

CLAIMS

WHAT IS CLAIMED IS:

1. A composition comprising a programmable nuclease having at least 80% sequence identity to SEQ ID NO: 37 and a non-naturally occurring guide nucleic acid.
2. The composition of claim 1, wherein the programmable nuclease has at least 85%, at least 90%, at least 92%, at least 95%, at least 97%, or at least 99% sequence identity to SEQ ID NO: 37, optionally wherein the programmable nuclease is SEQ ID NO: 37.
3. The composition of any one of claims 1 or 2, wherein the programmable nuclease comprises three partial RuvC domains, optionally wherein the programmable nuclease comprises a RuvC-I subdomain, a RuvC-II subdomain, and a RuvC-III subdomain.
4. The composition of any one of claims 1-3, wherein the non-naturally occurring guide nucleic acid comprises a crRNA.
5. The composition of any one of claims 1-4, wherein the non-naturally occurring guide nucleic acid comprises RNA having at least 10 nucleotides that hybridize to a region in a target nucleic acid adjacent to a protospacer adjacent motif.
6. The composition of any one of claims 1-5, further comprising a buffer, optionally wherein the buffer comprises a buffering agent, a salt, glycerol, a detergent, or any combination thereof.
7. The composition of claim 6, wherein:
 - a) the buffering agent is HEPES;
 - b) the salt is potassium acetate, magnesium acetate, sodium chloride, magnesium chloride, or any combination thereof;
 - c) the buffer comprises glycerol; and/or
 - d) the detergent is Tween, Triton-X, or any combination thereof.
8. The composition of claim 6 or 7, wherein a pH of the buffer is approximately 7.5.
9. The composition of any one of claims 1-8, wherein a pH of the composition is from 7 to 8, optionally wherein a pH of the composition is 7.5.
10. The composition of any one of claims 1-9, wherein the programmable nuclease exhibits catalytic activity at a temperature from 25°C to 45°C.
11. The composition of any one of claims 1-10, wherein the programmable nuclease exhibits catalytic activity after heating the composition to a temperature of greater than 45°C and restoring the temperature to from 25°C to 45°C.

12. The composition of any one of claims 1-11, further comprising a reporter, optionally wherein the reporter comprises a detector nucleic acid and a detection moiety.
13. The composition of claim 12, wherein the detection moiety comprises a fluorescent moiety, a quenching moiety, a fluorescent dye, an infrared dye, an ultraviolet dye, a fluorescence resonance energy transfer (FRET) pair, a polypeptide, a biotin, an avidin, a streptavidin, a polysaccharide, a polymer, or a nanoparticle.
14. The composition of claim 12 or 13, wherein the detector nucleic acid comprises DNA, RNA, or a combination thereof.
15. The composition of any one of claims 1-14, further comprising an amplification reagent, optionally wherein the amplification reagent comprises a primer, a recombinase, a single-stranded DNA binding (SSB) protein, a DNA polymerase, an RNA polymerase, a deoxynucleotide triphosphate, a nucleotide triphosphate, a reverse transcriptase, a helicase, a ligase, or any combination thereof.
16. A method of assay for a segment of a target nucleic acid in a sample, the method comprising:
- a) contacting the sample to:
 - i. a reporter comprising a detector nucleic acid; and
 - ii. the composition of any one of claims 1-15, wherein the non-naturally occurring guide nucleic acid hybridizes to a segment of the target nucleic acid; and
 - b) assaying for a signal produced by cleavage of the detector nucleic acid.
17. The method of claim 16, wherein the signal is present prior to cleavage of the detector nucleic acid and changes upon cleavage of the detector nucleic acid or wherein the signal is absent prior to cleavage of the detector nucleic acid and is present upon cleavage of the detector nucleic acid.
18. The method of claim 16 or 17, wherein the signal is calorimetric, potentiometric, amperometric, optical, or piezo-electric signal, optionally wherein the optical signal is a fluorescent or colorimetric signal.
19. The method of any one of claims 16-18, further comprising amplifying the target nucleic acid.