

What is claimed is:

1. A UvsX recombinase polypeptide comprising an amino acid sequence that is at least 95% identical to the amino acid sequence SEQ ID NO: 1, wherein said UvsX recombinase polypeptide comprises at least one amino acid substitution mutation at a position corresponding to position Pro321 and/or position Asp334 in the RB49 UvsX amino acid sequence SEQ ID NO:1, and wherein said UvsX recombinase polypeptide demonstrates recombinase activity.
2. The UvsX recombinase polypeptide of claim 1, said UvsX recombinase polypeptide having increased recombinase activity compared to a RB49 UvsX recombinase polypeptide having the amino acid sequence of SEQ ID NO:1 with a His to Ser substitution at amino acid position 63 of SEQ ID NO:1.
3. The UvsX recombinase polypeptide of claim 2, wherein said recombinase activity is increased in the presence of a single stranded template nucleic acid compared to a RB49 UvsX recombinase polypeptide having the amino acid sequence of SEQ ID NO:1 with a His to Ser substitution at amino acid position 63 of SEQ ID NO:1.
4. The UvsX recombinase polypeptide of claim 2, said UvsX recombinase polypeptide having improved seeding and/or amplification on a solid support compared to a RB49 UvsX recombinase polypeptide having the amino acid sequence of SEQ ID NO:1 with a His to Ser substitution at amino acid position 63 of SEQ ID NO:1.
5. A UvsX recombinase polypeptide comprising SEQ ID NO:2 with an Asp334Lys substitution and/or a Pro256Lys substitution in the amino acid sequence of SEQ ID NO:2.
6. The UvsX recombinase polypeptide of claim 1, wherein the UvsX recombinase polypeptide comprises an amino acid sequence that is at least 99% identical to SEQ ID NO: 1.
7. The UvsX recombinase polypeptide of claim 1, wherein the at least one substitution mutation comprises a mutation to a charged residue.

8. The UvsX recombinase polypeptide of claim 1, wherein the at least one substitution mutation comprises a mutation to a basic residue.
9. The UvsX recombinase polypeptide of claim 1, wherein the at least one substitution mutation at a position corresponding to position Pro321 in the RB49 UvsX amino acid sequence SEQ ID NO:1 comprises a Pro321Lys substitution mutation.
10. The UvsX recombinase polypeptide of claim 1, wherein the at least one substitution mutation at a position corresponding to position Asp334 in the RB49 UvsX amino acid sequence SEQ ID NO:1 comprises a Asp334Lys substitution mutation.
11. The UvsX recombinase polypeptide of claim 1, wherein the at least one substitution mutation corresponding to positions Pro321 and Asp334 in the RB49 UvsX amino acid sequence SEQ ID NO:1 comprises Pro321Lys and Asp334Lys substitution mutations.
12. The UvsX recombinase polypeptide of claim 1, further comprising a substitution mutation at a position corresponding to Pro256 in the RB49 UvsX amino acid sequence SEQ ID NO:1.
13. The UvsX recombinase polypeptide of claim 12, wherein the substitution mutation at a position corresponding to Pro256 in the RB49 UvsX amino acid sequence SEQ ID NO:1 comprises a Pro256Lys substitution mutation.
14. The UvsX recombinase polypeptide of claim 1, further comprising a substitution mutation at a position corresponding to His63 in the RB49 UvsX amino acid sequence SEQ ID NO:1.
15. The UvsX recombinase polypeptide of claim 14, wherein the substitution mutation at a position corresponding to His63 in the RB49 UvsX amino acid sequence SEQ ID NO:1 comprises a His63 Ser substitution mutation.
16. The UvsX recombinase polypeptide of claim 1, further comprising a mutation selected from the group consisting of: the addition of one or more glutamic acid residues at the C-terminus, the addition of one or more aspartic acid residues at the C-terminus, and a combination thereof.

17. The UvsX recombinase polypeptide of claim 1, comprising the amino acid sequence of SEQ ID NO: 2.

18. A UvsX recombinase polypeptide comprising the amino acid sequence of SEQ ID NO:2 with a substitution mutation at position Pro256 of SEQ ID NO:2.

19. The UvsX recombinase polypeptide of claim 18, wherein the substitution mutation at position Pro256 comprises a Pro256Lys substitution mutation in the amino acid sequence SEQ ID NO:2.

20. The UvsX recombinase polypeptide of claim 1, comprising amino acid substitution mutations at the positions corresponding to positions Pro321 and Asp334 in the RB49 amino acid sequence SEQ ID NO: 1.