

CLAIMS

1. A composition comprising two or more recombinant β -lactoglobulin proteins of differing amino acid sequence, the recombinant β -lactoglobulin proteins having at least 70% sequence identity to a wild type, mature β -lactoglobulin, and wherein at least one of the β -lactoglobulin proteins is an elongated β -lactoglobulin protein;

wherein the composition comprises one or more recombinant, elongated β -lactoglobulin proteins having an amino acid sequence comprising or consisting of

- a) a core sequence having at least 70% sequence identity to the sequence of a wild type, mature β -lactoglobulin; and
- b) an N-terminal elongation of the core sequence, the N-terminal elongation having a sequence consisting of the sequence:
 - i) KREAEAM, KREAEAEAM, or KREAEAEAEAM;
 - ii) REAEAEAEAM, REAEAEAM, or REAEAM;
 - iii) EAEAEAEAM, EAEAEAM, or EAEAM;
 - iv) EAEAEAEA, EAEAEA, or EAEA;
 - v) EAM;
 - vi) EA; or
 - vii) R.

2. The composition of claim 1, wherein the composition comprises:

- a) one or more recombinant, elongated β -lactoglobulin proteins comprising or consisting of a sequence of any one of SEQ ID Nos: 4, 5 and 7, 19, 20 and 22 and 71-74; and/or
- b) two or more or three or more recombinant, elongated β -lactoglobulin proteins of differing amino acid sequence.

3. The composition of claim 1 or 2, wherein the amount of recombinant, elongated β -lactoglobulin proteins in the composition is:

- a) at least 4% of total recombinant β -lactoglobulins in the composition; and/or
 - b) at least 40%, 50% or 60% of total recombinant β -lactoglobulins in the composition.
4. The composition of any one of claims 1 to 3, wherein the composition further comprises
- a) one or more recombinant, truncated β -lactoglobulin proteins that comprise or consist of an amino acid sequence having an N-terminal truncation of from 1 to 20 amino acids relative to the sequence of a wild type, mature β -lactoglobulin; and/or
 - b) one or more recombinant, substituted β -lactoglobulin proteins that comprise or consist of an amino acid sequence having one or more substitutions of from 1 to 20 amino acids relative to the sequence of a wild type, mature β -lactoglobulin.
5. The composition of claim 4, wherein the one or more substituted β -lactoglobulin proteins each comprise or consist of an amino acid sequence that comprises one or more substitutions of from 1 to 10, 1 to 5, 1 to 4, 1 to 3 amino acids, or one amino acid, relative to the sequence of
- a) a wild type, mature β -lactoglobulin;
 - b) any one of SEQ ID Nos: 1-3, 34, 36, 38, 40, 42, 44, 45, or 47;
 - c) any one of SEQ ID Nos: 1-3;
 - d) SEQ ID No: 1 or 2;
 - e) SEQ ID No: 1; or
 - f) SEQ ID No: 2.
6. The composition of claim 4 or 5, wherein the one or more truncated β -lactoglobulin proteins each comprise or consist of a sequence of any one of SEQ ID Nos: 8-18 and SEQ ID Nos: 23-30.
7. The composition of any one of claims 1 to 6, wherein the composition is free of aspartyl protease-like activity.

8. A recombinant, elongated β -lactoglobulin protein having an amino acid sequence comprising or consisting of

- a) a core sequence having at least 70% sequence identity to the sequence of a wild type, mature β -lactoglobulin; and
- b) an N-terminal elongation of the core sequence, the N-terminal elongation having a sequence consisting of
 - i) KREAEAEAEAM, KREAEAEAM, or KREAEAM;
 - ii) REAEAEAEAM, REAEAEAM, or REAEAM;
 - iii) EAEAEAEAM, EAEAEAM, or EAEAM;
 - iv) EAEAEAEA , EAEAEA, or EAEA;
 - v) EAM;
 - vi) EA; or
 - vii) R.

9. The recombinant, elongated β -lactoglobulin protein of claim 8, wherein the recombinant, elongated β -lactoglobulin protein has an amino acid sequence comprising or consisting of a sequence of any one of SEQ ID Nos: 4, 5, 7, 19-20, 22 and 71-74.

10. The composition of any one of claims 1 to 7, or the recombinant, elongated β -lactoglobulin protein of claim 8 or 9, wherein the wild type, mature β -lactoglobulin has a sequence of any one of SEQ ID Nos: 1-3, 34, 36, 38, 40, 42, 44, 45, or 47.

11. The composition or recombinant, elongated β -lactoglobulin protein of claim 10, wherein the one or more recombinant β -lactoglobulin proteins have at least 75%, 80%, 85%, 90% or 95% sequence identity to

- a) a wild type, mature β -lactoglobulin;
- b) any one of SEQ ID Nos: 1-3, 34, 36, 38, 40, 42, 44, 45, or 47;
- c) any one of SEQ ID Nos: 1-3;
- d) SEQ ID No: 1 or 2;
- e) SEQ ID No: 1; or

f) SEQ ID No:2.

12. A food product comprising the composition or recombinant, elongated β -lactoglobulin protein of any one of claims 1 to 11.
13. A method for preparing a food product, the method comprising
 - a) providing the composition or recombinant, elongated β -lactoglobulin protein of any one of claims 1 to 11, and
 - b) mixing the composition or the recombinant, elongated β -lactoglobulin protein with one or more additional ingredients to produce the food product.
14. The food product or method of claim 12 or 13, wherein the food product is:
 - a) in bar or solid moulded form;
 - b) selected from the group consisting of a fermented food, a yoghurt, a soup, a sauce, a bar, a gel, a foam, a nutritional formulation, a beverage, a beverage whitener, a cheese, a dairy tofu, a food emulsion and a dessert;
 - c) an infant formula, toddler milk, growing up formula, maternal formula, a sports beverage, food for active lifestyles, or a medical food or supplement; or
 - d) selected from the group consisting of a dairy beverage, a sports beverage, a smoothie, a protein fortified fruit or vegetable juice, a drinking yoghurt, an acid protein fortified beverage, a jelly drink, protein water, liquid coffee, liquid tea, and a liquid beverage whitener.
15. The food product or method of any one of claims 12 to 14, wherein the food product:
 - a) comprises an additional source of protein;
 - b) comprises an additional source of non-dairy protein;
 - c) comprises an additional source of non-dairy protein comprising a plant source, algal protein, mycoprotein, or a combination thereof;

- d) comprises an additional source of non-dairy protein comprising a plant source comprising one or more legumes, grains, seeds, nuts, tubers, or a combination thereof;

is suitable for those on a vegan diet; and/or

does not comprise any milk proteins other than the recombinant, β -lactoglobulin proteins.