Claims

1. A fusion polypeptide, comprising

GDF15 (Growth/differentiation factor 15) or its functional variant, and

Fc region of an immunoglobulin,

wherein,

the Fc region of the immunoglobulin is a single chain of human IgG4 Fc region, and is linked to the N-terminus of the GDF15 or its functional variant, via a flexible peptide linker,

the functional variant of GDF15 is a deletion variant in which at least one of 14 amino acids at positions 1 to 14 of the amino acid sequence of SEQ ID NO: 1 are deleted, the human IgG4 Fc region comprises the amino acid sequence of SEQ ID NO: 7, 8, or 9, and

the flexible peptide linker is represented by (GGGGS)n, wherein n is 1, 2, 3, 4, or 5.

2. The fusion polypeptide according to claim 1, wherein the human IgG4 Fc region further comprises the amino acid sequence of SEQ ID NO: 10 at the N-terminus of the amino acid sequence of SEQ ID NO: 7, 8, or 9.

3. The fusion polypeptide according to claim 1, wherein the human IgG4 Fc region further comprises an amino acid sequence of SEQ ID NO: 11 or SEQ ID NO: 12 at the N-terminus of an amino acid sequence selected from SEQ ID NOs: 7 to 9.

4. The fusion polypeptide according to claim 1, wherein the functional variant of GDF15 comprises the amino acid sequence of SEQ ID NO: 2.

5. The fusion polypeptide according to any one of claims 1 to 4, wherein GDF15 or its functional variant linked to the Fc region of the immunoglobulin in the fusion polypeptide has at least 1.5 times increased in vivo half-life, compared to GDF15 or its functional variant which is not linked to Fc region of the immunoglobulin.

6. A fusion polypeptide dimer, comprising two fusion polypeptides of any one of claims 1 to 4.

7. A nucleic acid molecule encoding the fusion polypeptide of any one of claims 1 to 4.

8. A recombinant vector comprising the nucleic acid molecule of claim 7.

9. A recombinant cell comprising the recombinant vector of claim 8.

10. A method of preparation of the fusion polypeptide of claim 1, the method comprising culturing the recombinant cell of claim 9.

11. A method of enhancing in vivo stability of GDF15 or its functional variant, comprising linking a single chain of human IgG4 Fc region to the N-terminus of GDF15 or its functional variant via a flexible peptide linker,

wherein the functional variant of GDF15 is a deletion variant in which at least one of 14 amino acids at positions 1 to 14 of the amino acid sequence of SEQ ID NO: 1 are deleted, the

human IgG4 Fc region comprises the amino acid sequence of SEQ ID NO: 7, 8, or 9, and the flexible peptide linker is represented by (GGGGS)n, wherein n is 1, 2, 3, 4, or 5.

12. The method for enhancing in vivo stability of GDF15 or its functional variant according to claim 11, wherein the human IgG4 Fc region further comprises the amino acid sequence of SEQ ID NO: 10 at the N-terminus of the amino acid sequence of SEQ ID NO: 7, 8, or 9.

13. The method for enhancing in vivo stability of GDF15 or its functional variant according to claim 11, wherein the human IgG4 Fc region further comprises an amino acid sequence of SEQ ID NO: 11 or SEQ ID NO: 12 at the N-terminus of an amino acid sequence selected from SEQ ID NOs: 7 to 9.

14. The method for enhancing in vivo stability of GDF15 or its functional variant according to claim 11, wherein the functional variant of GDF15 comprises the amino acid sequence of SEQ ID NO: 2.

15. The method for enhancing in vivo stability of GDF15 or its functional variant according to any one of claims 11 to 14, wherein GDF15 or its functional variant linked to the Fc region of the immunoglobulin in the fusion polypeptide has at least 1.5 times increased in vivo half-life, compared to GDF15 or its functional variant which is not linked to Fc region of the immunoglobulin.

16. A composition for weight loss, comprising at least one selected from the group

consisting of:

the fusion polypeptide of any one of claims 1 to 4,

a fusion polypeptide dimer comprising two of the fusion polypeptides,

a nucleic acid molecule encoding the fusion polypeptide,

a recombinant vector comprising the nucleic acid molecule, and

a recombinant cell comprising the recombinant vector.

17. A composition for dietary control, comprising at least one selected from the group consisting of:

the fusion polypeptide of any one of claims 1 to 4,

a fusion polypeptide dimer comprising two of the fusion polypeptides,

a nucleic acid molecule encoding the fusion polypeptide,

a recombinant vector comprising the nucleic acid molecule, and

a recombinant cell comprising the recombinant vector,

wherein the dietary control is decrease in size or amount of meal.

18. A pharmaceutical composition for prevention or treatment of metabolic disease, comprising at least one selected from the group consisting of:

the fusion polypeptide of any one of claims 1 to 5,

a fusion polypeptide dimer comprising two of the fusion polypeptides,

a nucleic acid molecule encoding the fusion polypeptide,

a recombinant vector comprising the nucleic acid molecule, and

a recombinant cell comprising the recombinant vector,

wherein the metabolic disease is obesity, diabetes, or nonalcoholic fatty liver disease.

19. The pharmaceutical composition according to claim 18, wherein the metabolic disease is obesity.