THAT WHICH IS CLAIMED IS:

1. A modified *Lachnospiraceae bacterium* CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) Cas12a (LbCas12a) polypeptide, wherein the modified LbCas12a polypeptide comprises an amino acid sequence having at least 80% identity to the amino acid sequence of **SEQ ID NO:1** (LbCas12a) and a mutation at one or more than one of the following positions of K116, K120, K121, D122, E125, T148, T149, T152, D156, E159, Q529, D535, K538, D541, Y542, L585, K591, M592, K595, V596, S599, K600, K601, Y616, Y646, W649 with reference to position numbering of **SEQ ID NO:1**, optionally a mutation at one or more than one of the following positions of K116, K120, K121, D122, E125, T152, D156, E159, G532, D535, K538, D541, and/or K595 with reference to position numbering of **SEQ ID NO:1**.

2. The modified LbCas12a polypeptide of claim 1, wherein the modified LbCas12a polypeptide comprises one or more than one or the amino acid mutations of K116R, K116N, K120R, K120H, K120N, K120T, K120Y, K120Q, K121S, K121T, K121H, K121R, K121G, K121D, K121Q, D122R, D122K, D122H, D122E, D122N, E125R, E125K, E125Q, E125Y, T148H, T148S, T148A, T148C, T149A, T149C, T149S, T149G, T149H, T149P, T149F, T149N, T149D, T149V, T152R, T152K, T152W, T152Y, T152H, T152Q, T152E, T152L, T152F, D156R, D156K, D156Y, D156W, D156Q, D156H, D156I, D156V, D156L, D156E, E159K, E159R, E159H, E159Y, E159Q, Q529N, Q529T, Q529H, Q529A, Q529F, Q529G, Q529G, Q529S, Q529P, Q529W, Q529D, G532D, G532N, G532S, G532H, G532F, G532K, G532R, G532Q, G532A, G532L, G532C, D535N, D535H, D535V, D535T, D535,S D535A, D535W, D535K, K538R K538V, K538Q, K538W, K538Y, K538F, K538H, K538L, K538M, K538C, K538G, K538A, K538P, D541N, D541H, D541R, D541K, D541Y, D541I, D541A, D541S, D541E, Y542R, Y542K, Y542H, Y542Q, Y542F, Y542L, Y542M, Y542P, Y542V, Y542N, Y542T, L585G, L585H, L585F, K591W, K591F, K591Y, K591H, K591R, K591S, K591A, K591G, K591P, M592R, M592K, M592Q, M592E, M592A, K595R, K595Q, K595Y, K595L, K595W, K595H, K595E, K595S, K595D, K595M, V596T, V596H, V596G, V596A, S599G, S599H, S599N, S599D, K600R, K600H, K600G, K601R, K601H, K601Q, K601T, Y616K, Y616R, Y616E, Y616F, Y616H, Y646R, Y646E, Y646K, Y646H, Y646Q, Y646W, Y646N,

W649H, W649K, W649Y, W649R, W649E, W649S, W649V, and/or W649T with reference to position numbering of **SEQ ID NO:1**, optionally comprises one or more than one of the amino acid mutations of K116R, K116N, K120Y, K121S, K121R, D122H, D122N, E125K, T152R, T152K, T152Y, T152Q, T152E, T152F, D156R, D156W, D156Q, D156H, D156I, D156V, D156L, D156E, E159K, E159R, G532N, G532S, G532H, G532K, G532R, G532L, D535N, D535H, D535T, D535,S D535A, D535W, K538R K538V, K538Q, K538W, K538Y, K538F, K538H, K538L, K538M, K538C, K538G, K538A, D541E, K595R, K595Q, K595Y, K595W, K595H, K595S, and/or K595M with reference to position numbering of **SEQ ID NO:1**.

3. The modified LbCas12a polypeptide of claim 1 or claim 2, wherein the modified LbCas12a polypeptide has an altered PAM (protospacer adjacent motif) specificity.

4. The modified LbCas12a polypeptide of claim 1 or claim 2, further comprising a mutation in the nuclease active site (e.g., RuvC domain) (e.g., deadLbCas12a, dLbCas12a).

5. A fusion protein comprising the modified LbCas12a polypeptide of any one of claims 1 to 4, and a polypeptide of interest.

6. The fusion protein of claim 5, wherein the polypeptide of interest is linked to the modified LbCas12a polypeptide.

7. The fusion protein of claim 5 or claim 6, wherein the polypeptide of interest comprises at least one polypeptide or protein domain having deaminase (deamination) activity, nickase activity, recombinase activity, transposase activity, methylase activity, glycosylase (DNA glycosylase) activity, glycosylase inhibitor activity (e.g., uracil-DNA glycosylase inhibitor (UGI)), demethylase activity, transcription activation activity, transcription repression activity, transcription release factor activity, histone modification activity, nuclease activity, single-strand RNA cleavage activity, double-strand RNA cleavage activity, restriction endonuclease activity (e.g., Fok1), nucleic acid binding activity, methyltransferase activity, DNA repair activity, DNA damage activity, dismutase activity, alkylation activity, depurination activity, oxidation activity, pyrimidine dimer forming activity, integrase activity, transposase

activity, polymerase activity, ligase activity, helicase activity, and/or photolyase activity.

8. The fusion protein of any one of claims 5 to 7, wherein the polypeptide of interest comprises at least one polypeptide or protein domain having deaminase activity.

9. The fusion protein of claim 8, wherein the at least one polypeptide or protein domain having deaminase activity is a cytosine deaminase domain or an adenine deaminase domain.

10. The fusion protein of any one of claims 5 to 9, wherein the at least one polypeptide has glycosylase inhibitor activity, optionally wherein the at least one polypeptide is a uracil-DNA glycosylase inhibitor (UGI).

11. A polynucleotide encoding the modified LbCas12a polypeptide of any one of claims 1 to 4, or the fusion protein of any one of claims 5 to 9.

12. The polynucleotide of claim 11, wherein the polynucleotide encoding the modified LbCas12a polypeptide or the polynucleotide encoding the fusion protein is operatively associated with a promoter, optionally wherein the promoter is a promoter region comprising an intron.

13. The polynucleotide of claim 11 or claim 12, wherein the polynucleotide is codon optimized for expression in an organism.

14. An expression cassette or vector comprising the polynucleotide of any one of claims 11 to 13.

15. A Type V Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) - associated (Cas) (CRISPR-Cas) system comprising:

(a) a fusion protein comprising (i) the modified LbCas12a polypeptide of any one of claims 1 to 4 or a nucleic acid encoding the modified LbCas12a polypeptide of any one of claims

1 to 4, and (ii) a polypeptide of interest or a nucleic acid encoding the polypeptide of interest; and

(b) a guide nucleic acid (CRISPR RNA, CRISPR DNA, crRNA,crDNA) comprising a spacer sequence and a repeat sequence, wherein the guide nucleic acid is capable of forming a complex with the modified LbCas12a polypeptide or the fusion protein and the spacer sequence is capable of hybridizing to a target nucleic acid, thereby guiding the modified LbCas12a polypeptide and the polypeptide of interest to the target nucleic acid, whereby the target nucleic acid is modified (e.g., cleaving or editing) or modulated (e.g., modulating transcription).

16. A cell comprising the polynucleotide of any one of claims 11 to 13, the expression cassette or vector of claim 14, or the system of claim 15.

17. A method of modifying a target nucleic acid, comprising:

contacting the target nucleic acid with:

(a)(i) the modified LbCas12a polypeptide of any one of claims 1 to 4, or the fusion protein of any one of claims 5 to 9, and (ii) a guide nucleic acid (e.g., CRISPR RNA, CRISPR DNA, crRNA,crDNA);

(b) a composition comprising (i) the modified LbCas12a polypeptide of any one of claims 1 to 4, or the fusion protein of any one of claims 5 to 9, and (ii) a guide nucleic acid; and/or

(c) the system of claim 15, thereby modifying the target nucleic acid.

18. A method of modifying a target nucleic acid, comprising

contacting a cell or a cell free system comprising the target nucleic acid with:

(a)(i) the polynucleotide of any one of claims 11 to 13, or an expression cassette or vector comprising the same, and (ii) a guide nucleic acid, or an expression cassette or vector comprising the same.

19. A method of editing a target nucleic acid, comprising:

contacting the target nucleic acid with:

(a)(i) the fusion protein of any one of claims 5 to 9, and (a)(ii) a guide nucleic acid;

(b) a complex or a composition comprising the fusion protein of any one of claims 5 to 6, and a guide nucleic acid; and/or

(c) the system of claim 15, thereby editing the target nucleic acid.

20. A method of editing a target nucleic acid, comprising contacting a cell or a cell free system comprising the target nucleic acid with:

(a)(i) a polynucleotide encoding the fusion protein of any one of claims 5 to 9, or an expression cassette or vector comprising the same, and (a)(ii) a guide nucleic acid, or an expression cassette or vector comprising the same; and/or

(b) a nucleic acid construct encoding a complex comprising the fusion protein of any one of claims 5 to 9, and a guide nucleic acid, or an expression cassette or vector comprising the same; and/or

(c) the system of claim 15, thereby editing the target nucleic acid.