THAT WHICH IS CLAIMED:

1. A deaminase comprising an amino acid sequence having at least 85% sequence identity to SEQ ID NO: 5, and comprises at least one of the following amino acid residues:

a) a C at a position corresponding to position 2 of SEQ ID NO: 5;

b) a F or C at a position corresponding to position 22 of SEQ ID NO: 5;

c) a Q at a position corresponding to position 23 of SEQ ID NO: 5;

d) a N at a position corresponding to position 35 of SEQ ID NO: 5;

e) a L at a position corresponding to position 40 of SEQ ID NO: 5;

f) a Q at a position corresponding to position 46 of SEQ ID NO: 5;

g) a A or M at a position corresponding to position 68 of SEQ ID NO: 5;

h) a H at a position corresponding to position 72 of SEQ ID NO: 5;

i) a W, A, Q, Y, or D at a position corresponding to position 75 of SEQ ID NO: 5;

j) a G at a position corresponding to position 76 of SEQ ID NO: 5;

k) a S at a position corresponding to position 81 of SEQ ID NO: 5;

l) a M at a position corresponding to position 105 of SEQ ID NO: 5;

m) a H at a position corresponding to position 108 of SEQ ID NO: 5;

n) a L at a position corresponding to position 109 of SEQ ID NO: 5;

o) a I or L at a position corresponding to position 117 of SEQ ID NO: 5;

p) a F at a position corresponding to position 120 of SEQ ID NO: 5;

q) a E, T, A, G, or V at a position corresponding to position 121 of SEQ ID NO: 5;

r) a I or H at a position corresponding to position 122 of SEQ ID NO: 5;

s) a K at a position corresponding to position 125 of SEQ ID NO: 5;

t) a A at a position corresponding to position 126 of SEQ ID NO: 5;

u) a H at a position corresponding to position 135 of SEQ ID NO: 5;

v) a V at a position corresponding to position 137 of SEQ ID NO: 5;

w) a Y at a position corresponding to position 138 of SEQ ID NO: 5;

x) a L at a position corresponding to position 139 of SEQ ID NO: 5;

y) a K or A at a position corresponding to position 142 of SEQ ID NO: 5;

z) a A, Q, L, or M at a position corresponding to position 145 of SEQ ID NO: 5;

aa) a K at a position corresponding to position 148 of SEQ ID NO: 5;

bb) a Q at a position corresponding to position 151 of SEQ ID NO: 5;

cc) a E or R at a position corresponding to position 153 of SEQ ID NO: 5;

dd) a W at a position corresponding to position 155 of SEQ ID NO: 5;

ee) a R or V at a position corresponding to position 156 of SEQ ID NO: 5;

ff) a F at a position corresponding to position 157 of SEQ ID NO: 5;

gg) a R at a position corresponding to position 158 of SEQ ID NO: 5;

hh) a Q at a position corresponding to position 159 of SEQ ID NO: 5;

ii) a D or W at a position corresponding to position 160 of SEQ ID NO: 5;

jj) a W, H, V, or A at a position corresponding to position 162 of SEQ ID NO: 5;

kk) a R at a position corresponding to position 165 of SEQ ID NO: 5; and

ll) a H at a position corresponding to position 166 of SEQ ID NO: 5.

2. The deaminase of claim 1, wherein said deaminase comprises:

a) a N at a position corresponding to position 35 of SEQ ID NO: 5 and a W at a position corresponding to position 162 of SEQ ID NO: 5;

b) a N at a position corresponding to position 35 of SEQ ID NO: 5 and a Q at a position corresponding to position 46 of SEQ ID NO: 5;

c) a S at a position corresponding to position 81 of SEQ ID NO: 5 and a R at a position corresponding to position 156 of SEQ ID NO: 5;

d) a Q at a position corresponding to position 46 of SEQ ID NO: 5 and a R at a position corresponding to position 156 of SEQ ID NO: 5;

e) a R at a position corresponding to position 156 of SEQ ID NO: 5 and a W at a position corresponding to position 162 of SEQ ID NO: 5;

f) a A at a position corresponding to position 68 of SEQ ID NO: 5 and a S at a position corresponding to position 81 of SEQ ID NO: 5;

g) a N at a position corresponding to position 35 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at position 162 of SEQ ID NO: 5;

h) a N at a position corresponding to position 35 of SEQ ID NO: 5, a Q at a position corresponding to position 46 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

i) a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

j) a N at a position corresponding to position 35 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

k) a N at a position corresponding to position 35 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

l) a M at a position corresponding to position 68 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

m) a Q at a position corresponding to position 46 of SEQ ID NO: 5, a M at a position corresponding to position 68 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

n) a M at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

o) a N at a position corresponding to position 35, a Q at a position corresponding to position 46 of SEQ ID NO: 5, a M at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

p) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

q) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

r) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

s) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

t) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

u) a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

v) a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

w) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

x) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

y) a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

z) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

aa) a S at a position corresponding to position 81 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

bb) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

cc) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

dd) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

ee) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ff) a W at a position corresponding to position 75 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

gg) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

hh) a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ii) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

jj) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

kk) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

ll) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

mm) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

nn) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

oo) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

pp) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a M at a position corresponding to position 105 of SEQ ID NO: 5;

qq) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a V at a position corresponding to position 121 of SEQ ID NO: 5;

rr) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

ss) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

tt) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

uu) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a V at a position corresponding to position 121 of SEQ ID NO: 5;

vv) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

ww) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

xx) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

yy) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

zz) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

aaa) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

bbb) a M at a position corresponding to position 145 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

ccc) a M at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

ddd) a Q at a position corresponding to position 159 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

eee) a S at a position corresponding to position 81 of SEQ ID NO: 5, a M at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

fff) a S at a position corresponding to position 81 of SEQ ID NO: 5, a V at a position corresponding to position 121 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

ggg) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

hhh) a G at a position corresponding to position 76 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

iii) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

jjj) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a G at a position corresponding to position 76 of SEQ ID NO: 5;

kkk) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

lll) a G at a position corresponding to position 76 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

mmm) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

nnn) a A at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

ooo) a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

ppp) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

qqq) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

rrr) a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 109 of SEQ ID NO: 5, a E at a position corresponding to position 153 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

sss) a A at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a A at a position corresponding to position 121 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ttt) a Q at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a I at a position corresponding to position 117 of SEQ ID NO: 5, a Q at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

uuu) a Y at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a G at a position corresponding to position 121 of SEQ ID NO: 5, a L at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

vvv) a C at a position corresponding to position 22 of SEQ ID NO: 5, a A at a position corresponding to position 68 of SEQ ID NO: 5, a Y at a position corresponding to position 75 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a H at a position corresponding to position 122 of

SEQ ID NO: 5, a Y at a position corresponding to position 138 of SEQ ID NO: 5, a L at a position corresponding to position 139 of SEQ ID NO: 5, a A at a position corresponding to position 142 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a R at a position corresponding to position 153 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, a D at a position corresponding to position 160 of SEQ ID NO: 5, and a H at a position corresponding to position 162 of SEQ ID NO: 5; or

www) a S at a position corresponding to position 81 of SEQ ID NO: 5.

3. The deaminase of claim 1, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to any one of SEQ ID NOs: 300-414, 596-598, and 720-723.

4. The deaminase of claim 1, wherein said deaminase has improved deaminase activity when compared to SEQ ID NO: 5 and/or

wherein the deaminase is an adenine deaminase.

5. A nucleic acid molecule comprising a polynucleotide encoding a deaminase having at least 85% sequence identity to SEQ ID NO: 5, wherein the deaminase comprises at least one of the following amino acid residues:

a) a C at a position corresponding to position 2 of SEQ ID NO: 5;
b) a F or C at a position corresponding to position 22 of SEQ ID NO: 5;
c) a Q at a position corresponding to position 23 of SEQ ID NO: 5;
d) a N at a position corresponding to position 35 of SEQ ID NO: 5;
e) a L at a position corresponding to position 40 of SEQ ID NO: 5;
f) a Q at a position corresponding to position 46 of SEQ ID NO: 5;
g) a A or M at a position corresponding to position 68 of SEQ ID NO: 5;
h) a H at a position corresponding to position 72 of SEQ ID NO: 5;
i) a W, A, Q, Y, or D at a position corresponding to position 75 of SEQ ID NO: 5;
j) a G at a position corresponding to position 76 of SEQ ID NO: 5;
k) a S at a position corresponding to position 81 of SEQ ID NO: 5;
l) a M at a position corresponding to position 105 of SEQ ID NO: 5;
m) a H at a position corresponding to position 108 of SEQ ID NO: 5;
n) a L at a position corresponding to position 109 of SEQ ID NO: 5;
o) a I or L at a position corresponding to position 117 of SEQ ID NO: 5;
p) a F at a position corresponding to position 120 of SEQ ID NO: 5;
q) a E, T, A, G, or V at a position corresponding to position 121 of SEQ ID NO: 5;
r) a I or H at a position corresponding to position 122 of SEQ ID NO: 5;
s) a K at a position corresponding to position 125 of SEQ ID NO: 5;
t) a A at a position corresponding to position 126 of SEQ ID NO: 5;
u) a H at a position corresponding to position 135 of SEQ ID NO: 5;
v) a V at a position corresponding to position 137 of SEQ ID NO: 5;

w) a Y at a position corresponding to position 138 of SEQ ID NO: 5;

x) a L at a position corresponding to position 139 of SEQ ID NO: 5;

y) a K or A at a position corresponding to position 142 of SEQ ID NO: 5;

z) a A, Q, L, or M at a position corresponding to position 145 of SEQ ID NO: 5;

aa) a K at a position corresponding to position 148 of SEQ ID NO: 5;

bb) a Q at a position corresponding to position 151 of SEQ ID NO: 5;

cc) a E or R at a position corresponding to position 153 of SEQ ID NO: 5;

dd) a W at a position corresponding to position 155 of SEQ ID NO: 5;

ee) a R or V at a position corresponding to position 156 of SEQ ID NO: 5;

ff) a F at a position corresponding to position 157 of SEQ ID NO: 5;

gg) a R at a position corresponding to position 158 of SEQ ID NO: 5;

hh) a Q at a position corresponding to position 159 of SEQ ID NO: 5;

ii) a D or W at a position corresponding to position 160 of SEQ ID NO: 5;

jj) a W, H, V, or A at a position corresponding to position 162 of SEQ ID NO: 5;

kk) a R at a position corresponding to position 165 of SEQ ID NO: 5; and

ll) a H at a position corresponding to position 166 of SEQ ID NO: 5.

6. The nucleic acid molecule of claim 5, wherein said deaminase comprises:

a) a N at a position corresponding to position 35 of SEQ ID NO: 5 and a W at a position corresponding to position 162 of SEQ ID NO: 5;

b) a N at a position corresponding to position 35 of SEQ ID NO: 5 and a Q at a position corresponding to position 46 of SEQ ID NO: 5;

c) a S at a position corresponding to position 81 of SEQ ID NO: 5 and a R at a position corresponding to position 156 of SEQ ID NO: 5;

d) a Q at a position corresponding to position 46 of SEQ ID NO: 5 and a R at a position corresponding to position 156 of SEQ ID NO: 5;

e) a R at a position corresponding to position 156 of SEQ ID NO: 5 and a W at a position corresponding to position 162 of SEQ ID NO: 5;

f) a A at a position corresponding to position 68 of SEQ ID NO: 5 and a S at a position corresponding to position 81 of SEQ ID NO: 5;

g) a N at a position corresponding to position 35 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at position 162 of SEQ ID NO: 5;

h) a N at a position corresponding to position 35 of SEQ ID NO: 5, a Q at a position corresponding to position 46 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

i) a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

j) a N at a position corresponding to position 35 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

k) a N at a position corresponding to position 35 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

l) a M at a position corresponding to position 68 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

m) a Q at a position corresponding to position 46 of SEQ ID NO: 5, a M at a position corresponding to position 68 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

n) a M at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

o) a N at a position corresponding to position 35, a Q at a position corresponding to position 46 of SEQ ID NO: 5, a M at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

p) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

q) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

r) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

s) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

t) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

u) a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

v) a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

w) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

x) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

y) a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

z) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

aa) a S at a position corresponding to position 81 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

bb) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

cc) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

dd) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

ee) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ff) a W at a position corresponding to position 75 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

gg) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

hh) a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ii) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

jj) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

kk) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

ll) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

mm) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

nn) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

oo) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

pp) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a M at a position corresponding to position 105 of SEQ ID NO: 5;

qq) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a V at a position corresponding to position 121 of SEQ ID NO: 5;

rr) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

ss) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

tt) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

uu) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a V at a position corresponding to position 121 of SEQ ID NO: 5;

vv) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

ww) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

xx) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

yy) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

zz) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

aaa) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

bbb) a M at a position corresponding to position 145 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

ccc) a M at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

ddd) a Q at a position corresponding to position 159 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

eee) a S at a position corresponding to position 81 of SEQ ID NO: 5, a M at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

fff) a S at a position corresponding to position 81 of SEQ ID NO: 5, a V at a position corresponding to position 121 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

ggg) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

hhh) a G at a position corresponding to position 76 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

iii) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

jjj) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a G at a position corresponding to position 76 of SEQ ID NO: 5;

kkk) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

lll) a G at a position corresponding to position 76 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

mmm) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

nnn) a A at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

ooo) a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

ppp) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

qqq) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

rrr) a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 109 of SEQ ID NO: 5, a E at a position corresponding to position 153 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

sss) a A at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a A at a position corresponding to position 121 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ttt) a Q at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a I at a position corresponding to position 117 of SEQ ID NO: 5, a Q at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

uuu) a Y at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a G at a position corresponding to position 121 of SEQ ID NO: 5, a L at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

vvv) a C at a position corresponding to position 22 of SEQ ID NO: 5, a A at a position corresponding to position 68 of SEQ ID NO: 5, a Y at a position corresponding to position 75 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a H at a position corresponding to position 122 of SEQ ID NO: 5, a Y at a position corresponding to position 138 of SEQ ID NO: 5, a L at a position corresponding to position 139 of SEQ ID NO: 5, a A at a position corresponding to position 142 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a R at a position corresponding to position 153 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, a D at a position corresponding to position 160 of SEQ ID NO: 5, and a H at a position corresponding to position 162 of SEQ ID NO: 5 ; or

www) a S at a position corresponding to position 81 of SEQ ID NO: 5.

7. The nucleic acid molecule of claim 5, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to any one of SEQ ID NOs: 300-414, 596-598, and 720-723.

8. The nucleic acid molecule of claim 5, wherein said deaminase has improved deaminase activity when compared to SEQ ID NO: 5 and/or

wherein the deaminase is an adenine deaminase.

9. The nucleic acid molecule of claim 5, further comprising a heterologous promoter operably linked to said polynucleotide.

10. A fusion protein comprising a DNA-binding polypeptide and a deaminase having at least 85% sequence identity to SEQ ID NO: 5, wherein the deaminase comprises at least one of the following amino acid residues:

a) a C at a position corresponding to position 2 of SEQ ID NO: 5;

b) a F or C at a position corresponding to position 22 of SEQ ID NO: 5;

c) a Q at a position corresponding to position 23 of SEQ ID NO: 5;

d) a N at a position corresponding to position 35 of SEQ ID NO: 5;

e) a L at a position corresponding to position 40 of SEQ ID NO: 5;

f) a Q at a position corresponding to position 46 of SEQ ID NO: 5;

g) a A or M at a position corresponding to position 68 of SEQ ID NO: 5;

h) a H at a position corresponding to position 72 of SEQ ID NO: 5;

i) a W, A, Q, Y, or D at a position corresponding to position 75 of SEQ ID NO: 5;

j) a G at a position corresponding to position 76 of SEQ ID NO: 5;

k) a S at a position corresponding to position 81 of SEQ ID NO: 5;

l) a M at a position corresponding to position 105 of SEQ ID NO: 5;

m) a H at a position corresponding to position 108 of SEQ ID NO: 5;

n) a L at a position corresponding to position 109 of SEQ ID NO: 5;

o) a I or L at a position corresponding to position 117 of SEQ ID NO: 5;

p) a F at a position corresponding to position 120 of SEQ ID NO: 5;

q) a E, T, A, G, or V at a position corresponding to position 121 of SEQ ID NO: 5;

r) a I or H at a position corresponding to position 122 of SEQ ID NO: 5;

s) a K at a position corresponding to position 125 of SEQ ID NO: 5;

t) a A at a position corresponding to position 126 of SEQ ID NO: 5;

u) a H at a position corresponding to position 135 of SEQ ID NO: 5;

v) a V at a position corresponding to position 137 of SEQ ID NO: 5;

w) a Y at a position corresponding to position 138 of SEQ ID NO: 5;

x) a L at a position corresponding to position 139 of SEQ ID NO: 5;

y) a K or A at a position corresponding to position 142 of SEQ ID NO: 5;

z) a A, Q, L, or M at a position corresponding to position 145 of SEQ ID NO: 5;

aa) a K at a position corresponding to position 148 of SEQ ID NO: 5;

bb) a Q at a position corresponding to position 151 of SEQ ID NO: 5;

cc) a E or R at a position corresponding to position 153 of SEQ ID NO: 5;

dd) a W at a position corresponding to position 155 of SEQ ID NO: 5;

ee) a R or V at a position corresponding to position 156 of SEQ ID NO: 5;

ff) a F at a position corresponding to position 157 of SEQ ID NO: 5;

gg) a R at a position corresponding to position 158 of SEQ ID NO: 5;

hh) a Q at a position corresponding to position 159 of SEQ ID NO: 5;

ii) a D or W at a position corresponding to position 160 of SEQ ID NO: 5;

jj) a W, H, V, or A at a position corresponding to position 162 of SEQ ID NO: 5;

kk) a R at a position corresponding to position 165 of SEQ ID NO: 5; and

ll) a H at a position corresponding to position 166 of SEQ ID NO: 5.

11. The fusion protein of claim 10, wherein said deaminase comprises:

a) a N at a position corresponding to position 35 of SEQ ID NO: 5 and a W at a position corresponding to position 162 of SEQ ID NO: 5;

b) a N at a position corresponding to position 35 of SEQ ID NO: 5 and a Q at a position corresponding to position 46 of SEQ ID NO: 5;

c) a S at a position corresponding to position 81 of SEQ ID NO: 5 and a R at a position corresponding to position 156 of SEQ ID NO: 5;

d) a Q at a position corresponding to position 46 of SEQ ID NO: 5 and a R at a position corresponding to position 156 of SEQ ID NO: 5;

e) a R at a position corresponding to position 156 of SEQ ID NO: 5 and a W at a position corresponding to position 162 of SEQ ID NO: 5;

f) a A at a position corresponding to position 68 of SEQ ID NO: 5 and a S at a position corresponding to position 81 of SEQ ID NO: 5;

g) a N at a position corresponding to position 35 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at position 162 of SEQ ID NO: 5;

h) a N at a position corresponding to position 35 of SEQ ID NO: 5, a Q at a position corresponding to position 46 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

i) a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

j) a N at a position corresponding to position 35 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

k) a N at a position corresponding to position 35 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

l) a M at a position corresponding to position 68 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

m) a Q at a position corresponding to position 46 of SEQ ID NO: 5, a M at a position corresponding to position 68 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

n) a M at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

o) a N at a position corresponding to position 35, a Q at a position corresponding to position 46 of SEQ ID NO: 5, a M at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

p) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

q) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

r) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

s) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

t) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

u) a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

v) a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

w) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

x) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

y) a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

z) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

aa) a S at a position corresponding to position 81 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

bb) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

cc) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

dd) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

ee) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ff) a W at a position corresponding to position 75 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

gg) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

hh) a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ii) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

jj) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

kk) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

ll) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

mm) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

nn) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

oo) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

pp) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a M at a position corresponding to position 105 of SEQ ID NO: 5;

qq) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a V at a position corresponding to position 121 of SEQ ID NO: 5;

rr) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

ss) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

tt) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

uu) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a V at a position corresponding to position 121 of SEQ ID NO: 5;

vv) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

ww) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

xx) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

yy) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

zz) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

aaa) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

bbb) a M at a position corresponding to position 145 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

ccc) a M at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

ddd) a Q at a position corresponding to position 159 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

eee) a S at a position corresponding to position 81 of SEQ ID NO: 5, a M at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

fff) a S at a position corresponding to position 81 of SEQ ID NO: 5, a V at a position corresponding to position 121 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

ggg) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

hhh) a G at a position corresponding to position 76 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

iii) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

jjj) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a G at a position corresponding to position 76 of SEQ ID NO: 5;

kkk) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

lll) a G at a position corresponding to position 76 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

mmm) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

nnn) a A at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

ooo) a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

ppp) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

qqq) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

rrr) a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 109 of SEQ ID NO: 5, a E at a position corresponding to position 153 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

sss) a A at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a A at a position corresponding to position 121 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ttt) a Q at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a I at a position corresponding to position 117 of SEQ ID NO: 5, a Q at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

uuu) a Y at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a G at a position corresponding to position 121 of SEQ ID NO: 5, a L at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

vvv) a C at a position corresponding to position 22 of SEQ ID NO: 5, a A at a position corresponding to position 68 of SEQ ID NO: 5, a Y at a position corresponding to position 75 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a H at a position corresponding to position 122 of SEQ ID NO: 5, a Y at a position corresponding to position 138 of SEQ ID NO: 5, a L at a position corresponding to position 139 of SEQ ID NO: 5, a A at a position corresponding to position 142 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a R at a position corresponding to position 153 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, a D at a position corresponding to position 160 of SEQ ID NO: 5, and a H at a position corresponding to position 162 of SEQ ID NO: 5 ; or

www) a S at a position corresponding to position 81 of SEQ ID NO: 5.

12. The fusion protein of claim 10, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to any one of SEQ ID NOs: 300-414, 596-598, and 720-723.

13. The fusion protein of claim 10, wherein said deaminase has improved deaminase activity when compared to SEQ ID NO: 5 and/or

wherein the deaminase is an adenine deaminase.

14. The fusion protein of claim 10, wherein the DNA-binding polypeptide is an RNA-guided nuclease (RGN) polypeptide, optionally wherein the RGN polypeptide has an amino acid sequence having at least 95% sequence identity to any one of SEQ ID NOs: 1-4, 49-162, 435, 575, 576, 698, and 699.

15. The fusion protein of claim 14, wherein the RGN is an RGN nickase, optionally wherein the RGN nickase has the amino acid sequence set forth as any one of SEQ ID NOs: 49-52 and 698.

16. The fusion protein of claim 10, wherein said fusion protein is selected from the group consisting of:

a) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 319 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

b) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 375 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

c) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 406 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

d) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 596 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

e) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 597 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

f) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 303 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

g) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 366 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49; and

h) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 720 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49.

17. The fusion protein of claim 10, wherein said fusion protein has the sequence set forth as any one of SEQ ID NOs: 577, 578, 582, 584, 588, 593, 594, 604, 605, 616, and 729.

18. A ribonucleoprotein (RNP) complex comprising the fusion protein of claim 10 and a guide RNA bound to the fusion protein.

19. A nucleic acid molecule comprising a polynucleotide encoding a fusion protein comprising a DNA-binding polypeptide and a deaminase, wherein the deaminase comprises at least one of the following amino acid residues:

a) a C at a position corresponding to position 2 of SEQ ID NO: 5;
b) a F or C at a position corresponding to position 22 of SEQ ID NO: 5;
c) a Q at a position corresponding to position 23 of SEQ ID NO: 5;
d) a N at a position corresponding to position 35 of SEQ ID NO: 5;
e) a L at a position corresponding to position 40 of SEQ ID NO: 5;
f) a Q at a position corresponding to position 46 of SEQ ID NO: 5;
g) a A or M at a position corresponding to position 68 of SEQ ID NO: 5;
h) a H at a position corresponding to position 72 of SEQ ID NO: 5;
i) a W, A, Q, Y, or D at a position corresponding to position 75 of SEQ ID NO: 5;
j) a G at a position corresponding to position 76 of SEQ ID NO: 5;
k) a S at a position corresponding to position 81 of SEQ ID NO: 5;
l) a M at a position corresponding to position 105 of SEQ ID NO: 5;
m) a H at a position corresponding to position 108 of SEQ ID NO: 5;
n) a L at a position corresponding to position 109 of SEQ ID NO: 5;
o) a I or L at a position corresponding to position 117 of SEQ ID NO: 5;
p) a F at a position corresponding to position 120 of SEQ ID NO: 5;
q) a E, T, A, G, or V at a position corresponding to position 121 of SEQ ID NO: 5;
r) a I or H at a position corresponding to position 122 of SEQ ID NO: 5;
s) a K at a position corresponding to position 125 of SEQ ID NO: 5;
t) a A at a position corresponding to position 126 of SEQ ID NO: 5;
u) a H at a position corresponding to position 135 of SEQ ID NO: 5;
v) a V at a position corresponding to position 137 of SEQ ID NO: 5;
w) a Y at a position corresponding to position 138 of SEQ ID NO: 5;

x) a L at a position corresponding to position 139 of SEQ ID NO: 5;

y) a K or A at a position corresponding to position 142 of SEQ ID NO: 5;

z) a A, Q, L, or M at a position corresponding to position 145 of SEQ ID NO: 5;

aa) a K at a position corresponding to position 148 of SEQ ID NO: 5;

bb) a Q at a position corresponding to position 151 of SEQ ID NO: 5;

cc) a E or R at a position corresponding to position 153 of SEQ ID NO: 5;

dd) a W at a position corresponding to position 155 of SEQ ID NO: 5;

ee) a R or V at a position corresponding to position 156 of SEQ ID NO: 5;

ff) a F at a position corresponding to position 157 of SEQ ID NO: 5;

gg) a R at a position corresponding to position 158 of SEQ ID NO: 5;

hh) a Q at a position corresponding to position 159 of SEQ ID NO: 5;

ii) a D or W at a position corresponding to position 160 of SEQ ID NO: 5;

jj) a W, H, V, or A at a position corresponding to position 162 of SEQ ID NO: 5;

kk) a R at a position corresponding to position 165 of SEQ ID NO: 5; and

ll) a H at a position corresponding to position 166 of SEQ ID NO: 5.

20. The nucleic acid molecule of claim 19, wherein said deaminase comprises:

a) a N at a position corresponding to position 35 of SEQ ID NO: 5 and a W at a position corresponding to position 162 of SEQ ID NO: 5;

b) a N at a position corresponding to position 35 of SEQ ID NO: 5 and a Q at a position corresponding to position 46 of SEQ ID NO: 5;

c) a S at a position corresponding to position 81 of SEQ ID NO: 5 and a R at a position corresponding to position 156 of SEQ ID NO: 5;

d) a Q at a position corresponding to position 46 of SEQ ID NO: 5 and a R at a position corresponding to position 156 of SEQ ID NO: 5;

e) a R at a position corresponding to position 156 of SEQ ID NO: 5 and a W at a position corresponding to position 162 of SEQ ID NO: 5;

f) a A at a position corresponding to position 68 of SEQ ID NO: 5 and a S at a position corresponding to position 81 of SEQ ID NO: 5;

g) a N at a position corresponding to position 35 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at position 162 of SEQ ID NO: 5;

h) a N at a position corresponding to position 35 of SEQ ID NO: 5, a Q at a position corresponding to position 46 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

i) a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

j) a N at a position corresponding to position 35 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

k) a N at a position corresponding to position 35 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

l) a M at a position corresponding to position 68 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

m) a Q at a position corresponding to position 46 of SEQ ID NO: 5, a M at a position corresponding to position 68 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

n) a M at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

o) a N at a position corresponding to position 35, a Q at a position corresponding to position 46 of SEQ ID NO: 5, a M at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

p) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

q) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

r) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

s) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

t) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

u) a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

v) a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

w) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

x) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

y) a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

z) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

aa) a S at a position corresponding to position 81 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

bb) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

cc) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

dd) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

ee) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ff) a W at a position corresponding to position 75 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

gg) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

hh) a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ii) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

jj) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

kk) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

ll) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

mm) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

nn) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

oo) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

pp) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a M at a position corresponding to position 105 of SEQ ID NO: 5;

qq) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a V at a position corresponding to position 121 of SEQ ID NO: 5;

rr) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

ss) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

tt) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

uu) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a V at a position corresponding to position 121 of SEQ ID NO: 5;

vv) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

ww) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

xx) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

yy) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

zz) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

aaa) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

bbb) a M at a position corresponding to position 145 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

ccc) a M at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

ddd) a Q at a position corresponding to position 159 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

eee) a S at a position corresponding to position 81 of SEQ ID NO: 5, a M at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

fff) a S at a position corresponding to position 81 of SEQ ID NO: 5, a V at a position corresponding to position 121 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

ggg) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

hhh) a G at a position corresponding to position 76 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

iii) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

jjj) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a G at a position corresponding to position 76 of SEQ ID NO: 5;

kkk) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

lll) a G at a position corresponding to position 76 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

mmm) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

nnn) a A at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

ooo) a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

ppp) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

qqq) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

rrr) a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 109 of SEQ ID NO: 5, a E at a position corresponding to position 153 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

sss) a A at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a A at a position corresponding to position 121 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ttt) a Q at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a I at a position corresponding to position 117 of SEQ ID NO: 5, a Q at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

uuu) a Y at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a G at a position corresponding to position 121 of SEQ ID NO: 5, a L at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

vvv) a C at a position corresponding to position 22 of SEQ ID NO: 5, a A at a position corresponding to position 68 of SEQ ID NO: 5, a Y at a position corresponding to position 75 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a H at a position corresponding to position 122 of SEQ ID NO: 5, a Y at a position corresponding to position 138 of SEQ ID NO: 5, a L at a position corresponding to position 139 of SEQ ID NO: 5, a A at a position corresponding to position 142 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a R at a position corresponding to position 153 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, a D at a position corresponding to position 160 of SEQ ID NO: 5, and a H at a position corresponding to position 162 of SEQ ID NO: 5 ; or

www) a S at a position corresponding to position 81 of SEQ ID NO: 5.

21. The nucleic acid molecule of claim 19, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to any one of SEQ ID NOs: 300-414, 596-598, and 720-723.

22. The nucleic acid molecule of claim 19, wherein said deaminase has improved deaminase activity when compared to SEQ ID NO: 5 and/or

wherein the deaminase is an adenine deaminase.

23. The nucleic acid molecule of claim 19, wherein the DNA-binding polypeptide is an RNA-guided nuclease (RGN) polypeptide, optionally wherein the RGN polypeptide has an amino acid sequence having at least 95% sequence identity to any one of SEQ ID NOs: 1-4, 49-162, 435, 575, 576, 698, and 699.

24. The nucleic acid molecule of claim 23, wherein the RGN is an RGN nickase, optionally wherein the RGN nickase has the amino acid sequence set forth as any one of SEQ ID NOs: 49-52 and 698.

25. The nucleic acid molecule of claim 19, wherein said fusion protein is selected from the group consisting of:

a) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 319 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

b) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 375 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

c) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 406 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

d) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 596 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

e) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 597 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

f) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 303 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

g) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 366 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49; and

h) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 720 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49.

26. The nucleic acid molecule of claim 19, wherein said fusion protein has the sequence set forth as any one of SEQ ID NOs: 577, 578, 582, 584, 588, 593, 594, 604, 605, 616, and 729.

27. A system for modifying a target DNA molecule comprising a target DNA sequence, said system comprising:

a) a fusion protein comprising an RNA-guided nuclease (RGN) polypeptide and a deaminase, wherein the deaminase has an amino acid sequence having at least 85% sequence identity to SEQ ID NO: 5, or a nucleotide sequence encoding said fusion protein, wherein said deaminase comprises at least one of the following amino acid residues:

i) a C at a position corresponding to position 2 of SEQ ID NO: 5;

ii) a F or C at a position corresponding to position 22 of SEQ ID NO: 5;

iii) a Q at a position corresponding to position 23 of SEQ ID NO: 5;

iv) a N at a position corresponding to position 35 of SEQ ID NO: 5;

v) a L at a position corresponding to position 40 of SEQ ID NO: 5;

vi) a Q at a position corresponding to position 46 of SEQ ID NO: 5;

vii) a A or M at a position corresponding to position 68 of SEQ ID NO: 5;

viii) a H at a position corresponding to position 72 of SEQ ID NO: 5;

ix) a W, A, Q, Y, or D at a position corresponding to position 75 of SEQ ID NO: 5;

x) a G at a position corresponding to position 76 of SEQ ID NO: 5;

xi) a S at a position corresponding to position 81 of SEQ ID NO: 5;

xii) a M at a position corresponding to position 105 of SEQ ID NO: 5;

xiii) a H at a position corresponding to position 108 of SEQ ID NO: 5;

xiv) a L at a position corresponding to position 109 of SEQ ID NO: 5;

xv) a I or L at a position corresponding to position 117 of SEQ ID NO: 5;

xvi) a F at a position corresponding to position 120 of SEQ ID NO: 5;

xvii) a E, T, A, G, or V at a position corresponding to position 121 of SEQ ID NO: 5;

xviii) a I or H at a position corresponding to position 122 of SEQ ID NO: 5;

xix) a K at a position corresponding to position 125 of SEQ ID NO: 5;

xx) a A at a position corresponding to position 126 of SEQ ID NO: 5;

xxi) a H at a position corresponding to position 135 of SEQ ID NO: 5;

xxii) a V at a position corresponding to position 137 of SEQ ID NO: 5;

xxiii) a Y at a position corresponding to position 138 of SEQ ID NO: 5;

xxiv) a L at a position corresponding to position 139 of SEQ ID NO: 5;

xxv) a K or A at a position corresponding to position 142 of SEQ ID NO: 5;

xxvi) a A, Q, L, or M at a position corresponding to position 145 of SEQ ID NO: 5;

xxvii) a K at a position corresponding to position 148 of SEQ ID NO: 5;

xxviii) a Q at a position corresponding to position 151 of SEQ ID NO: 5;

xxix) a E or R at a position corresponding to position 153 of SEQ ID NO: 5;

xxx) a W at a position corresponding to position 155 of SEQ ID NO: 5;

xxxi) a R or V at a position corresponding to position 156 of SEQ ID NO: 5;

xxxii) a F at a position corresponding to position 157 of SEQ ID NO: 5;

xxxiii) a R at a position corresponding to position 158 of SEQ ID NO: 5;

xxxiv) a Q at a position corresponding to position 159 of SEQ ID NO: 5;

xxxv) a D or W at a position corresponding to position 160 of SEQ ID NO: 5;

xxxvi) a W, H, V, or A at a position corresponding to position 162 of SEQ ID NO: 5;

xxxvii) a R at a position corresponding to position 165 of SEQ ID NO: 5; and

xxxviii) a H at a position corresponding to position 166 of SEQ ID NO: 5; and

b) one or more guide RNAs capable of hybridizing to a non-target strand of said target DNA sequence or one or more nucleotide sequences encoding the one or more guide RNAs.

28. The system of claim 27, wherein said deaminase comprises:

a) a N at a position corresponding to position 35 of SEQ ID NO: 5 and a W at a position corresponding to position 162 of SEQ ID NO: 5;

b) a N at a position corresponding to position 35 of SEQ ID NO: 5 and a Q at a position corresponding to position 46 of SEQ ID NO: 5;

c) a S at a position corresponding to position 81 of SEQ ID NO: 5 and a R at a position corresponding to position 156 of SEQ ID NO: 5;

d) a Q at a position corresponding to position 46 of SEQ ID NO: 5 and a R at a position corresponding to position 156 of SEQ ID NO: 5;

e) a R at a position corresponding to position 156 of SEQ ID NO: 5 and a W at a position corresponding to position 162 of SEQ ID NO: 5;

f) a A at a position corresponding to position 68 of SEQ ID NO: 5 and a S at a position corresponding to position 81 of SEQ ID NO: 5;

g) a N at a position corresponding to position 35 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at position 162 of SEQ ID NO: 5;

h) a N at a position corresponding to position 35 of SEQ ID NO: 5, a Q at a position corresponding to position 46 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

i) a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

j) a N at a position corresponding to position 35 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

k) a N at a position corresponding to position 35 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

l) a M at a position corresponding to position 68 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

m) a Q at a position corresponding to position 46 of SEQ ID NO: 5, a M at a position corresponding to position 68 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

n) a M at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

o) a N at a position corresponding to position 35, a Q at a position corresponding to position 46 of SEQ ID NO: 5, a M at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID

NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

p) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

q) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

r) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

s) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

t) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

u) a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

v) a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

w) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

x) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

y) a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

z) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

aa) a S at a position corresponding to position 81 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

bb) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

cc) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

dd) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

ee) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ff) a W at a position corresponding to position 75 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

gg) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

hh) a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ii) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

jj) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

kk) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

ll) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

mm) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

nn) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

oo) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

pp) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a M at a position corresponding to position 105 of SEQ ID NO: 5;

qq) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a V at a position corresponding to position 121 of SEQ ID NO: 5;

rr) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

ss) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

tt) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

uu) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a V at a position corresponding to position 121 of SEQ ID NO: 5;

vv) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

ww) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

xx) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

yy) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

zz) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

aaa) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

bbb) a M at a position corresponding to position 145 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

ccc) a M at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

ddd) a Q at a position corresponding to position 159 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

eee) a S at a position corresponding to position 81 of SEQ ID NO: 5, a M at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

fff) a S at a position corresponding to position 81 of SEQ ID NO: 5, a V at a position corresponding to position 121 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

ggg) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

hhh) a G at a position corresponding to position 76 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

iii) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

jjj) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a G at a position corresponding to position 76 of SEQ ID NO: 5;

kkk) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

lll) a G at a position corresponding to position 76 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

mmm) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

nnn) a A at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

ooo) a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

ppp) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

qqq) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

rrr) a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 109 of SEQ ID NO: 5, a E at a position corresponding to position 153 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

sss) a A at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a A at a position corresponding to position 121 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ttt) a Q at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a I at a position corresponding to position 117 of SEQ ID NO: 5, a Q at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

uuu) a Y at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a G at a position corresponding to position 121 of SEQ ID NO: 5, a L at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

vvv) a C at a position corresponding to position 22 of SEQ ID NO: 5, a A at a position corresponding to position 68 of SEQ ID NO: 5, a Y at a position corresponding to position 75 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a H at a position corresponding to position 122 of SEQ ID NO: 5, a Y at a position corresponding to position 138 of SEQ ID NO: 5, a L at a position corresponding to position 139 of SEQ ID NO: 5, a A at a position corresponding to position 142 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a R at a position corresponding to

position 153 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, a D at a position corresponding to position 160 of SEQ ID NO: 5, and a H at a position corresponding to position 162 of SEQ ID NO: 5 ; or

www) a S at a position corresponding to position 81 of SEQ ID NO: 5.

29. The system of claim 27, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to any one of SEQ ID NOs: 300-414, 596-598, and 720-723.

30. The system of claim 27, wherein said deaminase has improved deaminase activity when compared to SEQ ID NO: 5 and/or

wherein the deaminase is an adenine deaminase.

31. The system of claim 27, wherein at least one of said nucleotide sequences encoding the one or more guide RNAs and said nucleotide sequence encoding the fusion protein is operably linked to a promoter heterologous to said nucleotide sequence.

32. The system of claim 27, wherein the target DNA sequence is a eukaryotic target DNA sequence and/or

is located adjacent to a protospacer adjacent motif (PAM) that is recognized by the RGN polypeptide.

33. The system of claim 27, wherein the RGN polypeptide of the fusion protein has an amino acid sequence having at least 95% sequence identity to any one of SEQ ID NOs: 1-4, 49-162, 435, 575, 576, 698, and 699.

34. The system of claim 27, wherein the RGN polypeptide of the fusion protein is an RGN nickase, optionally wherein the RGN nickase has the amino acid sequence set forth as any one of SEQ ID NOs: 49-52 and 698.

35. The system of claim 27, wherein said fusion protein is selected from the group consisting of:

a) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 319 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

b) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 375 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

c) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 406 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

d) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity

to SEQ ID NO: 596 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

e) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 597 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

f) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 303 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

g) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 366 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49; and

h) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 720 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49.

36. The system of claim 27, wherein said fusion protein has the sequence set forth as any one of SEQ ID NOs: 577, 578, 582, 584, 588, 593, 594, 604, 605, 616, and 729.

37. A vector comprising the nucleic acid molecule of claim 5.

38. A vector comprising the nucleic acid molecule of claim 19.

39. A vector comprising the nucleic acid molecule of claim 19, further comprising at least one nucleotide sequence encoding a guide RNA capable of hybridizing to a non-target strand of a target sequence.

40. A cell comprising the deaminase of any one of claims 1-4, the nucleic acid molecule of any one of claims 5-9 and 19-26, the vector of claim 37 or 38, the fusion protein of any of claims 10-17, or the RNP complex of claim 18.

41. The cell of claim 40, wherein said cell is a mammalian cell.

42. A cell comprising the system of claim 27.

43. A pharmaceutical composition comprising a pharmaceutically acceptable carrier and the deaminase of any one of claims 1-4, the nucleic acid molecule of any one of claims 5-9 and 19-26, the vector of claim 38 or 39, the fusion protein of any of claims 10-17, the RNP complex of claim 18, the system of any one of claims 27-36, or the cell of any one of claims 40-42.

44. A method for modifying a target DNA molecule comprising a target DNA sequence, said method comprising delivering a system according to any one of claims 27-36 to said target DNA molecule or a cell comprising the target DNA molecule.

45. A method for modifying a target DNA molecule comprising a target sequence comprising:

a) assembling an RGN-deaminase ribonucleotide complex *in vitro* by combining:

i) one or more guide RNAs capable of hybridizing to a non-target strand of the target DNA sequence; and

ii) a fusion protein comprising an RNA-guided nuclease polypeptide (RGN), and at least one deaminase, wherein the deaminase has an amino acid sequence having at least 85% sequence identity to SEQ ID NO: 5;

under conditions suitable for formation of the RGN-deaminase ribonucleotide complex; wherein said deaminase has at least one of the following amino acid residues:

A) a C at a position corresponding to position 2 of SEQ ID NO: 5;

B) a F or C at a position corresponding to position 22 of SEQ ID NO: 5;

C) a Q at a position corresponding to position 23 of SEQ ID NO: 5;

D) a N at a position corresponding to position 35 of SEQ ID NO: 5;

E) a L at a position corresponding to position 40 of SEQ ID NO: 5;

F) a Q at a position corresponding to position 46 of SEQ ID NO: 5;

G) a A or M at a position corresponding to position 68 of SEQ ID NO: 5;

H) a H at a position corresponding to position 72 of SEQ ID NO: 5;

I) a W, A, Q, Y, or D at a position corresponding to position 75 of SEQ ID NO: 5;

J) a G at a position corresponding to position 76 of SEQ ID NO: 5;

K) a S at a position corresponding to position 81 of SEQ ID NO: 5;

L) a M at a position corresponding to position 105 of SEQ ID NO: 5;

M) a H at a position corresponding to position 108 of SEQ ID NO: 5;

N) a L at a position corresponding to position 109 of SEQ ID NO: 5;

O) a I or L at a position corresponding to position 117 of SEQ ID NO: 5;

P) a F at a position corresponding to position 120 of SEQ ID NO: 5;

Q) a E, T, A, G, or V at a position corresponding to position 121 of SEQ ID NO: 5;

R) a I or H at a position corresponding to position 122 of SEQ ID NO: 5;

S) a K at a position corresponding to position 125 of SEQ ID NO: 5;

T) a A at a position corresponding to position 126 of SEQ ID NO: 5;

U) a H at a position corresponding to position 135 of SEQ ID NO: 5;

V) a V at a position corresponding to position 137 of SEQ ID NO: 5;

W) a Y at a position corresponding to position 138 of SEQ ID NO: 5;

X) a L at a position corresponding to position 139 of SEQ ID NO: 5;

Y) a K or A at a position corresponding to position 142 of SEQ ID NO: 5;

Z) a A, Q, L, or M at a position corresponding to position 145 of SEQ ID NO: 5;

AA) a K at a position corresponding to position 148 of SEQ ID NO: 5;

BB) a Q at a position corresponding to position 151 of SEQ ID NO: 5;

CC) a E or R at a position corresponding to position 153 of SEQ ID NO: 5;

DD) a W at a position corresponding to position 155 of SEQ ID NO: 5;

EE) a R or V at a position corresponding to position 156 of SEQ ID NO: 5;

FF) a F at a position corresponding to position 157 of SEQ ID NO: 5;

GG) a R at a position corresponding to position 158 of SEQ ID NO: 5;

HH) a Q at a position corresponding to position 159 of SEQ ID NO: 5;

II) a D or W at a position corresponding to position 160 of SEQ ID NO: 5;

JJ) a W, H, V, or A at a position corresponding to position 162 of SEQ ID NO: 5;

KK) a R at a position corresponding to position 165 of SEQ ID NO: 5; and

LL) a H at a position corresponding to position 166 of SEQ ID NO: 5;

and

b) contacting said target DNA molecule or a cell comprising said target DNA molecule with the *in vitro*-assembled RGN-deaminase ribonucleotide complex;

wherein the one or more guide RNAs hybridize to a non-target strand of the target DNA sequence, thereby directing said fusion protein to bind to said target DNA sequence and modification of the target DNA molecule occurs.

46. The method of claim 45, wherein said deaminase comprises:

a) a N at a position corresponding to position 35 of SEQ ID NO: 5 and a W at a position corresponding to position 162 of SEQ ID NO: 5;

b) a N at a position corresponding to position 35 of SEQ ID NO: 5 and a Q at a position corresponding to position 46 of SEQ ID NO: 5;

c) a S at a position corresponding to position 81 of SEQ ID NO: 5 and a R at a position corresponding to position 156 of SEQ ID NO: 5;

d) a Q at a position corresponding to position 46 of SEQ ID NO: 5 and a R at a position corresponding to position 156 of SEQ ID NO: 5;

e) a R at a position corresponding to position 156 of SEQ ID NO: 5 and a W at a position corresponding to position 162 of SEQ ID NO: 5;

f) a A at a position corresponding to position 68 of SEQ ID NO: 5 and a S at a position corresponding to position 81 of SEQ ID NO: 5;

g) a N at a position corresponding to position 35 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at position 162 of SEQ ID NO: 5;

h) a N at a position corresponding to position 35 of SEQ ID NO: 5, a Q at a position corresponding to position 46 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

i) a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

j) a N at a position corresponding to position 35 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

k) a N at a position corresponding to position 35 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

l) a M at a position corresponding to position 68 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

m) a Q at a position corresponding to position 46 of SEQ ID NO: 5, a M at a position corresponding to position 68 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

n) a M at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

o) a N at a position corresponding to position 35, a Q at a position corresponding to position 46 of SEQ ID NO: 5, a M at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, and a W at a position corresponding to position 162 of SEQ ID NO: 5;

p) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

q) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

r) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

s) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

t) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

u) a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

v) a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

w) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

x) a W at a position corresponding to position 75 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

y) a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

z) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

aa) a S at a position corresponding to position 81 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

bb) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

cc) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

dd) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a A at a position corresponding to position 145 of SEQ ID NO: 5;

ee) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ff) a W at a position corresponding to position 75 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

gg) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

hh) a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ii) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

jj) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

kk) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 155 of SEQ ID NO: 5;

ll) a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

mm) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

nn) a W at a position corresponding to position 75 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

oo) a W at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

pp) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a M at a position corresponding to position 105 of SEQ ID NO: 5;

qq) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a V at a position corresponding to position 121 of SEQ ID NO: 5;

rr) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

ss) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

tt) a L at a position corresponding to position 40 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

uu) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a V at a position corresponding to position 121 of SEQ ID NO: 5;

vv) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

ww) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

xx) a M at a position corresponding to position 105 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

yy) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a M at a position corresponding to position 145 of SEQ ID NO: 5;

zz) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

aaa) a V at a position corresponding to position 121 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

bbb) a M at a position corresponding to position 145 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

ccc) a M at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

ddd) a Q at a position corresponding to position 159 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

eee) a S at a position corresponding to position 81 of SEQ ID NO: 5, a M at a position corresponding to position 145 of SEQ ID NO: 5, and a W at a position corresponding to position 160 of SEQ ID NO: 5;

fff) a S at a position corresponding to position 81 of SEQ ID NO: 5, a V at a position corresponding to position 121 of SEQ ID NO: 5, and a Q at a position corresponding to position 159 of SEQ ID NO: 5;

ggg) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

hhh) a G at a position corresponding to position 76 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

iii) a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

jjj) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a G at a position corresponding to position 76 of SEQ ID NO: 5;

kkk) a A at a position corresponding to position 68 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

lll) a G at a position corresponding to position 76 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

mmm) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, and a S at a position corresponding to position 81 of SEQ ID NO: 5;

nnn) a A at a position corresponding to position 68 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

ooo) a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

ppp) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

qqq) a A at a position corresponding to position 68 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, and a L at a position corresponding to position 117 of SEQ ID NO: 5;

rrr) a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 109 of SEQ ID NO: 5, a E at a position corresponding to position 153 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

sss) a A at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a A at a position corresponding to position 121 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

ttt) a Q at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a I at a position corresponding to position 117 of SEQ ID NO: 5, a Q at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

uuu) a Y at a position corresponding to position 75 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a G at a position corresponding to position 121 of SEQ ID NO: 5, a L at a position corresponding to position 145 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, and a D at a position corresponding to position 160 of SEQ ID NO: 5;

vvv) a C at a position corresponding to position 22 of SEQ ID NO: 5, a A at a position corresponding to position 68 of SEQ ID NO: 5, a Y at a position corresponding to position 75 of SEQ ID NO: 5, a G at a position corresponding to position 76 of SEQ ID NO: 5, a S at a position corresponding to position 81 of SEQ ID NO: 5, a H at a position corresponding to position 108 of SEQ ID NO: 5, a L at a position corresponding to position 117 of SEQ ID NO: 5, a H at a position corresponding to position 122 of SEQ ID NO: 5, a Y at a position corresponding to position 138 of SEQ ID NO: 5, a L at a position corresponding to position 139 of SEQ ID NO: 5, a A at a position corresponding to position 142 of SEQ ID NO: 5, a A at a position corresponding to position 145 of SEQ ID NO: 5, a R at a position corresponding to position 153 of SEQ ID NO: 5, a W at a position corresponding to position 155 of SEQ ID NO: 5, a R at a position corresponding to position 156 of SEQ ID NO: 5, a D at a position corresponding to position 160 of SEQ ID NO: 5, and a H at a position corresponding to position 162 of SEQ ID NO: 5 ; or

www) a S at a position corresponding to position 81 of SEQ ID NO: 5.

47. The method of claim 45, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to any one of SEQ ID NOs: 300-414, 596-598, and 720-723.

48. The method of claim 45, wherein said deaminase has improved deaminase activity when compared to SEQ ID NO: 5 and/or

wherein the deaminase is an adenine deaminase.

49. The method of claim 45, wherein the RGN of the fusion protein has an amino acid sequence having at least 95% sequence identity to any one of SEQ ID NOs: 1-4, 49-162, 435, 575, 576, 698, and 699.

50. The method of claim 45, wherein the RGN of the fusion protein is an RGN nickase, optionally wherein the RGN nickase has the amino acid sequence set forth as any one of SEQ ID NOs: 49-52 and 698.

51. The method of claim 45, wherein said fusion protein is selected from the group consisting of:

a) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 319 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

b) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 375 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

c) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 406 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

d) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 596 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

e) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 597 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

f) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 303 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49;

g) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 366 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49; and

h) a fusion protein comprising said deaminase, wherein said deaminase comprises an amino acid sequence having at least 90% sequence identity, at least 95% sequence identity, or 100% sequence identity to SEQ ID NO: 720 and is fused to the N-terminus of an RGN comprising an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 49.

52. The method of claim 45, wherein said fusion protein has the sequence set forth as any one of SEQ ID NOs: 577, 578, 582, 584, 588, 593, 594, 604, 605, 616, and 729.

53. The method of claim 45, wherein said target DNA sequence is a eukaryotic target DNA sequence and/or

is located adjacent to a protospacer adjacent motif (PAM).

54. The method of claim 45, wherein the target DNA molecule comprises a causal mutation for a disease or disorder and wherein modification of the target DNA molecule corrects said causal mutation, optionally wherein the correction of the causal mutation comprises correcting a nonsense mutation.

55. The method of claim 45, wherein the target DNA molecule is within a cell.

56. The method of claim 55, further comprising selecting a cell comprising said modified DNA molecule.

57. The cell of claim 42, or the system of any one of claims 27-36 for use as a medicament.