

sequence of native glucagon represented by SEQ ID NO: 1 was substituted with amino acid residues having positive and negative charges, and thereby glucagon derivatives were synthesized as shown in Table 1 below.

[TABLE 1]

SEQ ID NO	Amino Acid Sequence	Ring Formation
SEQ ID NO: 1	HSQGTFTSDYSKYLD SRRA QDFVQWLMNT	-
SEQ ID NO: 2	HSQGTFTSDYSKYLD CDRA QDFVQWLMNT	-
SEQ ID NO: 3	HSQGTFTSDYSKYLD CERA QDFVQWLMNT	-
SEQ ID NO: 4	HSQGTFTSDYSKYLD SCDA QDFVQWLMNT	-
SEQ ID NO: 5	HSQGTFTSDYSKYLD SCEA QDFVQWLMNT	-
SEQ ID NO: 6	HSQGTFTSDYSKYLD SCEA DDFVQWLMNT	-
SEQ ID NO: 7	YSQGTFTSDYSKYLD SCEA DDFVQWLMNT	-
SEQ ID NO: 8	YXQGTFTSDYSKYLD SCDA QDFVQWLINT	-
SEQ ID NO: 9	YXQGTFTSDYSKYLD SCDA QDFV V WLINT	-
SEQ ID NO: 10	YXQGTFTSDYSKYLD SCDA DDFV V WLINT	-
SEQ ID NO: 11	YXQGTFTSDYSKYLD EKCA KEFVQWLMNT	-
SEQ ID NO: 12	YXQGTFTSDYSKYLD SRRA QDFVQWLMNT	-
SEQ ID NO: 13	YXQGTFTSDYSCYL EKRA KEFVQWLMNT	-
SEQ ID NO: 14	YXQGTFTSDYSKYLD CKRA KEFVQWLMNT	-
SEQ ID NO: 15	YXQGTFTSDYSKYLD CEKRA QDFV V WLMNT	-
SEQ ID NO: 16	YXQGTFTSDYSKYLD CRRA QVFVQWLMRT	-
SEQ ID NO: 17	YXQGTFTSDYSKYLD CVRA QDFVQWLMRT	-
SEQ ID NO: 18	YXQGTFTSDYSKYLD SRRA CD FRL WLMNT	-
SEQ ID NO: 19	YXQGTFTSDYSKYLD EKRA <u>KEF</u> VQWLMNT	ring formed
SEQ ID NO: 20	YXQGTFTSDYSKYLD ECRA <u>KEF</u> VQWLMNT	ring formed
SEQ ID NO: 21	YXQGTFTSDYSKYLD EKCA <u>KEF</u> VQWLMNT	ring formed
SEQ ID NO: 22	YXQGTFTSDYSKYLD EKRC <u>KEF</u> VQWLMNT	ring formed
SEQ ID NO: 23	YXQGTFTSDYSKYC DEKRA <u>KEF</u> VQWLMNT	ring formed
SEQ ID NO: 24	YXQGTFTSDYSKCL DEKRA <u>KEF</u> VQWLMNT	ring formed
SEQ ID NO: 25	YXQGTFTSDYSKYLD EKRA <u>KCF</u> VQWLMNT	ring formed

ID NOS: 2 to 34.

[Claim 5]

A polynucleotide encoding the glucagon derivative according to any one of claims 1 to 4.

[Claim 6]

Use of a glucagon derivative according to any one of claims 1 to 4 as an active ingredient in the manufacture of a pharmaceutical composition for preventing or treating hypoglycemia.

[Claim 7]

Use of a glucagon derivative according to any one of claims 1 to 4 as an active ingredient in the manufacture of a pharmaceutical composition for preventing or treating obesity.

[Claim 8]

The use according to claim 6, further comprising a pharmaceutically acceptable carrier.

[Claim 9]

The use according to claim 7, further comprising a pharmaceutically acceptable carrier.

[Claim 10]

The use according to claim 7, wherein the pharmaceutical composition is to be administered alone or in combination with a pharmaceutical agent having the effect of preventing or treating obesity.

[Claim 11]

The use according to claim 7, further comprising a pharmaceutical agent having the effect of preventing or treating obesity.

[Claim 12]

The use according to claim 10, wherein the pharmaceutical agent having the effect of preventing or treating obesity is selected from the group consisting of a GLP-1 receptor agonist, a glucose-dependent insulintropic peptide (GIP) receptor antagonist, a leptin receptor agonist, a DPP-IV inhibitor, a Y5 receptor antagonist, a melanin-concentrating hormone (MCH) receptor antagonist, a Y2/3/4 receptor agonist, an MC3/4 receptor agonist, a gastric/pancreatic lipase inhibitor, a 5HT2c agonist, a β 3A receptor agonist, an amylin receptor agonist, a ghrelin antagonist, a ghrelin receptor antagonist, FGF1, an FGF21 receptor agonist, a cholecystokinin (CCK) receptor agonist, a pancreatic polypeptide (PP) receptor agonist, a dopamine reabsorption inhibitor, and a combination thereof.

[Claim 13]

The use according to claim 11, wherein the pharmaceutical agent having the effect of preventing or treating obesity is selected from the group consisting of a GLP-1 receptor agonist, a glucose-dependent insulintropic peptide (GIP) receptor antagonist, a leptin receptor agonist, a DPP-IV inhibitor, a Y5 receptor antagonist, a melanin-concentrating hormone (MCH) receptor antagonist, a Y2/3/4 receptor agonist, an MC3/4 receptor agonist, a gastric/pancreatic lipase inhibitor, a 5HT2c agonist, a β 3A receptor agonist, an amylin receptor agonist, a ghrelin antagonist, a ghrelin receptor antagonist, FGF1, an FGF21 receptor agonist, a cholecystokinin (CCK) receptor agonist, a pancreatic polypeptide (PP) receptor agonist, a dopamine reabsorption inhibitor, and a combination thereof.

[Claim 14]

A glucagon derivative according to any one of claims 1 to 4, or a pharmaceutical composition containing the same for use in therapy.