Claims

1. A peptide comprising the amino acid sequence IELSYGIK (SEQ ID NO: 176), with the proviso that the peptide comprises no more than 85 amino acid residues, and with the proviso that the peptide is not KPLAEIDSIELSYGIK (SEQ ID NO: 136), KCLAECDSIELSYGIK (SEQ ID NO: 141), KPLAEDISIELSYGIK (SEQ ID NO: 144), KPLAEISDIELSYGIK (SEQ ID NO: 145), KPLAEIGDIELSYGIK (SEQ ID NO: 146), KPLAEGDIELSYGIK (SEQ ID NO: 147), KPLAEIELSYGIK (SEQ ID NO: 148), KPLAEIDGIELSYGIK (SEQ ID NO: 150), KPLAEIGSIELSYGIK (SEQ ID NO: 152), or KGLAEIDSIELSYGIK (SEQ ID NO: 153).

2. The peptide according to claim 1, wherein the peptide comprises no more than 80, such as no more than 75, such as no more than 70, such as no more than 65, such as no more than 60, such as nor more than 55, such as no more than 50, such as no more than 55, such as no more than 40 amino acids, such as no more than 35, such as no more than 30, such as no more than 28, such as no more than 26, such as no more than 24, such as no more than 22, such as no more than 20, such as no more than 19, such as no more than 18, such as no more than 17, such as no more than 16, such as no more than 15, such as no more than 14, such as no more than 13, such as no more than 12, such as no more than 11, such as no more than 10 amino acids.

3. The peptide according to claim 1, wherein the peptide comprises an amino acid sequence selected from the group consisting of AEIDSIELSYGIK (SEQ ID NO: 171), SIELSYGIK (SEQ ID NO: 175), DSIELSYGIK (SEQ ID NO: 174), IDSIELSYGIK (SEQ ID NO: 173), EIDSIELSYGIK (SEQ ID NO: 172), and LAEIDSIELSYGIK (SEQ ID NO: 170).

4. The peptide according to claim 1, wherein the peptide consists of the amino acid sequence AEIDSIELSYGIK (SEQ ID NO: 171).

5. The peptide according to claim 1, wherein the peptide consists of the amino acid sequence LAEIDSIELSYGIK (SEQ ID NO: 170).

6. The peptide according to claim 1, wherein the peptide consists of the amino acid sequence EIDSIELSYGIK (SEQ ID NO: 172).

7. The peptide according to claim 1, wherein the peptide consists of the amino acid sequence IDSIELSYGIK (SEQ ID NO: 173).

8. The peptide according to claim 1, wherein the peptide consists of the amino acid sequence DSIELSYGIK (SEQ ID NO: 174).

9. The peptide according to claim 1, wherein the peptide consists of the amino acid sequence SIELSYGIK (SEQ ID NO: 175).

10. The peptide according to claim 1, wherein the peptide consists of the amino acid sequence IELSYGIK (SEQ ID NO: 176).

11. The peptide according to any one of the preceding claims, wherein the peptide is conjugated to a moiety.

12. The peptide according to claim 11, wherein the moiety is selected from the group consisting of polyethylene glycol (PEG), monosaccharides, fluorophores, chromophores, radioactive compounds, and cell-penetrating peptides.

13. The peptide according to any one of the preceding claims, wherein the peptide is further modified, such as being glycosylated or by PEGylation, amidation, esterification, acylation, acetylation and/or alkylation.

14. The peptide according to any one of the preceding claims, wherein the peptide comprises or consists of tandem repeats.

15. The peptide according to claim 14, wherein the tandem repeats comprise or consist of the amino acid sequence of any one or more of the sequences as described in the preceding claims.

16. The peptide according to any one of the preceding claims, wherein the peptide is fused to another polypeptide.

17. The peptide according to claim 16, wherein the polypeptide is selected from the group consisting of glutathione-S-transferase (GST) and protein A.

18. The peptide according to any of the preceding claims, wherein the peptide is fused to a tag.

19. The peptide according to claim 18, wherein the tag is an oligo-histidine tag.

20. The peptide according to any one of the preceding claims, wherein the peptide is cyclic.

21. The peptide according to any of the preceding claims, wherein the peptide is capable of forming at least one intramolecular cysteine bridge.

22. The peptide according to any one of the preceding claims, wherein the peptide comprises an amino acid residue P at the N-terminus.

23. The peptide according to any one of the preceding claims, wherein the peptide has 1 additional amino acid.

24. The peptide according to any one of the preceding claims, wherein the peptide further comprises a detectable moiety.

25. The peptide according to any one of the preceding claims, wherein the detectable moiety comprises or consists of a radioisotope.

26. The peptide according to any one of the preceding claims, wherein the radioisotope is selected from the group consisting of ^{99m}Tc, ^{111}In, ^{67}Ga, ^{68}Ga, ^{72}As,^{89}Zr, ^{123}I and ^{201}Tl.

27. The peptide according to any one of the preceding claims, wherein the detectable moiety is detectable by an imaging technique such as SPECT, PET, MRI, optical or ultrasound imaging.

28. Use of the peptide according to any of the preceding claims, for the preparation of a diagnostic composition for the diagnosis of a disease, disorder or damage of the pancreas in an individual.

29. A polynucleotide encoding upon expression, a peptide according to any one of claims 1 to 27.

30. A vector comprising the polynucleotide according to claim 29.

31. A cell comprising the polynucleotide according to claim 29, or the vector according to claim 30.

32. A composition comprising a peptide according to any one of claims 1 to 27, a polynucleotide according to claim 29, a vector according to claim 30 or a cell according to claim 31.

33. The composition according to claim 32, wherein the composition is a pharmaceutical composition.

~~34. The peptide according to any one of claims 1 to 27, the polynucleotide according to claim 29, the vector according to claim 30, the cell according to claim 31 or the composition according to any one of claims 32 or 33, for use as a medicament.~~

~~35.~~34. Use of ~~T~~the peptide according to any one of claims 1 to 27, the polynucleotide according to claim 29, the vector according to claim 30, the cell according to claim 31 or the composition according to any one of claims 32 or 33 for the manufacture of a medicament for ~~use in~~ the treatment of an endocrine disease, a nutritional disease and/or a metabolic disease in a mammal, wherein the endocrine disease, nutritional disease and/or metabolic disease are selected from the group consisting of diabetes mellitus, type 1 diabetes mellitus, type 2 diabetes mellitus, malnutrition-related diabetes mellitus, disorders of glucose regulation and pancreatic internal secretion, insulin resistance syndrome, impaired glucose tolerance, hyperglycemia, hyperinsulinemia, and any combinations thereof.

~~36.~~35. The ~~peptide or the composition for~~ use according to any ~~one of the preceding claims~~claim 34, wherein said peptide or composition comprises a second or further active ingredient.

~~37.~~36. The ~~peptide or the composition for~~ use according to claim 35~~36~~, wherein the second or further active ingredient is selected from the group consisting of insulin, glucagon-like peptide-1 (GLP-1), sulfonylurea, a dipeptidyl peptidase-4 (DPP4) inhibitor, an alpha-glucosidase inhibitor, a thiazolidinedione, a meglitinide and a sodium-glucose cotransporter-2 (SGLT2) inhibitor.

~~38.~~37. The ~~peptide according to any one of claims 1 to 27, the polynucleotide according to claim 29, the vector according to claim 30, the cell according to claim 31 or the composition according to any one of claims 32 or 33 for~~ use according to claim 34~~35~~, wherein the mammal is a human.

~~39. The peptide according to any one of claims 1 to 27, the polynucleotide according to claim 29, the vector according to claim 30, the cell according to claim 31 or the composition according to any one of claims 32 or 33 for use according to claim 35 , wherein the endocrine disease, nutritional disease and/or metabolic disease are selected from the group consisting of diabetes mellitus, type 1 diabetes mellitus, type 2 diabetes mellitus, malnutrition-related diabetes mellitus, disorders of glucose regulation and pancreatic internal secretion, insulin resistance syndrome, impaired glucose tolerance, hyperglycemia, hyperinsulinemia, and any combinations thereof.~~

~~40.~~38. The ~~peptide according to any one of claims 1 to 27, the polynucleotide according to claim 29, the vector according to claim 30, the cell according to claim 31 or the composition according to any one of claims 32 or 33 for~~ use according to claim 34~~39~~ , wherein the diabetes mellitus is selected from the group consisting of type 1 diabetes mellitus, type 2 diabetes mellitus, malnutrition-related diabetes mellitus, specified diabetes mellitus, and unspecified diabetes mellitus.

~~41. A method of treating an endocrine disease, a nutritional disease and/or a metabolic disease, the method comprising administering the peptide according to any one of claims 1 to 27, the polynucleotide according to claim 29, the vector according to~~

claim 30, the cell according to claim 31 or the composition according to any one of claims 32 or 33, to a subject in need thereof.

42. Use of the peptide according to any one of claims 1 to 27, the polynucleotide according to claim 29, the vector according to claim 30, the cell according to claim 31 or the composition according to any one of claims 32 or 33 for the manufacture of a medicament for the treatment of an endocrine disease, a nutritional disease and/or a metabolic disease in a mammal.

43. A method for delaying onset of diabetes and/or a diabetes associated disorder or disease, the method comprising administering a therapeutically effective amount of the peptide according to any one of claims 1 to 27, the polynucleotide according to claim 29, the vector according to claim 30, the cell according to claim 31 or the composition according to any one of claims 32 or 33, to an individual in need thereof.

44. A method for decreasing blood glucose levels, the method comprising administering a therapeutically effective amount of the peptide according to any one of claims 1 to 27, the polynucleotide according to claim 29, the vector according to claim 30, the cell according to claim 31 or the composition according to any one of claims 32 or 33, to an individual in need thereof.

45. The method according to claim 44, wherein insulin secretion is increased.

46. The method according to claim 44, wherein cellular uptake of glucose is increased.

47. The method according to claim 44, wherein the insulin production is increased.

48. The method according to claim 44, wherein the glucagon production is decreased.

49. A method for improving beta cell viability, the method comprising administering a therapeutically effective amount of the peptide according to any one of claims 1 to 27, the polynucleotide according to claim 29, the vector according to claim 30, the

cell according to claim 31 or the composition according to any one of claims 32 or 33, to an individual in need thereof.

50. A method for improving beta cell morphology, the method comprising administering a therapeutically effective amount of the peptide according to any one of claims 1 to 27, the polynucleotide according to claim 29, the vector according to claim 30, the cell according to claim 31 or the composition according to any one of claims 32 or 33, to an individual in need thereof.

51. A method for stabilising or improving viability and/or morphology of pancreatic islets, the method comprising administering a therapeutically effective amount of the peptide according to any one of claims 1 to 27, the polynucleotide according to claim 29, the vector according to claim 30, the cell according to claim 31 or the composition according to any one of claims 32 or 33, to an individual in need thereof.