Claims

1. A method for altering a targeted site of a DNA in a vertebrate cell, comprising a step of stimulating the cell with a factor inducing a DNA modifying enzyme endogenous to the cell, and bringing a complex of a nucleic acid sequence-recognizing module specifically binding to a target nucleotide sequence in a given DNA and a DNA modifying enzyme-binding module bonded to each other into contact with the 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,

wherein the DNA modifying enzyme-binding module has ability to bind to the DNA modifying enzyme and is at least one kind selected from the group consisting of CD81, MLL, C-terminal of APOBEC3G, Vif, Bet protein, TopoIIβ, IQGAP2 and ZNF335, fragments thereof, and variants thereof, each fragment having a binding region to the DNA modifying enzyme,

wherein the DNA modifying enzyme is deaminase,

wherein the nucleic acid sequence-recognizing module is selected from the group consisting of a CRISPR-Cas system wherein at least one DNA cleavage ability of Cas is inactivated, a zinc finger motif, a TAL effector and a PPR motif, and

wherein the factor inducing the DNA modifying enzyme endogenous to the cell is at least one factor selected from the group consisting of interferon, interleukin, mitogen, low-molecular-weight compound and hypoxic condition.

2. The method according to claim 1, wherein said targeted site is altered without cleaving at least one of the strands of said DNA.

3. The method according to claim 1 or 2, wherein said nucleic acid sequence-recognizing module is a CRISPR-Cas system wherein at least one DNA cleavage ability of Cas is inactivated.

4. The method according to any one of claims 1 to 3, wherein said DNA modifying enzyme-binding module is at least one kind selected from the group consisting of Vif, Bet protein, TopoIIβ, IQGAP2 and ZNF335 and fragments thereof, each fragment having a binding region to the DNA modifying enzyme.

5. The method according to any one of claims 1 to 4, wherein said deaminase is a protein belonging to the APOBEC family.

6. The method according to any one of claims 1 to 5, wherein the complex of the nucleic acid sequence-recognizing module bonded to the DNA modifying enzyme-binding module further comprises a base excision repair inhibitor bonded thereto.

7. The method according to any one of claims 1 to 6, wherein said factor inducing the DNA modifying enzyme includes one or more selected from the group consisting of interferon, an inhibitor of succinic acid dehydrogenase and hypoxic condition.

8. The method according to any one of claims 1 to 7, wherein said DNA and said complex are contacted by introducing a nucleic acid encoding the complex into said cell and culturing the cell to cause expression of the complex in the cell.

9. The method according to any one of claims 1 to 8, wherein the cell is stimulated by the factor inducing the DNA modifying enzyme by incubating the cell in the presence of the factor.

10. The method according to any one of claims 1 to 9, wherein said vertebrate cell is a mammalian cell.

11. The method according to any one of claims 1 to 10, wherein said DNA is a double stranded DNA.

12. A complex of a nucleic acid sequence-recognizing module specifically binding to a target nucleotide sequence in a DNA and a DNA modifying enzyme-binding module bonded to each other, wherein the nucleic acid sequence-recognizing module is a CRISPR-Cas system wherein at least one DNA cleavage ability of Cas is inactivated, wherein the 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,

wherein the DNA modifying enzyme-binding module has ability to

bind to a cell—endogenous DNA modifying enzyme and is at least one kind selected from the group consisting of CD81, MLL, C-terminal of APOBEC3G, Vif, Bet protein, TopoIIβ, IQGAP2 and ZNF335, fragments thereof, and variants thereof, each fragment having a binding region to the DNA modifying enzyme, and

wherein the cell-endogenous DNA modifying enzyme is deaminase.

13. A nucleic acid encoding the complex according to claim 12.

14. An agent for altering a targeted site of a DNA comprising the complex according to claim 12 or the nucleic acid according to claim 13.