Claims

1. A method of modifying a targeted site of a double stranded DNA, comprising a step of contacting a complex wherein a nucleic acid sequence-recognizing module that specifically binds to a target nucleotide sequence in a given double stranded DNA and a nucleic acid base converting enzyme are bonded, with said double stranded DNA, to convert one or more nucleotides in the targeted site to other one or more nucleotides or delete one or more nucleotides, or insert one or more nucleotides into said targeted site, without cleaving at least one strand of said double stranded DNA in the targeted site, wherein the nucleic acid sequence-recognizing module is a CRISPR-Cas system wherein at least one DNA cleavage ability of Cas is inactivated.

2. The method according to claim 1, which uses two or more kinds of nucleic acid sequence-recognizing modules each specifically binding to a different target nucleotide sequence.

3. The method according to claim 2, wherein the aforementioned different target nucleotide sequences are present in different genes.

4. The method according to any one of claims 1, 2 and 3, wherein the aforementioned nucleic acid base converting enzyme is a deaminase.

5. The method according to claim 4, wherein the aforementioned deaminase is a cytidine deaminase.

6. The method according to any one of claims 1 and 2 to 5, wherein the double stranded DNA is contacted with the complex by introducing a nucleic acid encoding the complex into a cell

having the double stranded DNA.

7. The method according to claim 6, wherein the aforementioned cell is a prokaryotic cell.

8. The method according to claim 6, wherein the aforementioned cell is an eukaryotic cell.

9. The method according to claim 6, wherein the aforementioned cell is a microbial cell.

10. The method according to claim 6, wherein the aforementioned cell is a plant cell.

11. The method according to claim 6, wherein the aforementioned cell is an insect cell.

12. The method according to claim 6, wherein the aforementioned cell is an animal cell.

13. The method according to claim 6, wherein the aforementioned cell is a vertebrate cell.

14. The method according to claim 6, wherein the aforementioned cell is a mammalian cell.

15. The method according to any one of claims 7 to 14, wherein the aforementioned cell is a polyploid cell, and all of the targeted sites in alleles on homologous chromosomes are modified.

16. The method according to any one of claims 6 to 15, comprising a step of introducing an expression vector comprising a nucleic acid encoding the aforementioned complex

in a form permitting control of an expression period into the aforementioned cell, and a step of inducing expression of the nucleic acid for a period necessary for fixing the modification of the targeted site in the double stranded DNA.

17. The method according to claim 16, wherein the target nucleotide sequence in the double stranded DNA is present in a gene essential for the aforementioned cell.

18. A nucleic acid-modifying enzyme complex wherein a nucleic acid sequence-recognizing module that specifically binds to a target nucleotide sequence in a given double stranded DNA and a nucleic acid base converting enzyme are bonded and the nucleic acid sequence-recognizing module is a CRISPR-Cas system wherein at least one DNA cleavage ability of Cas is inactivated, which complex converts one or more nucleotides in the targeted site to other one or more nucleotides or deletes one or more nucleotides, or inserts one or more nucleotides into said targeted site, without cleaving at least one strand of said double stranded DNA in the targeted site.

19. A nucleic acid encoding the nucleic acid-modifying enzyme complex according to claim 18.

20. A method of modifying a targeted site of a double stranded DNA, comprising a step of contacting a complex wherein a nucleic acid sequence-recognizing module that specifically binds to a target nucleotide sequence in a given double stranded DNA and a nucleic acid base converting enzyme are bonded, with said double stranded DNA, to convert one or more nucleotides in the targeted site to other one or more nucleotides or delete one or more nucleotides, or insert one or more nucleotides into said targeted site, without cleaving one of the strands of said double stranded DNA in the targeted site,

and the nucleic acid sequence-recognizing module is a CRISPR-Cas system wherein at least one DNA cleavage ability of Cas is deactivated, wherein the nucleic acid sequence-recognizing module is a CRISPR-Cas system wherein only one of the two DNA cleavage abilities of Cas is inactivated.

21. The method according to claim 20, wherein the Cas is a Cas9 wherein the 10th Asp residue is converted to an Ala residue.

22. The method according to claim 20, wherein the Cas is a Cas9 wherein the 840th His residue is converted to an Ala residue.

23. The method according to any one of claims 20 to 22, wherein the aforementioned nucleic acid base converting enzyme is a deaminase.

24. The method according to claim 23, wherein the aforementioned deaminase is a cytidine deaminase.

25. A nucleic acid-modifying enzyme complex wherein a nucleic acid sequence-recognizing module that specifically binds to a target nucleotide sequence in a given double stranded DNA and a nucleic acid base converting enzyme are bonded and the nucleic acid sequence-recognizing module is a CRISPR-Cas system wherein only one of the two DNA cleavage abilities of Cas is inactivated, which complex converts one or more nucleotides in the targeted site to other one or more nucleotides or deletes one or more nucleotides, or inserts one or more nucleotides into said targeted site, without cleaving one of the strands of said double stranded DNA in the targeted site.

26. A nucleic acid encoding the nucleic acid-modifying enzyme

complex according to claim 25.