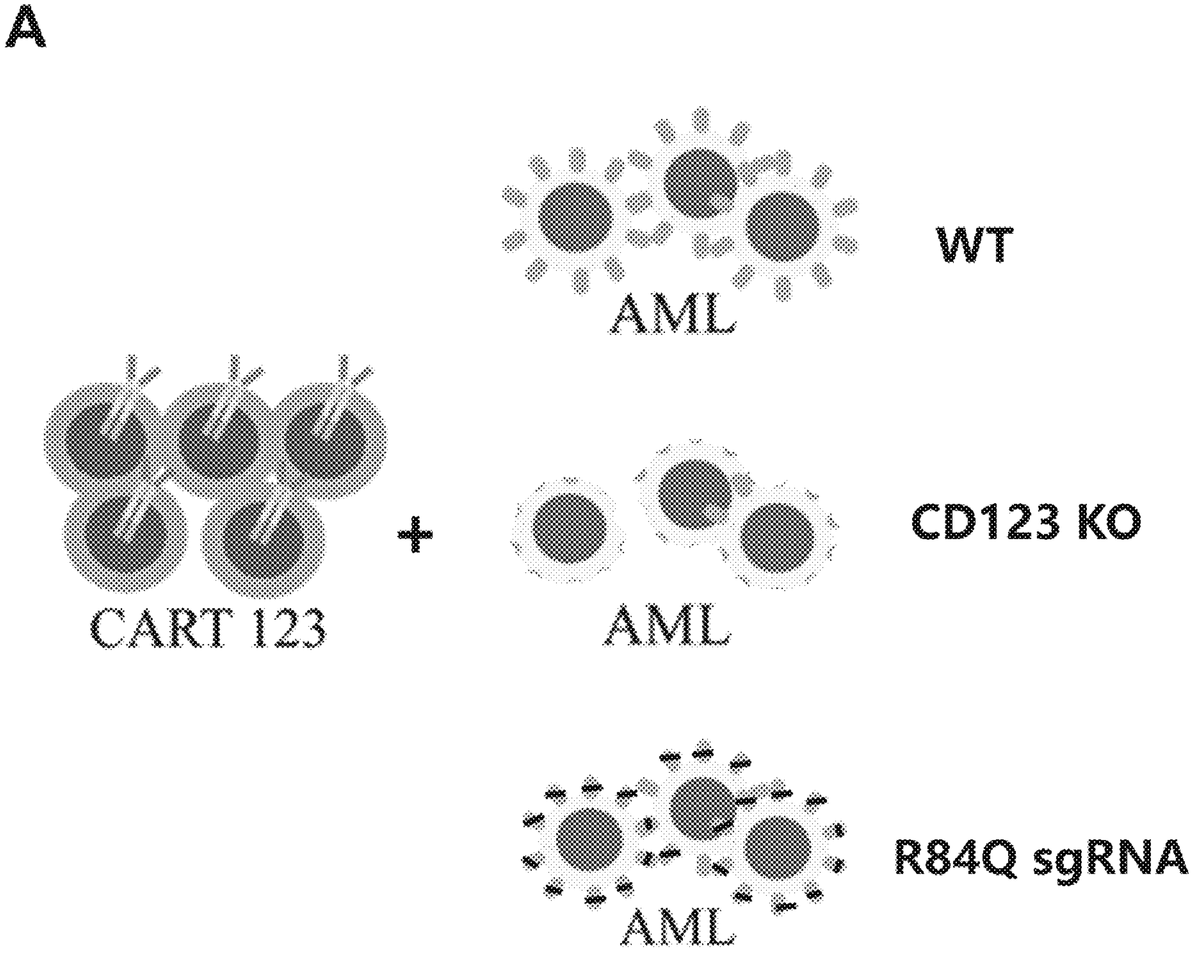
(57) **ABSTRACT**

The present disclosure describes compositions and methods for treating cancers such as acute myeloid leukemia (AML), in particular relapsed and refractory AML. The method entails administering to the patient an antibody or a chimeric antigen receptor (CAR)-expressing immune cell targeting a molecule such as CD33, CD123, CD117 or CLL-1 following, or concurrently with, transplanting to the patient an engineered stem cell expressing the same molecule but with a mutation disrupting the epitope to the antibody or CAR. Due to the mutation, the engineered stem cell, unlike endogenous hematopoietic cells, is not targeted by the therapy and thus can supply the patient with functional hematopoietic cells and antigens.

Specification includes a Sequence Listing.



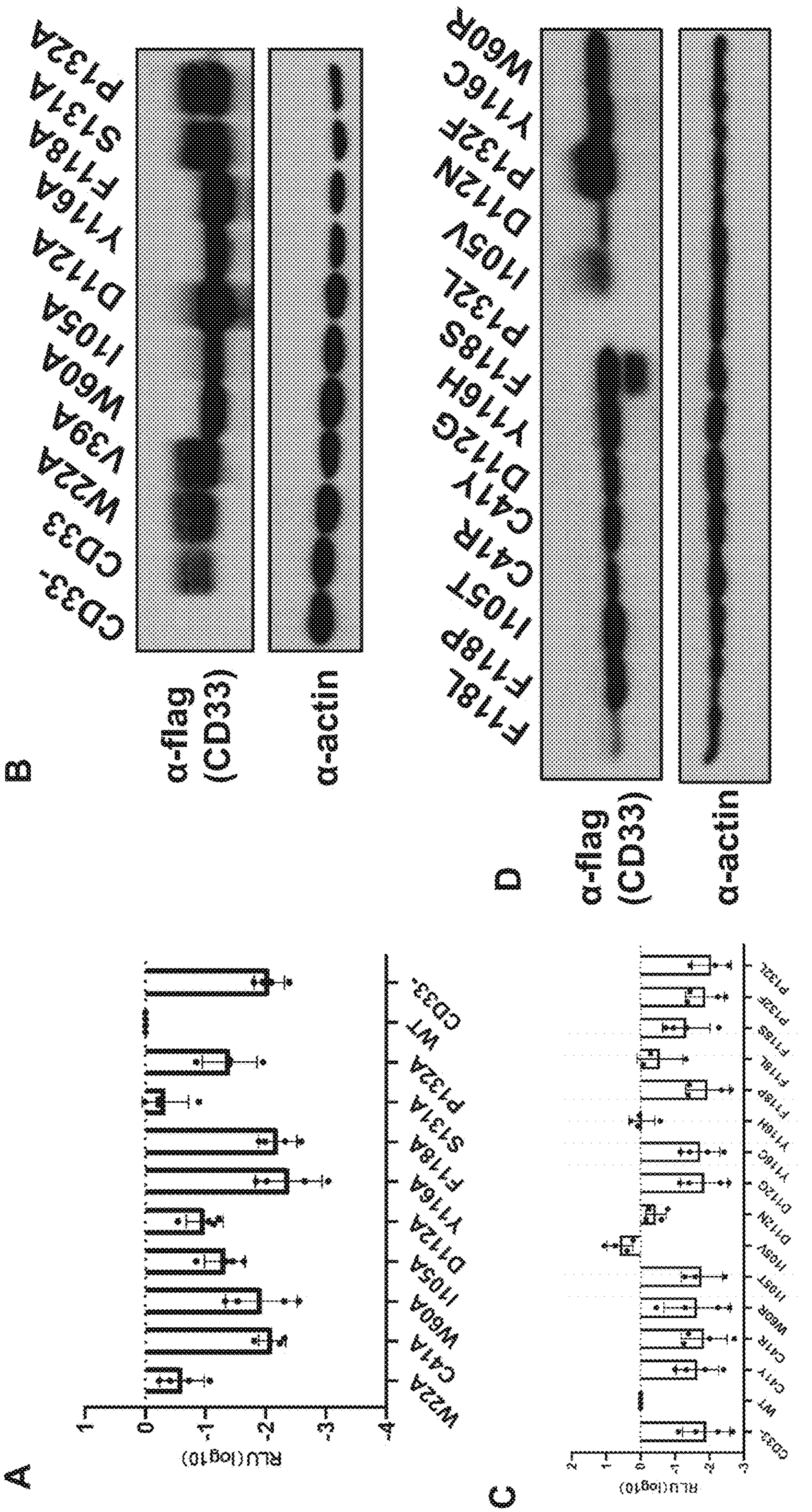

A
RLU (log10)
1
0
-1
-2
-3
-4
W22A
C41A
W60A
I105A
D112A
Y116A
F118A
S131A
P132A
WT
CD33-
B
α-flag (CD33)
α-actin
CD33-
CD33
W22A
V39A
W60A
I105A
D112A
Y116A
F118A
S131A
P132A
C
RLU (log10)
2
1
0
-1
-2
-3
CD33-
WT
C41Y
C41R
W60R
I105T
I105V
D112N
D112G
Y116C
Y116H
F118P
F118L
F118S
P132F
P132L
D
α-flag (CD33)
α-actin
F118L
F118P
I105T
C41R
C41Y
D112G
Y116H
F118S
P132L
I105V
D112N
P132F
Y116C
W60R

FIG. 1A-D

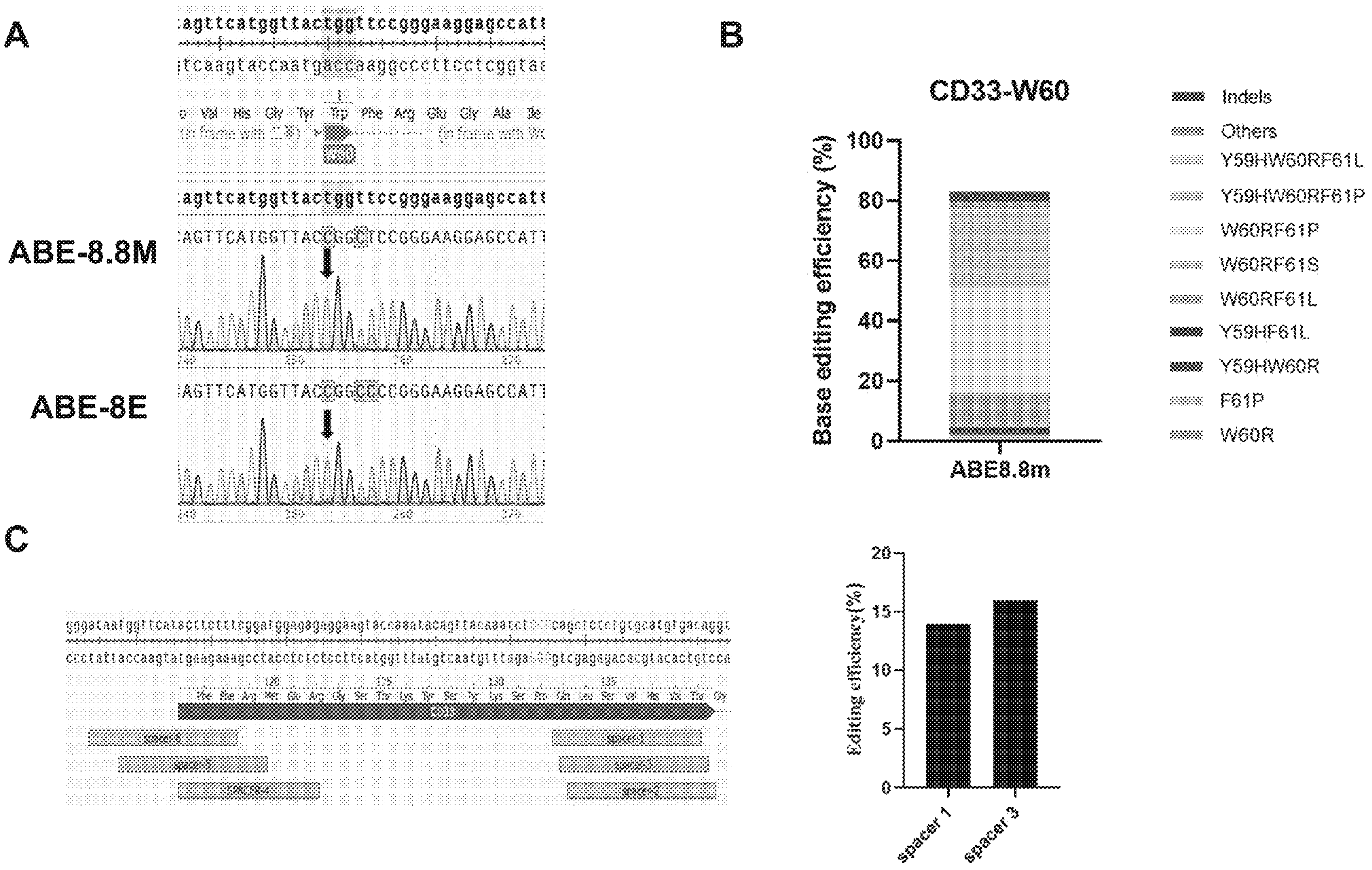

A
agttcatggttactggttccgggaaggagccatt
tcaagtaccaatgaccaaggcccttcctcggtaa
Val His Gly Tyr Trp Phe Arg Glu Gly Ala Ile
ABE-8.8M
AGTTCATGGTTACCGGCTCCGGGAAGGAGCCATT
ABE-8E
AGTTCATGGTTACCGGCCCCGGGAAGGAGCCATT
B
CD33-W60
Base editing efficiency (%)
100
80
60
40
20
0
ABE8.8m
Indels
Others
Y59HW60RF61L
Y59HW60RF61P
W60RF61P
W60RF61S
W60RF61L
Y59HF61L
Y59HW60R
F61P
W60R
C
120
125
130
135
Phe Phe Arg Met Glu Arg Gly Ser Thr Lys Tyr Ser Tyr Lys Ser Pro Gln Leu Ser Val His Val Thr Gly
Editing efficiency(%)
20
15
10
5
0
spacer 1
spacer 3

FIG. 2A-C

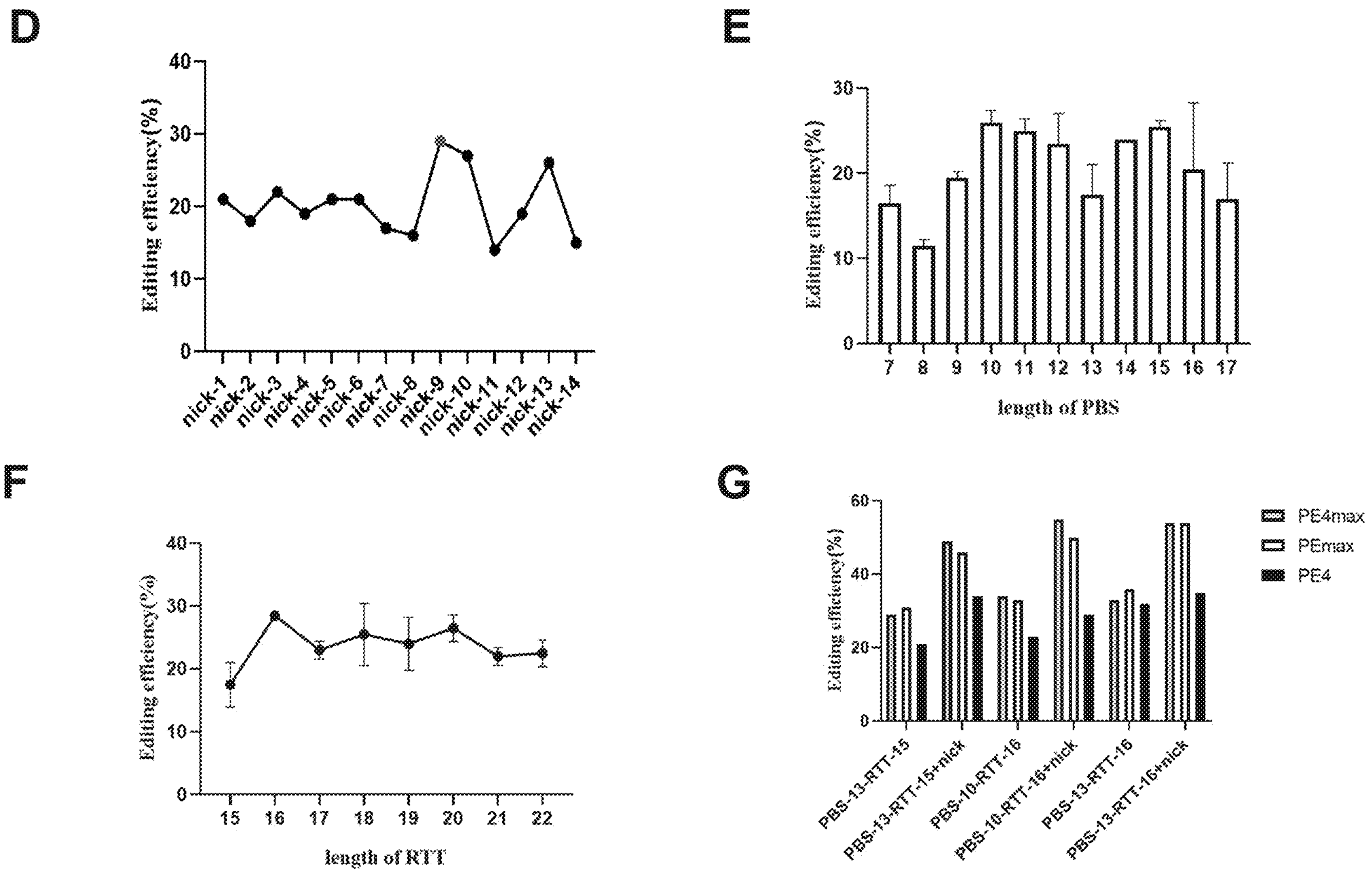

D
Editing efficiency(%)
40
30
20
10
0
nick-1
nick-2
nick-3
nick-4
nick-5
nick-6
nick-7
nick-8
nick-9
nick-10
nick-11
nick-12
nick-13
nick-14
E
Editing efficiency(%)
30
20
10
0
7
8
9
10
11
12
13
14
15
16
17
length of PBS
F
Editing efficiency(%)
40
30
20
10
0
15
16
17
18
19
20
21
22
length of RTT
G
Editing efficiency(%)
60
40
20
0
PBS-13-RTT-15
PBS-13-RTT-15+nick
PBS-10-RTT-16
PBS-10-RTT-16+nick
PBS-13-RTT-16
PBS-13-RTT-16+nick
PE4max
PEmax
PE4

FIG. 2D-G

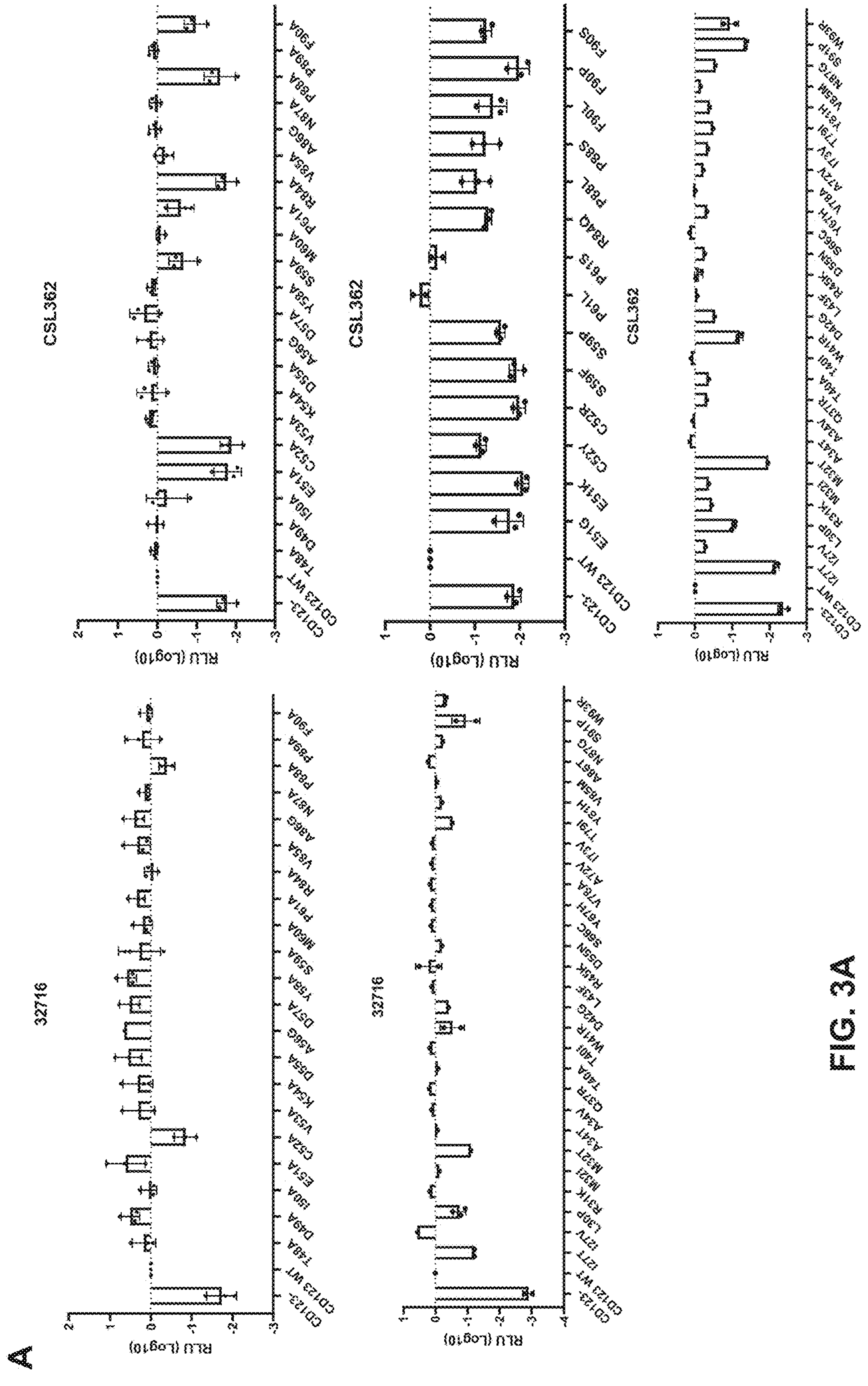

A
32716
RLU (Log10)
2
1
0
-1
-2
-3
CD123-
CD123 WT
T48A
D49A
I50A
E51A
C52A
V53A
K54A
D55A
A56G
D57A
Y58A
S59A
M60A
P61A
R84A
V85A
A86G
N87A
P88A
P89A
F90A
32716
RLU (Log10)
1
0
-1
-2
-3
-4
CD123-
CD123 WT
I27T
I27V
L30P
R31K
M32I
M32T
A34T
A34V
Q37R
T40A
T40I
W41R
D42G
L43P
R45K
D55N
S56C
Y67H
V78A
A72V
I73V
T79I
Y81H
V85M
A85T
N87G
S91P
W93R
CSL362
RLU (Log10)
2
1
0
-1
-2
-3
CD123-
CD123 WT
T48A
D49A
I50A
E51A
C52A
V53A
K54A
D55A
A56G
D57A
Y58A
S59A
M60A
P61A
R84A
V85A
A86G
N87A
P88A
P89A
F90A
CSL362
RLU (Log10)
1
0
-1
-2
-3
CD123-
CD123 WT
E51G
E51K
C52Y
C52R
S59F
S59P
P61L
P61S
R84Q
P88L
P88S
F90L
F90P
F90S
CSL362
RLU (Log10)
1
0
-1
-2
-3
CD123-
CD123 WT
I27T
I27V
L30P
R31K
M32I
M32T
A34T
A34V
Q37R
T40A
T40I
W41R
D42G
L43P
R45K
D55N
S56C
Y67H
V78A
A72V
I73V
T79I
Y81H
V85M
N87G
S91P
W93R

FIG. 3A

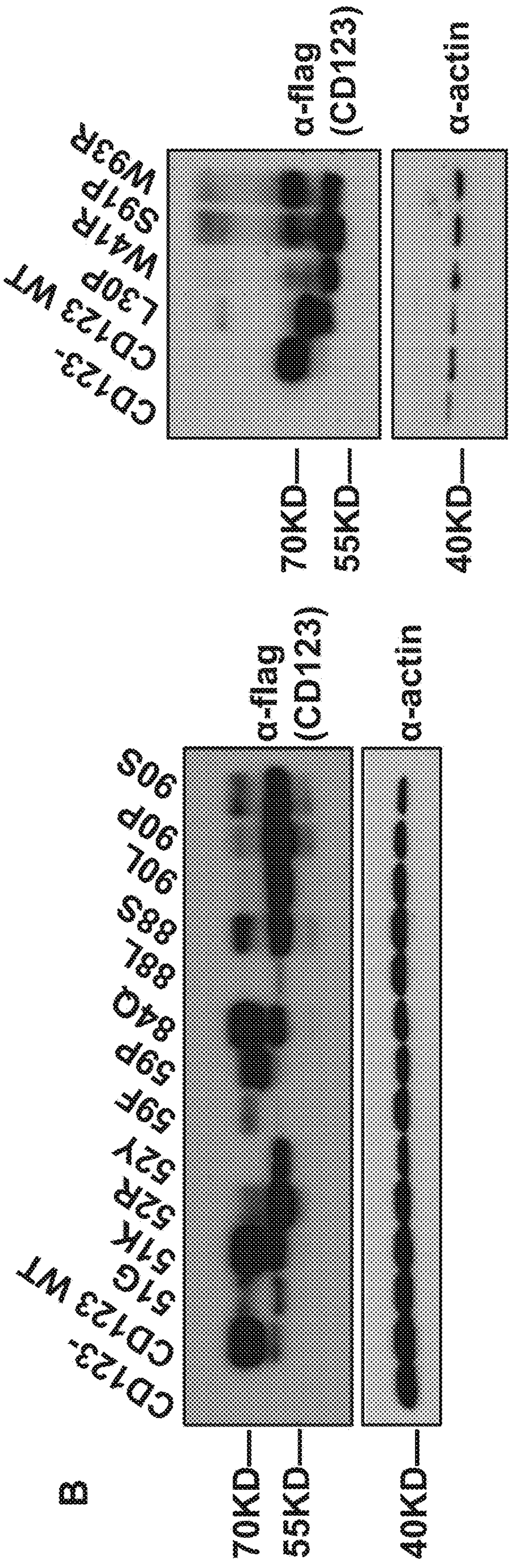

CD123-
CD123 WT
L30P
W41R
S91P
W93R
α-flag (CD123)
α-actin
70KD
55KD
40KD
B
CD123-
CD123 WT
51G
51K
52R
52Y
59F
59P
84Q
88L
88S
90L
90P
90S
α-flag (CD123)
α-actin
70KD
55KD
40KD

FIG. 3B

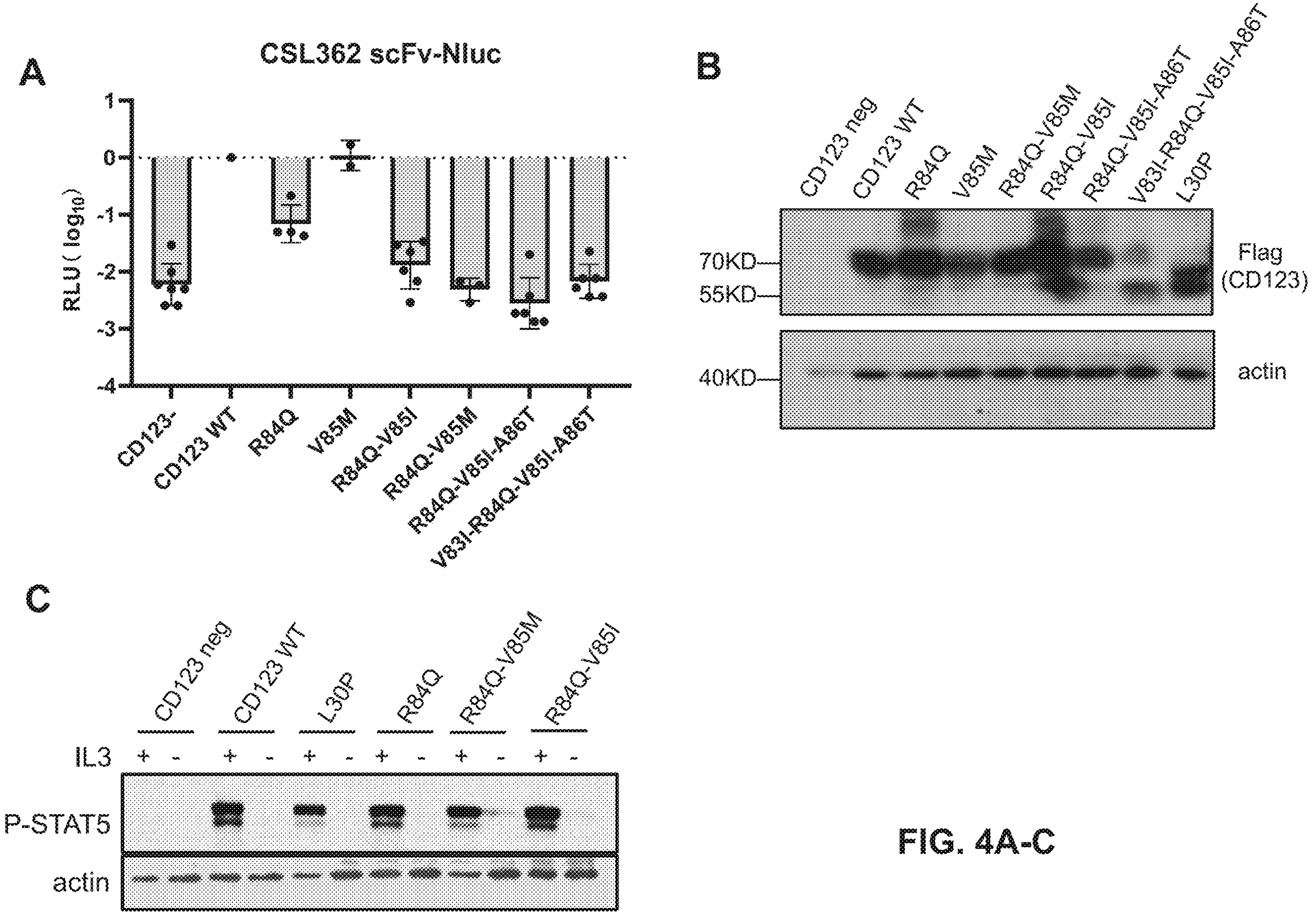

A
CSL362 scFv-Nluc
RLU (log10)
1
0
-1
-2
-3
-4
CD123-
CD123 WT
R84Q
V85M
R84Q-V85I
R84Q-V85M
R84Q-V85I-A86T
V83I-R84Q-V85I-A86T
B
CD123 neg
CD123 WT
R84Q
V85M
R84Q-V85M
R84Q-V85I
R84Q-V85I-A86T
V83I-R84Q-V85I-A86T
L30P
70KD
55KD
40KD
Flag
(CD123)
actin
C
CD123 neg
CD123 WT
L30P
R84Q
R84Q-V85M
R84Q-V85I
IL3
+ - + - + - + - + - + -
P-STAT5
actin

FIG. 4A-C

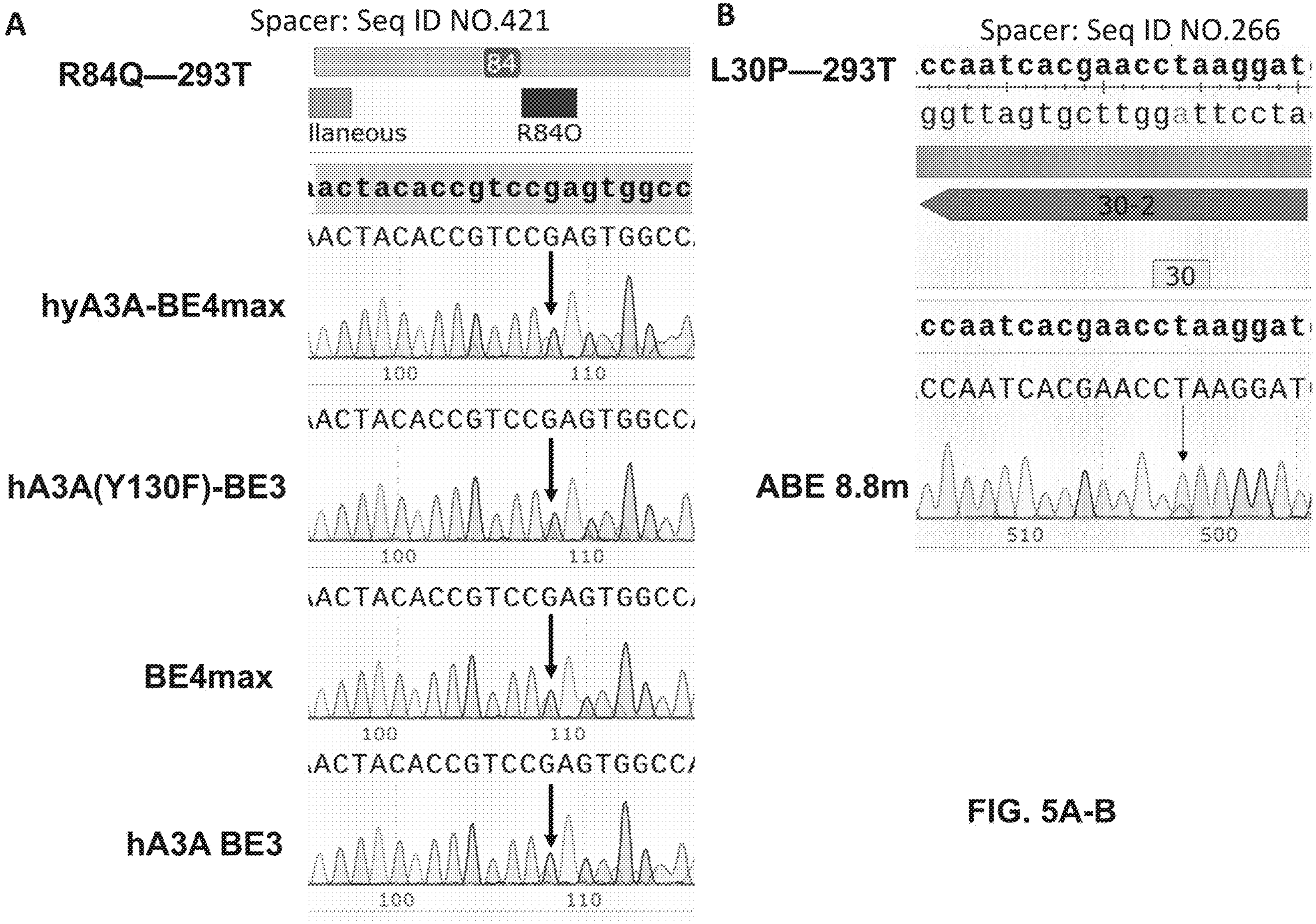

A
Spacer: Seq ID NO.421
R84Q—293T
84
llaneous
R84O
actacaccgtccgagtggcc
ACTACACCGTCCGAGTGGCC
hyA3A-BE4max
100
110
ACTACACCGTCCGAGTGGCC
hA3A(Y130F)-BE3
100
110
ACTACACCGTCCGAGTGGCC
BE4max
100
110
ACTACACCGTCCGAGTGGCC
hA3A BE3
100
110
B
Spacer: Seq ID NO.266
L30P—293T
ccaatcacgaacctaaggat
ggttagtgcttggattccta
30-2
30
ccaatcacgaacctaaggat
CCAATCACGAACCTAAGGAT
ABE 8.8m
510
500

FIG. 5A-B

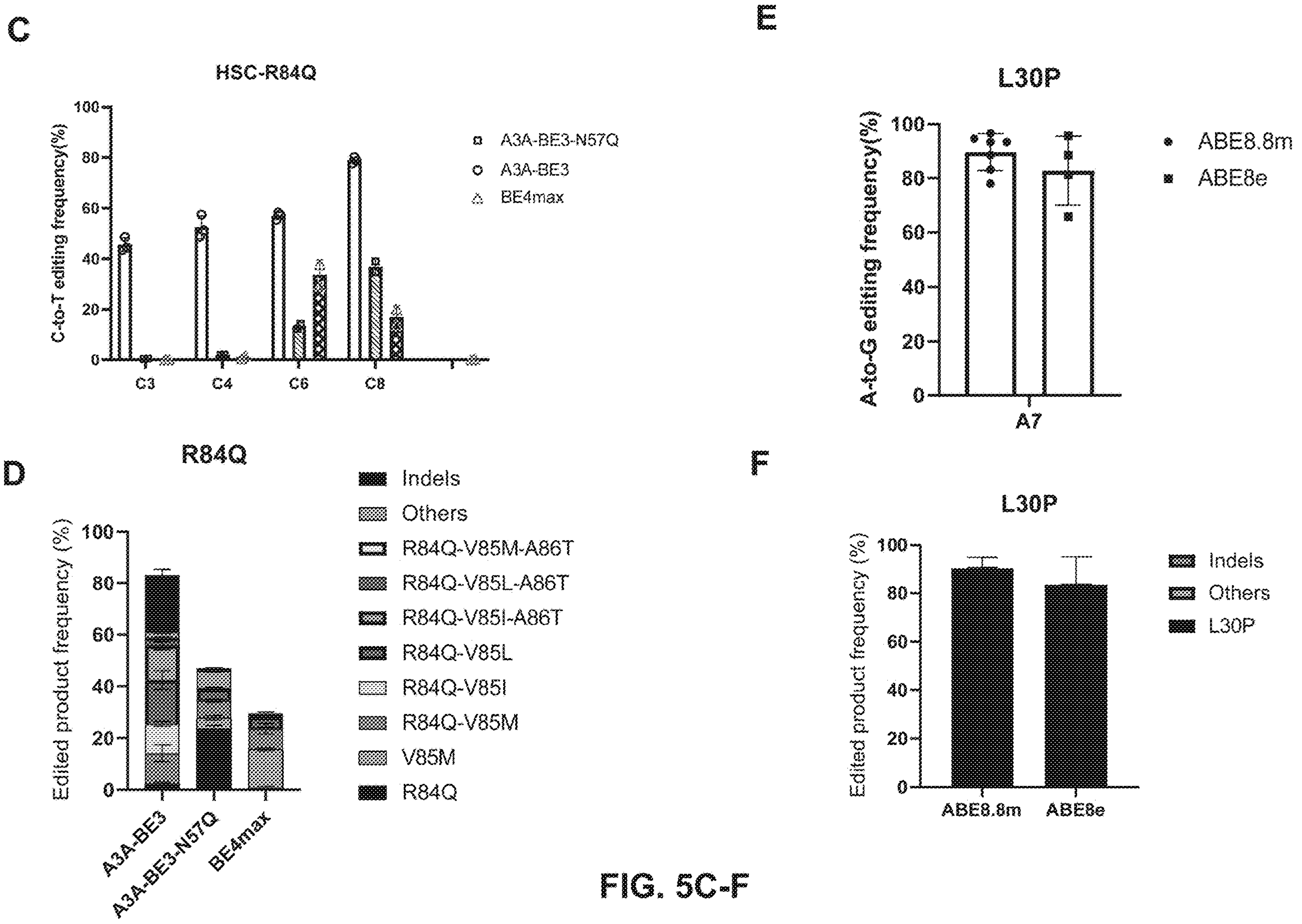
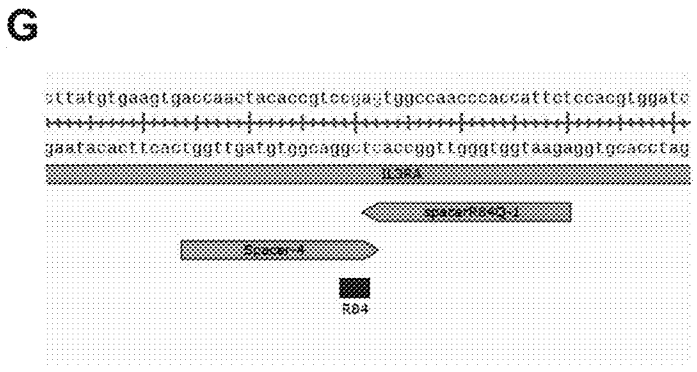

C
HSC-R84Q
C-to-T editing frequency(%)
100
80
60
40
20
0
C3
C4
C6
C8
A3A-BE3-N57Q
A3A-BE3
BE4max
E
L30P
A-to-G editing frequency(%)
100
80
60
40
20
0
A7
ABE8.8m
ABE8e
D
R84Q
Edited product frequency (%)
100
80
60
40
20
0
A3A-BE3
A3A-BE3-N57Q
BE4max
Indels
Others
R84Q-V85M-A86T
R84Q-V85L-A86T
R84Q-V85I-A86T
R84Q-V85L
R84Q-V85I
R84Q-V85M
V85M
R84Q
F
L30P
Edited product frequency (%)
100
80
60
40
20
0
ABE8.8m
ABE8e
Indels
Others
L30P

FIG. 5C-F


G
ttatgtgaagtgaccaactacaccgtccgagtggccaacccaccattctccacgtggatc
gaatacacttcactggttgatgtggcaggctcaccggttgggtggtaagaggtgcacctag
Spacer-4
R84

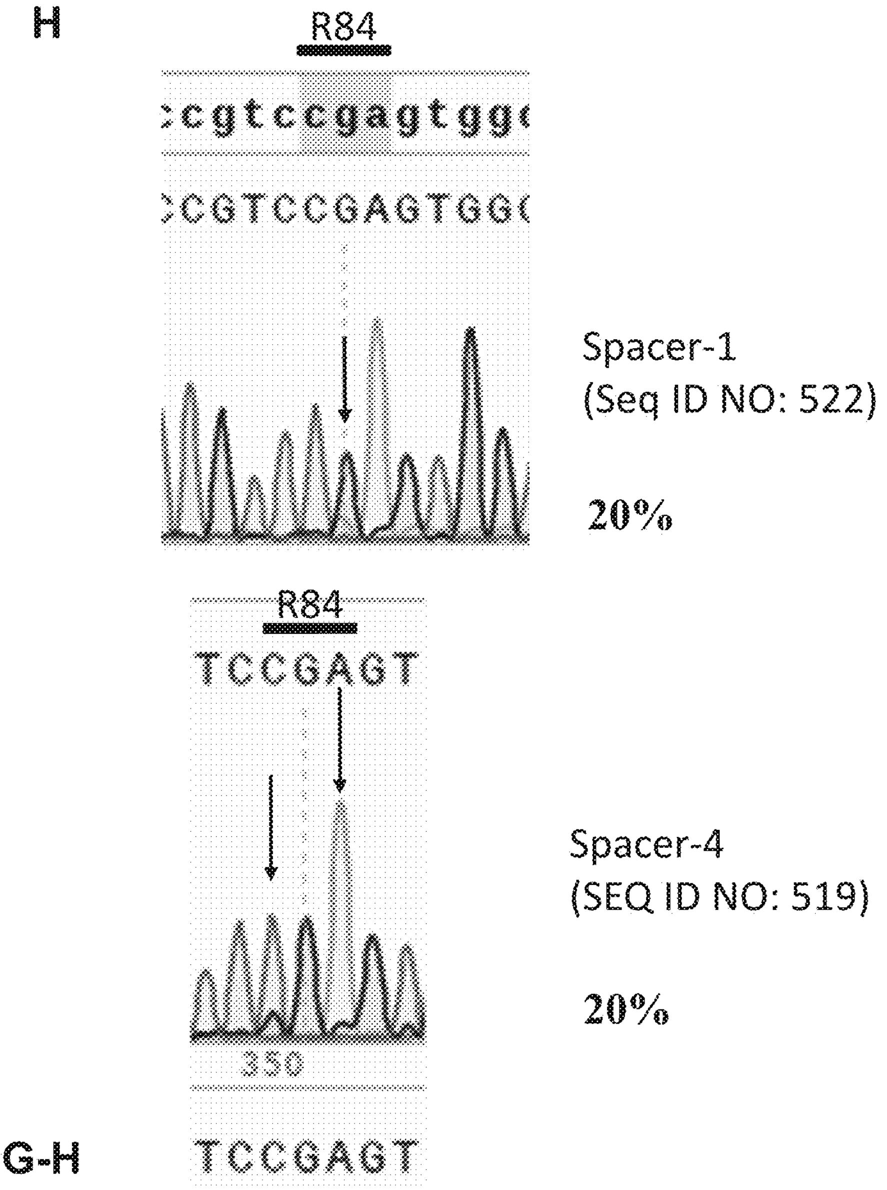

H
R84
cgtccgagtggc
CGTCCGAGTGGC
Spacer-1
(Seq ID NO: 522)
20%
R84
TCCGAGT
350
TCCGAGT
Spacer-4
(SEQ ID NO: 519)
20%

FIG. 5G-H

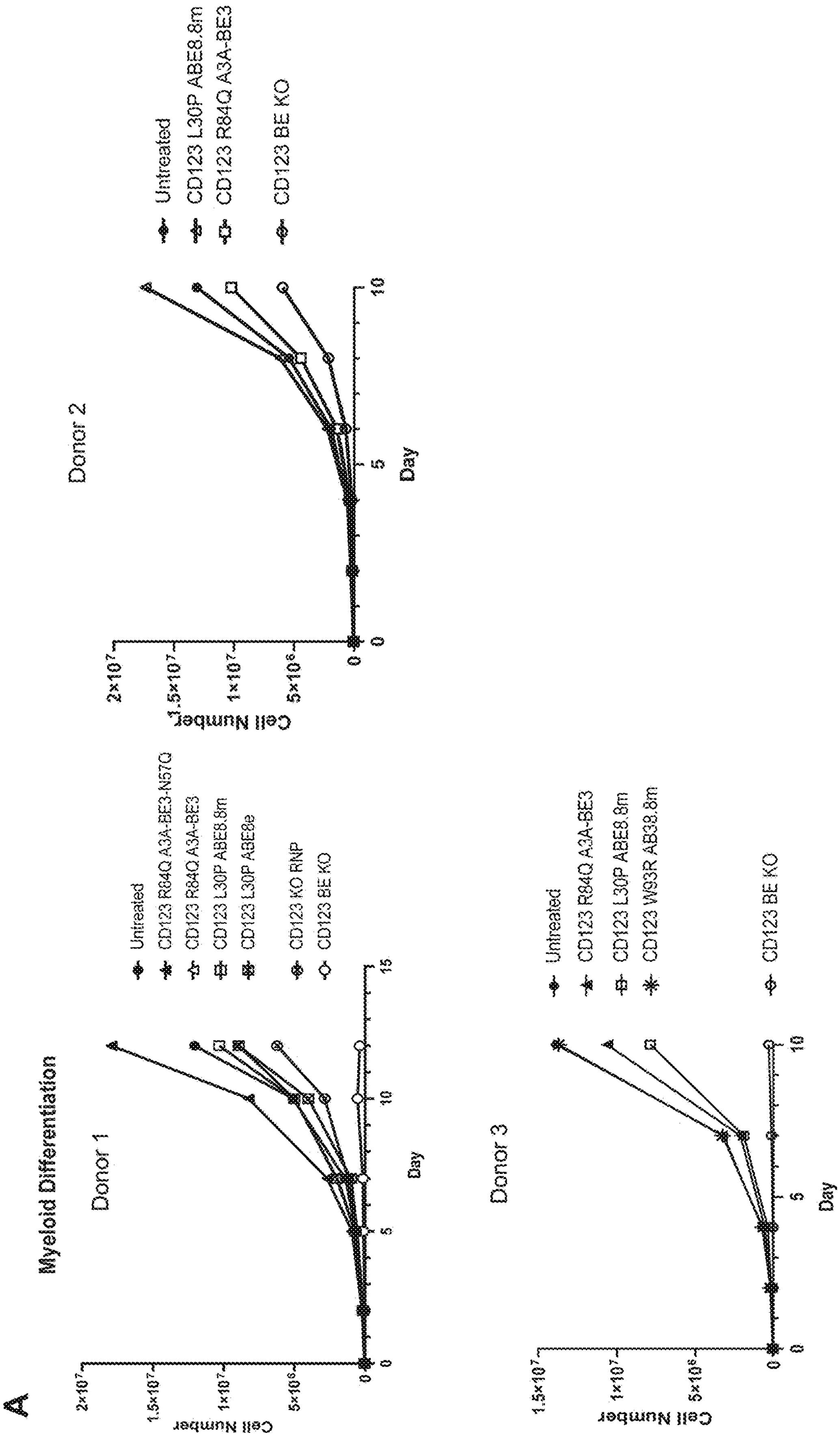

A
Myeloid Differentiation
Donor 1
Cell Number
2×10⁷
1.5×10⁷
1×10⁷
5×10⁶
0
0
5
10
15
Day
Untreated
CD123 R84Q A3A-BE3-N57Q
CD123 R84Q A3A-BE3
CD123 L30P ABE8.8m
CD123 L30P ABE8e
CD123 KO RNP
CD123 BE KO
Donor 2
Cell Number
2×10⁷
1.5×10⁷
1×10⁷
5×10⁶
0
0
5
10
Day
Untreated
CD123 L30P ABE8.8m
CD123 R84Q A3A-BE3
CD123 BE KO
Donor 3
Cell Number
1.5×10⁷
1×10⁷
5×10⁶
0
0
5
10
Day
Untreated
CD123 R84Q A3A-BE3
CD123 L30P ABE8.8m
CD123 W93R AB38.8m
CD123 BE KO

FIG. 6A

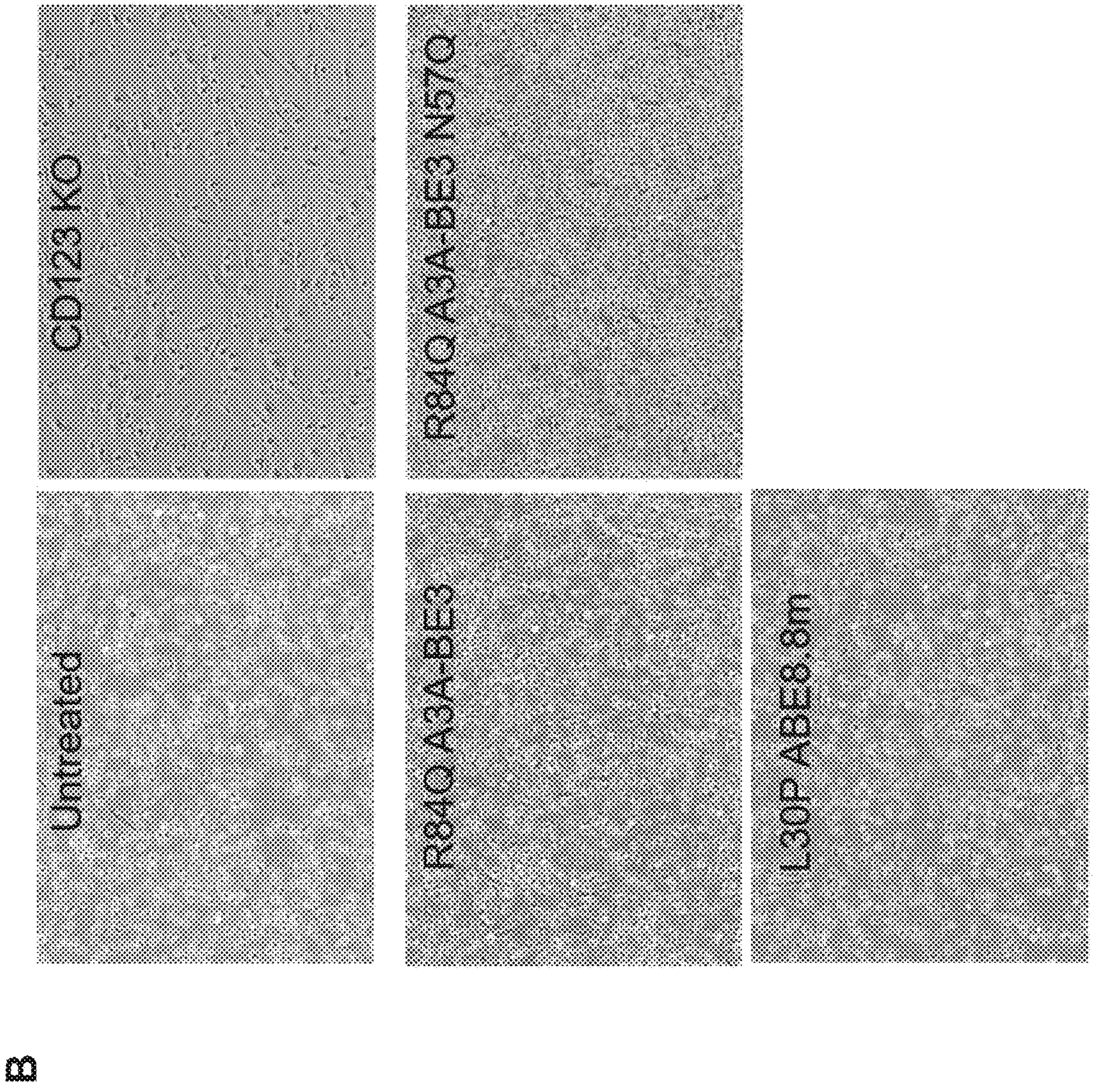

B
Untreated
CD123 KO
R84Q A3A-BE3
R84Q A3A-BE3 N57Q
L30P ABE8.8m

FIG. 6B

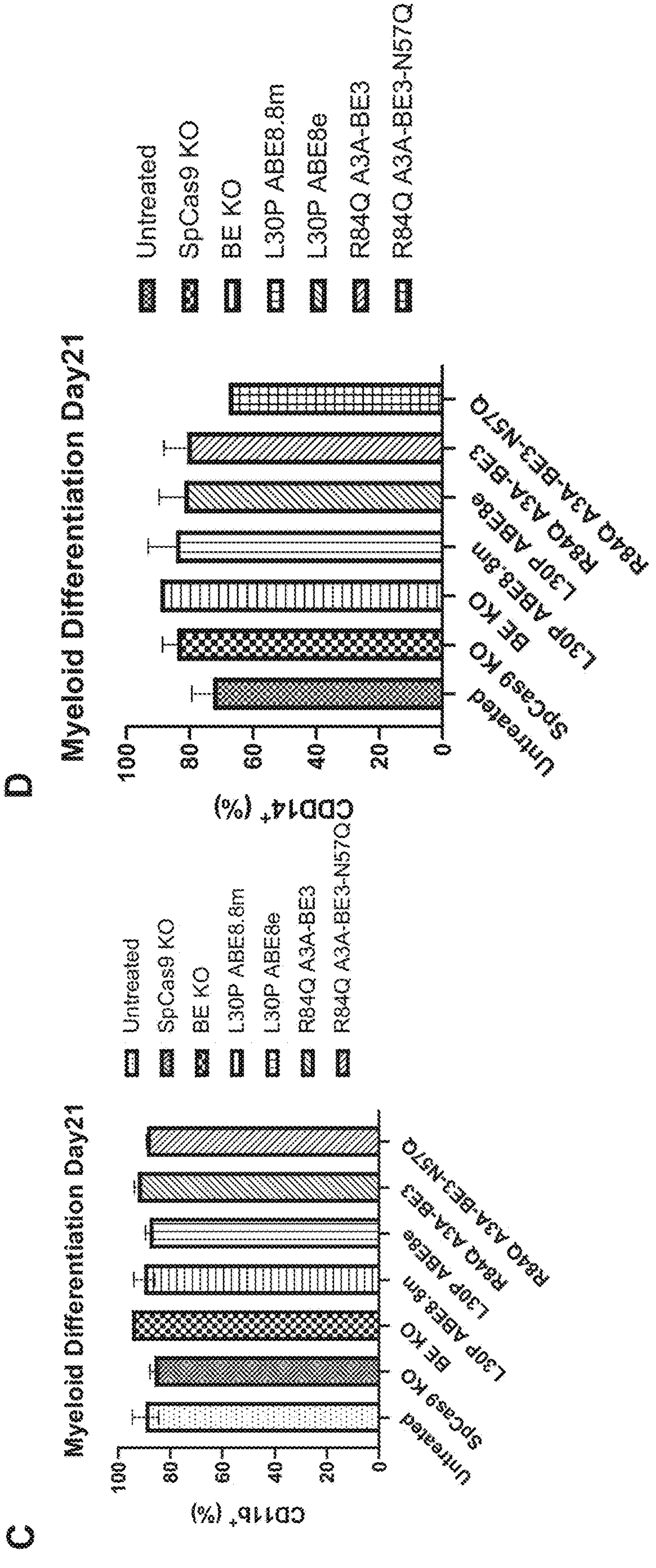

C
Myeloid Differentiation Day21
CD11b⁺ (%)
100
80
60
40
20
0
Untreated
SpCas9 KO
BE KO
L30P ABE8.8m
L30P ABE8e
R84Q A3A-BE3
R84Q A3A-BE3-N57Q
D
Myeloid Differentiation Day21
CDD14⁺ (%)
100
80
60
40
20
0
Untreated
SpCas9 KO
BE KO
L30P ABE8.8m
L30P ABE8e
R84Q A3A-BE3
R84Q A3A-BE3-N57Q

FIG. 6C-D

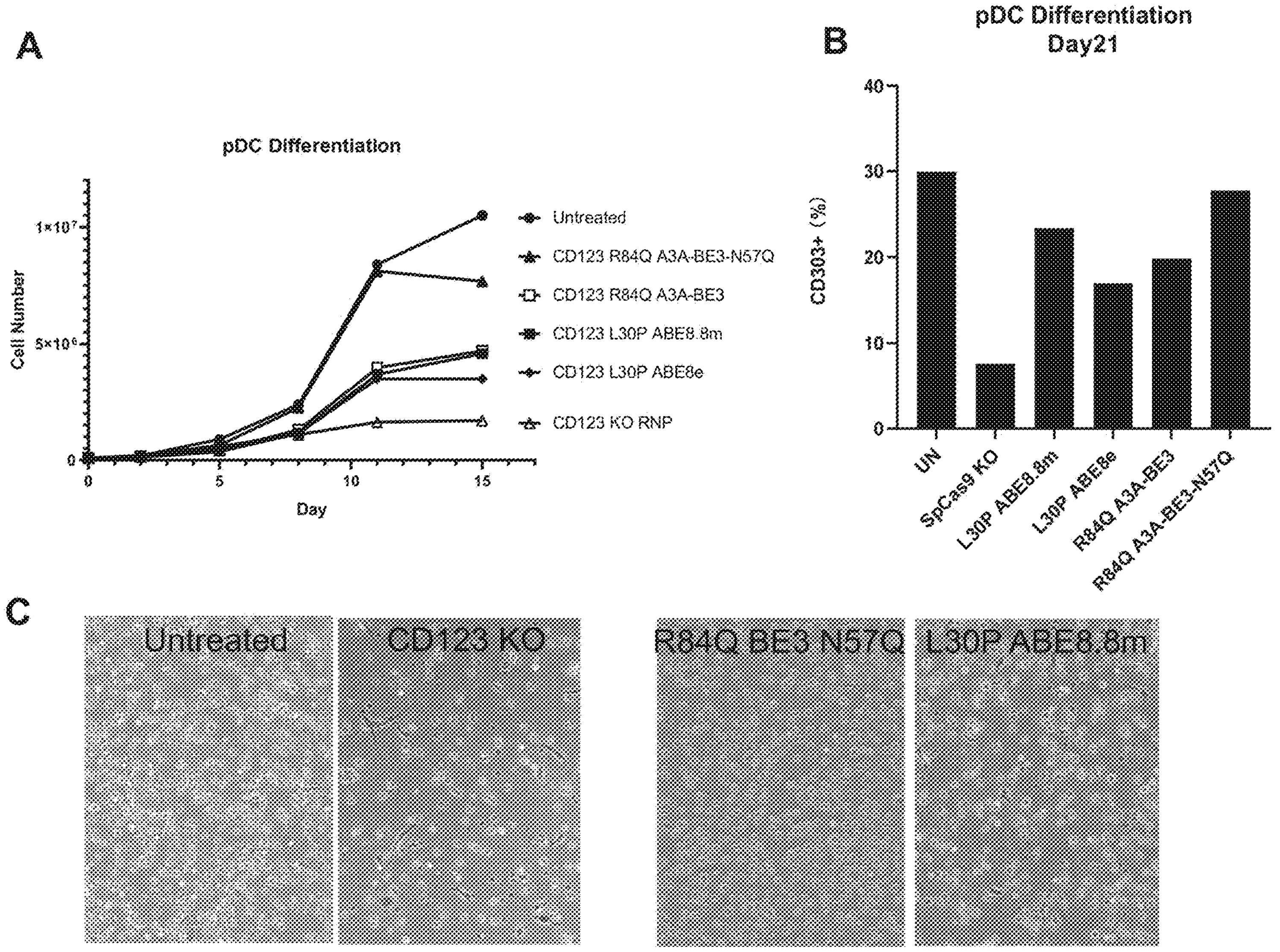

A
pDC Differentiation
Cell Number
1×10⁷
5×10⁶
0
0
5
10
15
Day
Untreated
CD123 R84Q A3A-BE3-N57Q
CD123 R84Q A3A-BE3
CD123 L30P ABE8.8m
CD123 L30P ABE8e
CD123 KO RNP
B
pDC Differentiation
Day21
CD303+ (%)
40
30
20
10
0
UN
SpCas9 KO
L30P ABE8.8m
L30P ABE8e
R84Q A3A-BE3
R84Q A3A-BE3-N57Q
C
Untreated
CD123 KO
R84Q BE3 N57Q
L30P ABE8.8m

FIG. 7A-C

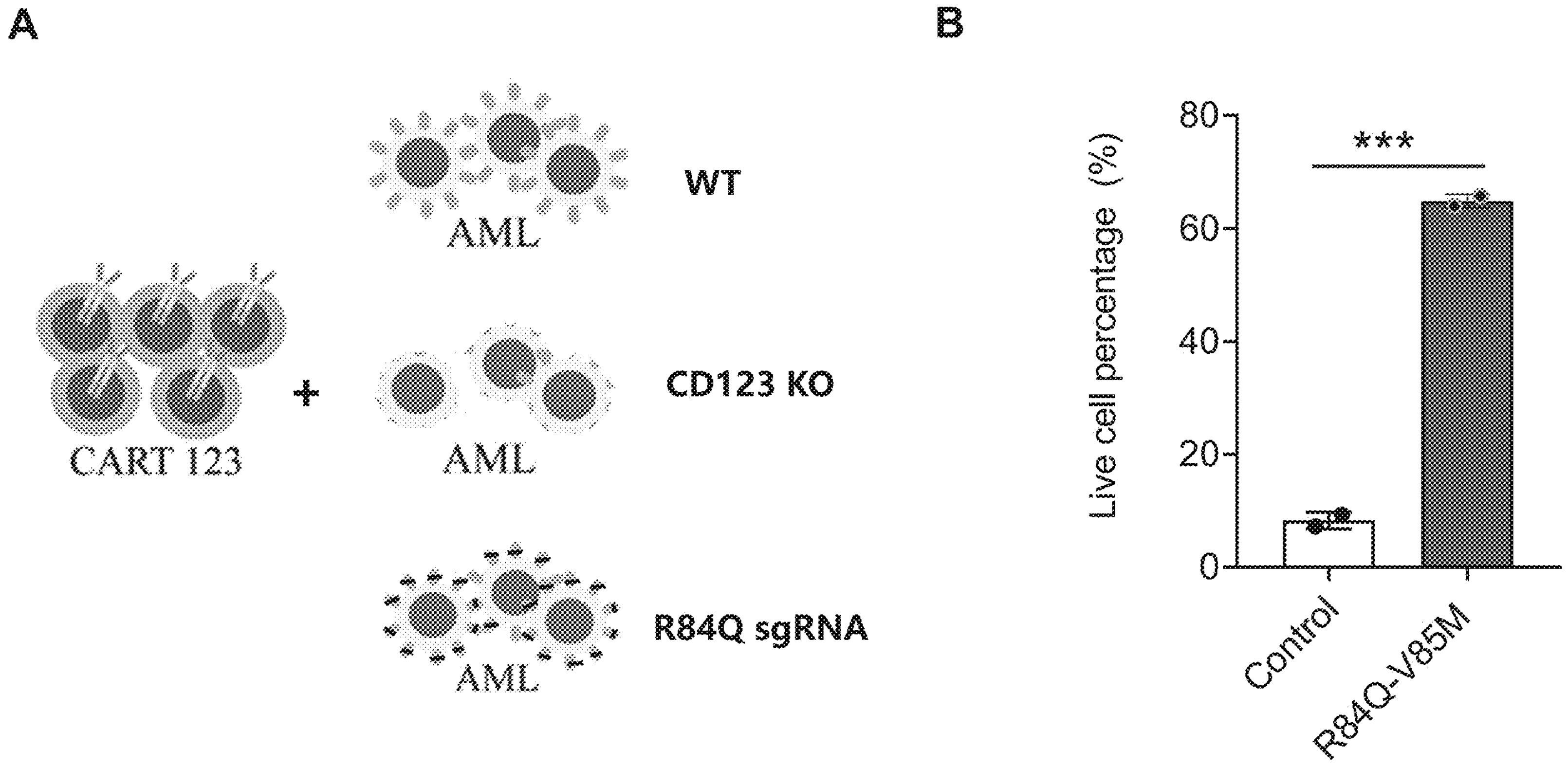

A
CART 123
+
AML
WT
AML
CD123 KO
AML
R84Q sgRNA
B
Live cell percentage (%)
80
60
40
20
0
***
Control
R84Q-V85M

FIG. 8A-B

COMPOSITIONS AND METHODS FOR TREATING ACUTE MYELOID LEUKEMIA

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Chinese application No. PCT/CN2023/072703, filed Jan. 17, 2023, and CN202311057422.8, filed Aug. 22, 2023, the content of each of which is hereby incorporated by reference in its entirety.

REFERENCE TO AN ELECTRONIC SEQUENCE LISTING

[0002] The content of the electronic sequence listing (366244.xml: Size: 797,237 bytes; and Date of Creation: Jan. 16, 2024) is herein incorporated by reference in its entirety.

BACKGROUND

[0003] Acute myeloid leukemia (AML) is a hematological malignancy caused by accumulated mutations in myeloid progenitor cells that cause hyperproliferation and blockage of differentiation, resulting in the accumulation of myeloid blasts in hematopoietic tissues. Despite a high initial response to standard chemotherapy, relapse is common and the prognosis is poor in most AML patients. The conventional chemotherapy drugs cannot fundamentally solve the high occurrences of relapse and drug resistance, and there is a possibility of relapse after hematopoietic stem cell transplantation. Therefore, it is urgent to develop new and improved therapeutic methods.

[0004] Chimeric antigen receptor (CAR) T cell therapy uses genetically modified T cells to target and kill cancer cells more specifically and effectively. After T cells are collected from the blood, the cells are engineered to express CARs on their surfaces. CARs can be introduced into T cells using CRISPR/Cas9 gene editing technology. When these allogeneic CAR T cells are injected into patients, the receptors enable the T cells to kill cancer cells.

[0005] CD33 (also known as Siglec3, sialic acid-binding Ig-like lectin 3, gp67, or p67) is a member of the Siglec lectin family whose expression is restricted to normal monocytes, granulocytes, hematopoietic progenitors, and immunophenotype-defined hematopoiesis stem cells in the stem cell population. It is expressed on the AML cells of most acute myeloid leukemia patients at both onset and relapse. It functions by binding sialic acid residues of glycoproteins and glycolipids. Anti-CD33 CAR-T cells represent an effective therapeutic option for CD33-expressing malignancies.

[0006] CD123 is the alpha chain of interleukin-3 receptor, and CD123 can specifically recognize and bind interleukin-3 (IL-3). IL-3 is mainly produced by helper T cells activated by antigen stimulation, which can promote cell growth and proliferation. It is related to the occurrence of tumors, allergic inflammation, and autoimmune diseases. CD123 is expressed in AML cells from most patients with acute myeloid leukemia. CD123 is also expressed in normal hematopoietic stem cells, functionally related to the differentiation of hematopoietic stem cells. Anti-CD123 CAR-T cells represent an effective therapeutic option for CD123-expressing malignancies.

[0007] CD117, also known as mast/stem cell growth factor receptor (SCFR), proto-oncogene c-Kit, tyrosine protein kinase Kit, is a 145-kd transmembrane glycoprotein. Studies in mice with inactivating mutations of c-kit or its ligand, stem cell factor (SCF), have shown that normal functional activity of c-kit is essential for maintaining normal hematopoiesis, melanogenesis, gametogenesis, and cell growth and differentiation. CD117 is expressed on hematopoietic progenitor cells, mast cells, germ cells, interstitial cells of Cajal (ICC), and also highly expressed in AML cells from most AML patients, and thus anti-CD117 CAR-T cells represent an effective treatment for CD117-expressing malignancies.

[0008] C-type lectin-like 1 (CLL-1) is also known as MICL, CLEC12A, CLEC-1, dendritic cell-associated lectin 1, and DCAL-2. CLL-1 is a glycoprotein receptor that is a member of a large family of C-type lectin-like receptors involved in immune regulation. Members of this family have diverse functions such as cell adhesion, intercellular signaling, glycoprotein turnover, and roles in inflammation and immune responses. CLL-1 is expressed on hematopoietic cells and primarily on innate immune cells, including monocytes, DCs, pDCs, and granulocyte and myeloid progenitor cells. CLL-1 is also expressed in cancer cells of most acute myeloid leukemia (AML) and myelodysplastic syndrome (MDS) patients. CLL-1 is a leukemia stem cell (LSC)-related surface antigen. Anti-CLL-1 CAR-T cells represent an effective therapeutic option for CLL-1-expressing malignancies.

SUMMARY

[0009] The present disclosure describes compositions and methods for treating cancers such as acute myeloid leukemia (AML). The method entails administering to the patient an antibody drug conjugates or a chimeric antigen receptor (CAR)-expressing immune cell targeting a molecule such as CD33, CD123, CD117 or CLL-1 following, or concurrently with, transplanting to the patient an engineered stem cell expressing the same molecule but with a mutation disrupting the epitope to the antibody or CAR. Due to the mutation, the engineered stem cell, unlike endogenous hematopoietic cells, is not targeted by the therapy and thus can supply the patient with functional hematopoietic cells and antigens.

[0010] One embodiment of the present disclosure provides a method for preparing a cancer patient for a therapy, comprising administering to the patient a stem cell expressing a mutant CD33 protein comprising a mutation in an epitope recognized by an anti-CD33 antibody which has reduced binding to the mutant CD33 protein as compared to the corresponding wild-type CD33 protein, wherein the therapy comprises the antibody, an antigen-binding fragment of the antibody, a chimeric antigen receptor (CAR) comprising the antigen-binding fragment, or an immune cell comprising the CAR.

[0011] Another embodiment of the present disclosure provides a method for preparing a cancer patient for a therapy, comprising administering to the patient a stem cell expressing a mutant CD123 protein comprising a mutation in an epitope recognized by an anti-CD123 antibody which has reduced binding to the mutant CD123 protein as compared to the corresponding wild-type CD123 protein, wherein the therapy comprises the antibody, an antigen-binding fragment of the antibody, a chimeric antigen receptor (CAR) comprising the antigen-binding fragment, or an immune cell comprising the CAR.

[0012] Another embodiment of the present disclosure provides a method for preparing a cancer patient for a therapy, comprising administering to the patient a stem cell expressing a mutant CD117 protein comprising a mutation in an epitope recognized by an anti-CD117 antibody which has reduced binding to the mutant CD117 protein as compared to the corresponding wild-type CD117 protein, wherein the therapy comprises the antibody, an antigen-binding fragment of the antibody, a chimeric antigen receptor (CAR) comprising the antigen-binding fragment, or an immune cell comprising the CAR.

[0013] Another embodiment of the present disclosure provides a method for preparing a cancer patient for a therapy, comprising administering to the patient a stem cell expressing a mutant CLL-1 protein comprising a mutation in an epitope recognized by an anti-CLL-1 antibody which has reduced binding to the mutant CLL-1 protein as compared to the corresponding wild-type CLL-1 protein, wherein the therapy comprises the antibody, an antigen-binding fragment of the antibody, a chimeric antigen receptor (CAR) comprising the antigen-binding fragment, or an immune cell comprising the CAR.

[0014] In some embodiments, the cancer is leukemia. In some embodiments, the cancer is acute myeloid leukemia (AML).

[0015] In some embodiments, the stem cell is a hematopoietic stem and progenitor cell (HSPC).

[0016] In some embodiments, the mutant CD33 protein comprises a mutation at one or more residues selected from the group consisting of C41, W60, I105, D112, Y116, F118, P132, W22, G34, R89, N100, N113, and S131 according to SEQ ID NO:1, wherein the mutation is preferably non-conservative. In some embodiments, the anti-CD33 antibody is my9.6 or an antigen-binding fragment thereof.

[0017] In some embodiments, the mutant CD33 protein comprises a mutation at one or more residues selected from the group consisting of C41, W60, I105, Y116, and F118 according to SEQ ID NO:1, wherein the mutation is preferably non-conservative. In some embodiments, the anti-CD33 antibody is HM195 or an antigen-binding fragment thereof.

[0018] In some embodiments, mutation is introduced to the stem cell with a base editor comprising a gRNA that comprises a spacer sequence selected from the group consisting of SEQ ID NO: 19-144. In some embodiments, mutation is introduced to the stem cell with a prime editor and a pegRNA that comprises a spacer sequence selected from the group consisting of SEQ ID NO:145-228.

[0019] In some embodiments, the mutant CD123 protein comprises a mutation at one or more residues selected from the group consisting of 127, L30, M32, W41, E51, C52, S59, P61, R84, P88, F90, S91, and W93 according to SEQ ID NO:2, wherein the mutation is preferably non-conservative. In some embodiments, the anti-CD123 antibody is CSL362 or 32716, or an antigen-binding fragment thereof.

[0020] In some embodiments, mutation is introduced to the stem cell with a base editor comprising a gRNA that comprises a spacer sequence selected from the group consisting of SEQ ID NO:229-516. In some embodiments, mutation is introduced to the stem cell with a prime editor and a pegRNA that comprises a spacer sequence selected from the group consisting of SEQ ID NO:517-541.

[0021] In some embodiments, the mutant CD117 protein comprises a mutation at one or more residues selected from the group consisting of T67, K69, T71, S81, Y83, T114, T119, and K129 according to SEQ ID NO:3, wherein the mutation is preferably non-conservative. In some embodiments, the anti-CD117 antibody is Ab85 or an antigen-binding fragment thereof.

[0022] In some embodiments, the mutant CD117 protein comprises a mutation at one or more residues selected from the group consisting of S236, H238, Y244, S273, T277, and T279 according to SEQ ID NO:3, wherein the mutation is preferably non-conservative. In some embodiments, the anti-CD117 antibody is Ab67 or an antigen-binding fragment thereof.

[0023] In some embodiments, mutation is introduced to the stem cell with a base editor comprising a gRNA that comprises a spacer sequence selected from the group consisting of SEQ ID NO:542-758. In some embodiments, mutation is introduced to the stem cell with a prime editor and a pegRNA that comprises a spacer sequence selected from the group consisting of SEQ ID NO:759-801.

[0024] In some embodiments, the mutant CLL-1 protein comprises a mutation at one or more residues selected from amino acid residues 142-158 according to SEQ ID NO:4, wherein the mutation is preferably non-conservative. In some embodiments, the anti-CLL-1 antibody is Hu6E7. N54A, or an antigen-binding fragment thereof.

[0025] In some embodiments, is introduced to the stem cell with a base editor comprising a gRNA that comprises a spacer sequence selected from the group consisting of SEQ ID NO:802-879. In some embodiments, mutation is introduced to the stem cell with a prime editor and a pegRNA that comprises a spacer sequence selected from the group consisting of SEQ ID NO:880-893.

[0026] In some embodiments, the therapy comprises the immune cell that comprises the CAR. In some embodiments, the immune cell is a T cell, an NK cell, or a macrophage.

[0027] In some embodiments, the method further comprises administering the therapy to the patient. In some embodiments, the therapy is administered after the stem cell is administered.

[0028] In some embodiments, the stem cell is autologous or allogeneic to the patient.

[0029] In some embodiments, the patient expresses CD33, CD123, CD117 or CLL-1 in cancer cells.

[0030] Also provided, in one embodiment, is a method for treating acute myeloid leukemia (AML) in a patient in need thereof, comprising: (a) editing the genome of a stem cell to introduce a mutation to an epitope of the CD33 protein recognized by an anti-CD33 antibody which has reduced binding to the mutated CD33 protein as compared to the corresponding wild-type CD33 protein, wherein the mutation is at one or more residues selected from the group consisting of C41, W60, I105, D112, Y116, F118, P132, W22, G34, R89, N100, N113, and S131 according to SEQ ID NO:1, and is preferably a non-conservative mutation, (b) transplanting to the patient the edited stem cell, and (c) administering to the patient the antibody, an antigen-binding fragment of the antibody, an antibody-drug conjugate comprising the antibody, a chimeric antigen receptor (CAR) comprising the antigen-binding fragment, or an immune cell comprising the CAR.

[0031] Also provided, in one embodiment, is a method for treating acute myeloid leukemia (AML) in a patient in need thereof, comprising: (a) editing the genome of a stem cell to introduce a mutation to an epitope of the CD123 protein recognized by an anti-CD123 antibody which has reduced binding to the mutated CD123 protein as compared to the corresponding wild-type CD123 protein, wherein the mutation is at one or more residues selected from the group consisting of 127, L30, M32, W41, E51, C52, S59, P61, R84, P88, F90, S91, and W93 according to SEQ ID NO:2, and is preferably a non-conservative mutation, (b) transplanting to the patient the edited stem cell, and (c) administering to the patient the antibody, an antigen-binding fragment of the antibody, an antibody-drug conjugate comprising the antibody, a chimeric antigen receptor (CAR) comprising the antigen-binding fragment, or an immune cell comprising the CAR.

[0032] Also provided, in one embodiment, is a method for treating acute myeloid leukemia (AML) in a patient in need thereof, comprising: (a) editing the genome of a stem cell to introduce a mutation to an epitope of the CD117 protein recognized by an anti-CD117 antibody which has reduced binding to the mutated CD117 protein as compared to the corresponding wild-type CD117 protein, wherein the mutation is at one or more residues selected from the group consisting of T67, K69, T71, S81, Y83, T114, T119, K129, S236, H238, Y244, S273, T277, and T279 according to SEQ ID NO:3, and is preferably a non-conservative mutation, (b) transplanting to the patient the edited stem cell, and (c) administering to the patient the antibody, an antigen-binding fragment of the antibody, an antibody-drug conjugate comprising the antibody, a chimeric antigen receptor (CAR) comprising the antigen-binding fragment, or an immune cell comprising the CAR.

[0033] Also provided, in one embodiment, is a method for treating acute myeloid leukemia (AML) in a patient in need thereof, comprising: (a) editing the genome of a stem cell to introduce a mutation to an epitope of the CLL-1protein recognized by an anti-CLL-1 antibody which has reduced binding to the mutated CLL-1protein as compared to the corresponding wild-type CLL-1protein, wherein the mutation is at one or more residues selected from amino acid residues 142 to 158 according to SEQ ID NO:4, and is preferably a non-conservative mutation, (b) transplanting to the patient the edited stem cell, and (c) administering to the patient the antibody, an antigen-binding fragment of the antibody, an antibody-drug conjugate comprising the antibody, a chimeric antigen receptor (CAR) comprising the antigen-binding fragment, or an immune cell comprising the CAR.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034] FIG. 1A-D. Determination of epitopes of CD33 that mediate the interaction by anti-CD33 scFv clone my9.6 or HM195. (A) Binding affinity of indicated CD33 mutations with anti-CD33 scFV clone my9.6. HEK 293T cells were transfected with wildtype or indicated CD33 mutant and then incubated with anti-CD33 scFV-luciferase fusion proteins, RLU: relative luminescence units. (B) Western blot of CD33 expression. HEK293T cells were transfected with flag tagged wild-type or indicated CD33 mutants. (C) Binding affinity of additional CD33 mutations. RLU: relative luminescence units (D) Western blot of CD33 expression. HEK293T cells were transfected with flag tagged wild-type or indicated CD33 mutants.

[0035] FIG. 2A-G. Mutating endogenous CD33 epitopes in HEK 293T cells and human CD34+ HSPCs by base editors and prime editor. (A) Sanger sequencing of base editors targeting W60 of CD33 in CD34+ HSPCs. Red arrow pointed at desired mutation site. (B) Deep sequencing of editing efficiency and editing products. (C) Illustration of Prime editing design and editing efficiency of in HEK293T cells. PE4 was used to target P132 site of CD33. (D-F) Optimization of PE4 with variable nick site (D), PBS lengths (E), RT template lengths (F). (G) Comparison of PE4, PE4max and PEmax in editing P132 into A132 of CD33. HSPCs: hematopioetic stem and progenitor cells

[0036] FIG. 3A-B. Determination of epitopes of CD123 that mediate the recognition by scFv clone 32716 or CSL362. (A) Binding affinity of indicated CD123 mutations with anti-CD123 scFv clone 32716 (left panels) or clone CSL362 (right panels). HEK 293T cells were transfected with wildtype or indicated CD123 mutant and then incubated with anti-CD123 scFv-luciferase fusion proteins. (B) Western blot of CD123 expression. HEK293T cells were transfected with flag tagged wild-type or indicated CD123 mutants.

[0037] FIG. 4A-C. CD123 combined mutation R84-V85 can reduce the affinity of the CSL362 antibody without affecting expression and the CD123 downstream signaling pathway. (A) Combined mutations at different sites and their binding affinity with CSL362. (B) Immunoprecipitation to detect the expression levels of different combined mutation variants. (C) Immunoprecipitation to detect CD123 downstream signaling pathway pSTAT5. The results show that combined mutations do not affect the normal function of CD123.

[0038] FIG. 5A-H. Mutation of endogenous CD123 sites in HEK 293T cells using base editors and prime editors. (A-B) Editing of CD123-R84 (A) or L30 (B) in HEK 293T cells targeted by BE. Arrows indicate the desired mutation sites. (C-E) Deep sequencing of edited efficiency (C, E) and edited products (D, F) in human hematopoietic stem progenitor cells. (E-F) ABE8.8m-mediated single-base editing products have a purity exceeding 90%, while CBE has more off-target products (C-D). (G) Precise editing of the CD123-R84 site using a prime editor. The schematic shows the design of pegRNA. (H) First-generation sequencing shows that both pegRNAs can effectively edit the R84 site. Arrows point to the editing site.

[0039] FIG. 6A-D. Hematopoietic stem cells after precise editing of antigen sites have normal myeloid differentiation and proliferative capacity. (A) Myeloid cell count. Cells with precise editing of CD123 R84Q or L30P antigen sites have better cell viability compared to CD123 knockout cells. (B) Myeloid cell morphology. Cells with precise editing of CD123 R84Q or L30P have consistent morphology with the control, while direct knockout of CD123 affects cell morphological changes. (C-D) Myeloid differentiation ratio. Edited hematopoietic stem progenitor cells were subjected to in vitro myeloid differentiation, and differentiation ability was verified using myeloid surface molecules CD11b (C) and CD14 (D). Precise editing of cells does not affect myeloid differentiation.

[0040] FIG. 7A-C. Hematopoietic stem cells after precise editing of antigen sites can differentiate into plasmacytoid dendritic cells. (A) Number of plasmacytoid dendritic cells. Cells with precise editing of CD123 R84Q or L30P antigen sites have more plasmacytoid dendritic cells compared to CD123 knockout cells. (B) Ratio of plasmacytoid dendritic cell differentiation. Edited hematopoietic stem progenitor cells were subjected to in vitro differentiation into plasmacytoid dendritic cells, and differentiation ability was verified using CD303 surface molecules. (C) Morphology of plasmacytoid dendritic cells. pDC: plasmacytoid dendritic cell.

[0041] FIG. **8**A-B. CD123-CAR-T cell targeting experiment. (A) Preparation of CAR-T cells containing CSL362 monoclonal antibody, and co-culturing CAR-T cells with wild-type AML tumor cells, CD123 knockout AML cells, or cells containing CD123-R84Q mutation. (B) The co-cultivation results of hematopoietic stem cells after precise editing through the guide editor and undergoing myeloid differentiation with CAR-T CD123 in vitro were obtained. Compared to the unedited control group, cells after precise editing showed resistance to CAR-T killing, significantly improving cell survival rates.

DETAILED DESCRIPTION

Definitions

[0042] The term "allogeneic" refers to any material derived from one individual which is then introduced to another individual of the same species, e.g., allogeneic T cell transplantation.

[0043] The term "autologous" refers to any material derived from the same individual to which it is later to be re-introduced. For example, the engineered autologous cell therapy (eACT™) method described herein involves collection of lymphocytes from a patient, which are then engineered to express, e.g., a CAR construct, and then administered back to the same patient.

[0044] The term "antibody" (Ab) includes, without limitation, a glycoprotein immunoglobulin which binds specifically to an antigen. In general, and antibody can comprise at least two heavy (H) chains and two light (L) chains interconnected by disulfide bonds, or an antigen-binding molecule thereof. Each H chain comprises a heavy chain variable region (abbreviated herein as VH) and a heavy chain constant region. The heavy chain constant region comprises three constant domains, CH1, CH2 and CH3. Each light chain comprises a light chain variable region (abbreviated herein as VL) and a light chain constant region. The light chain constant region comprises one constant domain, CL. The VH and VL regions can be further subdivided into regions of hypervariability, termed complementarity determining regions (CDRs), interspersed with regions that are more conserved, termed framework regions (FR). Each VH and VL comprises three CDRs and four FRs, arranged from amino-terminus to carboxy-terminus in the following order: FR1, CDR1, FR2, CDR2, FR3, CDR3, and FR4. The variable regions of the heavy and light chains contain a binding domain that interacts with an antigen. The constant regions of the Abs may mediate the binding of the immunoglobulin to host tissues or factors, including various cells of the immune system (e.g., effector cells) and the first component (Clq) of the classical complement system. In general, human antibodies are approximately 150 kD tetrameric agents composed of two identical heavy (H) chain polypeptides (about 50 kD each) and two identical light (L) chain polypeptides (about 25 kD each) that associate with each other into what is commonly referred to as a "Y-shaped" structure. The heavy and light chains are linked or connected to one another by a single disulfide bond: two other disulfide bonds connect the heavy chain hinge regions to one another, so that the dimers are connected to one another and the tetramer is formed. Naturally-produced antibodies are also glycosylated, e.g., on the CH2 domain.

[0045] The term "variable region" or "variable domain" is used interchangeably. The variable region typically refers to a portion of an antibody, generally, a portion of a light or heavy chain, typically about the amino-terminal 110 to 120 amino acids in the mature heavy chain and about 90 to 115 amino acids in the mature light chain, which differ extensively in sequence among antibodies and are used in the binding and specificity of a particular antibody for its particular antigen. The variability in sequence is concentrated in those regions called complementarity determining regions (CDRs) while the more highly conserved regions in the variable domain are called framework regions (FR). Without wishing to be bound by any particular mechanism or theory, it is believed that the CDRs of the light and heavy chains are primarily responsible for the interaction and specificity of the antibody with antigen. In certain embodiments, the variable region is a human variable region. In certain embodiments, the variable region comprises rodent or murine CDRs and human framework regions (FRs). In particular embodiments, the variable region is a primate (e.g., non-human primate) variable region. In certain embodiments, the variable region comprises rodent or murine CDRs and primate (e.g., non-human primate) framework regions (FRs).

[0046] The terms "VL" and "VL domain" are used interchangeably to refer to the light chain variable region of an antibody or an antigen-binding molecule thereof.

[0047] The terms "VH" and "VH domain" are used interchangeably to refer to the heavy chain variable region of an antibody or an antigen-binding molecule thereof.

[0048] "Chimeric antigen receptor" or "CAR" refers to a molecule engineered to comprise a binding motif and a means of activating immune cells (for example T cells such as naive T cells, central memory T cells, effector memory T cells or combination thereof) upon antigen binding. CARs are also known as artificial T cell receptors, chimeric T cell receptors or chimeric immunoreceptors. In some embodiments, a CAR comprises a binding motif, an extracellular domain, a transmembrane domain, one or more co-stimulatory domains, and an intracellular signaling domain. A T cell that has been genetically engineered to express a chimeric antigen receptor may be referred to as a CAR T cell. "Extracellular domain" (or "ECD") refers to a portion of a polypeptide that, when the polypeptide is present in a cell membrane, is understood to reside outside of the cell membrane, in the extracellular space.

[0049] The term "extracellular ligand-binding domain," as used herein, refers to an oligo- or polypeptide that is capable of binding a ligand, e.g., a cell surface molecule. For example, the extracellular ligand-binding domain may be chosen to recognize a ligand that acts as a cell surface marker on target cells associated with a particular disease state (e.g., cancer). Examples of cell surface markers that may act as ligands include those associated with viral, bacterial and parasitic infections, autoimmune disease and cancer cells.

[0050] The binding domain of the CAR may be followed by a "spacer," or, "hinge," which refers to the region that moves the antigen binding domain away from the effector cell surface to enable proper cell/cell contact, antigen binding and activation (Patel et al., Gene Therapy, 1999; 6: 412-419). The hinge region in a CAR is generally between the transmembrane (TM) and the binding domain. In certain embodiments, a hinge region is an immunoglobulin hinge region and may be a wild type immunoglobulin hinge region or an altered wild type immunoglobulin hinge region. Other exemplary hinge regions used in the CARs described herein include the hinge region derived from the extracellular regions of type 1 membrane proteins such as CD8alpha, CD4, CD28 and CD7, which may be wild-type hinge regions from these molecules or may be altered.

[0051] The "transmembrane" region or domain is the portion of the CAR that anchors the extracellular binding portion to the plasma membrane of the immune effector cell, and facilitates binding of the binding domain to the target antigen. The transmembrane domain may be a CD3zeta transmembrane domain, however other transmembrane domains that may be employed include those obtained from CD8alpha, CD4, CD28, CD45, CD9, CD16, CD22, CD33, CD64, CD80, CD86, CD134, CD137, and CD154. In one embodiment, the transmembrane domain is the transmembrane domain of CD137. In certain embodiments, the transmembrane domain is synthetic in which case it would comprise predominantly hydrophobic residues such as leucine and valine.

[0052] The "intracellular signaling domain" or "signaling domain" refers to the part of the chimeric antigen receptor protein that participates in transducing the message of effective CAR binding to a target antigen into the interior of the immune effector cell to elicit effector cell function, e.g., activation, cytokine production, proliferation and cytotoxic activity, including the release of cytotoxic factors to the CAR-bound target cell, or other cellular responses elicited with antigen binding to the extracellular CAR domain. The term "effector function" refers to a specialized function of the cell. Effector function of the T cell, for example, may be cytolytic activity or help or activity including the secretion of a cytokine. Thus, the terms "intracellular signaling domain" or "signaling domain," used interchangeably herein, refer to the portion of a protein which transduces the effector function signal and that directs the cell to perform a specialized function. While usually the entire intracellular signaling domain can be employed, in many cases it is not necessary to use the entire domain. To the extent that a truncated portion of an intracellular signaling domain is used, such truncated portion may be used in place of the entire domain as long as it transduces the effector function signal. The term intracellular signaling domain is meant to include any truncated portion of the intracellular signaling domain sufficient to transducing effector function signal. The intracellular signaling domain is also known as the, "signal transduction domain," and is typically derived from portions of the human CD3 or FcRy chains.

[0053] It is known that signals generated through the T cell receptor alone are insufficient for full activation of the T cell and that a secondary, or costimulatory signal is also required. Thus, T cell activation can be said to be mediated by two distinct classes of cytoplasmic signaling sequences: those that initiate antigen dependent primary activation through the T cell receptor (primary cytoplasmic signaling sequences) and those that act in an antigen independent manner to provide a secondary or costimulatory signal (secondary cytoplasmic signaling sequences). Cytoplasmic signaling sequences that act in a costimulatory manner may contain signaling motifs which are known as immunoreceptor tyrosine-based activation motif or ITAMs.

[0054] Examples of ITAM containing primary cytoplasmic signaling sequences that are of particular use in the disclosure include those derived from TCRzeta, FcRgamma, FcRbeta, CD3gamma, CD3delta, CD3epsilon, CD5, CD22, CD79a, CD79b and CD66d.

[0055] As used herein, the term, "costimulatory signaling domain," or "costimulatory domain", refers to the portion of the CAR comprising the intracellular domain of a costimulatory molecule. Costimulatory molecules are cell surface molecules other than antigen receptors or Fc receptors that provide a second signal required for efficient activation and function of T lymphocytes upon binding to antigen. Examples of such co-stimulatory molecules include CD27, CD28, 4-1 BB (CD137), OX40 (CD134), CD30, CD40, PD-1, ICOS (CD278), LFA-1, CD2, CD7, LIGHT, NKD2C, B7-H2 and a ligand that specifically binds CD83. Accordingly, while the present disclosure provides exemplary costimulatory domains derived from CD3zeta and 4-1 BB, other costimulatory domains are contemplated for use with the CARs described herein. The inclusion of one or more co stimulatory signaling domains may enhance the efficacy and expansion of T cells expressing CAR receptors. The intracellular signaling and costimulatory signaling domains may be linked in any order in tandem to the carboxyl terminus of the transmembrane domain.

[0056] Although scFv-based CARs engineered to contain a signaling domain from CD3 or FcRgamma have been shown to deliver a potent signal for T cell activation and effector function, they are not sufficient to elicit signals that promote T cell survival and expansion in the absence of a concomitant costimulatory signal. Other CARs containing a binding domain, a hinge, a transmembrane and the signaling domain derived from CD3zeta or FcRgamma together with one or more costimulatory signaling domains (e.g., intracellular costimulatory domains derived from CD28, CD137, CD134 and CD278) may more effectively direct antitumor activity as well as increased cytokine secretion, lytic activity, survival and proliferation in CAR expressing T cells in vitro, and in animal models and cancer patients.

[0057] A "conservative amino acid substitution" is one in which the amino acid residue is replaced with an amino acid residue having a similar side chain. Families of amino acid residues having similar side chains have been defined in the art, including basic side chains (e.g., lysine, arginine, histidine), acidic side chains (e.g., aspartic acid, glutamic acid), uncharged polar side chains (e.g., glycine, asparagine, glutamine, serine, threonine, tyrosine, cysteine), nonpolar side chains (e.g., alanine, valine, leucine, isoleucine, proline, phenylalanine, methionine, tryptophan), beta-branched side chains (e.g., threonine, valine, isoleucine) and aromatic side chains (e.g., tyrosine, phenylalanine, tryptophan, histidine). Thus, a nonessential amino acid residue in an immunoglobulin polypeptide is preferably replaced with another amino acid residue from the same side chain family. In another embodiment, a string of amino acids can be replaced with a structurally similar string that differs in order and/or composition of side chain family members.

[0058] Non-limiting examples of conservative amino acid substitutions are provided in the tables below, where a similarity score of 0 or higher indicates conservative substitution between the two amino acids.

[0059] A substitution or mutation that is not considered a conservative amino acid substitution/mutation can be referred to as a non-conservative substitution/mutation.

TABLE A

Amino Acid Similarity Matrix

	C	G	P	S	A	T	D	E	N	Q	H	K	R	V	M	I	L	F	Y	W
W	−8	−7	−6	−2	−6	−5	−7	−7	−4	−5	−3	−3	2	−6	−4	−5	−2	0	0	17
Y	0	−5	−5	−3	−3	−3	−4	−4	−2	−4	0	−4	−5	−2	−2	−1	−1	7	10	
F	−4	−5	−5	−3	−4	−3	−6	−5	−4	−5	−2	−5	−4	−1	0	1	2	9		
L	−6	−4	−3	−3	−2	−2	−4	−3	−3	−2	−2	−3	−3	2	4	2	6			
I	−2	−3	−2	−1	−1	0	−2	−2	−2	−2	−2	−2	−2	4	2	5				
M	−5	−3	−2	−2	−1	−1	−3	−2	0	−1	−2	0	0	2	6					
V	−2	−1	−1	−1	0	0	−2	−2	−2	−2	−2	−2	−2	4						
R	−4	−3	0	0	−2	−1	−1	−1	0	1	2	3	6							
K	−5	−2	−1	0	−1	0	0	0	1	1	0	5								
H	−3	−2	0	−1	−1	−1	1	1	2	3	6									
Q	−5	−1	0	−1	0	−1	2	2	1	4										
N	−4	0	−1	1	0	0	2	1	2											
E	−5	0	−1	0	0	0	3	4												
D	−5	1	−1	0	0	0	4													
T	−2	0	0	1	1	3														
A	−2	1	1	1	2															
S	0	1	1	1																
P	−3	−1	6																	
G	−3	5																		
C	12																			

[0060] A “patient” includes any human who is afflicted with a cancer (e.g., a leukemia). The terms “subject” and “patient” are used interchangeably herein.

[0061] A “therapeutically effective amount,” “effective dose,” “effective amount,” or “therapeutically effective dosage” of a therapeutic agent, e.g., engineered CAR T cells, is any amount that, when used alone or in combination with another therapeutic agent, protects a subject against the onset of a disease or promotes disease regression evidenced by a decrease in severity of disease symptoms, an increase in frequency and duration of disease symptom-free periods, or a prevention of impairment or disability due to the disease affliction. The ability of a therapeutic agent to promote disease regression can be evaluated using a variety of methods known to the skilled practitioner, such as in human subjects during clinical trials, in animal model systems predictive of efficacy in humans, or by assaying the activity of the agent in in vitro assays.

[0062] “Treatment” or “treating” of a subject refers to any type of intervention or process performed on, or the administration of an active agent to, the subject with the objective of reversing, alleviating, ameliorating, inhibiting, slowing down or preventing the onset, progression, development, severity or recurrence of a symptom, complication or condition, or biochemical indicia associated with a disease. In one embodiment, “treatment” or “treating” includes a partial remission. In another embodiment, “treatment” or “treating” includes a complete remission. In some embodiments, treatment may be of a subject who does not exhibit signs of the relevant disease, disorder and/or condition and/or of a subject who exhibits only early signs of the disease, disorder, and/or condition. In some embodiments, such treatment may be of a subject who exhibits one or more established signs of the relevant disease, disorder and/or condition. In some embodiments, treatment may be of a subject who has been diagnosed as suffering from the relevant disease, disorder, and/or condition. In some embodiments, treatment may be of a subject known to have one or more susceptibility factors that are statistically correlated with increased risk of development of the relevant disease, disorder, and/or condition.

[0063] A “zinc finger DNA binding protein” (or binding domain) is a protein, or a domain within a larger protein, that binds DNA in a sequence-specific manner through one or more zinc fingers, which are regions of amino acid sequence within the binding domain whose structure is stabilized through coordination of a zinc ion. Thus, each zinc finger of a multi-finger ZFP includes a recognition helix region for binding to DNA within a backbone. The term zinc finger DNA binding protein is often abbreviated as zinc finger protein or ZFP. The term “zinc finger nuclease” includes one ZFN as well as a pair of ZFNs (the members of the pair are referred to as “left and right” or “first and second” or “pair”) that dimerize to cleave the target gene.

[0064] A “TALE DNA binding domain” or “TALE” is a polypeptide comprising one or more TALE repeat domains/units. The repeat domains, each comprising a repeat variable diresidue (RVD), are involved in binding of the TALE to its cognate target DNA sequence. A single “repeat unit” (also referred to as a “repeat”) is typically 33-35 amino acids in length and exhibits at least some sequence homology with other TALE repeat sequences within a naturally occurring TALE protein. TALE proteins may be designed to bind to a target site using canonical or non-canonical RVDs within the repeat units. See, e.g., U.S. Pat. Nos. 8,586,526 and 9,458,205. Zinc finger and TALE DNA-binding domains can be “engineered” to bind to a predetermined nucleotide sequence, for example via engineering (altering one or more amino acids) of the recognition helix region of a naturally occurring zinc finger protein or by engineering of the amino acids involved in DNA binding (the repeat variable diresidue or RVD region). Therefore, engineered zinc finger proteins or TALE proteins are proteins that are non-naturally occurring. Non-limiting examples of methods for engineering zinc finger proteins and TALEs are design and selection. A designed protein is a protein not occurring in nature whose design/composition results principally from rational criteria. Rational criteria for design include application of substitution rules and computerized algorithms for processing information in a database storing information of existing ZFP or TALE designs (canonical and non-canonical RVDs) and binding data. See, for example, U.S. Pat. Nos. 9,458,205:

8,586,526; 6,140,081: 6,453,242; and 6,534,261: see also International Patent Publication Nos. WO 98/53058: WO 98/53059: WO 98/53060: WO 02/016536: and WO 03/016496. The term "TALEN" includes one TALEN as well as a pair of TALENs (the members of the pair are referred to as "left and right" or "first and second" or "pair") that dimerize to cleave the target gene.

[0065] CRISPR/Cas (Clustered regularly interspaced short palindromic repeats/CRISPR-associated protein) system has been the most powerful genomic editing tool since its conception for its unparalleled editing efficiency, convenience and the potential applications in living organism. Directed by guide RNA (gRNA), a Cas nuclease can generate DNA double strand breaks (DSBs) at the targeted genomic sites in various cells (both cell lines and cells from living organisms). These DSBs are then repaired by the endogenous DNA repair system, which could be utilized to perform desired genome editing.

[0066] Base editors (BE), which integrate the CRISPR/Cas system with the APOBEC (apolipoprotein B mRNA editing enzyme, catalytic polypeptide-like) cytosine deaminase family, were recently developed that greatly enhanced the efficiency of CRISPR/Cas9-mediated gene correction. Through fusion with Cas9 nickase (nCas9) or catalytically dead Cas9 (dCas9), the cytosine (C) deamination activity of rat APOBEC1 (rA1) can be purposely directed to the target bases in genome and to catalyze C to Thymine (T) substitutions at these bases.

[0067] Prime editing (PE) is a genome editing technology by which the genome of living organisms may be modified. Prime editing directly writes new genetic information into a targeted DNA site. It uses a fusion protein, consisting of a catalytically impaired endonuclease (e.g., Cas9) fused to an engineered reverse transcriptase enzyme, and a prime editing guide RNA (pegRNA), capable of identifying the target site and providing the new genetic information to replace the target DNA nucleotides. Prime editing mediates targeted insertions, deletions, and base-to-base conversions without the need for double strand breaks (DSBs) or donor DNA templates.

Transplantation of Engineered Tumor Antigen-Expressing Cells

[0068] Tumor-associated antigens are commonly targeted for cancer therapies. Ideally, non-cancer cells do not express these antigens and thus would not be killed by the therapies. However, frequently other tissues can also have expression, albeit lower expression sometimes, of these antigens. Such cells therefore can be targeted by the therapy, causing undesired adverse effects.

[0069] Example therapies targeting a tumor associated antigen include antibodies, either directly, or through antibody-dependent cellular cytotoxicity (ADCC) or antibody-dependent cellular phagocytosis (ADCP). Another example is chimeric antigen receptor (CAR) T cell therapy which uses genetically modified T cells to target and kill cancer cells.

[0070] The present disclosure provides compositions and methods for treating a cancer while reducing adverse effects associated with non-cancerous cells expressing a tumor associated antigen targeted by a therapy. In an illustrative example, a genome editing tool is used to modify the target epitope in a hematopoietic stem and progenitor cell (HSPC) such that the HSPC cannot be bound by the therapeutic antibody or CAR cell, while retaining the normal biological function. When the engineered HSPC is transplanted to a patient that receives the therapy, even if the patient's own HSPC is targeted by the therapy, the transplanted engineered HSPC can supplement the required activity of the HSPC, reducing or avoid the associated toxicities.

[0071] According to one embodiment of the present disclosure, provided is a method for preparing a cancer (e.g., leukemia, in particular AML) patient for a therapy. The therapy is designed to specifically target an antigen expressed by the cancer cells, which may include an antibody, an antigen-binding fragment, a chimeric antigen receptor (CAR), or an immune cells (e.g., T cells, NK cells, macrophages, monocytes), or their respective coding sequences. Example tumor associated antigens are known. In some embodiments, the cancer is leukemia. In some embodiments, the leukemia is AML, in particular relapsed and/or refractory AML. For acute myeloid leukemia (AML), the antigen may be CD33, CD123, CD117 or CLL-1, without limitation. In some embodiments, the cancer patient has cancer cells expressing CD33. In some embodiments, the cancer patient has cancer cells expressing CD123. In some embodiments, the cancer patient has cancer cells expressing CD117. In some embodiments, the cancer patient has cancer cells expressing CLL-1.

[0072] In some embodiments, the method entails administering to the patient a stem cell that expresses a mutant form of the antigen. In some embodiments, the mutation is at one or more amino acid residues within the epitope of the antigen targeted by the therapy, or at one or more amino acid residues that impact such binding, such by determining the conformation of the epitope. In some embodiments, the mutation does not affect, or at least does not significantly change, the activities of the antigen.

[0073] Amino acid residues that are important for the antibody binding have been identified for each of CD33, CD123, CD117 or CLL-1, for a number of commonly used antibodies.

[0074] For instance, for CD33, important residues for the binding by antibody my9.6 include C41, W60, I105, D112, Y116, F118, P132, W22, G34, R89, N100, N113, and S131 (residue positions according to CD33 protein sequence as shown in SEQ ID NO: 1). As publicly known, antibody my9.6 has a VH sequence of SEQ ID NO:5 and a VL sequence of SEQ ID NO:6. It is appreciated that an antigen-binding fragment of my9.6 or a CAR molecule that includes the antigen-binding fragment also has the same binding characteristics.

[0075] Also for CD33, important residues for the binding by antibody HM195 include C41, W60, I105, Y116, and F118 (residue positions according to CD33 protein sequence as shown in SEQ ID NO:1). As publicly known, antibody HM195 has a VH sequence of SEQ ID NO:7 and a VL sequence of SEQ ID NO:8. It is appreciated that an antigen-binding fragment of HM195 or a CAR molecule that includes the antigen-binding fragment also has the same binding characteristics.

[0076] For CD123, important residues for the binding by antibody CSL362 or 32716 include I27, L30, M32, W41, E51, C52, S59, P61, R84, P88, F90, S91, and W93 (residue positions according to CD123 protein sequence as shown in SEQ ID NO:2). As publicly known, antibody CSL362 has a VH sequence of SEQ ID NO:9 and a VL sequence of SEQ ID NO:10; and antibody 32716 has a VH sequence of SEQ

ID NO:11 and a VL sequence of SEQ ID NO:12. It is appreciated that an antigen-binding fragment of CSL362 or 32716 or a CAR molecule that includes the antigen-binding fragment also has the same binding characteristics.

[0077] For CD117, important residues for the binding by antibody Ab85 include T67, K69, T71, S81, Y83, T114, T119, and K129 (residue positions according to CD117 protein sequence as shown in SEQ ID NO:3). As publicly known, antibody Ab85 has a VH sequence of SEQ ID NO: 13 and a VL sequence of SEQ ID NO:14. It is appreciated that an antigen-binding fragment of Ab85 or a CAR molecule that includes the antigen-binding fragment also has the same binding characteristics.

[0078] Also for CD117, important residues for the binding by antibody Ab67 include S236, H238, Y244, S273, T277, and T279 (residue positions according to CD117 protein sequence as shown in SEQ ID NO:3). As publicly known, antibody Ab67 has a VH sequence of SEQ ID NO:15 and a VL sequence of SEQ ID NO:16. It is appreciated that an antigen-binding fragment of Ab67 or a CAR molecule that includes the antigen-binding fragment also has the same binding characteristics.

[0079] For CLL-1, important residues for the binding by antibody Hu6E7.N54A include residues 142 to 158 (DSCYFLSDDVQTWQESK) of the CD117 protein sequence as shown in SEQ ID NO:4). As publicly known, antibody Hu6E7.N54A has a VH sequence of SEQ ID NO: 17 and a VL sequence of SEQ ID NO: 18. It is appreciated that an antigen-binding fragment of Hu6E7.N54A or a CAR molecule that includes the antigen-binding fragment also has the same binding characteristics.

[0080] In some embodiments, the mutation eliminates or reduces binding of the antigen by a corresponding antibody, antigen-binding fragment or AR. In some embodiments, the mutation is a non-conservative mutation. Examples of non-conservative mutations are provided in Table A, indicated by a negative (<0) similarity score. In some embodiments, only amino acid residues having a similarity score of <−1 are used. In some embodiments, only amino acid residues having a similarity score of <−2, or <−3, or <−4 are used. In some embodiment, the mutation (for a residue that is not alanine) is to alanine. In some embodiments, the mutation is not to alanine. In some embodiments, the mutation is not to cysteine. Example mutations are provided in Table B.

TABLE B

	Example Mutations				
	Example mutations	Preferred	More preferred	Even more preferred	Most preferred
W	C/G/P/S/A/T/D/E/N/Q/H/K/V/M/I/L	G/P/S/A/T/D/E/N/Q/H/K/V/M/I/L/F/Y	G/P/A/T/D/E/N/Q/H/K/V/M/I	G/P/A/T/D/E/N/Q/V/M/I	G/P/A/T/D/E/Q/V/I
Y	G/P/S/A/T/D/E/N/Q/K/R/V/M/I/L	G/P/S/A/T/D/E/N/Q/H/K/R/V/M/I/L/W	G/P/S/A/T/D/E/Q/K/R	G/P/D/E/Q/K/R	G/P/R
F	C/G/P/S/A/T/D/E/N/Q/H/K/R/V	G/P/S/A/T/D/E/N/Q/H/K/R/V/M/W	G/P/S/A/T/D/E/N/Q/K/R	G/P/A/D/E/N/Q/K/R	G/P/D/E/Q/K
L	C/G/P/S/A/T/D/E/N/Q/H/K/R/Y/W	G/P/S/A/T/D/E/N/Q/H/K/R/Y/W	G/P/S/D/E/N/K/R	G/D	
I	C/G/P/S/A/D/E/N/Q/H/K/R/Y/W	G/P/S/A/T/D/E/N/Q/H/K/R/Y/W	G/W	W	W
M	C/G/P/S/A/T/D/E/Q/H/Y/W	G/P/S/A/T/D/E/N/Q/H/K/R/F/Y/W	G/D/W	W	
V	C/G/P/S/D/E/N/Q/H/K/R/F/Y/W	G/P/S/A/T/D/E/N/Q/H/K/R/F/Y/W	W	W	W
R	C/G/A/T/D/E/V/I/L/F/Y	G/P/S/A/T/D/E/N/V/M/I/L/F/Y	G/L/F/Y	F/Y	Y
K	C/G/P/A/V/I/L/F/Y/W	G/P/S/A/T/D/E/H/V/M/I/L/F/Y/W	L/F/Y/W	F/Y	F
H	C/G/S/A/T/V/M/I/L/F/W	G/P/S/A/T/K/V/M/I/L/F/Y/W	W		
Q	C/G/S/T/V/M/I/L/F/Y/W	G/P/S/A/T/V/M/I/L/F/Y/W	F/Y/W	F/Y/W	F/W
N	C/P/V/I/L/F/Y/W	G/P/A/T/R/V/M/I/L/F/Y/W	L/F/W	F/W	
E	C/P/R/V/M/I/L/F/Y/W	G/P/S/A/T/K/R/V/M/I/L/F/Y/W	L/F/Y/W	F/Y/W	F/W
D	C/P/R/V/M/I/L/F/Y/W	P/S/A/T/K/R/V/M/I/L/F/Y/W	M/L/F/Y/W	L/F/Y/W	F/W
T	C/Q/H/R/M/L/F/Y/W	G/P/D/E/N/Q/H/K/R/V/M/I/L/F/Y/W	F/Y/W	W	W
A	C/H/K/R/M/I/L/F/Y/W	D/E/N/Q/H/K/R/V/M/I/L/F/Y/W	F/Y/W	F/W	W
S	Q/H/V/M/I/L/F/Y/W	D/E/Q/H/K/R/V/M/I/L/F/Y/W	L/F/Y		
P	C/G/D/E/N/K/V/M/I/L/F/Y/W	G/T/D/E/N/Q/H/K/R/V/M/I/L/F/Y/W	L/F/Y/W	F/Y/W	F/Y/W
G	C/P/Q/H/K/R/V/M/I/L/F/Y/W	P/T/E/N/Q/H/K/R/V/M/I/L/F/Y/W	R/M/I/L/F/Y/W	L/F/Y/W	F/Y/W
C	G/P/A/T/D/E/N/Q/H/K/R/V/M/I/L/F/W	G/P/S/A/T/D/E/N/Q/H/K/R/V/M/I/L/F/Y/W	G/P/D/E/N/Q/H/K/R/M/L/F/W	D/E/N/Q/K/R/M/L/F/W	D/E/Q/K/M/L/W

[0081] The stem cell being engineered and transplanted can be any stem cell that is able to replace the endogenous cells that can be targeted by the therapy. For AML, for instance, the stem cell may be a hematopoietic stem and progenitor cell (HSPC) or an induced pluripotent stem cell (iPSC), without limitation. Prior to the transplantation, the stem cell may be cultured and/or differentiated. The stem cell, without limitation, may be obtained or derived from a donor subject, or from the patient.

[0082] In some embodiments, the therapy includes an corresponding antibody, an antigen-binding fragment of the antibody, a chimeric antigen receptor (CAR) that includes the antigen-binding fragment, or an immune cell that includes the CAR. Methods of preparing antibodies, fragments and CARs are known in the art, such as DNA synthesis, transduction, and expression.

[0083] In some embodiments, the CAR is expressed and enclosed in an immune cell for form a CAR-immune cell. In some embodiments, the immune cell is a T cell, an NK cell, or a macrophage, without limitation.

[0084] Administration of the therapy is preferably after the stem cell transplantation. In another embodiment, they can be done concurrently. In some embodiments, administration of the therapy, at least one, two or more of the administrations, take place before the stem cell transplantation.

[0085] One of ordinary skill in the art would recognize that multiple administrations of the compositions of the disclosure may be required to effect the desired therapy. For example a composition may be administered 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10 or more times over a span of 1 week, 2 weeks, 3 weeks, 1 month, 2 months, 3 months, 4 months, 5 months, 6 months, 1 year, 2 years, 5, years, 10 years, or more.

[0086] The methods for administering the cell compositions described herein includes any method which is effective to result in reintroduction of ex vivo genetically modified immune effector cells that either directly express a CAR in the subject or on reintroduction of the genetically modified progenitors of immune effector cells that on introduction into a subject differentiate into mature immune effector cells that express the CAR. One method comprises transducing peripheral blood T cells ex vivo with a nucleic acid construct in accordance with the present disclosure and returning the transduced cells into the subject.

[0087] Although the foregoing disclosure has been described in some detail by way of illustration and example for purposes of clarity of understanding, it will be readily apparent to one of ordinary skill in the art in light of the teachings of this disclosure that certain changes and modifications may be made thereto without departing from the spirit or scope of the appended claims. The following examples are provided by way of illustration only and not by way of limitation. Those skilled in the art will readily recognize a variety of noncritical parameters that could be changed or modified to yield similar results.

Gene Editing Methods and Edited Cells

[0088] The mutations can be introduced to the stem cell with methods known in the art, such as with a zinc finger DNA binding protein, the TALEN technology, a transposon, a retrotransposon, or a CRISPR-based technology, such as base editors and prime editors.

[0089] It is commonly known that based editors and prime editors have target sequence requirements and thus it is challenging to design suitable guide RNA sequences. Through trials and errors, the instant inventors were able to design and confirm a number of guide RNA sequences capable to introducing the desired mutations.

[0090] A base editor (BE) integrates the CRISPR/Cas system with the APOBEC (apolipoprotein B mRNA editing enzyme, catalytic polypeptide-like) AID (activation-induced cytidine deaminase) family. Through the fusion with the Cas9 nickase (nCas9) or a catalytically dead Cpf1 (dCpf1 also known as dCas12a), the nucleobase deaminase activity of APOBEC/AID family members can be purposely directed to the target bases in the genome and to catalyze base substitutions.

[0091] The term "nucleobase deaminase" as used herein, refers to a group of enzymes that catalyze the hydrolytic deamination of nucleobases such as cytidine, deoxycytidine, adenosine and deoxyadenosine. Non-limiting examples of nucleobase deaminases include cytidine deaminases and adenosine deaminases.

[0092] "Cytidine deaminase" refers to enzymes that catalyze the irreversible hydrolytic deamination of cytidine and deoxycytidine to uridine and deoxyuridine, respectively. Cytidine deaminases maintain the cellular pyrimidine pool. A family of cytidine deaminases is APOBEC ("apolipoprotein B mRNA editing enzyme, catalytic polypeptide-like"). Members of this family are C-to-U editing enzymes. Some APOBEC family members have two domains, one domain of APOBEC like proteins is the catalytic domain, while the other domain is a pseudocatalytic domain. More specifically, the catalytic domain is a zinc dependent cytidine deaminase domain and is important for cytidine deamination. RNA editing by APOBEC-1 requires homodimerisation and this complex interacts with RNA binding proteins to form the editosome.

[0093] Non-limiting examples of APOBEC proteins include APOBEC1, APOBEC2, APOBEC3A, APOBEC3B, APOBEC3C, APOBEC3D, APOBEC3F, APOBEC3G, APOBEC3H, APOBEC4, and activation-induced (cytidine) deaminase (AID).

[0094] "Adenosine deaminase", also known as adenosine aminohydrolase, or ADA, is an enzyme (EC 3.5.4.4) involved in purine metabolism. It is needed for the breakdown of adenosine from food and for the turnover of nucleic acids in tissues.

[0095] Non-limiting examples of adenosine deaminases include tRNA-specific adenosine deaminase (TadA), adenosine deaminase tRNA specific 1 (ADAT1), adenosine deaminase tRNA specific 2 (ADAT2), adenosine deaminase tRNA specific 3 (ADAT3), adenosine deaminase RNA specific B1 (ADARB1), adenosine deaminase RNA specific B2 (ADARB2), adenosine monophosphate deaminase 1 (AMPD1), adenosine monophosphate deaminase 2 (AMPD2), adenosine monophosphate deaminase 3 (AMPD3), adenosine deaminase (ADA), adenosine deaminase 2 (ADA2), adenosine deaminase like (ADAL), adenosine deaminase domain containing 1 (ADAD1), adenosine deaminase domain containing 2 (ADAD2), adenosine deaminase RNA specific (ADAR) and adenosine deaminase RNA specific B1 (ADARB1).

[0096] Prime editing is a genome editing technology by which the genome of living organisms may be modified. Prime editing directly writes new genetic information into a targeted DNA site. It uses a fusion protein, consisting of a catalytically impaired endonuclease (e.g., Cas9) fused to an engineered reverse transcriptase enzyme, and a prime editing guide RNA (pegRNA), capable of identifying the target site and providing the new genetic information to replace the target DNA nucleotides. Prime editing mediates targeted insertions, deletions, and base-to-base conversions without the need for double strand breaks (DSBs) or donor DNA templates.

[0097] The pegRNA is capable of identifying the target nucleotide sequence to be edited, and encodes new genetic information that replaces the targeted sequence. The pegRNA consists of an extended single guide RNA (sgRNA) containing a primer binding site (PBS) and a reverse transcriptase (RT) template sequence. During genome editing, the primer binding site allows the 3' end of the nicked DNA strand to hybridize to the pegRNA, while the RT template serves as a template for the synthesis of edited genetic information.

[0098] The fusion protein, in some embodiments, includes a nickase fused to a reverse transcriptase. An example nickase is Cas9 H840A. The Cas9 enzyme contains two nuclease domains that can cleave DNA sequences, a RuvC domain that cleaves the non-target strand and a HNH domain that cleaves the target strand. The introduction of a H840A substitution in Cas9, through which the histidine residue at 840 is replaced by an alanine, inactivates the HNH domain. With only the RuvC functioning domain, the catalytically impaired Cas9 introduces a single strand nick, hence a nickase.

[0099] Non-limiting examples of reverse-transcriptases include human immunodeficiency virus (HIV) reverse-transcriptase, moloney murine leukemia virus (M-MLV) reverse-transcriptase and avian myeloblastosis virus (AMV) reverse-transcriptase.

[0100] In some embodiments, the prime editing system further includes a single guide RNA (sgRNA) that directs the Cas9 H840A nickase portion of the fusion protein to nick the non-edited DNA strand.

[0101] Example gRNA for base editors and example pegRNA for prime editors are provided in Tables 1-4. For instance, for CD33, a gRNA can include a spacer sequence selected from SEQ ID NO:19-144, and pegRNA can include a spacer sequence selected from SEQ ID NO:145-228. For CD123, a gRNA can include a spacer sequence selected from SEQ ID NO: 229-516, and pegRNA can include a spacer sequence selected from SEQ ID NO: 517-541. For CD117, a gRNA can include a spacer sequence selected from SEQ ID NO: 542-758, and pegRNA can include a spacer sequence selected from SEQ ID NO: 759-801. For CLL-1, a gRNA can include a spacer sequence selected from SEQ ID NO: 802-879, and pegRNA can include a spacer sequence selected from SEQ ID NO: 880-893.

[0102] In some embodiments, to introduce a mutation at C41 of CD33, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:19-33. In some embodiments, to introduce a mutation at W60 of CD33, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:34-46. In some embodiments, to introduce a mutation at 1105 of CD33, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:47-58. In some embodiments, to introduce a mutation at D112 of CD33, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:59-65. In some embodiments, to introduce a mutation at Y116 of CD33, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:66-72.

[0103] In some embodiments, to introduce a mutation at F118 of CD33, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:73-80. In some embodiments, to introduce a mutation at P132 of CD33, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:81-89. In some embodiments, to introduce a mutation at W22 of CD33, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:90-99. In some embodiments, to introduce a mutation at G34 of CD33, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:101-110. In some embodiments, to introduce a mutation at R89 of CD33, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:111-118.

[0104] In some embodiments, to introduce a mutation at N100 of CD33, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:119-128. In some embodiments, to introduce a mutation at N113 of CD33, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:129-133. In some embodiments, to introduce a mutation at S131 of CD33, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:134-144.

[0105] In some embodiments, to introduce a mutation at W22, G34, or C41 of CD33, the pegRNA sequence can include a spacer of a sequence selected from SEQ ID NO: 145-180. In some embodiments, to introduce a mutation at W60 of CD33, the pegRNA sequence can include a spacer of a sequence selected from SEQ ID NO:181-186. In some embodiments, to introduce a mutation at R89, N100, or 1105 of CD33, the pegRNA sequence can include a spacer of a sequence selected from SEQ ID NO:187-212. In some embodiments, to introduce a mutation at D112, N113, Y116, or F118 of CD33, the pegRNA sequence can include a spacer of a sequence selected from SEQ ID NO:213-216. In some embodiments, to introduce a mutation at S131 or P132 of CD33, the pegRNA sequence can include a spacer of a sequence selected from SEQ ID NO:217-228.

[0106] In some embodiments, to introduce a mutation at 127 of CD123, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:229-263. In some embodiments, to introduce a mutation at L30 of CD123, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:264-298. In some embodiments, to introduce a mutation at M32 of CD123, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:299-330. In some embodiments, to introduce a mutation at W41 of CD123, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:331-345.

[0107] In some embodiments, to introduce a mutation at E51 of CD123, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:346-376. In some embodiments, to introduce a mutation at C52 of CD123, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:377-391. In some embodiments, to introduce a mutation at S59 of CD123, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:392-420. In some embodiments, to introduce a mutation at R84 of CD123, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:421-435.

[0108] In some embodiments, to introduce a mutation at P88 of CD123, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:436-450. In some embodiments, to introduce a mutation at F90 of CD123, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:451-466. In some embodiments, to introduce a mutation at S91 of CD123, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:467-497. In some embodiments, to introduce a mutation at W93 of CD123, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:498-516.

[0109] In some embodiments, to introduce a mutation at R84, P88, F90, S91, or W93 of CD123, the pegRNA sequence can include a spacer of a sequence selected from SEQ ID NO:517-533. In some embodiments, to introduce a mutation at E51, C52, S59, or P61 of CD123, the pegRNA sequence can include a spacer of a sequence selected from SEQ ID NO:534-537.

[0110] In some embodiments, to introduce a mutation at 127, L30, M32 or W41 of CD123, the pegRNA sequence can include a spacer of a sequence selected from SEQ ID NO:538-539. In some embodiments, to introduce a mutation at 127, L30, or M32 of CD123, the pegRNA sequence can include a spacer of SEQ ID NO:540. In some embodiments, to introduce a mutation at 127 or L30 of CD123, the pegRNA sequence can include a spacer of SEQ ID NO:541.

[0111] In some embodiments, to introduce a mutation at T67 of CD117, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:542-554. In some embodiments, to introduce a mutation at K69 of CD117, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:555-561. In some embodiments, to introduce a mutation at T71 of CD117, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:562-566. In some embodiments, to introduce a mutation at S81 of CD117, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:567-583.

[0112] In some embodiments, to introduce a mutation at Y83 of CD117, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:584-595. In some embodiments, to introduce a mutation at T114 of CD117, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:596-610. In some embodiments, to introduce a mutation at T119 of CD117, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:611-623. In some embodiments, to introduce a mutation at K129 of CD117, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:624-641.

[0113] In some embodiments, to introduce a mutation at S236 of CD117, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:642-661. In some embodiments, to introduce a mutation at H238 of CD117, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:662-666. In some embodiments, to introduce a mutation at Y244 of CD117, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:667-701. In some embodiments, to introduce a mutation at S273 of CD117, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:702-738. In some embodiments, to introduce a mutation at T277 of CD117, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:739-751. In some embodiments, to introduce a mutation at T279 of CD117, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:752-758.

[0114] In some embodiments, to introduce a mutation at T67, K69, T71, S81, or Y83 of CD117, the pegRNA sequence can include a spacer of a sequence selected from SEQ ID NO:759-769. In some embodiments, to introduce a mutation at T114, T119, or K129 of CD117, the pegRNA sequence can include a spacer of a sequence selected from SEQ ID NO:770-791.

[0115] In some embodiments, to introduce a mutation at S236, H238, or Y244 of CD117, the pegRNA sequence can include a spacer of a sequence selected from SEQ ID NO:792-796. In some embodiments, to introduce a mutation at S273, T277, or T279 of CD117, the pegRNA sequence can include a spacer of a sequence selected from SEQ ID NO:797-801.

[0116] In some embodiments, to introduce a mutation at one of the residue of 142 to 158 (DSCYFLSDDVQTWQESK: of SEQ ID NO:4, such as D142, S143, C144, Y145, F146, L147, S148, D149, D150, V151, Q152, T153, W154, Q155, E156, S157, or K158) of CLL-1, the gRNA sequence can include a spacer of a sequence selected from SEQ ID NO:802-879.

[0117] In some embodiments, to introduce a mutation at one of the residue of 142 to 158 (DSCYFLSDDVQTWQESK: of SEQ ID NO:4, such as D142, S143, C144, Y145, F146, L147, S148, D149, D150, V151, Q152, T153, W154, Q155, E156, S157, or K158) of CLL-1, the pegRNA sequence can include a spacer of a sequence selected from SEQ ID NO:880-893.

[0118] One embodiment provides a mutant CD123 protein comprising a mutation at residue R84 (position according to SEQ ID NO:2). In some embodiments, the mutation is to an amino acid residue that is not lysine. In some embodiments, the mutation is non-conservative. In some embodiments, the mutation is to glutamine (Q), asparagine (N) or histidine (H). In some embodiments, the mutant CD123 protein has reduced binding to an anti-CD123 antibody as disclosed herein, as compared to the wild-type CD123 protein.

[0119] In some embodiments, the mutation is R84Q. In some embodiments, the mutation is R84N. In some embodiments, the mutation is R84H.

[0120] In some embodiments, the mutant CD123 protein further comprises a mutation at residue V85 (position according to SEQ ID NO:2). In some embodiments, the mutation at residue V85 is to methionine (M), isoleucine (I), leucine (L), alanine (A), cysteine (C), glycine (G), or threonine (T). In some embodiments, the mutation is V85I. In some embodiments, the mutation is V85M.

[0121] In some embodiments, the mutations in CD123 are selected from the group consisting of R84Q and V85I, R84Q and V85M, R84H and V85I, and R84H and V85M. In some embodiments, the mutant CD123 protein comprises an amino acid sequence selected from the group consisting of SEQ ID NO: 894, 895, 896 and 897.

[0122] Also provided are polynucleotides encoding the mutant CD123 protein of the present disclosure, and cells comprising the mutant CD123 protein or a polynucleotide encoding the mutant CD123 protein.

EXAMPLES

Example 1. Identification and Editing of CD33 Epitope

[0123] This example identified the potential epitope of the CD33 protein for antibodies my9.6 or HM195, and designed mutants that abolished the antibody binding.

[0124] HEK 293T cells were transfected with wildtype or certain CD33 mutants and then incubated with anti-CD33 scFV-luciferase fusion proteins. The mutated residues included W22, C41, W60, I105, D112, Y116, F118, S131, and P132. The tested antibodies included my9.6 and HM195. FIGS. **1**A and **1**C show the binding affinity of the indicated CD33 mutations with anti-CD33 scFV of antibody my9.6 (RLU: relative luminescence units). FIGS. **1**B and **2**D present Western blot images of CD33 expression from the transfected cells. These figures clearly show that some of the mutations significantly reduced the binding and thus are within the epitope.

[0125] CRISPR-based base editors and prime editors were used to generate mutation at W60 of the CD33 protein. Sanger sequencing confirmed the W60R mutation in the CD34+ HSPCs. In FIG. **2**A, red arrow pointed at desired mutation site. The editing efficiency for editing products is shown in FIG. **2**B, including Y59h/W60R/F61L, Y59H/W60R/F61P, W60R/F61P, W60R/F61S, W60R/F61L, Y59H/F61L, Y59H/F61L, Y69H/W60R, F61P and W60R. It is clear that the vast majority of the products contained the desired W60R mutation.

[0126] FIG. **2**C illustrates the prime editing design (locations of spacers for PE4 for mutating P132 to A) and their editing efficiency in HEK293T cells. The editing was further optimized with variable nick sites (FIG. **2**D), PBS lengths (FIG. **2**E), or RT template lengths (FIG. **2**F). In FIG. **2**G, the editing efficiencies of PE4, PE4max and PEmax in editing P132 into A of CD33 were compared, all of which were high.

Example 2. Identification and Editing of CD123 Epitope

[0127] Like in Example 1, the epitopes of CD123 that mediate the recognition by scFv of clone 32716 or CSL362 were determined. HEK 293T cells were transfected with wildtype or indicated CD123 mutant and then incubated with anti-CD123 scFv-luciferase fusion proteins. The binding affinity of indicated CD123 mutations with anti-CD123 scFv clone 32716 (left panels) or clone CSL362 (right panels) is shown in FIG. **3**A. The expression of these mutants was confirmed by Western blot (FIG. **3**B).

[0128] Further reduction of affinity with the scFv was effectively achieved by introducing combined mutations, such as R84Q-V85I or R84Q-V85M, resulting in a 100-fold decrease (FIG. **4**A). The introduction of combined mutations did not affect the normal folding and expression of the CD123 protein (FIG. **4**B). Validation of downstream functions of the CD123 protein revealed that both combined mutations and single-point mutations did not affect the activation of downstream signaling pathways (FIG. **4**C), suggesting that these mutations can specifically reduce interaction with antibodies without affecting the normal protein function.

[0129] Precise editing of the CD123 antigen site was performed in HEK 293T cells and human hematopoietic stem progenitor cells using base editors and prime editors, respectively. Editing efficiency was confirmed through Sanger sequencing (R84 in FIG. **5**A or L30 in FIG. **4**B). Deep sequencing results showed the editing efficiency of each editing product (FIG. **5**C-F). As shown in FIG. **5**G-H, prime editors efficiently and precisely edited the CD123-R84 site. Arrows indicate the editing sites.

[0130] Further validation in hematopoietic stem progenitor cells confirmed that precise editing of the CD123 antigen site does not affect stem cell differentiation and function. Compared to CD123 knockout cells, cells with precise editing of CD123 R84Q or L30P antigen sites showed better cell viability (FIG. **6**A), and their cell morphology was consistent with the unedited control (FIG. **6**B). Flow cytometry analysis of myeloid differentiation and plasmacytoid dendritic cell differentiation proportions were consistent with the control (FIG. **6**C and FIG. **7**).

[0131] In CD123-CAR-T cell targeting experiments, cells with precise mutations could evade CAR-T cell killing. (A) CAR-T cells containing CSL362 monoclonal antibody were prepared and co-cultured with wild-type AML tumor cells, CD123 knockout AML cells, or cells containing CD123-R84Q mutation. CAR-T efficiently killed wild-type tumor cells expressing CD123, while the killing efficiency was significantly reduced for cells containing CD123-R84Q mutation (FIG. **8**A-C).

[0132] Additional similar testing was conduced for other epitope residues in CD33 and CD123, as well as for CD117 and CLL-1. The target residues and their corresponding spacer sequences used in gRNA for base editors or pegRNA for prime editors are summarized in Table 1 below.

TABLE 1A

Epitope Residues in CD33

Antibody	Target Residues in Epitope
my9.6	C41, W60, I105, D112, Y116, F118, P132, W22, G34, R89, N100, N113, S131
HM195	C41, W60, 1105, Y116, F118

TABLE 1B

CD33 Protein Sequence (SEQ ID NO: 1)
MPLLLLLPLLWAGALAMDPNF**W**LQVQESVTVQE**G**LCVLVP**C**TFFHPIPYY
DKNSPVHGY**W**FREGAIISRDSPVATNKLDQEVQEETQG**R**FRLLGDPSRN**N**
CSLS**I**VDARRR**DN**GS**Y**F**F**RMERGSTKYSYK**SP**QLSVHVTDLTHRPKILIP
GTLEPGHSKNLTCSVSWACEQGTPPIFSWLSAAPTSLGPRITHSSVLIIT
PRPQDHGTNLTCQVKFAGAGVTTERTIQLNVTYVPQNPTTGIFPGDGSGK
QETRAGVVHGAIGGAGVTALLALCLCLIFFIVKTHRRKAARTAVGRNDTH
PTTGSASPKHQKKSKLHGPTETSSCSGAAPTVEMDEELHYASLNFHGMNP
SKDTSTEYSEVRTQ

TABLE 1C

VH/VL of my9.6

Region	Sequence	SEQ ID NO:
VH	QVQLQQPGAEVVKPGASVKMSCKASGYTFTSYYIHWIKQTPGQGLEWVGVIYPGNDDISYNQKFQGKATLTADKSSTTAYMQLSSLTSEDSAVYYCAREVRLRYFDVWGQGTTVTVSS	5

TABLE 1C-continued

VH/VL of my9.6

Region	Sequence	SEQ ID NO:
VL	EIVLTQSPGSLAVSPGERVTMSCKSSQSVFFSSSQKNYLAWYQQIPGQSPRLLIYWASTRESGVPDRFTGSGSGTDFTLTISSVQPEDLAIYYCHQYLSSRTFGQGTKLEIKR	6

TABLE 1D

VH/VL of HM195

Region	Sequence	SEQ ID NO:
VH	QVQLVQSGAEVKKPGSSVKVSCKASGYTFTDYNMHWVRQAPGQGLEWIGYIYPYNGGTGYNQKFKSKATITADESTNTAYMELSSLRSEDTAVYYCARGRPAMDYWGQGTLVTVSS	7
VL	DIQMTQSPSSLSASVGDRVTITCRASESVDNYGISFMNWFQQKPGKAPKLLIYAASNQGSGVPSRFSGSGSGTDFTLTISSLQPDDFATYYCQQSKEVPWTFGQGTKVEIK	8

TABLE 1E

Example spacer sequences of gRNA for editing CD33 epitope

Residue	Editor	Cas	Spacer	SEQ ID NO:
C41	ABE/CBE	Sp cas9	gtgcagggcacgaggacgca	19
			aagtgcagggcacgaggacg	20
			gaaagtgcagggcacgagga	21
	CBE		aagaaagtgcagggcacgag	22
			gaagaaagtgcagggcacga	23
			ggaagaaagtgcagggcacg	24
			tggaagaaagtgcagggcac	25
			tgcagggcacgaggacgcac	26
			atggaagaaagtgcagggca	27
			ggatggaagaaagtgcaggg	28
			tgggatggaagaaagtgcag	29
		At cas9	atggaagaaagtgcagggcacg	30
			ggaagaaagtgcagggcacgag	31
			aagaaagtgcagggcacgagga	32
			gaagaaagtgcagggcacgagg	33
W60	ABE	Sp cas9	cggaaccagtaaccatgaac	34
			ggaaccagtaaccatgaact	35
			gaaccagtaaccatgaactg	36
			accagtaaccatgaactggg	37
			aaccagtaaccatgaactgg	38
			ccagtaaccatgaactgggg	39
			cttcccggaaccagtaacca	40
			tcccggaaccagtaaccatg	41
			ttcccggaaccagtaaccat	42
			tccttcccggaaccagtaac	43
			ggctccttcccggaaccagt	44
		At cas9	aaccagtaaccatgaactgggg	45
			ttcccggaaccagtaaccatga	46
1105	ABE	Sp cas9	tacgatgctcagggagcagt	47
			gtctacgatgctcagggagc	48
			cgtctacgatgctcagggag	49
			ggcgtctacgatgctcaggg	50
			tggcgtctacgatgctcagg	51
			ctggcgtctacgatgctcag	52
			cctggcgtctacgatgctca	53
			tcctggcgtctacgatgctc	54
			ctcctggcgtctacgatgct	55
		At cas9	tctacgatgctcagggagcagt	56
			ctacgatgctcagggagcagtt	57
			cgatgctcagggagcagttgtt	58
D112	ABE	At cas9	ggagggataatggttcatactt	59
			ggaggagggataatggttcata	60
			aggaggagggataatggttcat	61
		Sp cas9	ataatggttcatacttcttt	62
			gacgccaggaggagggataa	63
			ggaggagggataatggttca	64
			caggaggagggataatggtt	65
Y116	ABE	Sp cas9	ttcatacttctttcggatgg	66
			tcatacttctttcggatgga	67
			gttcatacttctttcggatg	68
			ccgaaagaagtatgaaccat	69
		At cas9	aatggttcatacttctttcgga	70
			ggttcatacttctttcggatgg	71
			catacttctttcggatggagag	72
F118	ABE	Sp cas9	ccgaaagaagtatgaaccat	73
			catccgaaagaagtatgaac	74
			ctctctccatccgaaagaag	75
		At cas9	catccgaaagaagtatgaacca	76
			atccgaaagaagtatgaaccat	77
			tccgaaagaagtatgaaccatt	78
			cgaaagaagtatgaaccattat	79
			ctctccatccgaaagaagtatg	80
P132	CBE	Sp cas9	caaatctccccagctctctg	81
			tctccccagctctctgtgca	82
			aatctccccagctctctgtg	83
			tacaaatctccccagctctc	84
		At cas9	atctccccagctctctgtgcat	85
			gttacaaatctccccagctctc	86
			atacagttacaaatctccccag	87
			aaatctccccagctctctgtgc	88
			acaaatctccccagctctctgt	89
W22	ABE	Sp cas9	agaaatttggatccatagcc	90
			tgcacttgcagccagaaatt	91
			agccagaaatttggatccat	92
			cagccagaaatttggatcca	93
			tgcagccagaaatttggatc	94
			cacttgcagccagaaatttg	95
			gcacttgcagccagaaattt	96
		At cas9	tgcacttgcagccagaaatttg	97
			tgcagccagaaatttggatcca	98
			ccagaaatttggatccatagcc	99
			cttgcagccagaaatttggatc	100
G34	ABE	Sp cas9	aaaccctcctgtaccgtcac	101
			cacaaaccctcctgtaccgt	102
			acgcacaaaccctcctgtac	103
			aggacgcacaaaccctcctg	104
			cgaggacgcacaaaccctcc	105
	CBE	At cas9	gacgcacaaaccctcctgtacc	106
			aaaccctcctgtaccgtcactg	107
			caaaccctcctgtaccgtcact	108
			cacaaaccctcctgtaccgtca	109
			cgaggacgcacaaaccctcctg	110

TABLE 1E-continued

Example spacer sequences of gRNA for editing CD33 epitope

Residue	Editor	Cas	Spacer	SEQ ID NO:
R89	CBE	Sp cas9	aggaggcggaatctgccctg	111
			aaggaggcggaatctgccct	112
		At cas9	aggcggaatctgccctgagtct	113
			gaatctgccctgagtctcctcc	114
			gaggcggaatctgccctgagtc	115
			aggaggcggaatctgccctgag	116
			aaggaggcggaatctgccctga	117
			ccaaggaggcggaatctgccct	118
N100	ABE/CBE	Sp cas9	aacaactgctccctgagcat	119
			aggaacaactgctccctgag	120
			gtaggaacaactgctccctg	121
			agtaggaacaactgctccct	122
			cagtaggaacaactgctccc	123
		At cas9	gggatcccagtaggaacaactg	124
			agtaggaacaactgctccctga	125
			cccagtaggaacaactgctccc	126
			ggggatcccagtaggaacaact	127
			atcccagtaggaacaactgctc	128
N113	ABE	Sp cas9	ataatggttcatacttcttt	129
			ggaggagggataatggttca	130
		At cas9	ggagggataatggttcatactt	131
			aggaggagggataatggttcat	132
			ataatggttcatacttctttcg	133
S131	ABE	Sp cas9	gggagatttgtaactgtatt	134
			gagctggggagatttgtaac	135
			gctggggagatttgtaactg	136
	CBE		tctccccagctctctgtgca	137
			caaatctccccagctctctg	138
			tacaaatctccccagctctc	139
			aatctccccagctctctgtg	140
	CBE	At cas9	atctccccagctctctgtgcat	141
			acaaatctccccagctctctgt	142
			aaatctccccagctctctgtgc	143
	ABE		agctggggagatttgtaactgt	144

TABLE IF

Example spacer sequences of pegRNA for editing CD33 epitope

Residue	Spacer	SEQ ID NO:
W22, G34, C41	TGGCTATGGATCCAAATTTCTGG	145
	AAATTTCTGGCTGCAAGTGCAGG	146
	GCAGGAGTCAGTGACGGTACAGG	147
	GGAGTCAGTGACGGTACAGGAGG	148
	GAGTCAGTGACGGTACAGGAGGG	149
	GGGAGAGGGGTTGTCGGGCTGGG	150
	GTGGGCAGGTGAGTGGCTGTGGG	151
	GGGGAGAGGGGTTGTCGGGCTGG	152
	TCGTTTCCCCACAGGGGCCCTGG	153
	CTGTGGGGAGAGGGGTTGTCGGG	154
	CCCCACAGGGGCCCTGGCTATGG	155
	GCAAGTGCAGGAGTCAGTGACGG	156
	GCTGACCCTCGTTTCCCCACAGG	157
	TGACCCTCGTTTCCCCACAGGGG	158
	CTGACCCTCGTTTCCCCACAGGG	159
	TGTGGGCAGGTGAGTGGCTGTGG	160
	TGGGCAGGTGAGTGGCTGTGGGG	161
	GCTGTGGGGAGAGGGGTTGTCGG	162
	CCCTGCTGTGGGCAGGTGAGTGG	163
	GTGAGTGGCTGTGGGGAGAGGGG	164
	GGTGAGTGGCTGTGGGGAGAGGG	165
	AGGTGAGTGGCTGTGGGGAGAGG	166
	GGGGAGTTCTTGTCGTAGTAGGG	167
	TGGGGAGTTCTTGTCGTAGTAGG	168
	GTTCTTGTCGTAGTAGGGTATGG	169
	TTCTTGTCGTAGTAGGGTATGGG	170
	TGGAGAGTCCCTGGATATAATGG	171
	GAACCAGTAACCATGAACTGGGG	172
	TGTCGTAGTAGGGTATGGGATGG	173
	TGGATATAATGGCTCCTTCCCGG	174
	TGTGGCCACTGGAGAGTCCCTGG	175
	CGGAACCAGTAACCATGAACTGG	176
	GGAAGAAAGTGCAGGGCACGAGG	177
	ATGGGATGGAAGAAAGTGCAGGG	178
	TATGGGATGGAAGAAAGTGCAGG	179
	GGAACCAGTAACCATGAACTGGG	180
W60	GACAAGAACTCCCCAGTTCATGG	181
	TGGAGAGTCCCTGGATATAATGG	182
	TGGATATAATGGCTCCTTCCCGG	183
	TCTAGCTTGTTTGTGGCCACTGG	184
	TTCTTGATCTAGCTTGTTTGTGG	185
	TGTGGCCACTGGAGAGTCCCTGG	186
R89, N100, 1105	GGGAAGGAGCCATTATATCCAGG	187
	GCCTCCTTGGGGATCCCAGTAGG	188
	GGAAGGAGCCATTATATCCAGGG	189
	GCTAGATCAAGAAGTACAGGAGG	190
	TATATCCAGGGACTCTCCAGTGG	191
	GAAGTACAGGAGGAGACTCAGGG	192
	AGAAGTACAGGAGGAGACTCAGG	193
	CATGGTTACTGGTTCCGGGAAGG	194
	CAAGCTAGATCAAGAAGTACAGG	195
	AGGGCAGATTCCGCCTCCTTGGG	196
	CAGTTCATGGTTACTGGTTCCGG	197
	GGGCAGATTCCGCCTCCTTGGGG	198
	AGTTCATGGTTACTGGTTCCGGG	199
	CAGGGCAGATTCCGCCTCCTTGG	200
	AGGGAGCAGTTGTTCCTACTGGG	201
	GGGAGATTTGTAACTGTATTTGG	202
	CAGGGAGCAGTTGTTCCTACTGG	203
	TGTTCCTACTGGGATCCCCAAGG	204
	TGAACCATTATCCCTCCTCCTGG	205
	TCCTACTGGGATCCCCAAGGAGG	206
	TCCTGGCGTCTACGATGCTCAGG	207
	TACTGGGATCCCCAAGGAGGCGG	208
	CCTGGCGTCTACGATGCTCAGGG	209
	TGTCACATGCACAGAGAGCTGGG	210
	GTCACATGCACAGAGAGCTGGGG	211
	CTGTCACATGCACAGAGAGCTGG	212
D112, N113, Y116, F118	GGGAGATTTGTAACTGTATTTGG	213
	TGTCACATGCACAGAGAGCTGGG	214
	GTCACATGCACAGAGAGCTGGGG	215
	CTGTCACATGCACAGAGAGCTGG	216
S131, P132	TGGTTCATACTTCTTTCGGATGG	217
	GACGCCAGGAGGAGGGATAATGG	218
	GCATCGTAGACGCCAGGAGGAGG	219
	CCCTGAGCATCGTAGACGCCAGG	220
	CATCGTAGACGCCAGGAGGAGGG	221
	TGAGCATCGTAGACGCCAGGAGG	222
	ATAATGGTTCATACTTCTTTCGG	223
	TACTTCTTTCGGATGGAGAGAGG	224
	GTACCCATGAACTTCCCTTGCGG	225
	TGTCACATGCACAGAGAGCTGGG	226
	GTCACATGCACAGAGAGCTGGGG	227
	CTGTCACATGCACAGAGAGCTGG	228

TABLE 2A

Epitope Residues in CD123	
Antibody	Target Residues in Epitope
CSL362 or 32716	I27, L30, M32, W41, E51, C52, S59, P61, R84, P88, F90, S91, W93

TABLE 2B

CD123 Protein Sequence (SEQ ID NO: 2)
MVLLWLTLLLIALPCLLQTKEDPNPP**I**TN**L**R**M**KAKAQQLT**W**DLNRNVTDI
ECVKDADY**S**M**P**AVNNSYCQFGAISLCEVTNYTV**R**VAN**P**P**FS**T**W**ILFPENS
GKPWAGAENLTCWIHDVDFLSCSWAVGPGAPADVQYDLYLNVANRRQQYE
CLHYKTDAQGTRIGCRFDDISRLSSGSQSSHILVRGRSAAFGIPCTDKFV
VFSQIEILTPPNMTAKCNKTHSFMHWKMRSHFNRKFRYELQIQKRMQPVI
TEQVRDRTSFQLLNPGTYTVQIRARERVYEFLSAWSTPQRFECDQEEGAN
TRAWRTSLLIALGTLLALVCVFVICRRYLVMQRLFPRIPHMKDPIGDSFQ
NDKLVVWEAGKAGLEECLVTEVQVVQKT

TABLE 2C

VH/VL of CSL362

Region	Sequence	SEQ ID NO:
VH	EVQLVQSGAEVKKPGESLKISCKGSGYSFTDYYMKWARQMPGKGLEWMGDIIPSNGATFYNQKFKGQVTISADKSISTTYLQWSSLKASDTAMYYCARSHLLRASWFAYWGQGTMVTVSSASTKGPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSS	9
VL	EVQLVQSGAEVKKPGESLKISCKGSGYSFTDYYMKWARQMPGKGLEWMGDIIPSNGATFYNQKFKGQVTISADKSISTTYLQWSSLKASDTAMYYCARSHLLRASWFAYWGQGTMVTVSSASTKGPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSS	10

TABLE 2D

VH/VL of 32716

Region	Sequence	SEQ ID NO:
VH	QIQLVQSGPELKKPGETVKISCKASGYIFTNYGMNWVKQAPGKSFKWMGWINTYTGESTYSADFKGRFAFSLETSASTAYLHINDLKNEDTATYFCARSGGYDPMDYWGQGTSVTVSS	11
VL	DIVLTQSPASLAVSLGQRATISCRASESVDNYGNTFMHWYQQKPGQPPKLLIYRASNLESGIPARFSGSGSRTDFTLTINPVEADDVATYYCQQSNEDPPTFGAGTKLELK	12

TABLE 2E

Example spacer sequences of gRNA for editing CD123 epitope

Residue	Editor	Cas	Spacer	SEQ ID NO:
I27	ABE	SpCas9	AGGTTCGTGATTGGTGGGTT	229
			TCCTTAGGTTCGTGATTGGT	230
			TTCATCCTTAGGTTCGTGAT	231
			GGTTCGTGATTGGTGGGTTT	232
			CCTTAGGTTCGTGATTGGTG	233
			TCATCCTTAGGTTCGTGATT	234
			GTTCGTGATTGGTGGGTTTG	235
		AtCas9	GTGATTGGTGGGTTTGGATCTT	236
			TTCGTGATTGGTGGGTTTGGAT	237
			GTTCGTGATTGGTGGGTTTGGA	238
			TAGGTTCGTGATTGGTGGGTTT	239
		Cpf1	ATCCTTAGGTTCGTGATTGG	240
	ABE	SpCas9	ACCCACCAATCACGAACCTA	241
			ATCACGAACCTAAGGATGAA	242
			ACCAATCACGAACCTAAGGA	243
			CCCACCAATCACGAACCTAA	244
			AGATCCAAACCCACCAATCA	245
			AATCACGAACCTAAGGATGA	246
			CAATCACGAACCTAAGGATG	247
			CCAATCACGAACCTAAGGAT	248
			CCACCAATCACGAACCTAAG	249
			AACCCACCAATCACGAACCT	250
			AAACCCACCAATCACGAACC	251
			ATCCAAACCCACCAATCACG	252
			GATCCAAACCCACCAATCAC	253
			GAAGATCCAAACCCACCAAT	254
		AtCas9	ACCAATCACGAACCTAAGGATG	255
			AAGATCCAAACCCACCAATCAC	256
			GAAGATCCAAACCCACCAATCA	257
			CCACCAATCACGAACCTAAGGA	258
			CAAACCCACCAATCACGAACCT	259
			ATCCAAACCCACCAATCACGAA	260
			CACCAATCACGAACCTAAGGAT	261
			AACCCACCAATCACGAACCTAA	262
		Cpf1	GATCCAAACCCACCAATCAC	263
L30	ABE	SpCas9	AGGTTCGTGATTGGTGGGTT	264
			TCCTTAGGTTCGTGATTGGT	265
			ATCCTTAGGTTCGTGATTGG	266
			TTCATCCTTAGGTTCGTGAT	267
			CCTTAGGTTCGTGATTGGTG	268
			TCATCCTTAGGTTCGTGATT	269
			TGCTTTCATCCTTAGGTTCG	270
			TTTGCTTTCATCCTTAGGTT	271
			AGCCTTTGCTTTCATCCTTA	272
			GCTTTCATCCTTAGGTTCGT	273
		AtCas9	TAGGTTCGTGATTGGTGGGTTT	274
			TGAGCCTTTGCTTTCATCCTTA	275
		Cpf1	ATCCTTAGGTTCGTGATTGG	276
	CBE	SpCas9	GAACCTAAGGATGAAAGCAA	277
			ACCCACCAATCACGAACCTA	278
			AACCTAAGGATGAAAGCAAA	279
			ATCACGAACCTAAGGATGAA	280
			ACCAATCACGAACCTAAGGA	281
			CCCACCAATCACGAACCTAA	282
			CGAACCTAAGGATGAAAGCA	283
			ACGAACCTAAGGATGAAAGC	284
			CACGAACCTAAGGATGAAAG	285
			AATCACGAACCTAAGGATGA	286
			CAATCACGAACCTAAGGATG	287
			CCACCAATCACGAACCTAAG	288
			AACCCACCAATCACGAACCT	289
			AAACCCACCAATCACGAACC	290
		AtCas9	CACGAACCTAAGGATGAAAGCA	291
			ACCAATCACGAACCTAAGGATG	292
			ACCTAAGGATGAAAGCAAAGGC	293
			CGAACCTAAGGATGAAAGCAAA	294

TABLE 2E-continued

Example spacer sequences of gRNA for editing CD123 epitope

Residue	Editor	Cas	Spacer	SEQ ID NO:
			GAACCTAAGGATGAAAGCAAAG	295
			CAAACCCACCAATCACGAACCT	296
			AACCCACCAATCACGAACCTAA	297
			CACCAATCACGAACCTAAGGAT	298
M32	ABE	SpCas9	TTCATCCTTAGGTTCGTGAT	299
			GAGCCTTTGCTTTCATCCTT	300
			TGCTTTCATCCTTAGGTTCG	301
			TTTGCTTTCATCCTTAGGTT	302
			AGCCTTTGCTTTCATCCTTA	303
			GCTTTCATCCTTAGGTTCGT	304
			TGAGCCTTTGCTTTCATCCT	305
		AtCas9	TGAGCCTTTGCTTTCATCCTTA	306
			GAGCCTTTGCTTTCATCCTTAG	307
		Cpf1	CTTTCATCCTTAGGTTCGTG	308
	ABE	SpCas9	GAACCTAAGGATGAAAGCAA	309
			GATGAAAGCAAAGGCTCAGC	310
			AAGGATGAAAGCAAAGGCTC	311
			AACCTAAGGATGAAAGCAAA	312
			ATCACGAACCTAAGGATGAA	313
			ACCAATCACGAACCTAAGGA	314
			GGATGAAAGCAAAGGCTCAG	315
			TAAGGATGAAAGCAAAGGCT	316
			CGAACCTAAGGATGAAAGCA	317
			ACGAACCTAAGGATGAAAGC	318
			AATCACGAACCTAAGGATGA	319
			CAATCACGAACCTAAGGATG	320
			CCAATCACGAACCTAAGGAT	321
		AtCas9	CACGAACCTAAGGATGAAAGCA	322
			ACCAATCACGAACCTAAGGATG	323
			ATGAAAGCAAAGGCTCAGCAGT	324
			GATGAAAGCAAAGGCTCAGCAG	325
			ACCTAAGGATGAAAGCAAAGGC	326
			CGAACCTAAGGATGAAAGCAAA	327
			GAACCTAAGGATGAAAGCAAAG	328
			CCACCAATCACGAACCTAAGGA	329
			CACCAATCACGAACCTAAGGAT	330
W41	ABE	SpCas9	TAAGGTCCCAGGTCAACTGC	331
			CAGGTCAACTGCTGAGCCTT	332
			AGGTCCCAGGTCAACTGCTG	333
			TGTTAAGGTCCCAGGTCAAC	334
			ACATTTCTGTTAAGGTCCCA	335
			AAGGTCCCAGGTCAACTGCT	336
			TTCTGTTAAGGTCCCAGGTC	337
		AtCas9	TTTCTGTTAAGGTCCCAGGTCA	338
			CAGGTCAACTGCTGAGCCTTTG	339
			GTCCCAGGTCAACTGCTGAGCC	340
			TTAAGGTCCCAGGTCAACTGCT	341
			GTTAAGGTCCCAGGTCAACTGC	342
			TTTCTGTTAAGGTCCCAGGTCA	343
			ACATTTCTGTTAAGGTCCCAGG	344
		Cpf1	TGTTAAGGTCCCAGGTCAAC	345
E51	CBE	SpCas9	GTCTTTAACACACTCGATAT	346
			CTCGATATCGGTCACATTTC	347
			AACACACTCGATATCGGTCA	348
			TTAACACACTCGATATCGGT	349
			GGCGTCTTTAACACACTCGA	350
			TCGGCGTCTTTAACACACTC	351
		AtCas9	GCGTCTTTAACACACTCGATAT	352
			TAACACACTCGATATCGGTCAC	353
			GTCTTTAACACACTCGATATCG	354
			GTCGGCGTCTTTAACACACTCG	355
			ACACACTCGATATCGGTCACAT	356
			ACACACTCGATATCGGTCACAT	357
		Cpf1	ACACACTCGATATCGGTCAC	358
	ABE	SpG	ATCGAGTGTGTTAAAGACGC	359
			GATATCGAGTGTGTTAAAGA	360
			ACCGATATCGAGTGTGTTAA	361
			AATGTGACCGATATCGAGTG	362
			GAAATGTGACCGATATCGAG	363
			AGTGTGTTAAAGACGCCGAC	364
			TCGAGTGTGTTAAAGACGCC	365
			CCGATATCGAGTGTGTTAAA	366
			GACCGATATCGAGTGTGTTA	367
			TGACCGATATCGAGTGTGTT	368
		AtCas9	GACCGATATCGAGTGTGTTAAA	369
			CGAGTGTGTTAAAGACGCCGAC	370
			GATATCGAGTGTGTTAAAGACG	371
			ACCGATATCGAGTGTGTTAAAG	372
			GTGACCGATATCGAGTGTGTTA	373
			CGATATCGAGTGTGTTAAAGAC	374
			AAATGTGACCGATATCGAGTGT	375
			ACAGAAATGTGACCGATATCGA	376
C52	CBE	SpCas9	GTCTTTAACACACTCGATAT	377
	ABE		TCTTTAACACACTCGATATC	378
			GTCGGCGTCTTTAACACACT	379
			AACACACTCGATATCGGTCA	380
			TTAACACACTCGATATCGGT	381
			GGCGTCTTTAACACACTCGA	382
			TCGGCGTCTTTAACACACTC	383
		AtCas9	GCGTCTTTAACACACTCGATAT	384
			TAACACACTCGATATCGGTCAC	385
			GTCTTTAACACACTCGATATCG	386
			GTCGGCGTCTTTAACACACTCG	387
			ACACACTCGATATCGGTCACAT	388
			CGGCGTCTTTAACACACTCGAT	389
			GAATAGTCGGCGTCTTTAACAC	390
		Cpf1	ACACACTCGATATCGGTCAC	391
S59	CBE	SpCas9	ATTTACCGGCATAGAATAGT	392
			GACGCCGACTATTCTATGCC	393
			TAAAGACGCCGACTATTCTA	394
			TATTCTATGCCGGTAAATCA	395
			ACTATTCTATGCCGGTAAAT	396
			CCGACTATTCTATGCCGGTA	397
			GCCGACTATTCTATGCCGGT	398
		AtCas9	ACGCCGACTATTCTATGCCGGT	399
			TATTCTATGCCGGTAAATCATA	400
			ACTATTCTATGCCGGTAAATCA	401
			CGACTATTCTATGCCGGTAAAT	402
			TGTTAAAGACGCCGACTATTCT	403
			AGACGCCGACTATTCTATGCCG	404
			TTAAAGACGCCGACTATTCTAT	405
			GTTAAAGACGCCGACTATTCTA	406
	ABE	SpCas9	ATTTACCGGCATAGAATAGT	407
			TTTACCGGCATAGAATAGTC	408
			ATGATTTACCGGCATAGAAT	409
			AATAGTCGGCGTCTTTAACA	410
			AGAATAGTCGGCGTCTTTAA	411
			ATAGAATAGTCGGCGTCTTT	412
		AtCas9	CGGCATAGAATAGTCGGCGTCT	413
			AGAATAGTCGGCGTCTTTAACA	414
			ATAGAATAGTCGGCGTCTTTAA	415
			GCATAGAATAGTCGGCGTCTTT	416
			CGGCATAGAATAGTCGGCGTCT	417
			ATTTACCGGCATAGAATAGTCG	418
			ACCGGCATAGAATAGTCGGCGT	419
			GAATAGTCGGCGTCTTTAACAC	420
R84	CBE	SpCas9	GGCCACTCGGACGGTGTAGT	421
			TGGTGGGTTGGCCACTCGGA	422
			GTTGGCCACTCGGACGGTGT	423
			TGGGTTGGCCACTCGGACGG	424

TABLE 2E-continued

Example spacer sequences of gRNA for editing CD123 epitope

Residue	Editor	Cas	Spacer	SEQ ID NO:
			GGTGGGTTGGCCACTCGGAC	425
			GAATGGTGGGTTGGCCACTC	426
			GCCACTCGGACGGTGTAGTT	427
			ACTCGGACGGTGTAGTTGGT	428
			AATGGTGGGTTGGCCACTCG	429
		AtCas9	CTCGGACGGTGTAGTTGGTCAC	430
			CACTCGGACGGTGTAGTTGGTC	431
			GGCCACTCGGACGGTGTAGTTG	432
			TTGGCCACTCGGACGGTGTAGT	433
			TCGGACGGTGTAGTTGGTCACT	434
			GGTTGGCCACTCGGACGGTGTA	435
P88	CBE	SpCas9	CCAACCCACCATTCTCCACG	436
			CAACCCACCATTCTCCACGT	437
			GGCCAACCCACCATTCTCCA	438
			AACCCACCATTCTCCACGTG	439
			GTGGCCAACCCACCATTCTC	440
			CGTCCGAGTGGCCAACCCAC	441
			CACCGTCCGAGTGGCCAACC	442
		AtCas9	CCACCATTCTCCACGTGGATCC	443
			AACCCACCATTCTCCACGTGGA	444
			CCAACCCACCATTCTCCACGTG	445
			GCCAACCCACCATTCTCCACGT	446
			CCGAGTGGCCAACCCACCATTC	447
			GTCCGAGTGGCCAACCCACCAT	448
			GTCCGAGTGGCCAACCCACCAT	449
			GTCCGAGTGGCCAACCCACCAT	450
F90	ABE	SpCas9	CCACGTGGAGAATGGTGGGT	451
			AGAATGGTGGGTTGGCCACT	452
			GGATCCACGTGGAGAATGGT	453
			AAGAGGATCCACGTGGAGAA	454
			GAATGGTGGGTTGGCCACTC	455
			CACGTGGAGAATGGTGGGTT	456
			GATCCACGTGGAGAATGGTG	457
			AGAGGATCCACGTGGAGAAT	458
			AATGGTGGGTTGGCCACTCG	459
			GTGGAGAATGGTGGGTTGGC	460
		AtCas9	ACGTGGAGAATGGTGGGTTGGC	461
			GGAGAATGGTGGGTTGGCCACT	462
			CCACGTGGAGAATGGTGGGTTG	463
			ATCCACGTGGAGAATGGTGGGT	464
			GATCCACGTGGAGAATGGTGGG	465
			GGATCCACGTGGAGAATGGTGG	466
S91	ABE	SpCas9	CCACGTGGAGAATGGTGGGT	467
			GGATCCACGTGGAGAATGGT	468
			AAGAGGATCCACGTGGAGAA	469
			AGGATCCACGTGGAGAATGG	470
			CACGTGGAGAATGGTGGGTT	471
			GATCCACGTGGAGAATGGTG	472
			AGAGGATCCACGTGGAGAAT	473
			GTGGAGAATGGTGGGTTGGC	474
			GGGAAGAGGATCCACGTGGA	475
		AtCas9	ACGTGGAGAATGGTGGGTTGGC	476
			GGAGAATGGTGGGTTGGCCACT	477
			CCACGTGGAGAATGGTGGGTTG	478
			ATCCACGTGGAGAATGGTGGGT	479
			GATCCACGTGGAGAATGGTGGG	480
			GGATCCACGTGGAGAATGGTGG	481
	CBE	SpCas9	CCAACCCACCATTCTCCACG	482
			TCCACGTGGATCCTCTTCCC	483
			CCACGTGGATCCTCTTCCCT	484
			AACCCACCATTCTCCACGTG	485
			GTGGCCAACCCACCATTCTC	486
		AtCas9	ACCATTCTCCACGTGGATCCTC	487
			TCCACGTGGATCCTCTTCCCTG	488
			ACCATTCTCCACGTGGATCCTC	489
			CACCATTCTCCACGTGGATCCT	490
			CCACCATTCTCCACGTGGATCC	491
			AACCCACCATTCTCCACGTGGA	492
			CCAACCCACCATTCTCCACGTG	493
			GCCAACCCACCATTCTCCACGT	494
			TCTCCACGTGGATCCTCTTCCC	495
			ATTCTCCACGTGGATCCTCTTC	496
			CATTCTCCACGTGGATCCTCTT	497
W93	ABE	SpCas9	CCACGTGGAGAATGGTGGGT	498
			GGATCCACGTGGAGAATGGT	499
			AAGAGGATCCACGTGGAGAA	500
			CTCAGGGAAGAGGATCCACG	501
			CACGTGGAGAATGGTGGGTT	502
			GATCCACGTGGAGAATGGTG	503
			AGAGGATCCACGTGGAGAAT	504
			TCAGGGAAGAGGATCCACGT	505
			TTCTCAGGGAAGAGGATCCA	506
		AtCas9	GGAAGAGGATCCACGTGGAG	507
			GGGAAGAGGATCCACGTGGA	508
			CAGGGAAGAGGATCCACGTG	509
			ACGTGGAGAATGGTGGGTTGGC	510
			CCACGTGGAGAATGGTGGGTTG	511
			ATCCACGTGGAGAATGGTGGGT	512
			GATCCACGTGGAGAATGGTGGG	513
			GTTCTCAGGGAAGAGGATCCAC	514
			GGATCCACGTGGAGAATGGTGG	515
			TGTTCTCAGGGAAGAGGATCCA	516

TABLE 2F

Example spacer sequences of pegRNA for editing CD123 epitope

Residue	Spacer	SEQ ID NO:
R84, P88, F90, S91, W93	AACAATAGCTATTGCCAGTT	517
	CATAGTCCTATGTCTCTCTT	518
	AAGACACAGCGAAGGCGAGA	519
	AAAGACACAGCGAAGGCGAG	520
	ACACAGCGAAGGCGAGAGGG	521
	TCTCACTGTTCTCAGGGAAG	522
	CACAGCGAAGGCGAGAGGGA	523
	ACATTTTTCTCACTGTTCTC	524
	CATTTTTCTCACTGTTCTCA	525
	AAAGAAAAAAGACACAGCGA	526
	GGGAGAGAGGGAAGGAGGGA	527
	AGGGAGAGAGGGAAGGAGGG	528
	GGGAGGGAGAGAGGGAAGGA	529
	AGGGAGGGAGAGAGGGAAGG	530
	GAGAGGGAGGGAGAGAGGGA	531
	AAGGCGAGAGGGAGGGAGAG	532
	AGGCGAGAGGGAGGGAGAGA	533
E51, C52, S59, P61	ACCCACCAATCACGAACCTA	534
	AAAGGCTCAGCAGTTGACCT	535
	CAAAGGCTCAGCAGTTGACC	536
	GAACCTAAGGATGAAAGCAA	537
I27, L30, M32, W41	GTCTTTAACACACTCGATAT	538
	TATCGGTCACATTTCTGTTA	539
I27, L30, M32	CACATTTCTGTTAAGGTCCC	540
I27, L30	GAGCCTTTGCTTTCATCCTTAGG	541

TABLE 3A

Epitope Residues in CD117	
Antibody	Target Residues in Epitope
Ab85	T67, K69, T71, S81, Y83, T114, T119, K129
Ab65	S236, H238, Y244, S273, T277, T279

TABLE 3B

CD117 Protein Sequence (SEQ ID NO: 3)

QPSVSPGEPSPPSIHPGKSDLIVRVGDEIRLLCTDPGFVKWTFEILDETN

ENKQNEWITEKAEATN**T**G**K**Y**T**CTNKHGLSN**S**I**Y**VFVRDPAKLFLVDRSLY

GKEDNDTLVRCPL**T**DPEV**T**NYSLKGCQGKPLPKDLRFIPDPKAGIMIKSV

KRAYHRLCLHCSVDQEGKSVLSEKFILKVRPAFKAVPVVSVSKASYLLRE

GEEFTVTCTIKDVSSSVYSTWKRENSQTKLQEKYN**S**W**H**HGDFN**Y**ERQATL

TISSARVNDSGVFMCYANNTFG**S**ANV**T**T**T**LEVVDKGFINIFPMINTTVFV

NDGENVDLIVEYEAFPKPEHQQWIYMNRTFTDKWEDYPKSENESNIRYVS

ELHLTRLKGTEGGTYTFLVSNSDVNAAIAFNVYVNTKPEILTYDRLVNGM

LQCVAAGFPEPTIDWYFCPGTEQRCSASVLPVDVQTLNSSGPPFGKLVVQ

SSIDSSAFKHNGTVECKAYNDVGKTSAYFNFAFKGNNKEQIHPHTLFTPL

LIGFVIVAGMMCIIVMILTYKYLQKPMYEVQWKVVEEINGNNYVYIDPTQ

LPYDHKWEFPRNRLSFGKTLGAGAFGKVVEATAYGLIKSDAAMTVAVKML

KPSAHLTEREALMSELKVLSYLGNHMNIVNLLGACTIGGPTLVITEYCCY

GDLLNFLRRKRDSFICSKQEDHAEAALYKNLLHSKESSCSDSTNEYMDMK

PGVSYVVPTKADKRRSVRIGSYIERDVTPAIMEDDELALDLEDLLSFSYQ

VAKGMAFLASKNCIHRDLAARNILLTHGRITKICDFGLARDIKNDSNYVV

KGNARLPVKWMAPESIFNCVYTFESDVWSYGIFLWELFSLGSSPYPGMPV

DSKFYKMIKEGFRMLSPEHAPAEMYDIMKTCWDADPLKRPTFKQIVQLIE

KQISESTNHIYSNLANCSPNRQKPVVDHSVRINSVGSTASSSQPLLVHDD

V

TABLE 3C

VH/VL of Ab85		
Region	Sequence	SEQ ID NO:
VH	EVQLVQSGAEVKKPGESLKISCKGSGYSFTNYWIGWVRQMPGKGLEWMAIINPRDSDTRYRPSFQGQVTISADKSISTAYLQWSSLKASDTAMYYCARHGRGYEGYEGAFDIWGQGTLVTVSS	13
VL	DIQMTQSPSSLSASVGDRVTITCRSSQGIRSDLGWYQQKPGKAPKLLIYDASNLETGVPSRFSGS GSGTDFTLTISSLQPEDFATYYCQQANGFPLTFGGGTKVEIK	14

TABLE 3D

VH/VL of Ab67		
Region	Sequence	SEQ ID NO:
VH	EVQLVESGGGLVQPGGSLRLSCAASGFTFSDADMDWVRQAPGKGLEWVGRTRNKAGSYTTEYAASVKGRFTISRDDSKNSLYLQMNSLKTEDTAVYYCAREPKYWIDFDLWGRGTLVTVSS	15
VL	DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQSYIAPYTFGGGTKVEIK	16

TABLE 3E

Example spacer sequences of gRNA for editing CD117 epitope				
Residue	Editor	Cas	Spacer	SEQ ID NO:
T67	ABE/CBE	Sp cas9	aacaccggcaaatacacgtg	542
			ccaacaccggcaaatacacg	543
			caccaacaccggcaaataca	544
			gccaccaacaccggcaaata	545
			aagccaccaacaccggcaaa	546
		At cas9	aacaccggcaaatacacgtgca	547
			caccaacaccggcaaatacacg	548
			accaacaccggcaaatacacgt	549
			gccaccaacaccggcaaataca	550
			gcagaagccaccaacaccggca	551
			ccaacaccggcaaatacacgtg	552
			caacaccggcaaatacacgtgc	553
			caccggcaaatacacgtgcacc	554
K69	ABE	Sp cas9	ccggcaaatacacgtgcacc	555
			accggcaaatacacgtgcac	556
			ggcaaatacacgtgcaccaa	557
			gcaaatacacgtgcaccaac	558
			caaatacacgtgcaccaaca	559
		At cas9	ccggcaaatacacgtgcaccaa	560
			ggcaaatacacgtgcaccaaca	561
T71	ABE/CBE	Sp cas9	tacacgtgcaccaacaaaca	562
			aatacacgtgcaccaacaaa	563
			acacgtgcaccaacaaacac	564
		At cas9	aaatacacgtgcaccaacaaac	565
			acacgtgcaccaacaaacacgg	566
S81	CBE	Sp cas9	attccatttatgtgtttgtt	567
			aattccatttatgtgtttgt	568
			agcaattccatttatgtgtt	569
			cttaagcaattccatttatg	570
			ggcttaagcaattccattta	571
	ABE		ataaatggaattgcttaagc	572
			aaatggaattgcttaagccg	573
			ggaattgcttaagccgtgtt	574
			acacataaatggaattgctt	575
			aacacataaatggaattgct	576
			cacataaatggaattgctta	577
	ABE	At cas9	caaacacataaatggaattgct	578
			aaacacataaatggaattgctt	579
			caaacacataaatggaattgct	580
	CBE		caattccatttatgtgtttgtt	581
			gcaattccatttatgtgtttgt	582
			gcttaagcaattccatttatgt	583
Y83	ABE	Sp cas9	ttatgtgtttgttagaggta	584
			tttatgtgtttgttagaggt	585
			atttatgtgtttgttagagg	586
			ccatttatgtgtttgttaga	587

TABLE 3E-continued

Example spacer sequences of gRNA for editing CD117 epitope

Residue	Editor	Cas	Spacer	SEQ ID NO:
			tccatttatgtgtttgttag	588
			ttccatttatgtgtttgtta	589
			tctaacaaacacataaatgg	590
			ctctaacaaacacataaatg	591
			acctctaacaaacacataaa	592
		At cas9	ctctaacaaacacataaatgga	593
			atttatgtgtttgttagaggta	594
			gcaattccatttatgtgtttgt	595
T114	ABE/ CBE	Sp cas9	ctcacagacccagaagtgac	596
			cctctcacagacccagaagt	597
			tcacagacccagaagtgacc	598
			tcctctcacagacccagaag	599
			tgtcctctcacagacccaga	600
			ctgtcctctcacagacccag	601
			gctgtcctctcacagaccca	602
			cgctgtcctctcacagaccc	603
			ccgctgtcctctcacagacc	604
		At cas9	ctgtcctctcacagacccagaa	605
			cacagacccagaagtgaccaat	606
			tgtcctctcacagacccagaag	607
			tcctctcacagacccagaagtg	608
			gctgtcctctcacagacccaga	609
			tccgctgtcctctcacagaccc	610
T119	ABE/ CBE	Sp cas9	gtgaccaattattccctca	611
			gtgaccaattattccctcaa	612
			aagtgaccaattattccctc	613
			gtgaccaattattccctcaa	614
			tgaccaattattccctcaag	615
			gaccaattattccctcaagg	616
			gaagtgaccaattattccct	617
		At cas9	cagacccagaagtgaccaatta	618
			gacccagaagtgaccaattatt	619
			acagacccagaagtgaccaatt	620
			gtgaccaattattccctcaagg	621
			tgaccaattattccctcaaggg	622
			agtgaccaattattccctcaag	623
K129	ABE	Sp cas9	ccaggggaagcctcttccca	624
			caggggaagcctcttcccaa	625
			aggggaagcctcttcccaag	626
			gaagcctcttcccaaggact	627
	CBE		ccttgggaagaggcttcccc	628
			tgggaagaggcttcccctgg	629
			aggcttcccctggcacccct	630
			ggcttcccctggcacccctt	631
	ABE	At cas9	tgccaggggaagcctcttccca	632
			ggggtgccaggggaagcctctt	633
	CBE		ttgggaagaggcttcccctggc	634
			cttgggaagaggcttcccctgg	635
			ccttgggaagaggcttcccctg	636
			agtccttgggaagaggcttccc	637
			aggcttcccctggcaccccttg	638
			ggcttcccctggcaccccttga	639
			aagaggcttcccctggcacccc	640
			agaggcttcccctggcacccct	641
S236	ABE	Sp cas9	aaatataatagctggcatca	642
			tataatagctggcatcacgg	643
			aatataatagctggcatcac	644
			ataatagctggcatcacggt	645
			agaaatataatagctggcat	646
			aggagaaatataatagctgg	647
	CBE		gccagctattatatttctcc	648
			caccgtgatgccagctatta	649
			cagctattatatttctcctg	650
			agctattatatttctcctgt	651
	ABE	At cas9	tataatagctggcatcacggtg	652
			aaatataatagctggcatcacg	653
			caggagaaatataatagctggc	654
			tacaggagaaatataatagctg	655
			taatagctggcatcacggtgac	656
			tagctggcatcacggtgacttc	657
			ggagaaatataatagctggcat	658
	CBE		ccgtgatgccagctattatatt	659
			accgtgatgccagctattatat	660
			tcaccgtgatgccagctattat	661
H238	ABE/ CBE	Sp cas9	agctggcatcacggtgactt	662
			gctggcatcacggtgacttc	663
			ggcatcacggtgacttcaat	664
		At cas9	ggcatcacggtgacttcaatta	665
			gcatcacggtgacttcaattat	666
Y244	ABE	Sp cas9	tgacttcaattatgaacgtc	667
			ttatgaacgtcaggcaacgt	668
			caattatgaacgtcaggcaa	669
			gacttcaattatgaacgtca	670
			acggtgacttcaattatgaa	671
			cataattgaagtcaccgtga	672
			gttcataattgaagtcaccg	673
			acgttcataattgaagtcac	674
			tgcctgacgttcataattga	675
			cgttgcctgacgttcataat	676
			ttcaattatgaacgtcaggc	677
			cttcaattatgaacgtcagg	678
			gtgacttcaattatgaacgt	679
			tcacggtgacttcaattatg	680
			ttcataattgaagtcaccgt	681
			ctgacgttcataattgaagt	682
			ttgcctgacgttcataattg	683
			gttgcctgacgttcataatt	684
		At cas9	caattatgaacgtcaggcaacg	685
			tatgaacgtcaggcaacgttga	686
			tgacttcaattatgaacgtcag	687
			cggtgacttcaattatgaacgt	688
			gttcataattgaagtcaccgtg	689
			cataattgaagtcaccgtgatg	690
			cgttcataattgaagtcaccgt	691
			tgcctgacgttcataattgaag	692
			ttgcctgacgttcataattgaa	693
			cgttgcctgacgttcataattg	694
			tcaattatgaacgtcaggcaac	695
			attatgaacgtcaggcaacgtt	696
			acggtgacttcaattatgaacg	697
			cacggtgacttcaattatgaac	698
			tcataattgaagtcaccgtgat	699
			acgttcataattgaagtcaccg	700
			gcctgacgttcataattgaagt	701
S273	CBE	Sp cas9	ggatcagcaaatgtcacaac	702
			tggatcagcaaatgtcacaa	703
			tttggatcagcaaatgtcac	704
			ttttggatcagcaaatgtca	705
			acttttggatcagcaaatgt	706
			aatacttttggatcagcaaa	707
			ataatacttttggatcagca	708
			aataatacttttggatcagc	709
			caataatacttttggatcag	710
	ABE		gctgatccaaaagtattat	711
			tgatccaaaagtattattgg	712
			gctgatccaaaagtattatt	713
			atttgctgatccaaaagtat	714
			gacatttgctgatccaaaag	715
			gtgacatttgctgatccaaa	716
			tgtgacatttgctgatccaa	717
			ttgtgacatttgctgatcca	718
			gttgtgacatttgctgatcc	719
			tgttgtgacatttgctgatc	720

TABLE 3E-continued

Example spacer sequences of gRNA for editing CD117 epitope

Residue	Editor	Cas	Spacer	SEQ ID NO:
	ABE	At cas9	atttgctgatccaaaagtatta	721
			ctgatccaaaagtattattggc	722
			aataatacttttggatcagcaa	723
			ttttggatcagcaaatgtcaca	724
			tttggatcagcaaatgtcacaa	725
			tacttttggatcagcaaatgtc	726
			taatacttttggatcagcaaat	727
			ctgatccaaaagtattattggc	728
			gatccaaaagtattattggcat	729
			tcagcaaatgtcacaacaacct	730
			atacttttggatcagcaaatgt	731
			aatacttttggatcagcaaatg	732
			ataatacttttggatcagcaaa	733
			tttgctgatccaaaagtattat	734
			tgctgatccaaaagtattattg	735
			gttgtgacatttgctgatccaa	736
			acatttgctgatccaaaagtat	737
			ggatcagcaaatgtcacaacaa	738
T277	ABE/ CBE	Sp cas9	agcaaatgtcacaacaacct	739
			gtcacaacaaccttggaagt	740
			cacaacaaccttggaagtag	741
			tgtcacaacaaccttggaag	742
			aatgtcacaacaaccttgga	743
			aaatgtcacaacaaccttgg	744
			caaatgtcacaacaaccttg	745
			gcaaatgtcacaacaacctt	746
			ggatcagcaaatgtcacaac	747
		At cas9	cacaacaaccttggaagtagta	748
			gcaaatgtcacaacaaccttgg	749
			tgtcacaacaaccttggaagta	750
			atgtcacaacaaccttggaagt	751
T279	ABE/ CBE	Sp cas9	caacaaccttggaagtagt	752
			caacaaccttggaagtagta	753
			acaaccttggaagtagtagg	754
			caaccttggaagtagtaggt	755
			aaccttggaagtagtaggta	756
		At cas9	caaccttggaagtagtaggtaa	757
			acaaccttggaagtagtaggta	758

TABLE 3F

Example spacer sequences of pegRNA for editing CD117 epitope

Residue	Spacer	SEQ ID NO:
T67, K69, T71, S81, Y83	CTGATCCGGGCTTTGTCAAATGG	759
	TACACGTGCACCAACAAACACGG	760
	CAAATGGACTTTTGAGATCCTGG	761
	GAATGAATGGATCACGGAAAAGG	762
	AAGGCAGAAGCCACCAACACCGG	763
	ATGAGAATAAGCAGAATGAATGG	764
	TAAGCAGAATGAATGGATCACGG	765
	ATTGCTTAAGCCGTGTTTGTTGG	766
	TGTCATCCAAAATTAAGAGCAGG	767
	GTTGGTGCACGTGTATTTGCCGG	768
	ACCTCTAACAAACACATAAATGG	769
T114, T119, K129	TTGTTGACCGCTCCTTGTATGGG	770
	CTTGTTGACCGCTCCTTGTATGG	771
	GAAAGAAGACAACGACACGCTGG	772
	TTATTCCCTCAAGGGGTGCCAGG	773
	TGACCAATTATTCCCTCAAGGGG	774
	TATTCCCTCAAGGGGTGCCAGGG	775
	GTGACCAATTATTCCCTCAAGGG	776

TABLE 3F-continued

Example spacer sequences of pegRNA for editing CD117 epitope

Residue	Spacer	SEQ ID NO:
	ATTCCCTCAAGGGGTGCCAGGGG	777
	TTGATCATGATGCCCGCCTTGGG	778
	ATGCAGACAGAGCCGATGGTAGG	779
	TGATCATGATGCCCGCCTTGGGG	780
	TTTGATCATGATGCCCGCCTTGG	781
	GCACCCCTTGAGGGAATAATTGG	782
	AACAATGCAGACAGAGCCGATGG	783
	GGGAATAATTGGTCACTTCTGGG	784
	AGGGAATAATTGGTCACTTCTGG	785
	AGGAATAAACCTCAAGTCCTTGG	786
	ATGATGCCCGCCTTGGGGTCAGG	787
	CTTCCCCTGGCACCCCTTGAGGG	788
	GCTTCCCCTGGCACCCCTTGAGG	789
	AACCTCAAGTCCTTGGGAAGAGG	790
	GGAATAAACCTCAAGTCCTTGGG	791
S236, H238, Y244	AAACCAGCAGACTAAACTACAGG	792
	TACAGGAGAAATATAATAGCTGG	793
	AAATATAATAGCTGGCATCACGG	794
	GATTCTGAATATAAATTATATGG	795
	TGCTGATCCAAAAGTATTATTGG	796
S273, T277, T279	TCAGCGAGAGTTAATGATTCTGG	797
	TGACTTCAATTATGAACGTCAGG	798
	TGTTATGCCAATAATACTTTTGG	799
	GTATTTACCTACTACTTCCAAGG	800
	TAATTTAAACATTCCCATAGAGG	801

TABLE 4A

Epitope Residues in CLL-1

Antibody	Target Residues in Epitope
Hu6E7.N54A	142 to 158 (DSCYFLSDDVQTWQESK) of SEQ ID NO: 4

TABLE 4B

CLL-1 Protein Sequence (SEQ ID NO: 4)
MSEEVTYADLQFQNSSEMEKIPEIGKFGEKAPPAPSHVWRPAALFLTLLC LLLLIGLGVLASMFHVTLKIEMKKMNKLQNISEELQRNISLQLMSNMNIS NKIRNLSTTLQTIATKLCRELYSKEQEHKCKPCPRRWIWHK**DSCYFLSDD** **VQTWQESK**MACAAQNASLLKINNKNALEFIKSQSRSYDYWLGLSPEEDST RGMRVDNIINSSAWVIRNAPDLNNMYCGYINRLYVQYYHCTYKKRMICEK MANPVQLGSTYFREA

TABLE 4C

VH/VL of Hu6E7.N54A

Region	Sequence	SEQ ID NO:
VH	EVQLVQSGAEVKKPGASVKVSCKASGYSFTDYYMHWVRQAPGQGLEWIGRINPYAGAAFYSQNFKDRVTLTVDTSTSTAYLELSSLRSEDTAVYYCAIERGADLEGYAMDYWGQGTLVTVSS	17

TABLE 4C-continued

VH/VL of Hu6E7.N54A

Region	Sequence	SEQ ID NO:
VL	DIQMTQSPSSLSASVGDRVTITCRASQ SVSTSSYNYMHWYQQKPGKPPKLLIKY ASNLESGVPSRFSGSGSGTDFTLTISS LQPEDFATYYCQHSWEIPLTFGQGTKV EIK	18

TABLE 4D

Example spacer sequences of gRNA for editing CLL-1 epitope

Residues	Editor	Cas	Spacer	SEQ ID NO:
142-158	ABE	Sp cas9	taagtgatgatgtccaaaca	802
			tgatgatgtccaaacatggc	803
			aacatggcaggagagtaaaa	804
	ABE/CBE		atgtttggacatcatcactt	805
	CBE		ttttactctcctgccatgtt	806
	ABE		aggacagctgttatttccta	807
			gacagctgttatttcctaag	808
			agctgttatttcctaagtga	809
	ABE/CBE		tgttatttcctaagtgatga	810
			tgatgtccaaacatggcagg	811
			atgtccaaacatggcaggag	812
			ggcaggagagtaaaatggcc	813
			caggagagtaaaatggcctg	814
			ggaaataacagctgtcctta	815
			atcacttaggaaataacagc	816
			atcatcacttaggaaataac	817
			gccattttactctcctgcca	818
	ABE		taaggacagctgttatttcc	819
			aaggacagctgttatttcct	820
			acagctgttatttcctaagt	821
			gctgttatttcctaagtgat	822
			atttcctaagtgatgatgtc	823
			ttcctaagtgatgatgtcca	824
			cctaagtgatgatgtccaaa	825
			atgatgtccaaacatggcag	826
	ABE/CBE		gatgtccaaacatggcagga	827
			gtccaaacatggcaggagag	828
			tccaaacatggcaggagagt	829
			caaacatggcaggagagtaa	830
	CBE		gctgtccttatgccaaatc	831
	ABE/CBE		taacagctgtccttatgcca	832
			ataacagctgtccttatgcc	833
			aataacagctgtccttatgc	834
			catcatcacttaggaaataa	835
			gacatcatcacttaggaaat	836
			ttggacatcatcacttagga	837
			tttggacatcatcacttagg	838
			gtttggacatcatcacttag	839
			ctgccatgtttggacatcat	840
			ctcctgccatgtttggacat	841
			actctcctgccatgtttgga	842
			ttactctcctgccatgtttg	843
			aggccattttactctcctgc	844
	ABE	At cas9	agctgttatttcctaagtgatg	845
			agctgttatttcctaagtgatg	846
			tttggcataaggacagctgtta	847
	ABE/CBE		ttaggaaataacagctgtcctt	848
			cttaggaaataacagctgtcct	849
			tcatcacttaggaaataacagc	850
			tctcctgccatgtttggacatc	851
	ABE		taaggacagctgttatttccta	852
	ABE/CBE		tgttatttcctaagtgatgatg	853
	ABE		cctaagtgatgatgtccaaaca	854
	ABE/CBE		gtgatgatgtccaaacatggca	855
			atgatgtccaaacatggcagga	856

TABLE 4D-continued

Example spacer sequences of gRNA for editing CLL-1 epitope

Residues	Editor	Cas	Spacer	SEQ ID NO:
			tgtttggacatcatcacttagg	857
			cctgccatgtttggacatcatc	858
			ttactctcctgccatgtttgga	859
			attttactctcctgccatgttt	860
			ttatttcctaagtgatgatgtc	861
	ABE		tcctaagtgatgatgtccaaac	862
	ABE/CBE		ccaaacatggcaggagagtaaa	863
			caaacatggcaggagagtaaaa	864
			atggcaggagagtaaaatggcc	865
			gcaggagagtaaaatggcctgt	866
			ggacatcatcacttaggaaata	867
			ttggacatcatcacttaggaaa	868
			actctcctgccatgtttggaca	869
			tttactctcctgccatgtttgg	870
	CBE		cattttactctcctgccatgtt	871
	ABE		gcataaggacagctgttatttc	872
			tttcctaagtgatgatgtccaa	873
	ABE/CBE		taagtgatgatgtccaaacatg	874
			tgatgatgtccaaacatggcag	875
			acttaggaaataacagctgtcc	876
			tgccatgtttggacatcatcac	877
			ctgccatgtttggacatcatca	878
			gccattttactctcctgccatg	879

TABLE 4F

Example spacer sequences of pegRNA for editing CLL-1 epitope

Residues	Spacer	SEQ ID NO:
142-158	TAAGTGATGATGTCCAAACATGG	880
	TGATGATGTCCAAACATGGCAGG	881
	ACAAATGTAAGCCTTGTCCAAGG	882
	CTTGTCCAAGGAGATGGATTTGG	883
	GTAAGCCTTGTCCAAGGAGATGG	884
	AAGGAGATGGATTTGGCATAAGG	885
	CCCATGATGGTAGAAACACCTGG	886
	CCATGATGGTAGAAACACCTGGG	887
	CACCCCTCTCTATCCCATGATGG	888
	GTTGTTTATCTTCAACAGGCTGG	889
	ATGTTTGGACATCATCACTTAGG	890
	GCTGGCATTCTGAGCAGCACAGG	891
	TTTTGTTGTTTATCTTCAACAGG	892
	TTTTACTCTCCTGCCATGTTTGG	893

[0133] The present disclosure is not to be limited in scope by the specific embodiments described which are intended as single illustrations of individual aspects of the disclosure, and any compositions or methods which are functionally equivalent are within the scope of this disclosure. It will be apparent to those skilled in the art that various modifications and variations can be made in the methods and compositions of the present disclosure without departing from the spirit or scope of the disclosure. Thus, it is intended that the present disclosure cover the modifications and variations of this disclosure provided they come within the scope of the appended claims and their equivalents.

[0134] All publications and patent applications mentioned in this specification are herein incorporated by reference to the same extent as if each individual publication or patent application was specifically and individually indicated to be incorporated by reference.

```
                               SEQUENCE LISTING


Sequence total quantity: 897
SEQ ID NO: 1           moltype = AA  length = 364
FEATURE                Location/Qualifiers
source                 1..364
                       mol_type = protein
                       organism = synthetic construct
SEQUENCE: 1
MPLLLLLPLL WAGALAMDPN FWLQVQESVT VQEGLCVLVP CTFFHPIPYY DKNSPVHGYW  60
FREGAIISRD SPVATNKLDQ EVQEETQGRF RLLGDPSRNN CSLSIVDARR RDNGSYFFRM  120
ERGSTKYSYK SPQLSVHVTD LTHRPKILIP GTLEPGHSKN LTCSVSWACE QGTPPIFSWL  180
SAAPTSLGPR TTHSSVLIIT PRPQDHGTNL TCQVKFAGAG VTTERTIQLN VTYVPQNPTT  240
GIFPGDGSGK QETRAGVVHG AIGGAGVTAL LALCLCLIFF IVKTHRRKAA RTAVGRNDTH  300
PTTGSASPKH QKKSKLHGPT ETSSCSGAAP TVEMDEELHY ASLNFHGMNP SKDTSTEYSE  360
VRTQ                                                               364

SEQ ID NO: 2           moltype = AA  length = 378
FEATURE                Location/Qualifiers
source                 1..378
                       mol_type = protein
                       organism = synthetic construct
SEQUENCE: 2
MVLLWLTLLL IALPCLLQTK EDPNPPITNL RMKAKAQQLT WDLNRNVTDI ECVKDADYSM  60
PAVNNSYCQF GAISLCEVTN YTVRVANPPF STWILFPENS GKPWAGAENL TCWIHDVDFL  120
SCSWAVGPGA PADVQYDLYL NVANRRQQYE CLHYKTDAQG TRIGCRFDDI SRLSSGSQSS  180
HILVRGRSAA FGIPCTDKFV VFSQIEILTP PNMTAKCNKT HSFMHWKMRS HFNRKFRYEL  240
QIQKRMQPVI TEQVRDRTSF QLLNPGTYTV QIRARERVYE FLSAWSTPQR FECDQEEGAN  300
TRAWRTSLLI ALGTLLALVC VFVICRRYLV MQRLFPRIPH MKDPIGDSFQ NDKLVVWEAG  360
KAGLEECLVT EVQVVQKT                                                378

SEQ ID NO: 3           moltype = AA  length = 951
FEATURE                Location/Qualifiers
source                 1..951
                       mol_type = protein
                       organism = synthetic construct
SEQUENCE: 3
QPSVSPGEPS PPSIHPGKSD LIVRVGDEIR LLCTDPGFVK WTFEILDETN ENKQNEWITE  60
KAEATNTGKY TCTNKHGLSN SIYVFVRDPA KLFLVDRSLY GKEDNDTLVR CPLTDPEVTN  120
YSLKGCQGKP LPKDLRFIPD PKAGIMIKSV KRAYHRLCLH CSVDQEGKSV LSEKFILKVR  180
PAFKAVPVVS VSKASYLLRE GEEFTVTCTI KDVSSSVYST WKRENSQTKL QEKYNSWHHG  240
DFNYERQATL TISSARVNDS GVFMCYANNT FGSANVTTTL EVVDKGFINI FPMINTTVFV  300
NDGENVDLIV EYEAFPKPEH QQWIYMNRTF TDKWEDYPKS ENESNIRYVS ELHLTRLKGT  360
EGGTYTFLVS NSDVNAAIAF NVYVNTKPEI LTYDRLVNGM LQCVAAGFPE PTIDWYFCPG  420
TEQRCSASVL PVDVQTLNSS GPPFGKLVVQ SSIDSSAFKH NGTVECKAYN DVGKTSAYFN  480
FAFKGNNKEQ IHPHTLFTPL LIGFVIVAGM MCIIVMILTY KYLQKPMYEV QWKVVEEING  540
NNYVYIDPTQ LPYDHKWEFP RNRLSFGKTL GAGAFGKVVE ATAYGLIKSD AAMTVAVKML  600
KPSAHLTERE ALMSELKVLS YLGNHMNIVN LLGACTIGGP TLVITEYCCY GDLLNFLRRK  660
RDSFICSKQE DHAEAALYKN LLHSKESSCS DSTNEYMDMK PGVSYVVPTK ADKRRSVRIG  720
SYIERDVTPA IMEDDELALD LEDLLSFSYQ VAKGMAFLAS KNCIHRDLAA RNILLTHGRI  780
TKICDFGLAR DIKNDSNYVV KGNARLPVKW MAPESIFNCV YTFESDVWSY GIFLWELFSL  840
GSSPYPGMPV DSKFYKMIKE GFRMLSPEHA PAEMYDIMKT CWDADPLKRP TFKQIVQLIE  900
KQISESTNHI YSNLANCSPN RQKPVVDHSV RINSVGSTAS SSQPLLVHDD V            951

SEQ ID NO: 4           moltype = AA  length = 265
FEATURE                Location/Qualifiers
source                 1..265
                       mol_type = protein
                       organism = synthetic construct
SEQUENCE: 4
MSEEVTYADL QFQNSSEMEK IPEIGKFGEK APPAPSHVWR PAALFLTLLC LLLLIGLGVL  60
ASMFHVTLKI EMKKMNKLQN ISEELQRNIS LQLMSNMNIS NKIRNLSTTL QTIATKLCRE  120
LYSKEQEHKC KPCPRRWIWH KDSCYFLSDD VQTWQESKMA CAAQNASLLK INNKNALEFI  180
KSQSRSYDYW LGLSPEEDST RGMRVDNIIN SSAWVIRNAP DLNNMYCGYI NRLYVQYYHC  240
TYKKRMICEK MANPVQLGST YFREA                                        265

SEQ ID NO: 5           moltype = AA  length = 118
FEATURE                Location/Qualifiers
source                 1..118
                       mol_type = protein
                       organism = synthetic construct
SEQUENCE: 5
QVQLQQPGAE VVKPGASVKM SCKASGYTFT SYYIHWIKQT PGQGLEWVGV IYPGNDDISY  60
NQKFQGKATL TADKSSTTAY MQLSSLTSED SAVYYCAREV RLRYFDVWGQ GTTVTVSS    118

SEQ ID NO: 6           moltype = AA  length = 113
FEATURE                Location/Qualifiers
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```
source                  1..113
                        mol_type = protein
                        organism = synthetic construct
SEQUENCE: 6
EIVLTQSPGS LAVSPGERVT MSCKSSQSVF FSSSQKNYLA WYQQIPGQSP RLLIYWASTR  60
ESGVPDRFTG SGSGTDFTLT ISSVQPEDLA IYYCHQYLSS RTFGQGTKLE IKR         113

SEQ ID NO: 7            moltype = AA  length = 116
FEATURE                 Location/Qualifiers
source                  1..116
                        mol_type = protein
                        organism = synthetic construct
SEQUENCE: 7
QVQLVQSGAE VKKPGSSVKV SCKASGYTFT DYNMHWVRQA PGQGLEWIGY IYPYNGGTGY  60
NQKFKSKATI TADESTNTAY MELSSLRSED TAVYYCARGR PAMDYWGQGT LVTVSS      116

SEQ ID NO: 8            moltype = AA  length = 111
FEATURE                 Location/Qualifiers
source                  1..111
                        mol_type = protein
                        organism = synthetic construct
SEQUENCE: 8
DIQMTQSPSS LSASVGDRVT ITCRASESVD NYGISFMNWF QQKPGKAPKL LIYAASNQGS  60
GVPSRFSGSG SGTDFTLTIS SLQPDDFATY YCQQSKEVPW TFGQGTKVEI K           111

SEQ ID NO: 9            moltype = AA  length = 180
FEATURE                 Location/Qualifiers
source                  1..180
                        mol_type = protein
                        organism = synthetic construct
SEQUENCE: 9
EVQLVQSGAE VKKPGESLKI SCKGSGYSFT DYYMKWARQM PGKGLEWMGD IIPSNGATFY  60
NQKFKGQVTI SADKSISTTY LQWSSLKASD TAMYYCARSH LLRASWFAYW GQGTMVTVSS  120
ASTKGPSVFP LAPSSKSTSG GTAALGCLVK DYFPEPVTVS WNSGALTSGV HTFPAVLQSS  180

SEQ ID NO: 10           moltype = AA  length = 112
FEATURE                 Location/Qualifiers
source                  1..112
                        mol_type = protein
                        organism = synthetic construct
SEQUENCE: 10
EVQLVQSGAE VKKPGESLKI SCKGSGYSFT DYYMKWARQM PGKGLEWMGD IIPSNGATFY  60
NQKFKGQVTI SADKSISTTY LQWSSLKASD TAMYYCARSH LLRASWFAYW GQ          112

SEQ ID NO: 11           moltype = AA  length = 118
FEATURE                 Location/Qualifiers
source                  1..118
                        mol_type = protein
                        organism = synthetic construct
SEQUENCE: 11
QIQLVQSGPE LKKPGETVKI SCKASGYIFT NYGMNWVKQA PGKSFKWMGW INTYTGESTY  60
SADFKGRFAF SLETSASTAY LHINDLKNED TATYFCARSG GYDPMDYWGQ GTSVTVSS    118

SEQ ID NO: 12           moltype = AA  length = 111
FEATURE                 Location/Qualifiers
source                  1..111
                        mol_type = protein
                        organism = synthetic construct
SEQUENCE: 12
DIVLTQSPAS LAVSLGQRAT ISCRASESVD NYGNTFMHWY QQKPGQPPKL LIYRASNLES  60
GIPARFSGSG SRTDFTLTIN PVEADDVATY YCQQSNEDPP TFGAGTKLEL K           111

SEQ ID NO: 13           moltype = AA  length = 123
FEATURE                 Location/Qualifiers
source                  1..123
                        mol_type = protein
                        organism = synthetic construct
SEQUENCE: 13
EVQLVQSGAE VKKPGESLKI SCKGSGYSFT NYWIGWVRQM PGKGLEWMAI INPRDSDTRY  60
RPSFQGQVTI SADKSISTAY LQWSSLKASD TAMYYCARHG RGYEGYEGAF DIWGQGTLVT  120
VSS                                                                123

SEQ ID NO: 14           moltype = AA  length = 107
FEATURE                 Location/Qualifiers
source                  1..107
                        mol_type = protein
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                       organism = synthetic construct
SEQUENCE: 14
DIQMTQSPSS LSASVGDRVT ITCRSSQGIR SDLGWYQQKP GKAPKLLIYD ASNLETGVPS  60
RFSGSGSGTD FTLTISSLQP EDFATYYCQQ ANGFPLTFGG GTKVEIK                107

SEQ ID NO: 15          moltype = AA  length = 121
FEATURE                Location/Qualifiers
source                 1..121
                       mol_type = protein
                       organism = synthetic construct
SEQUENCE: 15
EVQLVESGGG LVQPGGSLRL SCAASGFTFS DADMDWVRQA PGKGLEWVGR TRNKAGSYTT  60
EYAASVKGRF TISRDDSKNS LYLQMNSLKT EDTAVYYCAR EPKYWIDFDL WGRGTLVTVS  120
S                                                                  121

SEQ ID NO: 16          moltype = AA  length = 107
FEATURE                Location/Qualifiers
source                 1..107
                       mol_type = protein
                       organism = synthetic construct
SEQUENCE: 16
DIQMTQSPSS LSASVGDRVT ITCRASQSIS SYLNWYQQKP GKAPKLLIYA ASSLQSGVPS  60
RFSGSGSGTD FTLTISSLQP EDFATYYCQQ SYIAPYTFGG GTKVEIK                107

SEQ ID NO: 17          moltype = AA  length = 122
FEATURE                Location/Qualifiers
source                 1..122
                       mol_type = protein
                       organism = synthetic construct
SEQUENCE: 17
EVQLVQSGAE VKKPGASVKV SCKASGYSFT DYYMHWVRQA PGQGLEWIGR INPYAGAAFY  60
SQNFKDRVTL TVDTSTSTAY LELSSLRSED TAVYYCAIER GADLEGYAMD YWGQGTLVTV  120
SS                                                                 122

SEQ ID NO: 18          moltype = AA  length = 111
FEATURE                Location/Qualifiers
source                 1..111
                       mol_type = protein
                       organism = synthetic construct
SEQUENCE: 18
DIQMTQSPSS LSASVGDRVT ITCRASQSVS TSSYNYMHWY QQKPGKPPKL LIKYASNLES  60
GVPSRFSGSG SGTDFTLTIS SLQPEDFATY YCQHSWEIPL TFGQGTKVEI K           111

SEQ ID NO: 19          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 19
gtgcagggca cgaggacgca                                              20

SEQ ID NO: 20          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 20
aagtgcaggg cacgaggacg                                              20

SEQ ID NO: 21          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 21
gaaagtgcag ggcacgagga                                              20

SEQ ID NO: 22          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 22
aagaaagtgc agggcacgag                                              20

SEQ ID NO: 23          moltype = RNA  length = 20
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-continued

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FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 23
gaagaaagtg cagggcacga                                                       20

SEQ ID NO: 24          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 24
ggaagaaagt gcagggcacg                                                       20

SEQ ID NO: 25          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 25
tggaagaaag tgcagggcac                                                       20

SEQ ID NO: 26          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 26
tgcagggcac gaggacgcac                                                       20

SEQ ID NO: 27          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 27
atggaagaaa gtgcagggca                                                       20

SEQ ID NO: 28          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 28
ggatggaaga aagtgcaggg                                                       20

SEQ ID NO: 29          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 29
tgggatggaa gaaagtgcag                                                       20

SEQ ID NO: 30          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 30
atggaagaaa gtgcagggca cg                                                    22

SEQ ID NO: 31          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 31
ggaagaaagt gcagggcacg ag                                                    22

SEQ ID NO: 32          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
```

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```
SEQUENCE: 32
aagaaagtgc agggcacgag ga                                            22

SEQ ID NO: 33          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 33
gaagaaagtg cagggcacga gg                                            22

SEQ ID NO: 34          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 34
cggaaccagt aaccatgaac                                               20

SEQ ID NO: 35          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 35
ggaaccagta accatgaact                                               20

SEQ ID NO: 36          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 36
gaaccagtaa ccatgaactg                                               20

SEQ ID NO: 37          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 37
accagtaacc atgaactggg                                               20

SEQ ID NO: 38          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 38
aaccagtaac catgaactgg                                               20

SEQ ID NO: 39          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 39
ccagtaacca tgaactgggg                                               20

SEQ ID NO: 40          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 40
cttcccggaa ccagtaacca                                               20

SEQ ID NO: 41          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 41
tcccggaacc agtaaccatg                                               20

SEQ ID NO: 42          moltype = RNA  length = 20
```

-continued

```
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 42
ttcccggaac cagtaaccat                                             20

SEQ ID NO: 43           moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 43
tccttcccgg aaccagtaac                                             20

SEQ ID NO: 44           moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 44
ggctccttcc cggaaccagt                                             20

SEQ ID NO: 45           moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 45
aaccagtaac catgaactgg gg                                          22

SEQ ID NO: 46           moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 46
ttcccggaac cagtaaccat ga                                          22

SEQ ID NO: 47           moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 47
tacgatgctc agggagcagt                                             20

SEQ ID NO: 48           moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 48
gtctacgatg ctcagggagc                                             20

SEQ ID NO: 49           moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 49
cgtctacgat gctcagggag                                             20

SEQ ID NO: 50           moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 50
ggcgtctacg atgctcaggg                                             20

SEQ ID NO: 51           moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
```

-continued

```
SEQUENCE: 51
tggcgtctac gatgctcagg                                              20

SEQ ID NO: 52          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 52
ctggcgtcta cgatgctcag                                              20

SEQ ID NO: 53          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 53
cctggcgtct acgatgctca                                              20

SEQ ID NO: 54          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 54
tcctggcgtc tacgatgctc                                              20

SEQ ID NO: 55          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 55
ctcctggcgt ctacgatgct                                              20

SEQ ID NO: 56          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 56
tctacgatgc tcagggagca gt                                           22

SEQ ID NO: 57          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 57
ctacgatgct cagggagcag tt                                           22

SEQ ID NO: 58          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 58
cgatgctcag ggagcagttg tt                                           22

SEQ ID NO: 59          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 59
ggagggataa tggttcatac tt                                           22

SEQ ID NO: 60          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 60
ggaggaggga taatggttca ta                                           22

SEQ ID NO: 61          moltype = RNA  length = 22
```

-continued

```
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 61
aggaggaggg ataatggttc at                                          22

SEQ ID NO: 62          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 62
ataatggttc atacttcttt                                             20

SEQ ID NO: 63          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 63
gacgccagga ggagggataa                                             20

SEQ ID NO: 64          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 64
ggaggaggga taatggttca                                             20

SEQ ID NO: 65          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 65
caggaggagg gataatggtt                                             20

SEQ ID NO: 66          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 66
ttcatacttc tttcggatgg                                             20

SEQ ID NO: 67          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 67
tcatacttct ttcggatgga                                             20

SEQ ID NO: 68          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 68
gttcatactt ctttcggatg                                             20

SEQ ID NO: 69          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 69
ccgaaagaag tatgaaccat                                             20

SEQ ID NO: 70          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
```

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```
SEQUENCE: 70
aatggttcat acttctttcg ga                                           22

SEQ ID NO: 71          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 71
ggttcatact tctttcggat gg                                           22

SEQ ID NO: 72          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 72
catacttctt tcggatggag ag                                           22

SEQ ID NO: 73          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 73
ccgaaagaag tatgaaccat                                              20

SEQ ID NO: 74          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 74
catccgaaag aagtatgaac                                              20

SEQ ID NO: 75          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 75
ctctctccat ccgaaagaag                                              20

SEQ ID NO: 76          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 76
catccgaaag aagtatgaac ca                                           22

SEQ ID NO: 77          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 77
atccgaaaga agtatgaacc at                                           22

SEQ ID NO: 78          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 78
tccgaaagaa gtatgaacca tt                                           22

SEQ ID NO: 79          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 79
cgaaagaagt atgaaccatt at                                           22

SEQ ID NO: 80          moltype = RNA  length = 22
```

-continued

```
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 80
ctctccatcc gaaagaagta tg                                            22

SEQ ID NO: 81           moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 81
caaatctccc cagctctctg                                               20

SEQ ID NO: 82           moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 82
tctccccagc tctctgtgca                                               20

SEQ ID NO: 83           moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 83
aatctcccca gctctctgtg                                               20

SEQ ID NO: 84           moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 84
tacaaatctc cccagctctc                                               20

SEQ ID NO: 85           moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 85
atctccccag ctctctgtgc at                                            22

SEQ ID NO: 86           moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 86
gttacaaatc tccccagctc tc                                            22

SEQ ID NO: 87           moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 87
atacagttac aaatctcccc ag                                            22

SEQ ID NO: 88           moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 88
aaatctcccc agctctctgt gc                                            22

SEQ ID NO: 89           moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
```

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```
SEQUENCE: 89
acaaatctcc ccagctctct gt                                              22

SEQ ID NO: 90          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 90
agaaatttgg atccatagcc                                                 20

SEQ ID NO: 91          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 91
tgcacttgca gccagaaatt                                                 20

SEQ ID NO: 92          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 92
agccagaaat ttggatccat                                                 20

SEQ ID NO: 93          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 93
cagccagaaa tttggatcca                                                 20

SEQ ID NO: 94          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 94
tgcagccaga aatttggatc                                                 20

SEQ ID NO: 95          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 95
cacttgcagc cagaaatttg                                                 20

SEQ ID NO: 96          moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 96
gcacttgcag ccagaaattt                                                 20

SEQ ID NO: 97          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 97
tgcacttgca gccagaaatt tg                                              22

SEQ ID NO: 98          moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 98
tgcagccaga aatttggatc ca                                              22

SEQ ID NO: 99          moltype = RNA  length = 22
```

-continued

```
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 99
ccagaaattt ggatccatag cc                                           22

SEQ ID NO: 100         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 100
cttgcagcca gaaatttgga tc                                           22

SEQ ID NO: 101         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 101
aaaccctcct gtaccgtcac                                              20

SEQ ID NO: 102         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 102
cacaaaccct cctgtaccgt                                              20

SEQ ID NO: 103         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 103
acgcacaaac cctcctgtac                                              20

SEQ ID NO: 104         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 104
aggacgcaca aaccctcctg                                              20

SEQ ID NO: 105         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 105
cgaggacgca caaaccctcc                                              20

SEQ ID NO: 106         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 106
gacgcacaaa ccctcctgta cc                                           22

SEQ ID NO: 107         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 107
aaaccctcct gtaccgtcac tg                                           22

SEQ ID NO: 108         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
```

-continued

```
SEQUENCE: 108
caaaccctcc tgtaccgtca ct                                            22

SEQ ID NO: 109          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 109
cacaaaccct cctgtaccgt ca                                            22

SEQ ID NO: 110          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 110
cgaggacgca caaaccctcc tg                                            22

SEQ ID NO: 111          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 111
aggaggcgga atctgccctg                                               20

SEQ ID NO: 112          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 112
aaggaggcgg aatctgccct                                               20

SEQ ID NO: 113          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 113
aggcggaatc tgccctgagt ct                                            22

SEQ ID NO: 114          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 114
gaatctgccc tgagtctcct cc                                            22

SEQ ID NO: 115          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 115
gaggcggaat ctgccctgag tc                                            22

SEQ ID NO: 116          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 116
aggaggcgga atctgccctg ag                                            22

SEQ ID NO: 117          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 117
aaggaggcgg aatctgccct ga                                            22

SEQ ID NO: 118          moltype = RNA  length = 22
```

-continued

```
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 118
ccaaggaggc ggaatctgcc ct                                              22

SEQ ID NO: 119         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 119
aacaactgct ccctgagcat                                                 20

SEQ ID NO: 120         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 120
aggaacaact gctccctgag                                                 20

SEQ ID NO: 121         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 121
gtaggaacaa ctgctccctg                                                 20

SEQ ID NO: 122         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 122
agtaggaaca actgctccct                                                 20

SEQ ID NO: 123         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 123
cagtaggaac aactgctccc                                                 20

SEQ ID NO: 124         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 124
gggatcccag taggaacaac tg                                              22

SEQ ID NO: 125         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 125
agtaggaaca actgctccct ga                                              22

SEQ ID NO: 126         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 126
cccagtagga acaactgctc cc                                              22

SEQ ID NO: 127         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
```

-continued

```
SEQUENCE: 127
ggggatccca gtaggaacaa ct                                            22

SEQ ID NO: 128          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 128
atcccagtag gaacaactgc tc                                            22

SEQ ID NO: 129          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 129
ataatggttc atacttcttt                                               20

SEQ ID NO: 130          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 130
ggaggaggga taatggttca                                               20

SEQ ID NO: 131          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 131
ggagggataa tggttcatac tt                                            22

SEQ ID NO: 132          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 132
aggaggaggg ataatggttc at                                            22

SEQ ID NO: 133          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 133
ataatggttc atacttcttt cg                                            22

SEQ ID NO: 134          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 134
gggagatttg taactgtatt                                               20

SEQ ID NO: 135          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 135
gagctgggga gatttgtaac                                               20

SEQ ID NO: 136          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 136
gctggggaga tttgtaactg                                               20

SEQ ID NO: 137          moltype = RNA  length = 20
```

-continued

```
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 137
tctccccagc tctctgtgca                                              20

SEQ ID NO: 138         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 138
caaatctccc cagctctctg                                              20

SEQ ID NO: 139         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 139
tacaaatctc cccagctctc                                              20

SEQ ID NO: 140         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 140
aatctcccca gctctctgtg                                              20

SEQ ID NO: 141         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 141
atctccccag ctctctgtgc at                                           22

SEQ ID NO: 142         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 142
acaaatctcc ccagctctct gt                                           22

SEQ ID NO: 143         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 143
aaatctcccc agctctctgt gc                                           22

SEQ ID NO: 144         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 144
agctggggag atttgtaact gt                                           22

SEQ ID NO: 145         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 145
tggctatgga tccaaatttc tgg                                          23

SEQ ID NO: 146         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
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```
SEQUENCE: 146
aaatttctgg ctgcaagtgc agg                                          23

SEQ ID NO: 147         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 147
gcaggagtca gtgacggtac agg                                          23

SEQ ID NO: 148         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 148
ggagtcagtg acggtacagg agg                                          23

SEQ ID NO: 149         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 149
gagtcagtga cggtacagga ggg                                          23

SEQ ID NO: 150         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 150
gggagagggg ttgtcgggct ggg                                          23

SEQ ID NO: 151         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 151
gtgggcaggt gagtggctgt ggg                                          23

SEQ ID NO: 152         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 152
ggggagaggg gttgtcgggc tgg                                          23

SEQ ID NO: 153         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 153
tcgtttcccc acaggggccc tgg                                          23

SEQ ID NO: 154         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 154
ctgtggggag aggggttgtc ggg                                          23

SEQ ID NO: 155         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 155
ccccacaggg gccctggcta tgg                                          23

SEQ ID NO: 156         moltype = RNA  length = 23
```

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```
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 156
gcaagtgcag gagtcagtga cgg                                                 23

SEQ ID NO: 157          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 157
gctgaccctc gtttccccac agg                                                 23

SEQ ID NO: 158          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 158
tgaccctcgt ttccccacag ggg                                                 23

SEQ ID NO: 159          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 159
ctgaccctcg tttccccaca ggg                                                 23

SEQ ID NO: 160          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 160
tgtgggcagg tgagtggctg tgg                                                 23

SEQ ID NO: 161          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 161
tgggcaggtg agtggctgtg ggg                                                 23

SEQ ID NO: 162          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 162
gctgtgggga gaggggttgt cgg                                                 23

SEQ ID NO: 163          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 163
ccctgctgtg ggcaggtgag tgg                                                 23

SEQ ID NO: 164          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 164
gtgagtggct gtggggagag ggg                                                 23

SEQ ID NO: 165          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
```

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```
SEQUENCE: 165
ggtgagtggc tgtggggaga ggg                                         23

SEQ ID NO: 166          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 166
aggtgagtgg ctgtggggag agg                                         23

SEQ ID NO: 167          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 167
ggggagttct tgtcgtagta ggg                                         23

SEQ ID NO: 168          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 168
tggggagttc ttgtcgtagt agg                                         23

SEQ ID NO: 169          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 169
gttcttgtcg tagtagggta tgg                                         23

SEQ ID NO: 170          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 170
ttcttgtcgt agtagggtat ggg                                         23

SEQ ID NO: 171          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 171
tggagagtcc ctggatataa tgg                                         23

SEQ ID NO: 172          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 172
gaaccagtaa ccatgaactg ggg                                         23

SEQ ID NO: 173          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 173
tgtcgtagta gggtatggga tgg                                         23

SEQ ID NO: 174          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 174
tggatataat ggctccttcc cgg                                         23

SEQ ID NO: 175          moltype = RNA  length = 23
```

-continued

```
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 175
tgtggccact ggagagtccc tgg                                           23

SEQ ID NO: 176          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 176
cggaaccagt aaccatgaac tgg                                           23

SEQ ID NO: 177          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 177
ggaagaaagt gcagggcacg agg                                           23

SEQ ID NO: 178          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 178
atgggatgga agaaagtgca ggg                                           23

SEQ ID NO: 179          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 179
tatgggatgg aagaaagtgc agg                                           23

SEQ ID NO: 180          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 180
ggaaccagta accatgaact ggg                                           23

SEQ ID NO: 181          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 181
gacaagaact ccccagttca tgg                                           23

SEQ ID NO: 182          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 182
tggagagtcc ctggatataa tgg                                           23

SEQ ID NO: 183          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 183
tggatataat ggctccttcc cgg                                           23

SEQ ID NO: 184          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
```

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```
SEQUENCE: 184
tctagcttgt ttgtggccac tgg                                          23

SEQ ID NO: 185         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 185
ttcttgatct agcttgtttg tgg                                          23

SEQ ID NO: 186         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 186
tgtggccact ggagagtccc tgg                                          23

SEQ ID NO: 187         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 187
gggaaggagc cattatatcc agg                                          23

SEQ ID NO: 188         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 188
gcctccttgg ggatcccagt agg                                          23

SEQ ID NO: 189         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 189
ggaaggagcc attatatcca ggg                                          23

SEQ ID NO: 190         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 190
gctagatcaa gaagtacagg agg                                          23

SEQ ID NO: 191         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 191
tatatccagg gactctccag tgg                                          23

SEQ ID NO: 192         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 192
gaagtacagg aggagactca ggg                                          23

SEQ ID NO: 193         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 193
agaagtacag gaggagactc agg                                          23

SEQ ID NO: 194         moltype = RNA  length = 23
```

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```
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 194
catggttact ggttccggga agg                                           23

SEQ ID NO: 195          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 195
caagctagat caagaagtac agg                                           23

SEQ ID NO: 196          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 196
agggcagatt ccgcctcctt ggg                                           23

SEQ ID NO: 197          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 197
cagttcatgg ttactggttc cgg                                           23

SEQ ID NO: 198          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 198
gggcagattc cgcctccttg ggg                                           23

SEQ ID NO: 199          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 199
agttcatggt tactggttcc ggg                                           23

SEQ ID NO: 200          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 200
cagggcagat tccgcctcct tgg                                           23

SEQ ID NO: 201          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 201
agggagcagt tgttcctact ggg                                           23

SEQ ID NO: 202          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 202
gggagatttg taactgtatt tgg                                           23

SEQ ID NO: 203          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
```

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```
SEQUENCE: 203
cagggagcag ttgttcctac tgg                                          23

SEQ ID NO: 204         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 204
tgttcctact gggatcccca agg                                          23

SEQ ID NO: 205         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 205
tgaaccatta tccctcctcc tgg                                          23

SEQ ID NO: 206         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 206
tcctactggg atccccaagg agg                                          23

SEQ ID NO: 207         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 207
tcctggcgtc tacgatgctc agg                                          23

SEQ ID NO: 208         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 208
tactgggatc cccaaggagg cgg                                          23

SEQ ID NO: 209         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 209
cctggcgtct acgatgctca ggg                                          23

SEQ ID NO: 210         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 210
tgtcacatgc acagagagct ggg                                          23

SEQ ID NO: 211         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 211
gtcacatgca cagagagctg ggg                                          23

SEQ ID NO: 212         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 212
ctgtcacatg cacagagagc tgg                                          23

SEQ ID NO: 213         moltype = RNA  length = 23
```

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```
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 213
gggagatttg taactgtatt tgg                                          23

SEQ ID NO: 214         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 214
tgtcacatgc acagagagct ggg                                          23

SEQ ID NO: 215         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 215
gtcacatgca cagagagctg ggg                                          23

SEQ ID NO: 216         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 216
ctgtcacatg cacagagagc tgg                                          23

SEQ ID NO: 217         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 217
tggttcatac ttctttcgga tgg                                          23

SEQ ID NO: 218         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 218
gacgccagga ggagggataa tgg                                          23

SEQ ID NO: 219         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 219
gcatcgtaga cgccaggagg agg                                          23

SEQ ID NO: 220         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 220
ccctgagcat cgtagacgcc agg                                          23

SEQ ID NO: 221         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 221
catcgtagac gccaggagga ggg                                          23

SEQ ID NO: 222         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
```

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```
SEQUENCE: 222
tgagcatcgt agacgccagg agg                                          23

SEQ ID NO: 223         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 223
ataatggttc atacttcttt cgg                                          23

SEQ ID NO: 224         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 224
tacttctttc ggatggagag agg                                          23

SEQ ID NO: 225         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 225
gtacccatga acttcccttg cgg                                          23

SEQ ID NO: 226         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 226
tgtcacatgc acagagagct ggg                                          23

SEQ ID NO: 227         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 227
gtcacatgca cagagagctg ggg                                          23

SEQ ID NO: 228         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 228
ctgtcacatg cacagagagc tgg                                          23

SEQ ID NO: 229         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 229
aggttcgtga ttggtgggtt                                              20

SEQ ID NO: 230         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 230
tccttaggtt cgtgattggt                                              20

SEQ ID NO: 231         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 231
ttcatcctta ggttcgtgat                                              20

SEQ ID NO: 232         moltype = RNA  length = 20
```

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```
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 232
ggttcgtgat tggtgggttt                                                 20

SEQ ID NO: 233         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 233
ccttaggttc gtgattggtg                                                 20

SEQ ID NO: 234         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 234
tcatccttag gttcgtgatt                                                 20

SEQ ID NO: 235         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 235
gttcgtgatt ggtgggtttg                                                 20

SEQ ID NO: 236         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 236
gtgattggtg ggtttggatc tt                                              22

SEQ ID NO: 237         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 237
ttcgtgattg gtgggtttgg at                                              22

SEQ ID NO: 238         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 238
gttcgtgatt ggtgggtttg ga                                              22

SEQ ID NO: 239         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 239
taggttcgtg attggtgggt tt                                              22

SEQ ID NO: 240         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 240
atccttaggt tcgtgattgg                                                 20

SEQ ID NO: 241         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
```

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```
SEQUENCE: 241
acccaccaat cacgaaccta                                              20

SEQ ID NO: 242          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 242
atcacgaacc taaggatgaa                                              20

SEQ ID NO: 243          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 243
accaatcacg aacctaagga                                              20

SEQ ID NO: 244          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 244
cccaccaatc acgaacctaa                                              20

SEQ ID NO: 245          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 245
agatccaaac ccaccaatca                                              20

SEQ ID NO: 246          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 246
aatcacgaac ctaaggatga                                              20

SEQ ID NO: 247          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 247
caatcacgaa cctaaggatg                                              20

SEQ ID NO: 248          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 248
ccaatcacga acctaaggat                                              20

SEQ ID NO: 249          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 249
ccaccaatca cgaacctaag                                              20

SEQ ID NO: 250          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 250
aacccaccaa tcacgaacct                                              20

SEQ ID NO: 251          moltype = RNA  length = 20
```

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```
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 251
aaacccacca atcacgaacc                                                 20

SEQ ID NO: 252         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 252
atccaaaccc accaatcacg                                                 20

SEQ ID NO: 253         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 253
gatccaaacc caccaatcac                                                 20

SEQ ID NO: 254         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 254
gaagatccaa acccaccaat                                                 20

SEQ ID NO: 255         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 255
accaatcacg aacctaagga tg                                              22

SEQ ID NO: 256         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 256
aagatccaaa cccaccaatc ac                                              22

SEQ ID NO: 257         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 257
gaagatccaa acccaccaat ca                                              22

SEQ ID NO: 258         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 258
ccaccaatca cgaacctaag ga                                              22

SEQ ID NO: 259         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 259
caaacccacc aatcacgaac ct                                              22

SEQ ID NO: 260         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
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```
SEQUENCE: 260
atccaaaccc accaatcacg aa                                          22

SEQ ID NO: 261          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 261
caccaatcac gaacctaagg at                                          22

SEQ ID NO: 262          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 262
aacccaccaa tcacgaacct aa                                          22

SEQ ID NO: 263          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 263
gatccaaacc caccaatcac                                             20

SEQ ID NO: 264          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 264
aggttcgtga ttggtgggtt                                             20

SEQ ID NO: 265          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 265
tccttaggtt cgtgattggt                                             20

SEQ ID NO: 266          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 266
atccttaggt tcgtgattgg                                             20

SEQ ID NO: 267          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 267
ttcatcctta ggttcgtgat                                             20

SEQ ID NO: 268          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 268
ccttaggttc gtgattggtg                                             20

SEQ ID NO: 269          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 269
tcatccttag gttcgtgatt                                             20

SEQ ID NO: 270          moltype = RNA  length = 20
```

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```
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 270
tgctttcatc cttaggttcg                                                20

SEQ ID NO: 271          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 271
tttgctttca tccttaggtt                                                20

SEQ ID NO: 272          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 272
agcctttgct ttcatcctta                                                20

SEQ ID NO: 273          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 273
gctttcatcc ttaggttcgt                                                20

SEQ ID NO: 274          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 274
taggttcgtg attggtgggt tt                                             22

SEQ ID NO: 275          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 275
tgagcctttg ctttcatcct ta                                             22

SEQ ID NO: 276          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 276
atccttaggt tcgtgattgg                                                20

SEQ ID NO: 277          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 277
gaacctaagg atgaaagcaa                                                20

SEQ ID NO: 278          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 278
acccaccaat cacgaaccta                                                20

SEQ ID NO: 279          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
```

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```
SEQUENCE: 279
aacctaagga tgaaagcaaa                                         20

SEQ ID NO: 280          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 280
atcacgaacc taaggatgaa                                         20

SEQ ID NO: 281          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 281
accaatcacg aacctaagga                                         20

SEQ ID NO: 282          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 282
cccaccaatc acgaacctaa                                         20

SEQ ID NO: 283          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 283
cgaacctaag gatgaaagca                                         20

SEQ ID NO: 284          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 284
acgaacctaa ggatgaaagc                                         20

SEQ ID NO: 285          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 285
cacgaaccta aggatgaaag                                         20

SEQ ID NO: 286          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 286
aatcacgaac ctaaggatga                                         20

SEQ ID NO: 287          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 287
caatcacgaa cctaaggatg                                         20

SEQ ID NO: 288          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 288
ccaccaatca cgaacctaag                                         20

SEQ ID NO: 289          moltype = RNA  length = 20
```

-continued

```
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 289
aacccaccaa tcacgaacct                                                  20

SEQ ID NO: 290         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 290
aaacccacca atcacgaacc                                                  20

SEQ ID NO: 291         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 291
cacgaaccta aggatgaaag ca                                               22

SEQ ID NO: 292         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 292
accaatcacg aacctaagga tg                                               22

SEQ ID NO: 293         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 293
acctaaggat gaaagcaaag gc                                               22

SEQ ID NO: 294         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 294
cgaacctaag gatgaaagca aa                                               22

SEQ ID NO: 295         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 295
gaacctaagg atgaaagcaa ag                                               22

SEQ ID NO: 296         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 296
caaacccacc aatcacgaac ct                                               22

SEQ ID NO: 297         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 297
aacccaccaa tcacgaacct aa                                               22

SEQ ID NO: 298         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
```

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```
SEQUENCE: 298
caccaatcac gaacctaagg at                                              22

SEQ ID NO: 299          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 299
ttcatcctta ggttcgtgat                                                 20

SEQ ID NO: 300          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 300
gagcctttgc tttcatcctt                                                 20

SEQ ID NO: 301          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 301
tgctttcatc cttaggttcg                                                 20

SEQ ID NO: 302          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 302
tttgctttca tccttaggtt                                                 20

SEQ ID NO: 303          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 303
agcctttgct ttcatcctta                                                 20

SEQ ID NO: 304          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 304
gctttcatcc ttaggttcgt                                                 20

SEQ ID NO: 305          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 305
tgagcctttg ctttcatcct                                                 20

SEQ ID NO: 306          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 306
tgagcctttg ctttcatcct ta                                              22

SEQ ID NO: 307          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 307
gagcctttgc tttcatcctt ag                                              22

SEQ ID NO: 308          moltype = RNA  length = 20
```

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```
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 308
ctttcatcct taggttcgtg                                                20

SEQ ID NO: 309         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 309
gaacctaagg atgaaagcaa                                                20

SEQ ID NO: 310         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 310
gatgaaagca aaggctcagc                                                20

SEQ ID NO: 311         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 311
aaggatgaaa gcaaaggctc                                                20

SEQ ID NO: 312         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 312
aacctaagga tgaaagcaaa                                                20

SEQ ID NO: 313         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 313
atcacgaacc taaggatgaa                                                20

SEQ ID NO: 314         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 314
accaatcacg aacctaagga                                                20

SEQ ID NO: 315         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 315
ggatgaaagc aaaggctcag                                                20

SEQ ID NO: 316         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 316
taaggatgaa agcaaaggct                                                20

SEQ ID NO: 317         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
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```
SEQUENCE: 317
cgaacctaag gatgaaagca                                              20

SEQ ID NO: 318          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 318
acgaacctaa ggatgaaagc                                              20

SEQ ID NO: 319          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 319
aatcacgaac ctaaggatga                                              20

SEQ ID NO: 320          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 320
caatcacgaa cctaaggatg                                              20

SEQ ID NO: 321          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 321
ccaatcacga acctaaggat                                              20

SEQ ID NO: 322          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 322
cacgaaccta aggatgaaag ca                                           22

SEQ ID NO: 323          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 323
accaatcacg aacctaagga tg                                           22

SEQ ID NO: 324          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 324
atgaaagcaa aggctcagca gt                                           22

SEQ ID NO: 325          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 325
gatgaaagca aaggctcagc ag                                           22

SEQ ID NO: 326          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 326
acctaaggat gaaagcaaag gc                                           22

SEQ ID NO: 327          moltype = RNA  length = 22
```

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```
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 327
cgaacctaag gatgaaagca aa                                             22

SEQ ID NO: 328         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 328
gaacctaagg atgaaagcaa ag                                             22

SEQ ID NO: 329         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 329
ccaccaatca cgaacctaag ga                                             22

SEQ ID NO: 330         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 330
caccaatcac gaacctaagg at                                             22

SEQ ID NO: 331         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 331
taaggtccca ggtcaactgc                                                20

SEQ ID NO: 332         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 332
caggtcaact gctgagcctt                                                20

SEQ ID NO: 333         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 333
aggtcccagg tcaactgctg                                                20

SEQ ID NO: 334         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 334
tgttaaggtc ccaggtcaac                                                20

SEQ ID NO: 335         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 335
acatttctgt taaggtccca                                                20

SEQ ID NO: 336         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
```

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```
SEQUENCE: 336
aaggtcccag gtcaactgct                                              20

SEQ ID NO: 337         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 337
ttctgttaag gtcccaggtc                                              20

SEQ ID NO: 338         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 338
tttctgttaa ggtcccaggt ca                                           22

SEQ ID NO: 339         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 339
caggtcaact gctgagcctt tg                                           22

SEQ ID NO: 340         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 340
gtcccaggtc aactgctgag cc                                           22

SEQ ID NO: 341         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 341
ttaaggtccc aggtcaactg ct                                           22

SEQ ID NO: 342         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 342
gttaaggtcc caggtcaact gc                                           22

SEQ ID NO: 343         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 343
tttctgttaa ggtcccaggt ca                                           22

SEQ ID NO: 344         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 344
acatttctgt taaggtccca gg                                           22

SEQ ID NO: 345         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 345
tgttaaggtc ccaggtcaac                                              20

SEQ ID NO: 346         moltype = RNA  length = 20
```

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```
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 346
gtctttaaca cactcgatat                                                20

SEQ ID NO: 347          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 347
ctcgatatcg gtcacatttc                                                20

SEQ ID NO: 348          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 348
aacacactcg atatcggtca                                                20

SEQ ID NO: 349          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 349
ttaacacact cgatatcggt                                                20

SEQ ID NO: 350          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 350
ggcgtcttta acacactcga                                                20

SEQ ID NO: 351          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 351
tcggcgtctt taacacactc                                                20

SEQ ID NO: 352          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 352
gcgtctttaa cacactcgat at                                             22

SEQ ID NO: 353          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 353
taacacactc gatatcggtc ac                                             22

SEQ ID NO: 354          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 354
gtctttaaca cactcgatat cg                                             22

SEQ ID NO: 355          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
```

-continued

```
SEQUENCE: 355
gtcggcgtct ttaacacact cg                                            22

SEQ ID NO: 356          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 356
acacactcga tatcggtcac at                                            22

SEQ ID NO: 357          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 357
acacactcga tatcggtcac at                                            22

SEQ ID NO: 358          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 358
acacactcga tatcggtcac                                               20

SEQ ID NO: 359          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 359
atcgagtgtg ttaaagacgc                                               20

SEQ ID NO: 360          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 360
gatatcgagt gtgttaaaga                                               20

SEQ ID NO: 361          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 361
accgatatcg agtgtgttaa                                               20

SEQ ID NO: 362          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 362
aatgtgaccg atatcgagtg                                               20

SEQ ID NO: 363          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 363
gaaatgtgac cgatatcgag                                               20

SEQ ID NO: 364          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 364
agtgtgttaa agacgccgac                                               20

SEQ ID NO: 365          moltype = RNA  length = 20
```

-continued

```
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 365
tcgagtgtgt taaagacgcc                                              20

SEQ ID NO: 366          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 366
ccgatatcga gtgtgttaaa                                              20

SEQ ID NO: 367          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 367
gaccgatatc gagtgtgtta                                              20

SEQ ID NO: 368          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 368
tgaccgatat cgagtgtgtt                                              20

SEQ ID NO: 369          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 369
gaccgatatc gagtgtgtta aa                                           22

SEQ ID NO: 370          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 370
cgagtgtgtt aaagacgccg ac                                           22

SEQ ID NO: 371          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 371
gatatcgagt gtgttaaaga cg                                           22

SEQ ID NO: 372          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 372
accgatatcg agtgtgttaa ag                                           22

SEQ ID NO: 373          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 373
gtgaccgata tcgagtgtgt ta                                           22

SEQ ID NO: 374          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
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```
SEQUENCE: 374
cgatatcgag tgtgttaaag ac                                              22

SEQ ID NO: 375          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 375
aaatgtgacc gatatcgagt gt                                              22

SEQ ID NO: 376          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 376
acagaaatgt gaccgatatc ga                                              22

SEQ ID NO: 377          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 377
gtctttaaca cactcgatat                                                 20

SEQ ID NO: 378          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 378
tctttaacac actcgatatc                                                 20

SEQ ID NO: 379          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 379
gtcggcgtct ttaacacact                                                 20

SEQ ID NO: 380          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 380
aacacactcg atatcggtca                                                 20

SEQ ID NO: 381          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 381
ttaacacact cgatatcggt                                                 20

SEQ ID NO: 382          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 382
ggcgtcttta acacactcga                                                 20

SEQ ID NO: 383          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 383
tcggcgtctt taacacactc                                                 20

SEQ ID NO: 384          moltype = RNA  length = 22
```

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```
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 384
gcgtctttaa cacactcgat at                                          22

SEQ ID NO: 385         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 385
taacacactc gatatcggtc ac                                          22

SEQ ID NO: 386         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 386
gtctttaaca cactcgatat cg                                          22

SEQ ID NO: 387         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 387
gtcggcgtct ttaacacact cg                                          22

SEQ ID NO: 388         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 388
acacactcga tatcggtcac at                                          22

SEQ ID NO: 389         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 389
cggcgtcttt aacacactcg at                                          22

SEQ ID NO: 390         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 390
gaatagtcgg cgtctttaac ac                                          22

SEQ ID NO: 391         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 391
acacactcga tatcggtcac                                             20

SEQ ID NO: 392         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 392
atttaccggc atagaatagt                                             20

SEQ ID NO: 393         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
```

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```
SEQUENCE: 393
gacgccgact attctatgcc                                              20

SEQ ID NO: 394         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 394
taaagacgcc gactattcta                                              20

SEQ ID NO: 395         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 395
tattctatgc cggtaaatca                                              20

SEQ ID NO: 396         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 396
actattctat gccggtaaat                                              20

SEQ ID NO: 397         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 397
ccgactattc tatgccggta                                              20

SEQ ID NO: 398         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 398
gccgactatt ctatgccggt                                              20

SEQ ID NO: 399         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 399
acgccgacta ttctatgccg gt                                           22

SEQ ID NO: 400         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 400
tattctatgc cggtaaatca ta                                           22

SEQ ID NO: 401         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 401
actattctat gccggtaaat ca                                           22

SEQ ID NO: 402         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 402
cgactattct atgccggtaa at                                           22

SEQ ID NO: 403         moltype = RNA  length = 22
```

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```
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 403
tgttaaagac gccgactatt ct                                              22

SEQ ID NO: 404         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 404
agacgccgac tattctatgc cg                                              22

SEQ ID NO: 405         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 405
ttaaagacgc cgactattct at                                              22

SEQ ID NO: 406         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 406
gttaaagacg ccgactattc ta                                              22

SEQ ID NO: 407         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 407
atttaccggc atagaatagt                                                 20

SEQ ID NO: 408         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 408
tttaccggca tagaatagtc                                                 20

SEQ ID NO: 409         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 409
atgatttacc ggcatagaat                                                 20

SEQ ID NO: 410         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 410
aatagtcggc gtctttaaca                                                 20

SEQ ID NO: 411         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 411
agaatagtcg gcgtctttaa                                                 20

SEQ ID NO: 412         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
```

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```
SEQUENCE: 412
atagaatagt cggcgtcttt                                            20

SEQ ID NO: 413          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 413
cggcatagaa tagtcggcgt ct                                         22

SEQ ID NO: 414          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 414
agaatagtcg gcgtctttaa ca                                         22

SEQ ID NO: 415          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 415
atagaatagt cggcgtcttt aa                                         22

SEQ ID NO: 416          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 416
gcatagaata gtcggcgtct tt                                         22

SEQ ID NO: 417          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 417
cggcatagaa tagtcggcgt ct                                         22

SEQ ID NO: 418          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 418
atttaccggc atagaatagt cg                                         22

SEQ ID NO: 419          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 419
accggcatag aatagtcggc gt                                         22

SEQ ID NO: 420          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 420
gaatagtcgg cgtctttaac ac                                         22

SEQ ID NO: 421          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 421
ggccactcgg acggtgtagt                                            20

SEQ ID NO: 422          moltype = RNA  length = 20
```

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```
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 422
tggtgggttg gccactcgga                                          20

SEQ ID NO: 423          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 423
gttggccact cggacggtgt                                          20

SEQ ID NO: 424          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 424
tgggttggcc actcggacgg                                          20

SEQ ID NO: 425          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 425
ggtgggttgg ccactcggac                                          20

SEQ ID NO: 426          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 426
gaatggtggg ttggccactc                                          20

SEQ ID NO: 427          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 427
gccactcgga cggtgtagtt                                          20

SEQ ID NO: 428          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 428
actcggacgg tgtagttggt                                          20

SEQ ID NO: 429          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 429
aatggtgggt tggccactcg                                          20

SEQ ID NO: 430          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 430
ctcggacggt gtagttggtc ac                                       22

SEQ ID NO: 431          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
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```
SEQUENCE: 431
cactcggacg gtgtagttgg tc                                           22

SEQ ID NO: 432          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 432
ggccactcgg acggtgtagt tg                                           22

SEQ ID NO: 433          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 433
ttggccactc ggacggtgta gt                                           22

SEQ ID NO: 434          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 434
tcggacggtg tagttggtca ct                                           22

SEQ ID NO: 435          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 435
ggttggccac tcggacggtg ta                                           22

SEQ ID NO: 436          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 436
ccaacccacc attctccacg                                              20

SEQ ID NO: 437          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 437
caacccacca ttctccacgt                                              20

SEQ ID NO: 438          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 438
ggccaaccca ccattctcca                                              20

SEQ ID NO: 439          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 439
aacccaccat tctccacgtg                                              20

SEQ ID NO: 440          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 440
gtggccaacc caccattctc                                              20

SEQ ID NO: 441          moltype = RNA  length = 20
```

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```
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 441
cgtccgagtg gccaacccac                                                20

SEQ ID NO: 442          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 442
caccgtccga gtggccaacc                                                20

SEQ ID NO: 443          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 443
ccaccattct ccacgtggat cc                                             22

SEQ ID NO: 444          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 444
aacccaccat tctccacgtg ga                                             22

SEQ ID NO: 445          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 445
ccaacccacc attctccacg tg                                             22

SEQ ID NO: 446          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 446
gccaacccac cattctccac gt                                             22

SEQ ID NO: 447          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 447
ccgagtggcc aacccaccat tc                                             22

SEQ ID NO: 448          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 448
gtccgagtgg ccaacccacc at                                             22

SEQ ID NO: 449          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 449
gtccgagtgg ccaacccacc at                                             22

SEQ ID NO: 450          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
```

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```
SEQUENCE: 450
gtccgagtgg ccaacccacc at                                              22

SEQ ID NO: 451          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 451
ccacgtggag aatggtgggt                                                 20

SEQ ID NO: 452          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 452
agaatggtgg gttggccact                                                 20

SEQ ID NO: 453          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 453
ggatccacgt ggagaatggt                                                 20

SEQ ID NO: 454          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 454
aagaggatcc acgtggagaa                                                 20

SEQ ID NO: 455          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 455
gaatggtggg ttggccactc                                                 20

SEQ ID NO: 456          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 456
cacgtggaga atggtgggtt                                                 20

SEQ ID NO: 457          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 457
gatccacgtg gagaatggtg                                                 20

SEQ ID NO: 458          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 458
agaggatcca cgtggagaat                                                 20

SEQ ID NO: 459          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 459
aatggtgggt tggccactcg                                                 20

SEQ ID NO: 460          moltype = RNA  length = 20
```

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```
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 460
gtggagaatg gtgggttggc                                                    20

SEQ ID NO: 461         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 461
acgtggagaa tggtgggttg gc                                                 22

SEQ ID NO: 462         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 462
ggagaatggt gggttggcca ct                                                 22

SEQ ID NO: 463         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 463
ccacgtggag aatggtgggt tg                                                 22

SEQ ID NO: 464         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 464
atccacgtgg agaatggtgg gt                                                 22

SEQ ID NO: 465         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 465
gatccacgtg gagaatggtg gg                                                 22

SEQ ID NO: 466         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 466
ggatccacgt ggagaatggt gg                                                 22

SEQ ID NO: 467         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 467
ccacgtggag aatggtgggt                                                    20

SEQ ID NO: 468         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 468
ggatccacgt ggagaatggt                                                    20

SEQ ID NO: 469         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
```

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```
SEQUENCE: 469
aagaggatcc acgtggagaa                                               20

SEQ ID NO: 470          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 470
aggatccacg tggagaatgg                                               20

SEQ ID NO: 471          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 471
cacgtggaga atggtgggtt                                               20

SEQ ID NO: 472          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 472
gatccacgtg gagaatggtg                                               20

SEQ ID NO: 473          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 473
agaggatcca cgtggagaat                                               20

SEQ ID NO: 474          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 474
gtggagaatg gtgggttggc                                               20

SEQ ID NO: 475          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 475
gggaagagga tccacgtgga                                               20

SEQ ID NO: 476          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 476
acgtggagaa tggtgggttg gc                                            22

SEQ ID NO: 477          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 477
ggagaatggt gggttggcca ct                                            22

SEQ ID NO: 478          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 478
ccacgtggag aatggtgggt tg                                            22

SEQ ID NO: 479          moltype = RNA  length = 22
```

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```
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 479
atccacgtgg agaatggtgg gt                                          22

SEQ ID NO: 480         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 480
gatccacgtg gagaatggtg gg                                          22

SEQ ID NO: 481         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 481
ggatccacgt ggagaatggt gg                                          22

SEQ ID NO: 482         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 482
ccaacccacc attctccacg                                             20

SEQ ID NO: 483         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 483
tccacgtgga tcctcttccc                                             20

SEQ ID NO: 484         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 484
ccacgtggat cctcttccct                                             20

SEQ ID NO: 485         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 485
aacccaccat tctccacgtg                                             20

SEQ ID NO: 486         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 486
gtggccaacc caccattctc                                             20

SEQ ID NO: 487         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 487
accattctcc acgtggatcc tc                                          22

SEQ ID NO: 488         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
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SEQUENCE: 488
tccacgtgga tcctcttccc tg                                             22

SEQ ID NO: 489          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 489
accattctcc acgtggatcc tc                                             22

SEQ ID NO: 490          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 490
caccattctc cacgtggatc ct                                             22

SEQ ID NO: 491          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 491
ccaccattct ccacgtggat cc                                             22

SEQ ID NO: 492          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 492
aacccaccat tctccacgtg ga                                             22

SEQ ID NO: 493          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 493
ccaacccacc attctccacg tg                                             22

SEQ ID NO: 494          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 494
gccaacccac cattctccac gt                                             22

SEQ ID NO: 495          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 495
tctccacgtg gatcctcttc cc                                             22

SEQ ID NO: 496          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 496
attctccacg tggatcctct tc                                             22

SEQ ID NO: 497          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 497
cattctccac gtggatcctc tt                                             22

SEQ ID NO: 498          moltype = RNA  length = 20
```

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```
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 498
ccacgtggag aatggtgggt                                                  20

SEQ ID NO: 499           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 499
ggatccacgt ggagaatggt                                                  20

SEQ ID NO: 500           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 500
aagaggatcc acgtggagaa                                                  20

SEQ ID NO: 501           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 501
ctcagggaag aggatccacg                                                  20

SEQ ID NO: 502           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 502
cacgtggaga atggtgggtt                                                  20

SEQ ID NO: 503           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 503
gatccacgtg gagaatggtg                                                  20

SEQ ID NO: 504           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 504
agaggatcca cgtggagaat                                                  20

SEQ ID NO: 505           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 505
tcagggaaga ggatccacgt                                                  20

SEQ ID NO: 506           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 506
ttctcaggga agaggatcca                                                  20

SEQ ID NO: 507           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
```

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```
SEQUENCE: 507
ggaagaggat ccacgtggag                                              20

SEQ ID NO: 508         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 508
gggaagagga tccacgtgga                                              20

SEQ ID NO: 509         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 509
cagggaagag gatccacgtg                                              20

SEQ ID NO: 510         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 510
acgtggagaa tggtgggttg gc                                           22

SEQ ID NO: 511         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 511
ccacgtggag aatggtgggt tg                                           22

SEQ ID NO: 512         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 512
atccacgtgg agaatggtgg gt                                           22

SEQ ID NO: 513         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 513
gatccacgtg gagaatggtg gg                                           22

SEQ ID NO: 514         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 514
gttctcaggg aagaggatcc ac                                           22

SEQ ID NO: 515         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 515
ggatccacgt ggagaatggt gg                                           22

SEQ ID NO: 516         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 516
tgttctcagg gaagaggatc ca                                           22

SEQ ID NO: 517         moltype = RNA  length = 20
```

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```
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 517
ccacgtggag aatggtgggt                                                20

SEQ ID NO: 518         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 518
tgtgaagtga ccaactacac                                                20

SEQ ID NO: 519         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 519
gaccaactac accgtccgag                                                20

SEQ ID NO: 520         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 520
aagtgaccaa ctacaccgtc                                                20

SEQ ID NO: 521         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 521
gtgaccaact acaccgtccg                                                20

SEQ ID NO: 522         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 522
agaatggtgg gttggccact                                                20

SEQ ID NO: 523         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 523
aagaggatcc acgtggagaa                                                20

SEQ ID NO: 524         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 524
ccaacccacc attctccacg                                                20

SEQ ID NO: 525         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 525
catttttctc actgttctca                                                20

SEQ ID NO: 526         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
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```
SEQUENCE: 526
aaagaaaaaa gacacagcga                                              20

SEQ ID NO: 527         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 527
aggatccacg tggagaatgg                                              20

SEQ ID NO: 528         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 528
ggatccacgt ggagaatggt                                              20

SEQ ID NO: 529         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 529
tgaagtgacc aactacaccg tc                                           22

SEQ ID NO: 530         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 530
ttatgtgaag tgaccaacta ca                                           22

SEQ ID NO: 531         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 531
tccacgtgga gaatggtggg tt                                           22

SEQ ID NO: 532         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 532
tcagggaaga ggatccacgt                                              20

SEQ ID NO: 533         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 533
ctcactgttc tcagggaaga                                              20

SEQ ID NO: 534         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 534
atttaccggc atagaatagt                                              20

SEQ ID NO: 535         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 535
cttaacagaa atgtgaccga                                              20

SEQ ID NO: 536         moltype = RNA  length = 20
```

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```
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 536
cagaaatgtg accgatatcg                                                20

SEQ ID NO: 537           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 537
gtcggcgtct ttaacacact                                                20

SEQ ID NO: 538           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 538
gaaatgtgac cgatatcgag                                                20

SEQ ID NO: 539           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 539
caatagagag tatgatttac                                                20

SEQ ID NO: 540           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 540
agagtatgat ttaccggcat                                                20

SEQ ID NO: 541           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 541
atgatttacc ggcatagaat                                                20

SEQ ID NO: 542           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 542
aacaccggca aatacacgtg                                                20

SEQ ID NO: 543           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 543
ccaacaccgg caaatacacg                                                20

SEQ ID NO: 544           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
SEQUENCE: 544
caccaacacc ggcaaataca                                                20

SEQ ID NO: 545           moltype = RNA  length = 20
FEATURE                  Location/Qualifiers
source                   1..20
                         mol_type = other RNA
                         organism = synthetic construct
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```
SEQUENCE: 545
gccaccaaca ccggcaaata                                            20

SEQ ID NO: 546          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 546
aagccaccaa caccggcaaa                                            20

SEQ ID NO: 547          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 547
aacaccggca aatacacgtg ca                                         22

SEQ ID NO: 548          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 548
caccaacacc ggcaaataca cg                                         22

SEQ ID NO: 549          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 549
accaacaccg gcaaatacac gt                                         22

SEQ ID NO: 550          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 550
gccaccaaca ccggcaaata ca                                         22

SEQ ID NO: 551          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 551
gcagaagcca ccaacaccgg ca                                         22

SEQ ID NO: 552          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 552
ccaacaccgg caaatacacg tg                                         22

SEQ ID NO: 553          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 553
caacaccggc aaatacacgt gc                                         22

SEQ ID NO: 554          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 554
caccggcaaa tacacgtgca cc                                         22

SEQ ID NO: 555          moltype = RNA  length = 20
```

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```
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 555
ccggcaaata cacgtgcacc                                                  20

SEQ ID NO: 556         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 556
accggcaaat acacgtgcac                                                  20

SEQ ID NO: 557         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 557
ggcaaataca cgtgcaccaa                                                  20

SEQ ID NO: 558         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 558
gcaaatacac gtgcaccaac                                                  20

SEQ ID NO: 559         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 559
caaatacacg tgcaccaaca                                                  20

SEQ ID NO: 560         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 560
ccggcaaata cacgtgcacc aa                                               22

SEQ ID NO: 561         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 561
ggcaaataca cgtgcaccaa ca                                               22

SEQ ID NO: 562         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 562
tacacgtgca ccaacaaaca                                                  20

SEQ ID NO: 563         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 563
aatacacgtg caccaacaaa                                                  20

SEQ ID NO: 564         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
```

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```
SEQUENCE: 564
acacgtgcac caacaaacac                                              20

SEQ ID NO: 565          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 565
aaatacacgt gcaccaacaa ac                                           22

SEQ ID NO: 566          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 566
acacgtgcac caacaaacac gg                                           22

SEQ ID NO: 567          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 567
attccattta tgtgtttgtt                                              20

SEQ ID NO: 568          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 568
aattccattt atgtgtttgt                                              20

SEQ ID NO: 569          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 569
agcaattcca tttatgtgtt                                              20

SEQ ID NO: 570          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 570
cttaagcaat tccatttatg                                              20

SEQ ID NO: 571          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 571
ggcttaagca attccattta                                              20

SEQ ID NO: 572          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 572
ataaatggaa ttgcttaagc                                              20

SEQ ID NO: 573          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 573
aaatggaatt gcttaagccg                                              20

SEQ ID NO: 574          moltype = RNA  length = 20
```

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```
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 574
ggaattgctt aagccgtgtt                                             20

SEQ ID NO: 575         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 575
acacataaat ggaattgctt                                             20

SEQ ID NO: 576         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 576
aacacataaa tggaattgct                                             20

SEQ ID NO: 577         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 577
cacataaatg gaattgctta                                             20

SEQ ID NO: 578         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 578
caaacacata aatggaattg ct                                          22

SEQ ID NO: 579         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 579
aaacacataa atggaattgc tt                                          22

SEQ ID NO: 580         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 580
caaacacata aatggaattg ct                                          22

SEQ ID NO: 581         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 581
caattccatt tatgtgtttg tt                                          22

SEQ ID NO: 582         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 582
gcaattccat ttatgtgttt gt                                          22

SEQ ID NO: 583         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
```

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```
SEQUENCE: 583
gcttaagcaa ttccatttat gt                                            22

SEQ ID NO: 584          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 584
ttatgtgttt gttagaggta                                               20

SEQ ID NO: 585          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 585
tttatgtgtt tgttagaggt                                               20

SEQ ID NO: 586          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 586
atttatgtgt ttgttagagg                                               20

SEQ ID NO: 587          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 587
ccatttatgt gtttgttaga                                               20

SEQ ID NO: 588          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 588
tccatttatg tgtttgttag                                               20

SEQ ID NO: 589          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 589
ttccatttat gtgtttgtta                                               20

SEQ ID NO: 590          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 590
tctaacaaac acataaatgg                                               20

SEQ ID NO: 591          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 591
ctctaacaaa cacataaatg                                               20

SEQ ID NO: 592          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 592
acctctaaca aacacataaa                                               20

SEQ ID NO: 593          moltype = RNA  length = 22
```

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```
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 593
ctctaacaaa cacataaatg ga                                           22

SEQ ID NO: 594         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 594
atttatgtgt ttgttagagg ta                                           22

SEQ ID NO: 595         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 595
gcaattccat ttatgtgttt gt                                           22

SEQ ID NO: 596         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 596
ctcacagacc cagaagtgac                                              20

SEQ ID NO: 597         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 597
cctctcacag acccagaagt                                              20

SEQ ID NO: 598         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 598
tcacagaccc agaagtgacc                                              20

SEQ ID NO: 599         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 599
tcctctcaca gacccagaag                                              20

SEQ ID NO: 600         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 600
tgtcctctca cagacccaga                                              20

SEQ ID NO: 601         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 601
ctgtcctctc acagacccag                                              20

SEQ ID NO: 602         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
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```
SEQUENCE: 602
gctgtcctct cacagaccca                                              20

SEQ ID NO: 603          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 603
cgctgtcctc tcacagaccc                                              20

SEQ ID NO: 604          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 604
ccgctgtcct ctcacagacc                                              20

SEQ ID NO: 605          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 605
ctgtcctctc acagacccag aa                                           22

SEQ ID NO: 606          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 606
cacagaccca gaagtgacca at                                           22

SEQ ID NO: 607          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 607
tgtcctctca cagacccaga ag                                           22

SEQ ID NO: 608          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 608
tcctctcaca gacccagaag tg                                           22

SEQ ID NO: 609          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 609
gctgtcctct cacagaccca ga                                           22

SEQ ID NO: 610          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 610
tccgctgtcc tctcacagac cc                                           22

SEQ ID NO: 611          moltype = RNA  length = 19
FEATURE                 Location/Qualifiers
source                  1..19
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 611
gtgaccaatt attccctca                                               19

SEQ ID NO: 612          moltype = RNA  length = 20
```

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```
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 612
gtgaccaatt attccctcaa                                                  20

SEQ ID NO: 613         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 613
aagtgaccaa ttattccctc                                                  20

SEQ ID NO: 614         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 614
gtgaccaatt attccctcaa                                                  20

SEQ ID NO: 615         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 615
tgaccaatta ttccctcaag                                                  20

SEQ ID NO: 616         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 616
gaccaattat tccctcaagg                                                  20

SEQ ID NO: 617         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 617
gaagtgacca attattccct                                                  20

SEQ ID NO: 618         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 618
cagacccaga agtgaccaat ta                                               22

SEQ ID NO: 619         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 619
gacccagaag tgaccaatta tt                                               22

SEQ ID NO: 620         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 620
acagacccag aagtgaccaa tt                                               22

SEQ ID NO: 621         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
```

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```
SEQUENCE: 621
gtgaccaatt attccctcaa gg                                              22

SEQ ID NO: 622          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 622
tgaccaatta ttccctcaag gg                                              22

SEQ ID NO: 623          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 623
agtgaccaat tattccctca ag                                              22

SEQ ID NO: 624          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 624
ccaggggaag cctcttccca                                                 20

SEQ ID NO: 625          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 625
caggggaagc ctcttcccaa                                                 20

SEQ ID NO: 626          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 626
aggggaagcc tcttcccaag                                                 20

SEQ ID NO: 627          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 627
gaagcctctt cccaaggact                                                 20

SEQ ID NO: 628          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 628
ccttgggaag aggcttcccc                                                 20

SEQ ID NO: 629          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 629
tgggaagagg cttcccctgg                                                 20

SEQ ID NO: 630          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 630
aggcttcccc tggcacccct                                                 20

SEQ ID NO: 631          moltype = RNA  length = 20
```

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```
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 631
ggcttcccct ggcacccctt                                                 20

SEQ ID NO: 632          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 632
tgccagggga agcctcttcc ca                                              22

SEQ ID NO: 633          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 633
ggggtgccag gggaagcctc tt                                              22

SEQ ID NO: 634          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 634
ttgggaagag gcttcccctg gc                                              22

SEQ ID NO: 635          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 635
cttgggaaga ggcttcccct gg                                              22

SEQ ID NO: 636          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 636
ccttgggaag aggcttcccc tg                                              22

SEQ ID NO: 637          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 637
agtccttggg aagaggcttc cc                                              22

SEQ ID NO: 638          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 638
aggcttcccc tggcacccct tg                                              22

SEQ ID NO: 639          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 639
ggcttcccct ggcacccctt ga                                              22

SEQ ID NO: 640          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
```

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```
SEQUENCE: 640
aagaggcttc ccctggcacc cc                                                 22

SEQ ID NO: 641          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 641
agaggcttcc cctggcaccc ct                                                 22

SEQ ID NO: 642          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 642
aaatataata gctggcatca                                                    20

SEQ ID NO: 643          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 643
tataatagct ggcatcacgg                                                    20

SEQ ID NO: 644          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 644
aatataatag ctggcatcac                                                    20

SEQ ID NO: 645          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 645
ataatagctg gcatcacggt                                                    20

SEQ ID NO: 646          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 646
agaaatataa tagctggcat                                                    20

SEQ ID NO: 647          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 647
aggagaaata taatagctgg                                                    20

SEQ ID NO: 648          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 648
gccagctatt atatttctcc                                                    20

SEQ ID NO: 649          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 649
caccgtgatg ccagctatta                                                    20

SEQ ID NO: 650          moltype = RNA  length = 20
```

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```
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 650
cagctattat atttctcctg                                                 20

SEQ ID NO: 651          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 651
agctattata tttctcctgt                                                 20

SEQ ID NO: 652          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 652
tataatagct ggcatcacgg tg                                              22

SEQ ID NO: 653          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 653
aaatataata gctggcatca cg                                              22

SEQ ID NO: 654          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 654
caggagaaat ataatagctg gc                                              22

SEQ ID NO: 655          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 655
tacaggagaa atataatagc tg                                              22

SEQ ID NO: 656          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 656
taatagctgg catcacggtg ac                                              22

SEQ ID NO: 657          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 657
tagctggcat cacggtgact tc                                              22

SEQ ID NO: 658          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 658
ggagaaatat aatagctggc at                                              22

SEQ ID NO: 659          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
```

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```
SEQUENCE: 659
ccgtgatgcc agctattata tt                                            22

SEQ ID NO: 660          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 660
accgtgatgc cagctattat at                                            22

SEQ ID NO: 661          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 661
tcaccgtgat gccagctatt at                                            22

SEQ ID NO: 662          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 662
agctggcatc acggtgactt                                               20

SEQ ID NO: 663          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 663
gctggcatca cggtgacttc                                               20

SEQ ID NO: 664          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 664
ggcatcacgg tgacttcaat                                               20

SEQ ID NO: 665          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 665
ggcatcacgg tgacttcaat ta                                            22

SEQ ID NO: 666          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 666
gcatcacggt gacttcaatt at                                            22

SEQ ID NO: 667          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 667
tgacttcaat tatgaacgtc                                               20

SEQ ID NO: 668          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 668
ttatgaacgt caggcaacgt                                               20

SEQ ID NO: 669          moltype = RNA  length = 20
```

-continued

```
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 669
caattatgaa cgtcaggcaa                                                20

SEQ ID NO: 670          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 670
gacttcaatt atgaacgtca                                                20

SEQ ID NO: 671          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 671
acggtgactt caattatgaa                                                20

SEQ ID NO: 672          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 672
cataattgaa gtcaccgtga                                                20

SEQ ID NO: 673          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 673
gttcataatt gaagtcaccg                                                20

SEQ ID NO: 674          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 674
acgttcataa ttgaagtcac                                                20

SEQ ID NO: 675          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 675
tgcctgacgt tcataattga                                                20

SEQ ID NO: 676          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 676
cgttgcctga cgttcataat                                                20

SEQ ID NO: 677          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 677
ttcaattatg aacgtcaggc                                                20

SEQ ID NO: 678          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
```

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```
SEQUENCE: 678
cttcaattat gaacgtcagg                                              20

SEQ ID NO: 679          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 679
gtgacttcaa ttatgaacgt                                              20

SEQ ID NO: 680          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 680
tcacggtgac ttcaattatg                                              20

SEQ ID NO: 681          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 681
ttcataattg aagtcaccgt                                              20

SEQ ID NO: 682          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 682
ctgacgttca taattgaagt                                              20

SEQ ID NO: 683          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 683
ttgcctgacg ttcataattg                                              20

SEQ ID NO: 684          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 684
gttgcctgac gttcataatt                                              20

SEQ ID NO: 685          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 685
caattatgaa cgtcaggcaa cg                                           22

SEQ ID NO: 686          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 686
tatgaacgtc aggcaacgtt ga                                           22

SEQ ID NO: 687          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 687
tgacttcaat tatgaacgtc ag                                           22

SEQ ID NO: 688          moltype = RNA  length = 22
```

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```
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 688
cggtgacttc aattatgaac gt                                            22

SEQ ID NO: 689          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 689
gttcataatt gaagtcaccg tg                                            22

SEQ ID NO: 690          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 690
cataattgaa gtcaccgtga tg                                            22

SEQ ID NO: 691          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 691
cgttcataat tgaagtcacc gt                                            22

SEQ ID NO: 692          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 692
tgcctgacgt tcataattga ag                                            22

SEQ ID NO: 693          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 693
ttgcctgacg ttcataattg aa                                            22

SEQ ID NO: 694          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 694
cgttgcctga cgttcataat tg                                            22

SEQ ID NO: 695          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 695
tcaattatga acgtcaggca ac                                            22

SEQ ID NO: 696          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 696
attatgaacg tcaggcaacg tt                                            22

SEQ ID NO: 697          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
```

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```
SEQUENCE: 697
acggtgactt caattatgaa cg                                            22

SEQ ID NO: 698          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 698
cacggtgact tcaattatga ac                                            22

SEQ ID NO: 699          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 699
tcataattga agtcaccgtg at                                            22

SEQ ID NO: 700          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 700
acgttcataa ttgaagtcac cg                                            22

SEQ ID NO: 701          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 701
gcctgacgtt cataattgaa gt                                            22

SEQ ID NO: 702          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 702
ggatcagcaa atgtcacaac                                               20

SEQ ID NO: 703          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 703
tggatcagca aatgtcacaa                                               20

SEQ ID NO: 704          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 704
tttggatcag caaatgtcac                                               20

SEQ ID NO: 705          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 705
ttttggatca gcaaatgtca                                               20

SEQ ID NO: 706          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 706
acttttggat cagcaaatgt                                               20

SEQ ID NO: 707          moltype = RNA  length = 20
```

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```
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 707
aatactttg gatcagcaaa                                                        20

SEQ ID NO: 708          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 708
ataatacttt tggatcagca                                                       20

SEQ ID NO: 709          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 709
aataatactt ttggatcagc                                                       20

SEQ ID NO: 710          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 710
caataatact tttggatcag                                                       20

SEQ ID NO: 711          moltype = RNA  length = 19
FEATURE                 Location/Qualifiers
source                  1..19
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 711
gctgatccaa aagtattat                                                        19

SEQ ID NO: 712          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 712
tgatccaaaa gtattattgg                                                       20

SEQ ID NO: 713          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 713
gctgatccaa aagtattatt                                                       20

SEQ ID NO: 714          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 714
atttgctgat ccaaaagtat                                                       20

SEQ ID NO: 715          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 715
gacatttgct gatccaaaag                                                       20

SEQ ID NO: 716          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
```

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```
SEQUENCE: 716
gtgacatttg ctgatccaaa                                              20

SEQ ID NO: 717         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 717
tgtgacattt gctgatccaa                                              20

SEQ ID NO: 718         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 718
ttgtgacatt tgctgatcca                                              20

SEQ ID NO: 719         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 719
gttgtgacat ttgctgatcc                                              20

SEQ ID NO: 720         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 720
tgttgtgaca tttgctgatc                                              20

SEQ ID NO: 721         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 721
atttgctgat ccaaaagtat ta                                           22

SEQ ID NO: 722         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 722
ctgatccaaa agtattattg gc                                           22

SEQ ID NO: 723         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 723
aataatactt ttggatcagc aa                                           22

SEQ ID NO: 724         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 724
ttttggatca gcaaatgtca ca                                           22

SEQ ID NO: 725         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 725
tttggatcag caaatgtcac aa                                           22

SEQ ID NO: 726         moltype = RNA  length = 22
```

-continued

```
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 726
tacttttgga tcagcaaatg tc                                           22

SEQ ID NO: 727         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 727
taatactttt ggatcagcaa at                                           22

SEQ ID NO: 728         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 728
ctgatccaaa agtattattg gc                                           22

SEQ ID NO: 729         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 729
gatccaaaag tattattggc at                                           22

SEQ ID NO: 730         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 730
tcagcaaatg tcacaacaac ct                                           22

SEQ ID NO: 731         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 731
atacttttgg atcagcaaat gt                                           22

SEQ ID NO: 732         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 732
aatacttttg gatcagcaaa tg                                           22

SEQ ID NO: 733         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 733
ataatacttt tggatcagca aa                                           22

SEQ ID NO: 734         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 734
tttgctgatc caaaagtatt at                                           22

SEQ ID NO: 735         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
```

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```
SEQUENCE: 735
tgctgatcca aaagtattat tg                                            22

SEQ ID NO: 736          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 736
gttgtgacat ttgctgatcc aa                                            22

SEQ ID NO: 737          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 737
acatttgctg atccaaaagt at                                            22

SEQ ID NO: 738          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 738
ggatcagcaa atgtcacaac aa                                            22

SEQ ID NO: 739          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 739
agcaaatgtc acaacaacct                                               20

SEQ ID NO: 740          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 740
gtcacaacaa ccttggaagt                                               20

SEQ ID NO: 741          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 741
cacaacaacc ttggaagtag                                               20

SEQ ID NO: 742          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 742
tgtcacaaca accttggaag                                               20

SEQ ID NO: 743          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 743
aatgtcacaa caaccttgga                                               20

SEQ ID NO: 744          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 744
aaatgtcaca acaaccttgg                                               20

SEQ ID NO: 745          moltype = RNA  length = 20
```

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```
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 745
caaatgtcac aacaaccttg                                                    20

SEQ ID NO: 746          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 746
gcaaatgtca caacaacctt                                                    20

SEQ ID NO: 747          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 747
ggatcagcaa atgtcacaac                                                    20

SEQ ID NO: 748          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 748
cacaacaacc ttggaagtag ta                                                 22

SEQ ID NO: 749          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 749
gcaaatgtca caacaacctt gg                                                 22

SEQ ID NO: 750          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 750
tgtcacaaca accttggaag ta                                                 22

SEQ ID NO: 751          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 751
atgtcacaac aaccttggaa gt                                                 22

SEQ ID NO: 752          moltype = RNA  length = 19
FEATURE                 Location/Qualifiers
source                  1..19
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 752
caacaacctt ggaagtagt                                                     19

SEQ ID NO: 753          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 753
caacaacctt ggaagtagta                                                    20

SEQ ID NO: 754          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
```

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```
SEQUENCE: 754
acaaccttgg aagtagtagg                                              20

SEQ ID NO: 755         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 755
caaccttgga agtagtaggt                                              20

SEQ ID NO: 756         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 756
aaccttggaa gtagtaggta                                              20

SEQ ID NO: 757         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 757
caaccttgga agtagtaggt aa                                           22

SEQ ID NO: 758         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 758
acaaccttgg aagtagtagg ta                                           22

SEQ ID NO: 759         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 759
ctgatccggg ctttgtcaaa tgg                                          23

SEQ ID NO: 760         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 760
tacacgtgca ccaacaaaca cgg                                          23

SEQ ID NO: 761         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 761
caaatggact tttgagatcc tgg                                          23

SEQ ID NO: 762         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 762
gaatgaatgg atcacggaaa agg                                          23

SEQ ID NO: 763         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 763
aaggcagaag ccaccaacac cgg                                          23

SEQ ID NO: 764         moltype = RNA  length = 23
```

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```
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 764
atgagaataa gcagaatgaa tgg                                         23

SEQ ID NO: 765         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 765
taagcagaat gaatggatca cgg                                         23

SEQ ID NO: 766         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 766
attgcttaag ccgtgtttgt tgg                                         23

SEQ ID NO: 767         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 767
tgtcatccaa aattaagagc agg                                         23

SEQ ID NO: 768         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 768
gttggtgcac gtgtatttgc cgg                                         23

SEQ ID NO: 769         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 769
acctctaaca aacacataaa tgg                                         23

SEQ ID NO: 770         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 770
ttgttgaccg ctccttgtat ggg                                         23

SEQ ID NO: 771         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 771
cttgttgacc gctccttgta tgg                                         23

SEQ ID NO: 772         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 772
gaaagaagac aacgacacgc tgg                                         23

SEQ ID NO: 773         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
```

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```
SEQUENCE: 773
ttattccctc aaggggtgcc agg                                          23

SEQ ID NO: 774          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 774
tgaccaatta ttccctcaag ggg                                          23

SEQ ID NO: 775          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 775
tattccctca aggggtgcca ggg                                          23

SEQ ID NO: 776          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 776
gtgaccaatt attccctcaa ggg                                          23

SEQ ID NO: 777          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 777
attccctcaa ggggtgccag ggg                                          23

SEQ ID NO: 778          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 778
ttgatcatga tgcccgcctt ggg                                          23

SEQ ID NO: 779          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 779
atgcagacag agccgatggt agg                                          23

SEQ ID NO: 780          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 780
tgatcatgat gcccgccttg ggg                                          23

SEQ ID NO: 781          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 781
tttgatcatg atgcccgcct tgg                                          23

SEQ ID NO: 782          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 782
gcaccccttg agggaataat tgg                                          23

SEQ ID NO: 783          moltype = RNA  length = 23
```

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```
FEATURE               Location/Qualifiers
source                1..23
                      mol_type = other RNA
                      organism = synthetic construct
SEQUENCE: 783
aacaatgcag acagagccga tgg                                         23

SEQ ID NO: 784        moltype = RNA  length = 23
FEATURE               Location/Qualifiers
source                1..23
                      mol_type = other RNA
                      organism = synthetic construct
SEQUENCE: 784
gggaataatt ggtcacttct ggg                                         23

SEQ ID NO: 785        moltype = RNA  length = 23
FEATURE               Location/Qualifiers
source                1..23
                      mol_type = other RNA
                      organism = synthetic construct
SEQUENCE: 785
agggaataat tggtcacttc tgg                                         23

SEQ ID NO: 786        moltype = RNA  length = 23
FEATURE               Location/Qualifiers
source                1..23
                      mol_type = other RNA
                      organism = synthetic construct
SEQUENCE: 786
aggaataaac ctcaagtcct tgg                                         23

SEQ ID NO: 787        moltype = RNA  length = 23
FEATURE               Location/Qualifiers
source                1..23
                      mol_type = other RNA
                      organism = synthetic construct
SEQUENCE: 787
atgatgcccg ccttggggtc agg                                         23

SEQ ID NO: 788        moltype = RNA  length = 23
FEATURE               Location/Qualifiers
source                1..23
                      mol_type = other RNA
                      organism = synthetic construct
SEQUENCE: 788
cttcccctgg cacccccttga ggg                                        23

SEQ ID NO: 789        moltype = RNA  length = 23
FEATURE               Location/Qualifiers
source                1..23
                      mol_type = other RNA
                      organism = synthetic construct
SEQUENCE: 789
gcttcccctg gcaccccttg agg                                         23

SEQ ID NO: 790        moltype = RNA  length = 23
FEATURE               Location/Qualifiers
source                1..23
                      mol_type = other RNA
                      organism = synthetic construct
SEQUENCE: 790
aacctcaagt ccttgggaag agg                                         23

SEQ ID NO: 791        moltype = RNA  length = 23
FEATURE               Location/Qualifiers
source                1..23
                      mol_type = other RNA
                      organism = synthetic construct
SEQUENCE: 791
ggaataaacc tcaagtcctt ggg                                         23

SEQ ID NO: 792        moltype = RNA  length = 23
FEATURE               Location/Qualifiers
source                1..23
                      mol_type = other RNA
                      organism = synthetic construct
```

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```
SEQUENCE: 792
aaaccagcag actaaactac agg                                          23

SEQ ID NO: 793          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 793
tacaggagaa atataatagc tgg                                          23

SEQ ID NO: 794          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 794
aaatataata gctggcatca cgg                                          23

SEQ ID NO: 795          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 795
gattctgaat ataaattata tgg                                          23

SEQ ID NO: 796          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 796
tgctgatcca aaagtattat tgg                                          23

SEQ ID NO: 797          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 797
tcagcgagag ttaatgattc tgg                                          23

SEQ ID NO: 798          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 798
tgacttcaat tatgaacgtc agg                                          23

SEQ ID NO: 799          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 799
tgttatgcca ataatacttt tgg                                          23

SEQ ID NO: 800          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 800
gtatttacct actacttcca agg                                          23

SEQ ID NO: 801          moltype = RNA  length = 23
FEATURE                 Location/Qualifiers
source                  1..23
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 801
taatttaaac attcccatag agg                                          23

SEQ ID NO: 802          moltype = RNA  length = 20
```

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```
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 802
taagtgatga tgtccaaaca                                                 20

SEQ ID NO: 803          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 803
tgatgatgtc caaacatggc                                                 20

SEQ ID NO: 804          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 804
aacatggcag gagagtaaaa                                                 20

SEQ ID NO: 805          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 805
atgtttggac atcatcactt                                                 20

SEQ ID NO: 806          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 806
ttttactctc ctgccatgtt                                                 20

SEQ ID NO: 807          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 807
aggacagctg ttatttccta                                                 20

SEQ ID NO: 808          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 808
gacagctgtt atttcctaag                                                 20

SEQ ID NO: 809          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 809
agctgttatt tcctaagtga                                                 20

SEQ ID NO: 810          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 810
tgttatttcc taagtgatga                                                 20

SEQ ID NO: 811          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
```

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```
SEQUENCE: 811
tgatgtccaa acatggcagg                                                20

SEQ ID NO: 812          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 812
atgtccaaac atggcaggag                                                20

SEQ ID NO: 813          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 813
ggcaggagag taaaatggcc                                                20

SEQ ID NO: 814          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 814
caggagagta aaatggcctg                                                20

SEQ ID NO: 815          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 815
ggaaataaca gctgtcctta                                                20

SEQ ID NO: 816          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 816
atcacttagg aaataacagc                                                20

SEQ ID NO: 817          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 817
atcatcactt aggaaataac                                                20

SEQ ID NO: 818          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 818
gccattttac tctcctgcca                                                20

SEQ ID NO: 819          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 819
taaggacagc tgttatttcc                                                20

SEQ ID NO: 820          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 820
aaggacagct gttatttcct                                                20

SEQ ID NO: 821          moltype = RNA  length = 20
```

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```
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 821
acagctgtta tttcctaagt                                              20

SEQ ID NO: 822         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 822
gctgttattt cctaagtgat                                              20

SEQ ID NO: 823         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 823
atttcctaag tgatgatgtc                                              20

SEQ ID NO: 824         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 824
ttcctaagtg atgatgtcca                                              20

SEQ ID NO: 825         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 825
cctaagtgat gatgtccaaa                                              20

SEQ ID NO: 826         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 826
atgatgtcca aacatggcag                                              20

SEQ ID NO: 827         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 827
gatgtccaaa catggcagga                                              20

SEQ ID NO: 828         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 828
gtccaaacat ggcaggagag                                              20

SEQ ID NO: 829         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 829
tccaaacatg gcaggagagt                                              20

SEQ ID NO: 830         moltype = RNA  length = 20
FEATURE                Location/Qualifiers
source                 1..20
                       mol_type = other RNA
                       organism = synthetic construct
```

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```
SEQUENCE: 830
caaacatggc aggagagtaa                                                20

SEQ ID NO: 831          moltype = RNA  length = 19
FEATURE                 Location/Qualifiers
source                  1..19
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 831
gctgtcctta tgccaaatc                                                 19

SEQ ID NO: 832          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 832
taacagctgt ccttatgcca                                                20

SEQ ID NO: 833          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 833
ataacagctg tccttatgcc                                                20

SEQ ID NO: 834          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 834
aataacagct gtccttatgc                                                20

SEQ ID NO: 835          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 835
catcatcact taggaaataa                                                20

SEQ ID NO: 836          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 836
gacatcatca cttaggaaat                                                20

SEQ ID NO: 837          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 837
ttggacatca tcacttagga                                                20

SEQ ID NO: 838          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 838
tttggacatc atcacttagg                                                20

SEQ ID NO: 839          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 839
gtttggacat catcacttag                                                20

SEQ ID NO: 840          moltype = RNA  length = 20
```

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```
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 840
ctgccatgtt tggacatcat                                             20

SEQ ID NO: 841          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 841
ctcctgccat gtttggacat                                             20

SEQ ID NO: 842          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 842
actctcctgc catgtttgga                                             20

SEQ ID NO: 843          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 843
ttactctcct gccatgtttg                                             20

SEQ ID NO: 844          moltype = RNA  length = 20
FEATURE                 Location/Qualifiers
source                  1..20
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 844
aggccatttt actctcctgc                                             20

SEQ ID NO: 845          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 845
agctgttatt tcctaagtga tg                                          22

SEQ ID NO: 846          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 846
agctgttatt tcctaagtga tg                                          22

SEQ ID NO: 847          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 847
tttggcataa ggacagctgt ta                                          22

SEQ ID NO: 848          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 848
ttaggaaata acagctgtcc tt                                          22

SEQ ID NO: 849          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
```

-continued

```
SEQUENCE: 849
cttaggaaat aacagctgtc ct                                            22

SEQ ID NO: 850         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 850
tcatcactta ggaaataaca gc                                            22

SEQ ID NO: 851         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 851
tctcctgcca tgtttggaca tc                                            22

SEQ ID NO: 852         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 852
taaggacagc tgttatttcc ta                                            22

SEQ ID NO: 853         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 853
tgttatttcc taagtgatga tg                                            22

SEQ ID NO: 854         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 854
cctaagtgat gatgtccaaa ca                                            22

SEQ ID NO: 855         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 855
gtgatgatgt ccaaacatgg ca                                            22

SEQ ID NO: 856         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 856
atgatgtcca aacatggcag ga                                            22

SEQ ID NO: 857         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 857
tgtttggaca tcatcactta gg                                            22

SEQ ID NO: 858         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 858
cctgccatgt ttggacatca tc                                            22

SEQ ID NO: 859         moltype = RNA  length = 22
```

-continued

```
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 859
ttactctcct gccatgtttg ga                                            22

SEQ ID NO: 860         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 860
attttactct cctgccatgt tt                                            22

SEQ ID NO: 861         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 861
ttatttccta agtgatgatg tc                                            22

SEQ ID NO: 862         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 862
tcctaagtga tgatgtccaa ac                                            22

SEQ ID NO: 863         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 863
ccaaacatgg caggagagta aa                                            22

SEQ ID NO: 864         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 864
caaacatggc aggagagtaa aa                                            22

SEQ ID NO: 865         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 865
atggcaggag agtaaaatgg cc                                            22

SEQ ID NO: 866         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 866
gcaggagagt aaaatggcct gt                                            22

SEQ ID NO: 867         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 867
ggacatcatc acttaggaaa ta                                            22

SEQ ID NO: 868         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
```

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```
SEQUENCE: 868
ttggacatca tcacttagga aa                                          22

SEQ ID NO: 869          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 869
actctcctgc catgtttgga ca                                          22

SEQ ID NO: 870          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 870
tttactctcc tgccatgttt gg                                          22

SEQ ID NO: 871          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 871
cattttactc tcctgccatg tt                                          22

SEQ ID NO: 872          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 872
gcataaggac agctgttatt tc                                          22

SEQ ID NO: 873          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 873
tttcctaagt gatgatgtcc aa                                          22

SEQ ID NO: 874          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 874
taagtgatga tgtccaaaca tg                                          22

SEQ ID NO: 875          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 875
tgatgatgtc caaacatggc ag                                          22

SEQ ID NO: 876          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 876
acttaggaaa taacagctgt cc                                          22

SEQ ID NO: 877          moltype = RNA  length = 22
FEATURE                 Location/Qualifiers
source                  1..22
                        mol_type = other RNA
                        organism = synthetic construct
SEQUENCE: 877
tgccatgttt ggacatcatc ac                                          22

SEQ ID NO: 878          moltype = RNA  length = 22
```

-continued

```
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 878
ctgccatgtt tggacatcat ca                                           22

SEQ ID NO: 879         moltype = RNA  length = 22
FEATURE                Location/Qualifiers
source                 1..22
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 879
gccattttac tctcctgcca tg                                           22

SEQ ID NO: 880         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 880
taagtgatga tgtccaaaca tgg                                          23

SEQ ID NO: 881         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 881
tgatgatgtc caaacatggc agg                                          23

SEQ ID NO: 882         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 882
acaaatgtaa gccttgtcca agg                                          23

SEQ ID NO: 883         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 883
cttgtccaag gagatggatt tgg                                          23

SEQ ID NO: 884         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 884
gtaagccttg tccaaggaga tgg                                          23

SEQ ID NO: 885         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 885
aaggagatgg atttggcata agg                                          23

SEQ ID NO: 886         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 886
cccatgatgg tagaaacacc tgg                                          23

SEQ ID NO: 887         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
```

-continued

```
SEQUENCE: 887
ccatgatggt agaaacacct ggg                                          23

SEQ ID NO: 888         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 888
cacccctctc tatcccatga tgg                                          23

SEQ ID NO: 889         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 889
gttgtttatc ttcaacaggc tgg                                          23

SEQ ID NO: 890         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 890
atgtttggac atcatcactt agg                                          23

SEQ ID NO: 891         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 891
gctggcattc tgagcagcac agg                                          23

SEQ ID NO: 892         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 892
ttttgttgtt tatcttcaac agg                                          23

SEQ ID NO: 893         moltype = RNA  length = 23
FEATURE                Location/Qualifiers
source                 1..23
                       mol_type = other RNA
                       organism = synthetic construct
SEQUENCE: 893
ttttactctc ctgccatgtt tgg                                          23

SEQ ID NO: 894         moltype = AA  length = 378
FEATURE                Location/Qualifiers
source                 1..378
                       mol_type = protein
                       organism = synthetic construct
SEQUENCE: 894
MVLLWLTLLL IALPCLLQTK EDPNPPITNL RMKAKAQQLT WDLNRNVTDI ECVKDADYSM  60
PAVNNSYCQF GAISLCEVTN YTVQIANPPF STWILFPENS GKPWAGAENL TCWIHDVDFL  120
SCSWAVGPGA PADVQYDLYL NVANRRQQYE CLHYKTDAQG TRIGCRFDDI SRLSSGSQSS  180
HILVRGRSAA FGIPCTDKFV VFSQIEILTP PNMTAKCNKT HSFMHWKMRS HFNRKFRYEL  240
QIQKRMQPVI TEQVRDRTSF QLLNPGTYTV QIRARERVYE FLSAWSTPQR FECDQEEGAN  300
TRAWRTSLLI ALGTLLALVC VFVICRRYLV MQRLFPRIPH MKDPIGDSFQ NDKLVVWEAG  360
KAGLEECLVT EVQVVQKT                                                378

SEQ ID NO: 895         moltype = AA  length = 378
FEATURE                Location/Qualifiers
source                 1..378
                       mol_type = protein
                       organism = synthetic construct
SEQUENCE: 895
MVLLWLTLLL IALPCLLQTK EDPNPPITNL RMKAKAQQLT WDLNRNVTDI ECVKDADYSM  60
PAVNNSYCQF GAISLCEVTN YTVQMANPPF STWILFPENS GKPWAGAENL TCWIHDVDFL  120
SCSWAVGPGA PADVQYDLYL NVANRRQQYE CLHYKTDAQG TRIGCRFDDI SRLSSGSQSS  180
HILVRGRSAA FGIPCTDKFV VFSQIEILTP PNMTAKCNKT HSFMHWKMRS HFNRKFRYEL  240
QIQKRMQPVI TEQVRDRTSF QLLNPGTYTV QIRARERVYE FLSAWSTPQR FECDQEEGAN  300
```

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TRAWRTSLLI ALGTLLALVC VFVICRRYLV MQRLFPRIPH MKDPIGDSFQ NDKLVVWEAG  360
KAGLEECLVT EVQVVQKT                                                378

SEQ ID NO: 896          moltype = AA  length = 378
FEATURE                 Location/Qualifiers
source                  1..378
                        mol_type = protein
                        organism = synthetic construct
SEQUENCE: 896
MVLLWLTLLL IALPCLLQTK EDPNPPITNL RMKAKAQQLT WDLNRNVTDI ECVKDADYSM  60
PAVNNSYCQF GAISLCEVTN YTVHIANPPF STWILFPENS GKPWAGAENL TCWIHDVDFL  120
SCSWAVGPGA PADVQYDLYL NVANRRQQYE CLHYKTDAQG TRIGCRFDDI SRLSSGSQSS  180
HILVRGRSAA FGIPCTDKFV VFSQIEILTP PNMTAKCNKT HSFMHWKMRS HFNRKFRYEL  240
QIQKRMQPVI TEQVRDRTSF QLLNPGTYTV QIRARERVYE FLSAWSTPQR FECDQEEGAN  300
TRAWRTSLLI ALGTLLALVC VFVICRRYLV MQRLFPRIPH MKDPIGDSFQ NDKLVVWEAG  360
KAGLEECLVT EVQVVQKT                                                378

SEQ ID NO: 897          moltype = AA  length = 378
FEATURE                 Location/Qualifiers
source                  1..378
                        mol_type = protein
                        organism = synthetic construct
SEQUENCE: 897
MVLLWLTLLL IALPCLLQTK EDPNPPITNL RMKAKAQQLT WDLNRNVTDI ECVKDADYSM  60
PAVNNSYCQF GAISLCEVTN YTVHMANPPF STWILFPENS GKPWAGAENL TCWIHDVDFL  120
SCSWAVGPGA PADVQYDLYL NVANRRQQYE CLHYKTDAQG TRIGCRFDDI SRLSSGSQSS  180
HILVRGRSAA FGIPCTDKFV VFSQIEILTP PNMTAKCNKT HSFMHWKMRS HFNRKFRYEL  240
QIQKRMQPVI TEQVRDRTSF QLLNPGTYTV QIRARERVYE FLSAWSTPQR FECDQEEGAN  300
TRAWRTSLLI ALGTLLALVC VFVICRRYLV MQRLFPRIPH MKDPIGDSFQ NDKLVVWEAG  360
KAGLEECLVT EVQVVQKT                                                378
```

1. A mutant CD123 protein comprising a mutation at residue R84 according to SEQ ID NO:2, wherein the mutation is to an amino acid residue that is not lysine.

2. The mutant CD123 protein of claim **1**, wherein the mutation is to glutamine (Q), asparagine (N) or histidine (H).

3. The mutant CD123 protein of claim **1**, wherein the mutation is R84Q.

4. The mutant CD123 protein of claim **1**, which further comprises a mutation at residue V85 according to SEQ ID NO:2.

5. The mutant CD123 protein of claim **3**, wherein the mutation at residue V85 is to methionine (M), isoleucine (I), leucine (L), alanine (A), cysteine (C), glycine (G), or threonine (T).

6. The mutant CD123 protein of claim **4**, wherein the mutations are selected from the group consisting of R84Q and V85I , R84Q and V85M, R84H and V85I , and R84H and V85M.

7. The mutant CD123 protein of claim **1**, which comprises an amino acid sequence selected from the group consisting of SEQ ID NO: 894, 895, 896 and 897.

8. A polynucleotide encoding the mutant CD123 protein of claim **1**.

9. A cell comprising the mutant CD123 protein of claim **1** or a polynucleotide encoding the mutant CD123 protein.

10. A method for preparing a cancer patient for a therapy comprising an anti-CD123 antibody or antigen-binding fragment thereof, comprising administering to the patient a cell expressing the mutant CD123 protein of claim **1** which has reduced binding to the anti-CD123 antibody or antigen-binding fragment thereof as compared to the corresponding wild-type CD123 protein.

11. The method of claim **10**, wherein the cell is a stem cell.

12. The method of claim **11**, wherein the stem cell is a hematopoietic stem and progenitor cell (HSPC).

13. The method of claim **10**, wherein the therapy comprises the antibody, an antigen-binding fragment of the antibody, a chimeric antigen receptor (CAR) comprising the antigen-binding fragment, or an immune cell comprising the CAR.

14. The method of claim **10**, wherein the cancer is leukemia.

15. The method of claim **10**, wherein the cancer is acute myeloid leukemia (AML).

16. The method of claim **10**, wherein the anti-CD123 antibody is CSL362 or 32716.

17. A method for preparing the polynucleotide of claim **8** in a cell, comprising introducing to the cell with a base editor comprising a gRNA that comprises a spacer sequence selected from the group consisting of SEQ ID NO:229-516.

18. A method for preparing the polynucleotide of claim **8** in a cell, comprising introducing to the cell a prime editor and a pegRNA that comprises a spacer sequence selected from the group consisting of SEQ ID NO:517-541.

* * * * *