CLAIMS

[Claim 1]

A method for designing a fusion protein containing a functional region, and a binding region fused thereto that can bind to a DNA base or specific DNA base sequence, the method comprising

designing the binding region to contain one or more PPR motifs having a structure of the following formula 1:

(Helix A)-X-(Helix B)-L (Formula 1)

(wherein, in the formula 1:

Helix A is a part that can form an α-helix structure;

X does not exist, or is a part consisting of 1 to 9 amino acids;

Helix B is a part that can form an α-helix structure; and

L is a part consisting of 2 to 7 amino acids),

wherein,

under the following definitions:

the first amino acid of Helix A is referred to as No. 1 amino acid (No. 1 A.A.), the fourth amino acid as No. 4 amino acid (No. 4 A.A.), and

- when a next PPR motif ($M_{n+1}$) contiguously exists on the C-terminus side of the PPR motif ($M_n$) (when there is no amino acid insertion between the PPR motifs), the -2nd amino acid counted from the end (C-terminus side) of the amino acids constituting the PPR motif ($M_n$);

- when a non-PPR motif consisting of 1 to 20 amino acids exists between the PPR motif ($M_n$) and the next PPR motif ($M_{n+1}$) on the C-terminus side, the amino acid locating upstream of the first amino acid of the next PPR motif ($M_{n+1}$) by 2 positions, i.e., the -2nd amino acid; or

- when any next PPR motif ($M_{n+1}$) does not exist on the C-terminus side of the PPR motif ($M_n$), or 21 or more amino acids constituting a non-PPR motif exist between the PPR motif ($M_n$) and the next PPR motif ($M_{n+1}$) on the C-terminus side, the 2nd amino acid counted from the end (C-terminus side) of the amino acids constituting the PPR motif ($M_n$)

is referred to as No. "ii" (-2) amino acid (No. "ii" (-2) A.A.),

wherein a combination of the three amino acids of No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A of one PPR motif ($M_n$) contained in the binding region is corresponding to the DNA base or DNA base sequence.

[Claim 2]

The method according to claim 1 wherein the combination of the three amino acids is designated according to any of the following definitions:

(1-1) when No. 4 A.A. is glycine (G), No. 1 A.A. may be an arbitrary amino acid, and No. "ii" (-2) A.A. is aspartic acid (D), asparagine (N), or serine (S);

(1-2) when No. 4 A.A. is isoleucine (I), each of No. 1 A.A. and No. "ii" (-2) A.A. may be an arbitrary amino acid;

(1-3) when No. 4 A.A. is leucine (L), each of No. 1 A.A. and No. "ii" (-2) A.A. may be an arbitrary amino acid;

(1-4) when No. 4 A.A. is methionine (M), each of No. 1 A.A. and No. "ii" (-2) A.A. may be an arbitrary amino acid;

(1-5) when No. 4 A.A. is asparagine (N), each of No. 1 A.A. and No. "ii" (-2) A.A. may be an arbitrary amino acid;

(1-6) when No. 4 A.A. is proline (P), each of No. 1 A.A. and No. "ii" (-2) A.A. may be an arbitrary amino acid;

(1-7) when No. 4 A.A. is serine (S), each of No. 1 A.A. and No. "ii" (-2) A.A. may be an arbitrary amino acid;

(1-8) when No. 4 A.A. is threonine (T), each of No. 1 A.A. and No. "ii" (-2) A.A. may be an arbitrary amino acid; and

(1-9) when No. 4 A.A. is valine (V), each of No. 1 A.A. and No. "ii" (-2) A.A. may be an arbitrary amino acid.

[Claim 3]

The method according to claim 1 or 2, wherein the combination of the three amino acids is designated according to any of the following definitions:

(2-1) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A. are an arbitrary amino acid, glycine, and aspartic acid, respectively, the PPR motif selectively binds to G;

(2-2) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are glutamic acid, glycine, and aspartic acid, respectively, the PPR motif

selectively binds to G;

(2-3) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, glycine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-4) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are glutamic acid, glycine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-5) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, glycine, and serine, respectively, the PPR motif selectively binds to A, and next binds to C;

(2-6) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, isoleucine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to T and C;

(2-7) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, isoleucine, and asparagine, respectively, the PPR motif selectively binds to T, and next binds to C;

(2-8) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, leucine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to T and C;

(2-9) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, leucine, and aspartic acid, respectively, the PPR motif selectively binds to C;

(2-10) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, leucine, and lysine, respectively, the PPR motif selectively binds to T;

(2-11) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, methionine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to T;

(2-12) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, methionine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-13) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, methionine, and aspartic acid, respectively, the PPR motif

selectively binds to T, and next binds to C;

(2-14) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to C and T;

(2-15) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-16) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are phenylalanine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-17) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are glycine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-18) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-19) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are threonine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-20) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A. are valine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T, and next binds to C;

(2-21) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A. are tyrosine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T, and next binds to C;

(2-22) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and asparagine, respectively, the PPR motif selectively binds to C;

(2-23) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, asparagine, and asparagine, respectively, the PPR motif selectively binds to C;

(2-24) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are serine, asparagine, and asparagine, respectively, the PPR motif selectively

binds to C;

(2-25) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, asparagine, and asparagine, respectively, the PPR motif selectively binds to C;

(2-26) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and serine, respectively, the PPR motif selectively binds to C;

(2-27) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, asparagine, and serine, respectively, the PPR motif selectively binds to C;

(2-28) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and threonine, respectively, the PPR motif selectively binds to C;

(2-29) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, asparagine, and threonine, respectively, the PPR motif selectively binds to C;

(2-30) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and tryptophan, respectively, the PPR motif selectively binds to C, and next binds to T;

(2-31) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, asparagine, and tryptophan, respectively, the PPR motif selectively binds to T, and next binds to C;

(2-32) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, proline, and an arbitrary amino acid, respectively, the PPR motif selectively binds to T;

(2-33) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, proline, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-34) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are phenylalanine, proline, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-35) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are tyrosine, proline, and aspartic acid, respectively, the PPR motif selectively

binds to T;

(2-36) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, serine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to A and G;

(2-37) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, serine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-38) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are phenylalanine, serine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-39) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, serine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-40) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, threonine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to A and G;

(2-41) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, threonine, and aspartic acid, respectively, the PPR motif selectively binds to G;

(2-42) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, threonine, and aspartic acid, respectively, the PPR motif selectively binds to G;

(2-43) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, threonine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-44) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are phenylalanine, threonine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-45) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, threonine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-46) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, threonine, and asparagine, respectively, the PPR motif selectively

binds to A;

(2-47) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, valine, and an arbitrary amino acid, respectively, the PPR motif binds with A, C, and T, but does not bind to G;

(2-48) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, valine, and aspartic acid, respectively, the PPR motif selectively binds to C, and next binds to A;

(2-49) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, valine, and glycine, respectively, the PPR motif selectively binds to C; and

(2-50) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, valine, and threonine, respectively, the PPR motif selectively binds to T.

[Claim 4]

The method according to any one of claims 1 to 3, wherein the functional region is a DNA-cleaving enzyme, or a nuclease domain thereof, or a transcription control domain, and the fusion protein functions as a target sequence-specific DNA-cleaving enzyme or transcription control factor.

[Claim 5]

The method according to claim 4, wherein the DNA-cleaving enzyme is the nuclease domain of FokI (SEQ ID NO: 6).

[Claim 6]

A method for editing a genome, characterized by utilizing the fusion protein designed by the method according any one of claims 1 to 5 (excluding a method for performing in a human individual).

[Claim 7]

A method for producing a genome, the method comprising editing a genome by the method according to claim 6, and producing the edited genome (excluding a method for performing in a human individual).

[Claim 8]

A method for producing a cell containing an edited genome, the method comprising editing a genome by the method according to claim 6, and producing a cell containing the edited genome (excluding a method for performing in a human

individual).

[Claim 9]

A method of using a protein for binding to a DNA base or specific DNA base sequence, wherein the protein contains one or 2 to 30 PPR motifs having a structure of the following formula 1:

(Helix A)-X-(Helix B)-L (Formula 1)

(wherein, in the formula 1:

Helix A is a part that can form an α-helix structure;

X does not exist, or is a part consisting of 1 to 9 amino acids;

Helix B is a part that can form an α-helix structure; and

L is a part consisting of 2 to 7 amino acids),

wherein,

under the following definitions:

the first amino acid of Helix A is referred to as No. 1 amino acid (No. 1 A.A.), the fourth amino acid as No. 4 amino acid (No. 4 A.A.), and

- when a next PPR motif ($M_{n+1}$) contiguously exists on the C-terminus side of the PPR motif ($M_n$) (when there is no amino acid insertion between the PPR motifs), the -2nd amino acid counted from the end (C-terminus side) of the amino acids constituting the PPR motif ($M_n$);

- when a non-PPR motif consisting of 1 to 20 amino acids exists between the PPR motif ($M_n$) and the next PPR motif ($M_{n+1}$) on the C-terminus side, the amino acid locating upstream of the first amino acid of the next PPR motif ($M_{n+1}$) by 2 positions, i.e., the -2nd amino acid; or

- when any next PPR motif ($M_{n+1}$) does not exist on the C-terminus side of the PPR motif ($M_n$), or 21 or more amino acids constituting a non-PPR motif exist between the PPR motif ($M_n$) and the next PPR motif ($M_{n+1}$) on the C-terminus side, the 2nd amino acid counted from the end (C-terminus side) of the amino acids constituting the PPR motif ($M_n$)

is referred to as No. "ii" (-2) amino acid (No. "ii" (-2) A.A.),

wherein a combination of the three amino acids of No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A of one PPR motif ($M_n$) contained in the protein is designated according to any of the following definitions:

(1-1) when No. 4 A.A. is glycine (G), No. 1 A.A. may be an arbitrary amino acid,

and No. "ii" (-2) A.A. is aspartic acid (D), asparagine (N), or serine (S);

(1-2) when No. 4 A.A. is isoleucine (I), each of No. 1 A.A. and No. "ii" (-2) A.A. may be an arbitrary amino acid;

(1-3) when No. 4 A.A. is leucine (L), each of No. 1 A.A. and No. "ii" (-2) A.A. may be an arbitrary amino acid;

(1-4) when No. 4 A.A. is methionine (M), each of No. 1 A.A. and No. "ii" (-2) A.A. may be an arbitrary amino acid;

(1-5) when No. 4 A.A. is asparagine (N), each of No. 1 A.A. and No. "ii" (-2) A.A. may be an arbitrary amino acid;

(1-6) when No. 4 A.A. is proline (P), each of No. 1 A.A. and No. "ii" (-2) A.A. may be an arbitrary amino acid;

(1-7) when No. 4 A.A. is serine (S), each of No. 1 A.A. and No. "ii" (-2) A.A. may be an arbitrary amino acid;

(1-8) when No. 4 A.A. is threonine (T), each of No. 1 A.A. and No. "ii" (-2) A.A. may be an arbitrary amino acid; and

(1-9) when No. 4 A.A. is valine (V), each of No. 1 A.A. and No. "ii" (-2) A.A. may be an arbitrary amino acid.

[Claim 10]

The method according to claim 9, wherein the combination of the three amino acids is designated according to any of the following definitions:

(2-1) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A. are an arbitrary amino acid, glycine, and aspartic acid, respectively, the PPR motif selectively binds to G;

(2-2) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are glutamic acid, glycine, and aspartic acid, respectively, the PPR motif selectively binds to G;

(2-3) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, glycine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-4) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are glutamic acid, glycine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-5) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are

an arbitrary amino acid, glycine, and serine, respectively, the PPR motif selectively binds to A, and next binds to C;

(2-6) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, isoleucine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to T and C;

(2-7) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, isoleucine, and asparagine, respectively, the PPR motif selectively binds to T, and next binds to C;

(2-8) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, leucine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to T and C;

(2-9) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, leucine, and aspartic acid, respectively, the PPR motif selectively binds to C;

(2-10) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, leucine, and lysine, respectively, the PPR motif selectively binds to T;

(2-11) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, methionine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to T;

(2-12) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, methionine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-13) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, methionine, and aspartic acid, respectively, the PPR motif selectively binds to T, and next binds to C;

(2-14) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to C and T;

(2-15) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-16) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A.,

are phenylalanine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-17) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are glycine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-18) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-19) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are threonine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-20) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A. are valine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T, and next binds to C;

(2-21) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A. are tyrosine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T, and next binds to C;

(2-22) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and asparagine, respectively, the PPR motif selectively binds to C;

(2-23) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, asparagine, and asparagine, respectively, the PPR motif selectively binds to C;

(2-24) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are serine, asparagine, and asparagine, respectively, the PPR motif selectively binds to C;

(2-25) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, asparagine, and asparagine, respectively, the PPR motif selectively binds to C;

(2-26) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and serine, respectively, the PPR motif selectively binds to C;

(2-27) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A.,

are valine, asparagine, and serine, respectively, the PPR motif selectively binds to C;

(2-28) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and threonine, respectively, the PPR motif selectively binds to C;

(2-29) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, asparagine, and threonine, respectively, the PPR motif selectively binds to C;

(2-30) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and tryptophan, respectively, the PPR motif selectively binds to C, and next binds to T;

(2-31) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, asparagine, and tryptophan, respectively, the PPR motif selectively binds to T, and next binds to C;

(2-32) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, proline, and an arbitrary amino acid, respectively, the PPR motif selectively binds to T;

(2-33) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, proline, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-34) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are phenylalanine, proline, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-35) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are tyrosine, proline, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-36) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, serine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to A and G;

(2-37) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, serine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-38) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A.,

are phenylalanine, serine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-39) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, serine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-40) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, threonine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to A and G;

(2-41) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, threonine, and aspartic acid, respectively, the PPR motif selectively binds to G;

(2-42) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, threonine, and aspartic acid, respectively, the PPR motif selectively binds to G;

(2-43) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, threonine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-44) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are phenylalanine, threonine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-45) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, threonine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-46) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, threonine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-47) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, valine, and an arbitrary amino acid, respectively, the PPR motif binds with A, C, and T, but does not bind to G;

(2-48) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, valine, and aspartic acid, respectively, the PPR motif selectively binds to C, and next binds to A;

(2-49) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A.,

are an arbitrary amino acid, valine, and glycine, respectively, the PPR motif selectively binds to C; and

(2-50) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, valine, and threonine, respectively, the PPR motif selectively binds to T.

[Claim 11]

A nucleic acid encoding a protein, wherein the protein contains one or 2 to 30 of PPR motifs having a structure of the following formula 1:

(Helix A)-X-(Helix B)-L (Formula 1)

(wherein, in the formula 1:

Helix A is a part that can form an α-helix structure;

X does not exist, or is a part consisting of 1 to 9 amino acids;

Helix B is a part that can form an α-helix structure; and

L is a part consisting of 2 to 7 amino acids),

wherein,

under the following definitions:

the first amino acid of Helix A is referred to as No. 1 amino acid (No. 1 A.A.), the fourth amino acid as No. 4 amino acid (No. 4 A.A.), and

- when a next PPR motif ($M_{n+1}$) contiguously exists on the C-terminus side of the PPR motif ($M_n$) (when there is no amino acid insertion between the PPR motifs), the -2nd amino acid counted from the end (C-terminus side) of the amino acids constituting the PPR motif ($M_n$);

- when a non-PPR motif consisting of 1 to 20 amino acids exists between the PPR motif ($M_n$) and the next PPR motif ($M_{n+1}$) on the C-terminus side, the amino acid locating upstream of the first amino acid of the next PPR motif ($M_{n+1}$) by 2 positions, i.e., the -2nd amino acid; or

- when any next PPR motif ($M_{n+1}$) does not exist on the C-terminus side of the PPR motif ($M_n$), or 21 or more amino acids constituting a non-PPR motif exist between the PPR motif ($M_n$) and the next PPR motif ($M_{n+1}$) on the C-terminus side, the 2nd amino acid counted from the end (C-terminus side) of the amino acids constituting the PPR motif ($M_n$)

is referred to as No. "ii" (-2) amino acid (No. "ii" (-2) A.A.),

one PPR motif ($M_n$) contained in the protein is a PPR motif having a specific

combination of the three amino acids of No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A corresponding to a target DNA base or target DNA base sequence, and

wherein the combination of three amino acids of No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A is any of the following definitions:

(2-1) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A. are an arbitrary amino acid, glycine, and aspartic acid, respectively, the PPR motif selectively binds to G;

(2-2) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are glutamic acid, glycine, and aspartic acid, respectively, the PPR motif selectively binds to G;

(2-3) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, glycine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-4) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are glutamic acid, glycine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-5) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, glycine, and serine, respectively, the PPR motif selectively binds to A, and next binds to C;

(2-6) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, isoleucine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to T and C;

(2-7) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, isoleucine, and asparagine, respectively, the PPR motif selectively binds to T, and next binds to C;

(2-8) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, leucine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to T and C;

(2-9) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, leucine, and aspartic acid, respectively, the PPR motif selectively binds to C;

(2-10) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, leucine, and lysine, respectively, the PPR motif

selectively binds to T;

(2-11) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, methionine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to T;

(2-12) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, methionine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-13) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, methionine, and aspartic acid, respectively, the PPR motif selectively binds to T, and next binds to C;

(2-14) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to C and T;

(2-15) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-16) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are phenylalanine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-17) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are glycine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-18) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-19) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are threonine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-20) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A. are valine, asparagine, and aspartic acid, respectively, the PPR motif selectively binds to T, and next binds to C;

(2-21) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A. are tyrosine, asparagine, and aspartic acid, respectively, the PPR motif selectively

binds to T, and next binds to C;

(2-22) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and asparagine, respectively, the PPR motif selectively binds to C;

(2-23) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, asparagine, and asparagine, respectively, the PPR motif selectively binds to C;

(2-24) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are serine, asparagine, and asparagine, respectively, the PPR motif selectively binds to C;

(2-25) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, asparagine, and asparagine, respectively, the PPR motif selectively binds to C;

(2-26) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and serine, respectively, the PPR motif selectively binds to C;

(2-27) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, asparagine, and serine, respectively, the PPR motif selectively binds to C;

(2-28) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and threonine, respectively, the PPR motif selectively binds to C;

(2-29) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, asparagine, and threonine, respectively, the PPR motif selectively binds to C;

(2-30) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, asparagine, and tryptophan, respectively, the PPR motif selectively binds to C, and next binds to T;

(2-31) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, asparagine, and tryptophan, respectively, the PPR motif selectively binds to T, and next binds to C;

(2-32) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, proline, and an arbitrary amino acid, respectively,

the PPR motif selectively binds to T;

(2-33) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, proline, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-34) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are phenylalanine, proline, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-35) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are tyrosine, proline, and aspartic acid, respectively, the PPR motif selectively binds to T;

(2-36) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, serine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to A and G;

(2-37) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, serine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-38) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are phenylalanine, serine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-39) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, serine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-40) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, threonine, and an arbitrary amino acid, respectively, the PPR motif selectively binds to A and G;

(2-41) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, threonine, and aspartic acid, respectively, the PPR motif selectively binds to G;

(2-42) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, threonine, and aspartic acid, respectively, the PPR motif selectively binds to G;

(2-43) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, threonine, and asparagine, respectively, the PPR

motif selectively binds to A;

(2-44) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are phenylalanine, threonine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-45) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, threonine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-46) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are valine, threonine, and asparagine, respectively, the PPR motif selectively binds to A;

(2-47) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, valine, and an arbitrary amino acid, respectively, the PPR motif binds with A, C, and T, but does not bind to G;

(2-48) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are isoleucine, valine, and aspartic acid, respectively, the PPR motif selectively binds to C, and next binds to A;

(2-49) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, valine, and glycine, respectively, the PPR motif selectively binds to C; and

(2-50) when the three amino acids, No. 1 A.A., No. 4 A.A., and No. "ii" (-2) A.A., are an arbitrary amino acid, valine, and threonine, respectively, the PPR motif selectively binds to T

(excluding a protein consisting of any sequence selected from the amino acid sequence of SEQ ID NO:1, the amino acid sequence of SEQ ID NO:2, the amino acid sequence of SEQ ID NO: 3, the amino acid sequence of SEQ ID NO:4, and the amino acid sequence of SEQ ID NO: 5).

[Claim 12]

The nucleic acid according to claim 11, wherein the PPR motif is any selected from the group consisting of

the 9 PPR motifs contained in protein consisting of the amino acid sequence of SEQ ID NO: 1,

the 11 PPR motifs contained in protein consisting of the amino acid sequence of SEQ ID NO: 2,

the 15 PPR motifs contained in protein consisting of the amino acid sequence of SEQ ID NO: 3,

the 10 PPR motifs contained in protein consisting of the amino acid sequence of SEQ ID NO: 4, and

the 11 PPR motifs contained in protein consisting of the amino acid sequence of SEQ ID NO: 5.

[Claim 13]

A nucleic acid encoding a protein that can bind in a DNA base-selective manner or a DNA base sequence-specific manner, the protein consisting of the amino acid sequence of NOs. 230-541 of SEQ ID NO.:1, NOs. 234-621 of SEQ ID NO.:2, NOs. 106-632 of SEQ ID NO.:3, NOs. 106-632 of SEQ ID NO.:4, or NOs. 256-624 of SEQ ID NO.:5 including substitution of one or more amino acids according to any of definitions (2-1) - (2-50) defined in claim 11.

[Claim 14]

A vector containing the nucleic acid according to any one of claims 11 to 13.

[Claim 15]

A cell in which the vector according to claim 14 has been introduced.

[Claim 16]

The cell according to claim 15, the cell being E. coli.