Claims

1. A nutritional composition comprising *L. reuteri* as a probiotic strain, wherein *L. reuteri* is pre-conditioned, wherein *L. reuteri* is preferably pre-conditioned with galacto-oligosaccharide (GOS).

2. The nutritional composition according to claim 1, wherein the pre-conditioned *L. reuteri* is obtained or obtainable by a process comprising the following steps:
a) cultivating a probiotic *L. reuteri* strain in the presence of galacto-oligosaccharide (GOS) in a growth medium, thereby pre-conditioning the probiotic *L. reuteri* strain;
b) harvesting the pre-conditioned *L. reuteri* from the growth medium, wherein the process is optionally comprising the following further step:
c) adding (fresh) GOS to the pre-conditioned probiotic *L. reuteri* strain obtained from step b).

3. The nutritional composition according to claim 1 or claim 2, further comprising at least one vitamin, wherein the at least one vitamin is optionally selected from the list consisting of: vitamin A, vitamin B1, vitamin B2, vitamin B3, vitamin B6, vitamin B12, vitamin C, vitamin D, vitamin E, vitamin K, vitamin B7, vitamin B5, vitamin B9, and any combinations thereof; preferably a combination comprising or consisting of high amounts of vitamin B3, vitamin C, vitamin D, vitamin E, vitamin K, vitamin B7, vitamin B5, vitamin B9, wherein the high amount are defined as being at least 30% more than in the draft of the Codex Standard For Follow-Up Formula For Older Infants And Product For Young Children CXS 156-1987 aged 6-36 months, report dated March 2023, appendix 2 from page 30, wherein the at least one vitamin is preferably present in the following amount:
vitamin A, in an amount ranging of from 1000 IU / 100 g to 3000 IU / 100 g, preferably of from 1500 IU / 100 g to 2600 IU / 100 g, more preferably of from 2000 IU / 100 g to 2500 IU / 100 g, wherein one IU for vitamin A is the biological equivalent of 0.3 microgram of retinol or of beta-carotene; and/or
vitamin B1, in an amount ranging of from 0.1 mg / 100 g to 1 mg / 100 g, preferably of from 0.3 mg / 100 g to 1 mg / 100 g, more preferably of from 0.5 mg / 100 g to 0.9 mg / 100 g; and/or
vitamin B2, in an amount ranging of from 1 mg / 100 g to 3 mg / 100 g, preferably of from 1 mg / 100 g to 2 mg / 100 g, more preferably of from 1.1 mg / 100 g to 1.6 mg / 100 g; and/or
vitamin B3, in an amount ranging of from 1.5 mg / 100 g to 12 mg / 100 g, preferably of from 3 mg / 100 g to 10 mg / 100 g, more preferably of from 4 mg / 100 g to 8 mg / 100 g; and/or

vitamin B6, in an amount ranging of from 0 mg / 100 g to 1.3 mg / 100 g, preferably of from 0.2 mg / 100 g to 1 mg / 100 g, more preferably of from 0.3 mg / 100 g to 0.7 mg / 100 g; and/or

vitamin B12, in an amount ranging of from 0 microgram / 100 g to 3 microgram / 100 g, preferably of from 1 microgram / 100 g to 2.5 microgram / 100 g, more preferably of from 1 microgram / 100 g to 2 microgram / 100 g; and/or

vitamin C, in an amount ranging of from 80 mg / 100 g to 400 mg / 100 g, preferably of from 85 mg / 100 g to 300 mg / 100 g, more preferably of from 100 mg / 100 g to 200 mg / 100 g; and/or

vitamin D, in an amount ranging of from 130 IU / 100 g to 900 IU / 100 g, preferably of from 200 IU / 100 g to 700 IU / 100 g, more preferably of from 350 IU / 100 g to 500 IU / 100 g, wherein one IU for vitamin D is the biological equivalent of 0.025 microgram of cholecalciferol or ergocalciferol; and/or

vitamin E, in an amount ranging of from 11 IU / 100 g to 30 IU / 100 g, preferably of from 12 IU / 100 g to 25 IU / 100 g, more preferably of from 12 IU / 100 g to 20 IU / 100 g, wherein one IU for vitamin E is the biological equivalent of 0.67 mg of d-alpha-tocopherol, or of 0.9 mg of dl-alpha-tocopherol; and/or

vitamin K, in an amount ranging of from 23 microgram / 100 g to 100 microgram / 100 g, preferably of from 25 microgram / 100 g to 80 microgram / 100 g, more preferably of from 25 microgram / 100 g to 70 microgram / 100 g; and/or

vitamin B7, in an amount ranging of from 9 microgram / 100 g to 100 microgram / 100 g, preferably of from 12 microgram / 100 g to 60 microgram / 100 g, more preferably of from 15 microgram / 100 g to 30 microgram / 100 g; and/or

vitamin B5, in an amount ranging of from 2.1 mg / 100 g to 10 mg / 100 g, preferably of from 2.5 mg / 100 g to 8 mg / 100 g, more preferably of from 3 mg / 100 g to 6 mg / 100 g; and/or

vitamin B9, in an amount ranging of from 51 microgram / 100 g to 350 microgram / 100 g, preferably of from 70 microgram / 100 g to 300 microgram / 100 g, more preferably of from 90 microgram / 100 g to 200 microgram / 100 g; and/or, wherein the at least one vitamin is preferably present in the following amount:

vitamin A, in an amount ranging of from 200 IU / 100 kcal to 1000 IU / 100 kcal, preferably of from 300 IU / 100 kcal to 800 IU / 100 kcal, more preferably of from 300 IU / 100 kcal to 600 IU / 100 kcal, wherein one IU for vitamin A is the biological equivalent of 0.3 microgram of retinol or of beta-carotene; and/or

vitamin B1, in an amount ranging of from 0.02 mg / 100 kcal to 0.5 mg / 100 kcal, preferably of from 0.05 mg / 100 kcal to 0.4 mg / 100 kcal, more preferably of from 0.05 mg / 100 kcal to 0.2 mg / 100 kcal; and/or

vitamin B2, in an amount ranging of from 0.02 mg / 100 kcal to 0.6 mg / 100 kcal, preferably of from 0.05 mg / 100 kcal to 0.5 mg / 100 kcal, more preferably of from 0.08 mg / 100 kcal to 0.5 mg / 100 kcal; and/or

vitamin B3, in an amount ranging of from 0.3 mg / 100 kcal to 3 mg / 100 kcal, preferably of from 0.6 mg / 100 kcal to 2.5 mg / 100 kcal, more preferably of from 0.8 mg / 100 kcal to 2 mg / 100 kcal; and/or

vitamin B6, in an amount ranging of from 0 mg / 100 kcal to 0.3 mg / 100 kcal, preferably of from 0.05 mg / 100 kcal to 0.25 mg / 100 kcal, more preferably of from 0.05 mg / 100 kcal to 0.20 mg / 100 kcal; and/or

vitamin B12, in an amount ranging of from 0 microgram / 100 kcal to 0.65 microgram / 100 kcal, preferably of from 0.05 microgram / 100 kcal to 0.6 microgram / 100 kcal, more preferably of from 0.05 microgram / 100 kcal to 0.5 microgram / 100 kcal; and/or

vitamin C, in an amount ranging of from 17 mg / 100 kcal to 100 mg / 100 kcal, preferably of from 20 mg / 100 kcal to 80 mg / 100 kcal, more preferably of from 20 mg / 100 kcal to 50 mg / 100 kcal; and/or

vitamin D, in an amount ranging of from 26 IU / 100 kcal to 150 IU / 100 kcal, preferably of from 40 IU / 100 kcal to 120 IU / 100 kcal, more preferably of from 50 IU / 100 kcal to 130 IU / 100 kcal, wherein one IU for vitamin D is the biological equivalent of 0.025 microgram of cholecalciferol or ergocalciferol; and/or

vitamin E, in an amount ranging of from 2.0 IU / 100 kcal to 12 IU / 100 kcal, preferably of from 2.5 IU / 100 kcal to 10 IU / 100 kcal, more preferably of from 2.6 IU / 100 kcal to 5 IU / 100 kcal, wherein one IU for vitamin E is the biological equivalent of 0.67 mg of d-alpha-tocopherol, or of 0.9 mg of dl-alpha-tocopherol; and/or

vitamin K, in an amount ranging of from 4.6 microgram / 100 kcal to 25 microgram / 100 kcal, preferably of from 5 microgram / 100 kcal to 20 microgram / 100 kcal, more preferably of from 5 microgram / 100 kcal to 15 microgram / 100 kcal; and/or

vitamin B7, in an amount ranging of from 2 microgram / 100 kcal to 15 microgram / 100 kcal, preferably of from 2.5 microgram / 100 kcal to 12 microgram / 100 kcal, more preferably of from 3 microgram / 100 kcal to 10 microgram / 100 kcal; and/or

vitamin B5, in an amount ranging of from 0.43 mg / 100 kcal to 2 mg / 100 kcal, preferably of from 0.5 mg / 100 kcal to 1.6 mg / 100 kcal, more preferably of from 0.55 mg / 100 kcal to 1.2 mg / 100 kcal; and/or

vitamin B9, in an amount ranging of from 13 microgram / 100 kcal to 80 microgram / 100 kcal, preferably of from 15 microgram / 100 kcal to 60 microgram / 100 kcal, more preferably of from 20 microgram / 100 kcal to 45 microgram / 100 kcal.

4. The nutritional composition according to claim 3, comprising high amounts of the following at least one vitamin:

- vitamin B3;
- vitamin D;
- vitamin B9;
- vitamin B3, vitamin D and vitamin B9;
- vitamin B3 and vitamin D;
- vitamin B3 and vitamin B9;
- vitamin D and vitamin B9;
- vitamin B3 and vitamin B7;
- vitamin D and vitamin B7;
- vitamin B9 and vitamin B7;
- vitamin B3, vitamin D and vitamin B7;
- vitamin B3, vitamin D, vitamin B9 and vitamin B7;
- vitamin B3, vitamin D and vitamin K;
- vitamin B3, vitamin D, vitamin B7 and vitamin K;
- vitamin B3, vitamin D, vitamin B7, vitamin B9 and vitamin K;
- vitamin B3, vitamin D, vitamin B7, vitamin B9, vitamin C and vitamin K;
- vitamin B3, vitamin D, vitamin B7, vitamin B9, vitamin C, vitamin E and vitamin K;
- vitamin D and vitamin B5;
- vitamin B9 and vitamin B5;
- vitamin B3, vitamin D, vitamin B5 and vitamin B9;
- vitamin B3, vitamin D and vitamin B5;
- vitamin B3, vitamin B9 and vitamin B5;
- vitamin D, vitamin B9 and vitamin B5;
- vitamin B3, vitamin D, vitamin B7, vitamin B9, vitamin C, vitamin E, vitamin K and vitamin B5;

preferably comprising high amounts of the following at least one vitamin:

- vitamin D;
- vitamin B3, vitamin D and vitamin B9;
- vitamin B3 and vitamin D;
- vitamin D and vitamin B9;
- vitamin D and vitamin B7;
- vitamin B3, vitamin D and vitamin B7;
- vitamin B3, vitamin D, vitamin B9 and vitamin B7;

- vitamin B3, vitamin D and vitamin K;
- vitamin B3, vitamin D, vitamin B7 and vitamin K.

5. The nutritional composition according to any of the preceding claims, further comprising lipids comprising fatty acid (FA) triacylglycerols (TAG, said fatty acid TAG comprising preferably stearic, palmitic and myristic esters, wherein the sum of the amount of stearic, palmitic and myristic esters at the sn-1(3) position of the TAG is less than 13.0 wt-% of TAG and the myristic acid represents up to 3.7 wt-% of the total FA, the palmitic acid represents up to 11.1 wt-% of the total FA and stearic acid represents up to 4.6 wt-% of the total FA, wherein the short chain fatty acid (SCFA) are present in preferably less than 40 wt-%, wherein the mono-unsaturated fatty acids (MUFA) are present in preferably more than 35.1 wt-%, wherein the lipids preferably comprise a mixture of oils selected from:
16.9 wt-% to 22.0 wt-% of rapeseed oil, 11.5 to 14.5 wt-% of sunflower oil, 40.0 to 58 wt-% of high oleic sunflower oil, and 15.0 wt-% to 20.5 wt-% of coconut oil.

6. The nutritional composition according to any of the preceding claims, further comprising at least one mineral, wherein the at least one mineral is preferably selected from the list consisting of: calcium, phosphorous, magnesium, iron, zinc, potassium, copper, manganese, selenium, sodium and any combinations thereof; preferably selenium, manganese, a combination comprising or consisting of selenium, manganese, or a combination comprising or consisting of magnesium, manganese, selenium, wherein the at least one mineral is preferably present in the following amount:
magnesium, in an amount ranging of from 30 mg / 100 g to 200 mg / 100 g, preferably of from 40 mg / 100 g to 150 mg / 100 g, more preferably of from 15 mg / 100 g to 150 mg / 100 g; and/or
manganese, in an amount ranging of from 70 microgram / 100 g to 800 microgram / 100 g, preferably of from 100 microgram / 100 g to 450 microgram / 100 g, more preferably of from 100 microgram / 100 g to 250 microgram / 100 g; and/or
selenium, in an amount ranging of from 7 microgram / 100 g to 120 microgram / 100 g, preferably of from 10 microgram / 100 g to 50 microgram / 100 g, more preferably of from 10 microgram / 100 g to 25 microgram / 100 g;
and/or
magnesium in an amount ranging of from 6 mg / 100 kcal to 30 mg / 100 kcal, preferably of from 8 mg / 100 kcal to 25 mg / 100 kcal, more preferably of from 10 mg / 100 kcal to 15 mg / 100 kcal; and/or

manganese in an amount ranging of from 15 microgram / 100 kcal to 250 microgram / 100 kcal, preferably of from 20 microgram / 100 kcal to 200 microgram / 100 kcal, more preferably of from 20 microgram / 100 kcal to 70 microgram / 100 kcal; and/or
selenium in an amount ranging of from 2.5 microgram / 100 kcal to 12 microgram / 100 kcal, preferably of from 2.8 microgram / 100 kcal to 9 microgram / 100 kcal, more preferably of from 3.0 microgram / 100 kcal to 9 microgram / 100 kcal.

7. The nutritional composition according to any of the preceding claims, further comprising at least one further probiotic, wherein the at least one further probiotic is preferably selected from the list consisting of a *Dorea*, a *Bifidobacterium*, and any combination thereof, wherein the at least one further probiotic is more preferably a *Bifidobacterium* selected from the list consisting of: *Bifidobacterium dentium, Bifidobacterium infantis*, and combination thereof.

8. The nutritional composition according to claim 7, wherein the at least one further probiotic is a *Limosilactobacillus*, or wherein the at least one further probiotic is *Dorea phocaeensis*.

9. The nutritional composition according to any of the preceding claims, wherein the nutritional composition is an infant formula, a starter infant formula, a follow-on or follow-up infant formula, a baby food, an infant cereal composition, a growing-up milk, a fortifier or a supplement.

10. The nutritional composition according to any of the preceding claims, for use in improving and/or increasing and/or maintaining and/or treating and/or stimulating and/or promoting and/or preventing at least one muscle condition in a subject, wherein the subject is preferably an infant, a young child, or a child, such as a subject which was born by C- section and/or preterm, and/or small for gestational age (SGA) and/or with a low, very low, or extremely low weight at birth (LWB, VLBW, or ELBW) and/or experienced intra-uterine growth retardation (IUGR).

11. The nutritional composition for use according to claim 10, for use in improving and/or increasing and/or maintaining and/or treating and/or stimulating and/or promoting and/or preventing at least one muscle condition in a subject, selected from the list consisting of:
increasing muscle strength;
increasing muscle force;
increasing grip strength;
improving endurance capacity;
increasing muscle quality;

increasing or maintaining muscle mass;
increasing muscle specific force;
increasing exercise capacity;
modulating muscle health;
increasing muscle force generation;
treating a muscle disorder;
preventing a muscle disorder;
(promoting muscle health);
promoting normal muscle function;
modulating muscle stem cells function;
promoting muscle stem cell function;
increasing muscle stem cell function;
and any combinations thereof;

12. The nutritional composition for use according to claim 10 or claim 11, for use in increasing muscle strength and/or increasing muscle force and/or increasing grip strength and/or increasing or maintaining muscle mass in a subject.

13. The nutritional composition for use according to claim 10 or claim 11, for use in treating a muscle disorder in a subject, such as infant, a young child or a child.

14. Use of a nutritional composition according to any of claims 1 to 9, for improving and/or increasing and/or maintaining and/or treating and/or stimulating and/or promoting at least one muscle condition in a subject.

15. The nutritional composition according to any of claims 1 to 9, for use in :
preventing at least one muscle disorder in a subject, such as an infant, a young child or a child; or
stimulating at least one muscle condition in a subject, wherein the subject is an infant, a young child or a child, or older than a child like a teenager, an adult, including elderly, suffering from a disease, notably from a muscle disorder; or
increasing muscle strength in a subject, wherein the subject is an infant, a young child or a child, or older than a child or a teenager, an adult, including elderly, recovering from a disease, notably from a muscle disorder; or
increasing muscle strength in a subject, wherein the subject is an infant, a young child or a child, or older than a child like a teenager, an adult, including elderly, suffering from a disease, notably from a muscle disorder; or

increasing muscle force in a subject, wherein the subject is an infant, a young child or a child, or older than a child or a teenager, an adult, including elderly, recovering or suffering from a disease, notably from a muscle disorder; or

increasing grip strength in a subject, wherein the subject is an infant, a young child or a child, or older than a child or a teenager, an adult, including elderly, recovering or suffering from a disease, notably from a muscle disorder; or

increasing muscle quality in a subject, wherein the subject is an infant, a young child or a child, or older than a child or a teenager, an adult, including elderly, recovering or suffering from a disease, notably from a muscle disorder; or

increasing muscle mass in a subject, wherein the subject is an infant, a young child or a child, or older than a child or a teenager, an adult, including elderly, recovering or suffering from a disease, notably from a muscle disorder; or

increasing muscle specific force in a subject, wherein the subject is an infant, a young child or a child, or older than a child or a teenager, an adult, including elderly, recovering or suffering from a disease, notably from a muscle disorder; or

increasing muscle force generation in a subject, wherein the subject is an infant, a young child or a child, or older than a child or a teenager, an adult, including elderly, recovering or suffering from a disease, notably from a muscle disorder; or

promoting muscle health in a subject, wherein the subject is an infant, a young child or a child, or older than a child or a teenager, an adult, including elderly, recovering or suffering from a disease, notably from a muscle disorder; or

promoting and/or increasing muscle stem cells function in a subject, wherein the subject is an infant, a young child or a child, or older than a child or a teenager, an adult, including elderly, recovering or suffering from a disease, notably from a muscle disorder.