



(51) International Patent Classification:

A23L 33/115 (2016.01) A23L 33/17 (2016.01)

A23L 33/12 (2016.01) A61P 3/02 (2006.01)

A23L 33/15 (2016.01) A61P 15/14 (2006.01)

A23L 33/16 (2016.01)

(21) International Application Number:

PCT/US2017/030829

(22) International Filing Date:

03 May 2017 (03.05.2017)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

1607676.2 03 May 2016 (03.05.2016) GB

(71) Applicant: ABBOTT LABORATORIES [US/US]; Dept. 377/AP6A-1, 100 Abbott Park Road, Abbott Park, Illinois 60064 (US).

(72) Inventors: HUYNH, Thi Thi Dieu; 100 Abbott Park Road, Abbott Park, Illinois 60064 (US). LOW, Yen Ling; 100 Abbott Park Road, Abbott Park, Illinois 60064 (US).

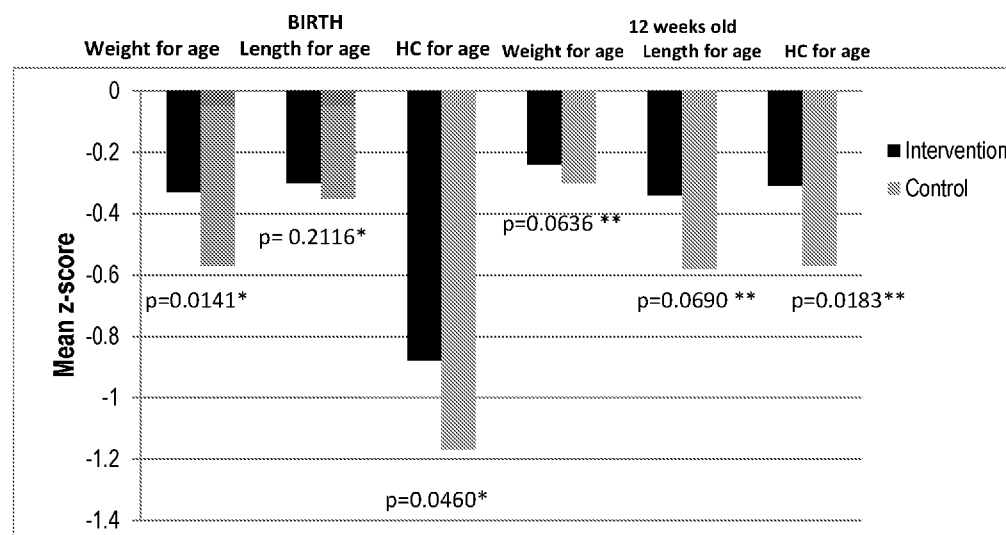
(74) Agent: ENGLE, Mark R. et al.; Abbott Nutrition a Division of, Abbott Laboratories, 3300 Stelzer Road, Dept 108140 RP3-2, Columbus, Ohio 43219 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,

(54) Title: NUTRITIONAL COMPOSITIONS AND METHODS OF PROMOTING EXCLUSIVE BREASTFEEDING, BIRTH SIZE AND INFANT GROWTH

Fig 1



(57) Abstract: The present invention relates to nutritional compositions for mothers and methods for birth and post-partum outcomes for infants of those mothers. More particularly, the general inventive concepts relate to the administration of a nutritional composition to a mother to increase birth size, to increase infant growth and to promote exclusive breastfeeding of the infant by the mother. The inventive concepts also relate to the administration of a nutritional composition to a nutritionally-compromised mother to increase breast milk production in the mother.



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

**NUTRITIONAL COMPOSITIONS AND METHODS OF PROMOTING EXCLUSIVE
BREASTFEEDING, BIRTH SIZE AND INFANT GROWTH**

FIELD OF INVENTION

5

The general inventive concepts relate to nutritional compositions for mothers and methods for birth and post-partum outcomes for infants of those mothers. More particularly, the general inventive concepts relate to the administration of a nutritional composition to a mother to increase birth size, to increase infant growth and to promote exclusive
10 breastfeeding of the infant by the mother. The inventive concepts also relate to the administration of a nutritional composition to a nutritionally-compromised mother to increase breast milk production in the mother.

BACKGROUND

15

Reduced birth size, for example low birth weight, of infants has been linked with inhibited growth and reduced cognitive development of the infant. Low birth size has also been linked with chronic diseases for the infant later in life.

20

Similarly, failure of an infant to thrive and increase in size is recognised as having significant negative impacts on health and development. Stunted growth of infants has been linked with a greater risk of illness, delayed mental development and reduced cognitive capacity.

25

Breastfeeding is an important factor in an infant's development. Breast milk contains many of the protein, lipid, and carbohydrate components in amounts well suited to an infant's requirements, as well as containing important immune components which act to protect the infant in the period when their own immune system is yet to become functional.

30

As a result of these factors, breastfeeding of neonates is encouraged. The World Health Organisation (WHO) recognises that the benefits of breast milk consumption by neonates and infants include promotion of physical, sensory and cognitive development, as well as protecting the infant from infectious and chronic diseases. Breastfeeding is also beneficial for the mother, as it reduces the risk of ovarian cancer and breast cancer.

35

The WHO recommends that infants should be exclusively breastfed – that is, where the infant receives no other foodstuff – for the first 6 months of life. However, achieving and

maintaining exclusive breastfeeding is often difficult for some mothers. Nutritionally-compromised or undernourished mothers may have particular difficulty in producing enough breast milk to permit exclusive breastfeeding. These difficulties may lead to the infant and mother not benefitting from the benefits of breastfeeding, or those benefits being reduced.

5 However, previous efforts to promote exclusive breastfeeding via supplementation have failed.

Nutritional supplementation during breastfeeding in mothers with nutritional risk is described by Gonzalez-Cossio *et al.* (*J Nutr.* 128, 1692-702 (1998)). The supplement used had a high
10 fat content and high energy content. The study indicated supplementation of nutritionally compromised mothers with high energy, high fat supplements improved exclusive breastfeeding. No effect of the supplementation on infant growth was described.

In a report from van Steenbergen *et al.*, energy supplementation of mothers during
15 pregnancy did not result in an increase in milk output. In addition, no effect on birth weight was detected (*Am J Clin Nutr* **50**, 274-9. (1989)).

SUMMARY OF INVENTION

20 Previous studies of the effects of nutritional supplementation of pregnant or lactating mothers have used high energy food supplements (460 kcal – 510 kcal per serving), with a high proportion of the energy contribution coming from fat (45% to 65%). The supplements used in such studies also contained small amounts of micronutrients or a narrow range of different micronutrients. The studies have reported variable efficacy of such supplementation
25 in improving breastfeeding and growth outcomes, if such outcomes were presented at all.

In contrast, as described herein, the present invention describes nutritional supplementation of mothers with a healthier, low energy nutritional supplement which is low in fat content and is rich in a range of micronutrients in order to improve breastfeeding and growth outcomes.

30 In particular, a clinical trial was conducted in order to investigate whether administration to the mother of a nutritional composition could improve the birth and postpartum outcomes of birth size, infant size and growth, as well as duration of exclusive breastfeeding. Breast milk intake of infants was also assessed to investigate whether administration to the mother of a nutritional composition could improve or increase breast milk volume, particularly in
35 nutritionally compromised mothers.

The trial results demonstrated that administration of a low-fat, nutrient-rich nutritional composition to pregnant and breastfeeding mothers was able to increase birth size, increase infant growth and promote exclusive breastfeeding. Infants born to nutritionally-compromised mothers receiving the low-fat, nutrient-rich nutritional composition were found to have a significantly higher infant milk intake attributable to increased breast milk production in these mothers.

At birth new-borns from mothers in the intervention group were larger for all measures (weight, length and head circumference). Figure 1 shows that new-borns from mothers receiving the nutritional supplement had a greater weight, a longer length, and a larger head circumference compared to new-borns from mothers in the control group. This is indicated by the fact that the mean z-score for the intervention group is higher (closer to zero) for all measures, compared to the z-score of new-borns from the control group (Figure 1). Administration of the nutritional composition to the pregnant mother therefore led to improved birth size of the new-borns.

Figure 1 also shows that infants of mothers in the intervention group showed increased infant size after 12 weeks compared to infants of mothers in the control group. For all measures (weight, length and head circumference) infants from the intervention group showed higher (closer to zero) mean z-scores compared to infants from the control group. Administration of the nutritional composition to the breastfeeding mothers therefore led to improved growth of the infant by 12 weeks of age.

Mothers in the intervention group were more likely to be exclusively breastfeeding at all time points measured. Figure 2 shows the percentage of mothers in each group that were exclusively breastfeeding at each of week 4, week 8 and week 12 postpartum. The intervention group receiving the nutritional composition showed a higher percentage of mothers were exclusively breastfeeding at each of these time points.

Mothers in the intervention group also had a greater likelihood of being able to exclusively breastfeed over 12 weeks than mothers in the control group. This is shown in Figure 3, displaying the odds of exclusive breastfeeding at 12 weeks. The data in Figure 3 indicate that mothers in the intervention group were more than twice as likely to be exclusively breastfeeding at 12 weeks compared to mothers in the control group.

Mothers in the intervention group who were more nutritionally compromised (MUAC <24 cm) were also able to produce a greater volume of breast milk as compared to comparable mothers in the control group. In particular, Figure 4 shows that infants born to intervention mothers enrolled in the study who had MUAC measured at baseline <50 percentile had a higher breast milk intake than infants born to mothers in the control group.

Therefore, in a first aspect the invention provides a method for promoting increased birth size of a new-born, the method comprising administering to a pregnant mother a nutritional composition comprising: a protein component providing about 5 wt% to about 40 wt% by dry weight of the composition; a carbohydrate component providing about 20 wt% to about 80 wt% by dry weight of the composition; a fat component providing no more than about 20 wt% by dry weight of the composition; and a micronutrient component providing about 0.5 wt% to about 4.5 wt% by dry weight of the composition. In certain exemplary embodiments, the method is a method for promoting increased birth weight, birth length and/or head circumference at birth.

In a second aspect, the invention provides a method for promoting increased infant size, the method comprising administering to a mother breastfeeding the infant a nutritional composition comprising: a protein component providing about 5 wt% to about 40 wt% by dry weight of the composition; a carbohydrate component providing about 20 wt% to about 80 wt% by dry weight of the composition; a fat component providing no more than about 20 wt% by dry weight of the composition; and a micronutrient component providing about 0.5 wt% to about 4.5 wt% by dry weight of the composition. In certain exemplary embodiments, the method is a method for promoting increased infant weight, infant length and/or head circumference of the infant.

In a third aspect the invention provides a method of promoting exclusive breastfeeding of a new-born or infant by a mother, the method comprising administering to the mother a nutritional composition comprising: a protein component providing about 5 wt% to about 40 wt% by dry weight of the composition; a carbohydrate component providing about 20 wt% to about 80 wt% by dry weight of the composition; a fat component providing no more than about 20 wt% by dry weight of the composition; and a micronutrient component providing about 0.5 wt% to about 4.5 wt% by dry weight of the composition.

In a fourth aspect, the present invention provides a method of increasing breast milk production in a nutritionally-compromised mother, the method comprising administering to the mother a nutritional composition comprising: a protein component providing about 5 wt% to about 40 wt% by dry weight of the composition; a carbohydrate component providing about 20 wt% to about 80

wt% by dry weight of the composition; a fat component providing no more than about 20 wt% by dry weight of the composition; and a micronutrient component providing about 0.5 wt% to about 4.5 wt% by dry weight of the composition.

- 5 To illustrate various aspects of the general inventive concepts, several exemplary embodiments of nutritional compositions and methods for their administration are provided herein.

BRIEF DESCRIPTION OF FIGURES

10

Figure 1: Weight, length and head circumference at birth and at 12 weeks of age for new-borns and infants from the intervention group and new-borns and infants from the control group. Values presented as mean z-score for each group for the indicated measurements. * p-value is from ANCOVA analysis controlling for mother's age, mother's mid arm circumference and infant gender.
15 ** p-value is from GEE analysis considering repeated measures of growth indicators at birth, weeks 4, 8 and 12 controlling for mother's mid-upper arm circumference (MUAC) and/or infant gender and/or wealth index score, and/or site and visit.

20

Figure 2: Percentage of mothers in the intervention group and of mothers in the control group that were exclusively breastfeeding at week 4, week 8 and week 12 postpartum.

25

Figure 3: Odds that a mother receiving the nutritional supplement would be exclusively breastfeeding at 12 weeks postpartum, compared to a mother in the control group. p=0.0358, p-value from GEE analysis, controlling for mother's MUAC, mother's age, delivery mode, infant gender, and study site

30

Figure 4: Mean breast milk intake (grams) of infants of nutritionally compromised mothers (mid-upper arm circumference <50th percentile) at week 4, week 8 and week 12. p=0.0268, based on GEE analysis controlling for mother's baseline MUAC, wealth index score, study site and study visit.

35

Figure 5: Mean calorie (A) and protein (B) intake for mothers in the intervention and control groups at baseline (enrolment), week 4, week 8, and week 12 postpartum. Figure 5C shows carbohydrate, protein and fat intake at week 12 postpartum for mothers in the intervention group and mothers in the control group.

Figure 6: Mean body size of mothers over time in the intervention group and mothers in the control group as measured by (A) mean body weight (kg) and (B) body mass index (BMI). Baseline = enrolment.

5 **DETAILED DESCRIPTION**

Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by the ordinary person skilled in the art to which the invention pertains. Without limiting any term, further clarifications of some of the terms used
10 herein are provided below.

The terms "nutritional formula" or "nutritional product" or "nutritional composition," as used herein, are used interchangeably and, unless otherwise specified, refer to nutritional liquids, nutritional solids, nutritional semi-liquids, nutritional semi-solids, nutritional powders,
15 nutritional supplements, and any other nutritional food product as known in the art. The nutritional powders may be reconstituted to form a nutritional liquid, all of which are suitable for oral consumption by a human.

The term "nutritional liquid," as used herein, unless otherwise specified, refers to nutritional
20 products in ready-to-drink liquid form, concentrated form, and nutritional liquids made by reconstituting the nutritional powders described herein prior to use.

The term "nutritional powder," as used herein, unless otherwise specified, refers to nutritional products in flowable or scoopable form that can be reconstituted with water or
25 another aqueous liquid prior to consumption and includes both spray dried and dry-mixed/dry-blended powders.

The term "nutritional semi-solid," as used herein, unless otherwise specified, refers to nutritional products that are intermediate in properties, such as rigidity, between solids and
30 liquids. Some semi-solids examples include puddings, gelatins, and doughs.

The term "nutritional semi-liquid," as used herein, unless otherwise specified, refers to nutritional products that are intermediate in properties, such as flow properties, between liquids and solids. Some semi-liquids examples include thick shakes and liquid gels.

The term “micronutrient” is used herein to refer collectively to vitamins and minerals that enable physiological functions.

The terms “administer,” “administering,” “administered,” and “administration,” as used herein, unless otherwise specified, should be understood to include providing a nutritional composition to a subject, the act of consuming a nutritional composition (self-administration), and combinations thereof. In addition, it should be understood that the methods disclosed herein may be practised with or without doctor supervision or other medical direction.

The term “mother” as used herein refers to a human mother. In particular, the mother may be a pregnant mother, or a breastfeeding mother. Whilst it is anticipated that an infant will be breastfed by the infant’s biological mother, breastfeeding by a wet-nurse is also contemplated. In such a scenario, the “breastfeeding mother” to which the nutritional composition is administered is the wet-nurse.

The term “new-born” or “neonate” as used herein refers to a child at the time of birth, up to 4 weeks of age. The term “infant” as used herein, unless otherwise specified, refers to a human about 36 months of age or younger. The term “toddler”, as used herein, unless otherwise specified, refers to a subgroup of infants from about 12 months of age to about 36 months (3 years) of age. The term “child”, as used herein, unless otherwise specified, refers to a human about 3 years of age to about 18 years of age. The term “adult”, as used herein, unless otherwise specified, refers to a human about 18 years of age or older.

“Exclusive breastfeeding” as used herein refers to the feeding of a new-born or infant exclusively by breastmilk expressed by the mother. That is, a mother is deemed to be exclusively breastfeeding when no foodstuff other than the mother’s breastmilk has been consumed by the infant since birth, with the exception of vitamin supplements, mineral supplements, and/or medications. Exclusive breastfeeding may be directly from the breast or via bottle-feeding of expressed breastmilk, or a combination. As used herein, a method of “promoting exclusive breastfeeding” is a method which results in an increased likelihood or probability that the mother will be exclusively breastfeeding at a given time point, compared to an equivalent mother that has not been subject to the method. “Promoting exclusive breastfeeding” also encompasses prolonging the duration of exclusive breastfeeding by a mother, for example in relation to the average duration for mothers of equivalent medical, geographical and/or socio-economic background. Such comparisons can be readily determined by the skilled person.

An infant's or new-born's "z-score" for a given form of measurement, as used herein, refers to the extent the measurement value observed for the infant or new-born differs from the median value for the reference population at that age, in units of standard deviations.

Thus, an infant's or new-born's z-score for a given measurement (e.g. weight or height) is determined by taking the observed value for the infant or new-born and calculating how many standard deviations above (positive z-score) or below (negative z-score) the measured value is from the median value for the reference population. That is, the z-value for an infant or new-born can be calculated as follows:

$$\text{Z-score} = (\text{observed value} - \text{median value of the reference population}) / \text{standard deviation value of reference population}$$

The most common reference population is the international reference population of the Global Database on Child Growth and Malnutrition, published by the World Health Organisation (WHO). Other suitable reference populations would be known by the skilled person. Taking birth weight as an example, the median weight for the reference population at a particular age determines what weight value is the "zero" z-score for that age, and the standard deviation for the population around this median weight determines the difference in weight corresponding to an integer on the scale of z-scores. That is, if the median weight for the reference population at 4 weeks is 4kg and the standard deviation is ± 0.1 kg, an infant with a weight of 4.1kg at 4 weeks has a z-score of +1, and an infant with a weight of 3.9 kg at 4 weeks has a z-score of -1.

"Birth size" as used herein refers to the size of the new-born at birth, as measured by weight, length and/or head circumference. A method of promoting increased birth size results in new-borns of mothers subject to the method having higher z-scores for one or more of weight, length and/or head circumference compared to new-borns of mothers who have not been subject to the method. This increase in z-score may be in comparison to the mean z-score for a population of new-borns from mothers of equivalent medical, geographical and/or socio-economic background as the mother of the new-born being measured. For example, a method of promoting increased birth size may be indicated by new-borns of mothers that have been subject to the method having a z-score for birth weight of -1.5, if the mean z-score for a population of new-borns from mothers not subject to the method was -1.6 or less, e.g. -1.8.

“Size of an infant” or “infant size” as used herein refers to the size of the infant at a specified time after birth, as measured by weight, length and/or head circumference. A method of promoting increased infant size results in infants of mothers subject to the method having higher z-scores for one or more of weight, length and/or head circumference at a given age, compared to infants of the same age from mothers who have not been subject to the method. This increase in infant size may be indicated by infants from mothers subject to the method having an increased z-score compared to the average z-score for infants of the same age from mothers of equivalent medical, geographical and/or socio-economic background as the mother of the infant being measured who have not been subject to the method. For example, a method of promoting increased infant size may be indicated by infants of mothers that have been subject to the method having a z-score for weight at 4 weeks of -1.5, if the mean z-score for a population of 4 week old infants from mothers not subject to the method was -1.6 or less, e.g. -1.8.

Such an increase in infant size may be measurable, for example, at 4, 8 and/or 12 weeks of age. That is, the increased size may be evident at any or all time points, and may be detectable by measurements taken, for example, at 4, 8 or 12 weeks of age.

“Increased growth of an infant” refers to an increase in the z-score of an infant compared to the z-score of the same infant at a younger age or when a new-born. That is, the growth of an infant has increased if the z-score of the infant is higher at the time of measurement than the z-score of the same infant for the same measurement when the infant was at a younger age. For example, an increase in infant growth may be indicated by the infant having a z-score for weight at 8 weeks of -1.5, if the z-score for the same infant for weight at 4 weeks was -1.6 or less, for example -1.9. If an infant was growing at the average rate for the reference population, the z-score for that infant at any given age would remain the same. An increase in the z-score of the infant over time would therefore demonstrate that the infant has grown faster than average for the reference population.

Increased growth of infants from mothers subject to methods of the invention may also be indicated by an increased rate of growth compared to infants from equivalent mothers not subject to methods of the invention. Said increased growth rate may be detectable as an absolute difference in growth rate – for example, infants showing increased growth may have an increase in weight of 0.2kg/week compared to an increase in weight of 0.1kg/week in infants from equivalent mothers in the control group.

Said increase in growth rate may also be detectable as a relative difference in growth rate compared to infants from equivalent mothers not subject to methods of the invention – for example, infants showing an increased growth rate may exhibit a change in z-score over time that is higher than the change in z-score over time for infants from equivalent mothers not subject to methods of the invention. If no change in z-score over time is observed, e.g. from birth to 12 weeks, the measured infants are growing at the median rate for the reference population. If the change in z-score is positive, the measured infants are growing faster than the median rate for the reference population. If the change in z-score is negative, the measured infants are growing slower than the median rate for the reference population. Therefore, a relative increased growth rate compared to infants from control mothers would be indicated by a change in z-score over time that is more positive (or less negative). For example, increased growth rate may be indicated if the change in z-score over time for infants from mothers subject to methods of the invention is +0.5, if the change in z-score over time for infants from equivalent mothers not subject to methods of the invention is lower than +0.5, e.g. +0.4, 0 or -0.1. By way of further example, increased growth may be indicated if the change in z-score over time for infants from mothers subject to methods of the invention is -0.1, if the change in z-score over time for infants from equivalent mothers not subject to methods of the invention is lower than -0.1, e.g. -0.25 or -0.3.

A method for “increasing growth of an infant” may also refer to methods in which the growth of the infant is at a rate of at least 1cm/week for length of the infant, a rate of at least 0.2 kg/week for weight of the infant, and/or at least 0.5 cm/week for head circumference of the infant. Exemplary embodiments of further suitable growth rates are described herein.

All percentages, parts and ratios as used herein, are by dry weight of the total composition, unless otherwise specified. All such weights, as they pertain to listed ingredients, are based on the active level and, therefore, do not include solvents or by-products that may be included in commercially available materials, unless otherwise specified. For example, where the composition is a solid, the percentages are based on the total weight of the composition prior to reconstitution. Where the composition is a liquid, the percentages are based on the total weight of the composition minus the solvent, in other words by dry weight of the composition.

Numerical ranges as used herein are intended to include every number and subset of numbers within that range, whether specifically disclosed or not. Further, these numerical ranges should be construed as providing support for a claim directed to any number or

subset of numbers in that range. For example, a disclosure of from 1 to 10 should be construed as supporting a range of from 2 to 8, from 3 to 7, from 5 to 6, from 1 to 9, from 3.6 to 4.6, from 3.5 to 9.9, and so forth.

5 All references to singular characteristics or limitations of the present disclosure shall include the corresponding plural characteristic or limitation, and vice versa, unless otherwise specified or clearly implied to the contrary by the context in which the reference is made. Unless otherwise specified, "a" "an," "the," and "at least one" are used interchangeably. Furthermore, as used in the description and the appended claims, the singular forms "a,"
10 "an," and "the" are inclusive of their plural forms, unless the context clearly indicates otherwise.

All combinations of method or process steps as used herein can be performed in any order, unless otherwise specified or clearly implied to the contrary by the context in which the
15 referenced combination is made.

In the following passages different aspects and embodiments of the invention are defined in more detail. Each aspect and embodiment so defined may be freely combined with any other aspect or aspects unless clearly indicated to the contrary. For example, a method for
20 promoting exclusive breastfeeding can also have the effect of promoting increased birth size and/or promoting increased infant size and/or promoting increased infant growth.

It is demonstrated herein that a nutritional composition having the characteristics of being low in calories, low in fat, and/or nutrient rich is able to improve birth size and postpartum
25 outcomes, such as exclusive breastfeeding and infant growth, when administered to pregnant or breastfeeding mothers. Nutritional compositions having a combination of the characteristics of being low in calories, low in fat and nutrient rich are particularly effective. Nutritional compositions that are low in calories, low in fat and nutrient rich are even more preferred.

30

Thus, in one aspect is provided a method for promoting increased birth size of a new-born, the method comprising administering to a pregnant mother a nutritional composition comprising:

a protein component providing about 5 wt% to about 40 wt% by dry weight of the
35 composition;

a carbohydrate component providing about 20 wt% to about 80 wt% by dry weight of the composition;

a fat component providing no more than about 20 wt% by dry weight of the composition; and

a micronutrient component providing about 0.5 wt% to about 4.5 wt% by dry weight of the

5 composition.

In certain exemplary embodiments, the method is a method for promoting increased birth

weight. In certain exemplary embodiments, the method is a method for promoting increased

birth length. In certain exemplary embodiments, the method is a method for promoting

10 increased head circumference at birth. In certain exemplary embodiments, an increase in the

specified measure may be an increase in the new-born's z-score. In certain exemplary

embodiments, the new-born's z-score increases by at least 0.05, by at least 0.1, by at least

1.5.

15 In these exemplary methods, the increased birth size of new-borns of mothers subject to the

method may be compared to new-borns of mothers who have not been administered the

nutritional composition, for example compared to the average (e.g. mean) value for new-

borns from mothers of equivalent medical, geographical and/or socio-economic background

as the mother of the new-born being measured.

20

In certain exemplary embodiments, the method is for promoting increased birth size of a

new-born in pregnant mothers in need thereof i.e. pregnant mothers subject to, or at risk of,

having a new-born with a lower than average (e.g. mean) birth size. The average birth size

may be determined with reference to mothers of equivalent medical, geographical and/or

25 socio-economic background. The pregnant mothers subject to, or at risk of, having a new-

born with lower than average birth size may be nutritionally-compromised. Alternatively or

in addition, said pregnant mothers may have a disease or condition that results in an

increased likelihood of having a new-born with lower than average birth size. Such diseases

or conditions include but are not limited to anaemia, renal disease, pulmonary disease,

30 diabetes mellitus, collagen-vascular disease, cardiac disease. In certain exemplary

embodiments, the method is for promoting the increased birth size of new-born wherein the

new-born is suspected to be at risk of having a lower than average birth size, or has been

determined to be at risk of having a lower than average birth size. The new-born suspected

to be at risk or determined to be at risk may have a particular disease or condition known to

35 be associated with reduced size at birth.

In another aspect is provided a method for promoting increased infant size, the method comprising administering to a mother breastfeeding the infant a nutritional composition comprising:

a protein component providing about 5 wt% to about 40 wt% by dry weight of the

composition;

a carbohydrate component providing about 20 wt% to about 80 wt% by dry weight of the composition;

a fat component providing no more than about 20 wt% by dry weight of the composition; and

a micronutrient component providing about 0.5 wt% to about 4.5 wt% by dry weight of the composition.

In certain exemplary embodiments, the method is a method for promoting increased infant weight. In certain exemplary embodiments, the method is a method for promoting increased infant length. In certain exemplary embodiments, the method is a method for promoting increased infant head circumference.

In these exemplary methods, the increased infant size of mothers subject to the method may be compared to infants of mothers who have not been administered the nutritional composition, for example compared to the average (e.g. mean) value for infants from mothers of equivalent medical, geographical and/or socio-economic background as the mother of the infant being measured. In such exemplary embodiments, an increase in the specified measure may be an increase in the infant's z-score for a given age compared to the infants of the same age from mothers who have not been administered the nutritional composition. In certain exemplary embodiments, the infant's z-score increases by at least 0.05, by at least 0.1, by at least 1.5.

In certain exemplary embodiments, the increased infant size is measurable at 4 weeks, 8 weeks and/or 12 weeks of age.

In certain exemplary embodiments, the method is for promoting increased infant size by administering the nutritional composition to a breastfeeding mother in need thereof. The breastfeeding mother in need thereof may be a mother subject to, or at risk of, having an infant with a lower than average (e.g. mean) infant size. The average infant size may be determined with reference to mothers of equivalent medical, geographical and/or socio-economic background. The breastfeeding mothers subject to, or at risk of, having an infant with lower than average size may be nutritionally-compromised. Alternatively or in addition,

said breastfeeding mothers may have a disease or condition that results in an increased likelihood of having an infant with lower than average size. Such diseases or conditions include but are not limited to anaemia, renal disease, pulmonary disease, diabetes mellitus, collagen-vascular disease, cardiac disease. In certain exemplary embodiments, the method is for promoting the increased size of an infant wherein the infant is suspected to be at risk of having a lower than average size, or has been determined to be at risk of having a lower than average size. The infant suspected to be at risk or determined to be at risk may have a particular disease or condition known to be associated with reduced size.

- 10 In another aspect is provided a method for increasing infant growth, the method comprising administering to a mother breastfeeding the infant a nutritional composition comprising: a protein component providing about 5 wt% to about 40 wt% by dry weight of the composition;
- 15 a carbohydrate component providing about 20 wt% to about 80 wt% by dry weight of the composition;
- a fat component providing no more than about 20 wt% by dry weight of the composition; and a micronutrient component providing about 0.5 wt% to about 4.5 wt% by dry weight of the composition.
- 20 In certain exemplary embodiments, the increased growth is detectable as an increase in the infant's z-score for weight-for-age, length-for-age and/or head circumference compared to the infant's score for the same measurement(s) at a younger age or when a new-born. If the infant was growing at the expected (median) rate for the reference population used to determine the z-scores, no change in z-score over time would be observed. Therefore, an
- 25 increase in z-score over time is indicative of a rate of growth that is faster than the expected rate of growth in the reference population.

- In certain exemplary embodiments, the infant's z-score increases by at least 0.05, by at least 0.1, by at least 0.2, by at least 0.3, by at least 0.4, by at least 0.5. Such an increase in
- 30 growth may be detectable, for example, between birth and 12 weeks of age, birth and 8 weeks of age, birth and 4 weeks of age, 4 weeks and 12 weeks of age, 4 weeks and 8 weeks of age, or 8 weeks and 12 weeks of age. In certain exemplary embodiments, the increased growth is detectable as an increase in the infant's z-score for head circumference compared to the infant's score for head circumference at a younger age or when a new-born
- 35 In certain exemplary embodiments, the infant's z-score for head circumference increases by

0.2-0.7 from birth to 12 weeks. In certain exemplary embodiments, the infant's z-score for head circumference increases by about 0.5 from birth to 12 weeks.

5 In certain exemplary methods of increasing growth of an infant, the increased growth is detectable as growth of at least 1 cm/week for length of the infant, for example at least 1.1 cm/week, at least 1.2 cm/week, at least 1.3 cm/week, at least 1.4 cm/week, at least 1.5 cm/week, at least 1.6 cm/week, at least 1.7 cm/week, at least 1.8 cm/week, at least 1.9 cm/week, at least 2.0 cm/week. In certain exemplary embodiments the increased growth may be detectable as growth of at least 0.2 kg/week for weight of the infant, for example at
10 least 0.25 kg/week, for example at least 0.3 kg/week, at least 0.4 kg/week, at least 0.5 kg/week, at least 0.6 kg/week, at least 0.8 kg/week, at least 0.9 kg/week, at least 1.0 kg/week. In certain exemplary embodiments the increased growth may be detectable as growth of at least 0.5 cm/week for head circumference of the infant, for example at least 0.6 cm/week, at least 0.7 cm/week, at least 0.8 cm/week, at least 0.9 cm/week, at least 1
15 cm/week.

In certain exemplary methods, the increased growth of infants of mothers subject to the method is in comparison to the growth of infants of mothers who have not been administered the nutritional composition, for example compared to the average (e.g. mean) value for
20 infants from mothers of equivalent medical, geographical and/or socio-economic background as the mother of the infant being measured.

In certain such exemplary methods, increased growth of infants of mothers subject to the method is detectable as a relative increase in growth rate compared to infants from
25 equivalent control mothers not subject to the method. Such a relative increase in growth rate may be detectable as a change in z-score compared to the infant's score for the same measurement(s) at a younger age or when a new-born, wherein the change in z-score is higher than the change in z-score over the same period for infants of equivalent mothers not subject to the method. That is, infants of mothers subject to the method exhibit a rate of
30 growth, relative to the reference population, that is greater than the rate of growth, relative to the reference population, exhibited by infants of mothers not subject to the method. The change in z-score may be for one or more of weight-for-age, length-for-age, and head circumference, for example length-for age. In certain exemplary embodiments, the change in z-score is from birth to 12 weeks of age. In certain exemplary embodiments, infants of
35 mothers subject to the method exhibit a change in z-score at least 0.05 units higher,

optionally at least 0.1 units higher, optionally at least 0.15 units higher than the change in z-score exhibited by infants of equivalent mothers not subject to the method.

In certain exemplary methods of increasing growth of an infant, the increased growth is detectable as an absolute increase in growth rate compared to infants from equivalent control mothers not subject to the method. In certain such embodiments, the increased growth rate is detectable as a rate of growth in length and/or head circumference that is higher than that exhibited by infants from control mothers by at least 0.1 cm/week, at least 0.2 cm/week, at least 0.3 cm/week, at least 0.4 cm/week, at least 0.5 cm/week, at least 0.6 cm/week, at least 0.7 cm/week, at least 0.8 cm/week, at least 0.9 cm/week, at least 1.0 cm/week. In certain exemplary embodiments the increased growth rate is detectable as a rate of growth in weight that is higher than that exhibited by infants from control mothers by at least 0.05 kg/week, at least 0.1 kg/week at least 0.2 kg/week, for example at least 0.25 kg/week, for example at least 0.3 kg/week, at least 0.4 kg/week, at least 0.5 kg/week

In certain exemplary embodiments, the method is for increasing infant growth by administering the nutritional composition to a breastfeeding mother in need thereof. The breastfeeding mother in need thereof may be a mother subject to, or at risk of, having an infant with lower than average (e.g. mean) infant growth. The average infant growth may be determined with reference to mothers of equivalent medical, geographical and/or socio-economic background. The breastfeeding mothers subject to, or at risk of, having an infant with lower than average growth may be nutritionally-compromised. Alternatively or in addition, said breastfeeding mothers may have a disease or condition that results in an increased likelihood of having an infant with lower than average growth. Such diseases or conditions include but are not limited to anaemia, renal disease, pulmonary disease, diabetes mellitus, collagen-vascular disease, cardiac disease. In certain exemplary embodiments, the method is for promoting the increased growth of an infant wherein the infant is suspected to be at risk of having a lower than average growth rate, or has been determined to be at risk of having a lower than average growth rate. The infant suspected to be at risk or determined to be at risk may have a particular disease or condition known to be associated with reduced growth.

In a further aspect is provided a method of promoting exclusive breastfeeding of a new born or infant by a mother, the method comprising administering to the mother a nutritional composition comprising:

a protein component providing about 5 wt% to about 40 wt% by dry weight of the composition;

a carbohydrate component providing about 20 wt% to about 80 wt% by dry weight of the composition;

- 5 a fat component providing no more than about 20 wt% by dry weight of the composition; and
a micronutrient component providing about 0.5 wt% to about 4.5 wt% by dry weight of the composition.

10 In certain exemplary embodiments, the method promotes exclusive breastfeeding for at least 1 week post-partum, at least 2 weeks post-partum, at least 3 weeks post-partum. In certain exemplary embodiments, the method promotes exclusive breastfeeding for at least 4 weeks post-partum. In certain exemplary embodiments, the method promotes exclusive
15 breastfeeding for at least 5 weeks post-partum, at least 6 weeks post-partum, at least 7 weeks post-partum. In certain exemplary embodiments, the method promotes breastfeeding for at least 8 weeks post-partum. In certain exemplary embodiments, the method promotes exclusive breastfeeding for at least 9 weeks post-partum, at least 10 weeks post-partum, at
least 11 weeks post-partum. In certain exemplary embodiments, the method promotes exclusive breastfeeding for at least 12 weeks post-partum.

20 In certain exemplary methods for promoting exclusive breastfeeding, the mother to whom the nutritional composition is administered is more likely to be exclusively breastfeeding for the indicated time period compared to mothers who have not received the nutritional composition, for example compared to the average value for mothers of equivalent medical,
geographical and/or socio-economic background as the mother being measured.

25

In certain exemplary methods for promoting exclusive breastfeeding, the effect is detectable on an individual basis. In such exemplary embodiments, the mother to whom the nutritional composition is administered is exclusively breastfeeding for the indicated time period. In certain such embodiments, the mother is exclusively breastfeeding for at least 1 week post-
30 partum, at least 2 weeks post-partum, at least 3 weeks post-partum. In certain exemplary embodiments, the mother is exclusively breastfeeding for at least 4 weeks post-partum. In certain exemplary embodiments, the mother is exclusively breastfeeding for at least 5 weeks post-partum, at least 6 weeks post-partum, at least 7 weeks post-partum. In certain exemplary embodiments, the mother is exclusively breastfeeding for at least 8 weeks post-
35 partum. In certain exemplary embodiments, the mother is exclusively breastfeeding for at least 9 weeks post-partum, at least 10 weeks post-partum, at least 11 weeks post-partum. In

certain exemplary embodiments, mother is exclusively breastfeeding for at least 12 weeks post-partum.

5 In certain exemplary methods for promoting exclusive breastfeeding, administration of the nutritional compositions described herein prolongs the duration of exclusive breastfeeding by the mother compared to the average duration for mothers of equivalent medical, geographical and/or socio-economic background. In certain such exemplary embodiments, the duration is prolonged by at least 1 week, at least 2 weeks, at least 3 weeks, at least 4 weeks, at least 5 weeks, at least 6 weeks, at least 7 weeks, at least 9 weeks, at least 10
10 weeks, at least 11 weeks, at least 12 weeks, at least 3 months, at least 4 months, at least 5 months, at least 6 months.

In certain exemplary embodiments, the method is for increasing exclusive breastfeeding by administering the nutritional composition to a breastfeeding mother in need thereof. The
15 breastfeeding mother in need thereof may be a mother subject to, or at risk of, ceasing exclusive breastfeeding earlier than 12 weeks post-partum. The breastfeeding mothers subject to, or at risk of, ceasing exclusive breastfeeding earlier than 12 weeks post-partum may be nutritionally-compromised. Alternatively or in addition, said breastfeeding mothers may have a disease or condition that results in an increased likelihood of ceasing
20 breastfeeding earlier than 12 weeks post-partum. Such diseases or conditions include but are not limited to anaemia, renal disease, pulmonary disease, diabetes mellitus, collagen-vascular disease, cardiac disease.

In a further aspect is provided a method of increasing breast milk production in a
25 nutritionally-compromised mother, the method comprising administering to the mother a nutritional composition comprising:
a protein component providing about 5 wt% to about 40 wt% by dry weight of the composition;
a carbohydrate component providing about 20 wt% to about 80 wt% by dry weight of the
30 composition;
a fat component providing no more than about 20 wt% by dry weight of the composition; and
a micronutrient component providing about 0.5 wt% to about 4.5 wt% by dry weight of the composition.

35 In certain exemplary methods, the term “nutritionally-compromised mother” should be understood to mean a mother who has a mid-upper arm circumference or “MUAC” less than

the 50th percentile. In certain exemplary embodiments, the term “nutritionally-compromised mother” should be understood to mean a mother who has a mid-upper arm circumference or “MUAC” less than 24 cm. A “nutritionally-compromised mother” may be nutritionally-compromised as a consequence of having a particular disease or condition or suffering from a particular disease or condition in the past. Such diseases or conditions include but are not limited to anaemia, renal disease, pulmonary disease, diabetes mellitus, collagen-vascular disease, cardiac disease.

In certain exemplary methods, the effect is detectable on an individual basis i.e. breast milk production is increased in the mother upon administration of the nutritional composition relative to the situation prior to the administration of the nutritional composition.

In certain exemplary methods, the mother to whom the nutritional composition is administered exhibits an increase in breast milk production as compared to nutritionally compromised mothers who have not received the nutritional composition, for example compared to the average value for nutritionally-compromised mothers of equivalent medical, geographical and/or socio-economic background as the mother being measured.

In certain exemplary methods, the mother may experience at least a 1% increase in breast milk production, at least a 2% increase in breast milk production, at least a 3% increase in breast milk production. The increase in breast milk production may be for a sustained period, for example up to 4 weeks post-partum, up to 8 weeks post-partum, up to 12 weeks post-partum.

Methods according to the invention wherein the nutritional composition is administered to a breastfeeding mother are particularly advantageous because, surprisingly, the additional calorie intake provided by the nutritional composition does not lead to the mother gaining weight. For some mothers, it is desirable to lose weight at a healthy rate following birth. As demonstrated herein (see Examples), it has surprisingly been found that administration of nutritional compositions according to methods of the invention has the advantage of not inhibiting this post-partum weight loss, despite the compositions providing additional calories to the mother.

Nutritional composition

Exemplary embodiments of the nutritional composition to be used in the methods of the inventions are provided below.

5 In certain exemplary embodiments, the nutritional composition has a total calorific content of less than about 450 kcal per 100g dry weight. In certain exemplary embodiments, the nutritional composition has a total calorific content of less than about 400 kcal, less than about 350 kcal per 100g dry weight. In certain exemplary embodiments, the nutritional composition has a total calorific content of from about 200 to about 450 kcal, from about 250 to about 450 kcal, from about 300 to about 400 kcal, from about 320 kcal to about 370 kcal, 10 from about 340 to about 350 kcal per 100g dry weight. In certain exemplary embodiments, the nutritional composition has a total calorific content of about 344 kcal per 100g dry weight.

In certain exemplary embodiments, the nutritional composition comprises a fat component. In certain exemplary embodiments, the nutritional composition comprises no more than 15 about 20 wt% fat, no more than about 15 wt% fat, no more than about 12 wt% fat, no more than about 10 wt% fat, no more than about 5 wt% fat, no more than about 3 wt% fat, or no more than 2 wt% fat by dry weight of the nutritional composition. In certain exemplary 20 embodiments, the nutritional composition comprises from about 0.1 wt% to about 20 wt% fat, or from about 0.2 wt% to about 10 wt% fat, or from about 0.5 wt% to about 5 wt%, or from about 1 wt% to about 3 wt%, or from about 1.5 to about 2.5 wt% fat by dry weight of the composition. In certain exemplary embodiments, the nutritional composition comprises about 2 wt% fat by dry weight of the composition.

In certain exemplary embodiments, the fat component provides less than about 45% of the 25 total calorific content of the nutritional composition. In certain exemplary embodiments, the fat component provides less than about 40% of the total calorific content of the nutritional composition. In certain exemplary embodiments, the fat component provides less than about 35%, less than about 30%, less than about 25%, less than about 20%, less than about 15%, less than about 10%, less than about 7% of the total calorific content of the nutritional composition. In certain exemplary 30 embodiments, the fat component provides from about 1% to about 45%, 1% to about 40%, from about 1% to about 30%, or from about 1% to about 25%, from about 1% to about 20%, from about 1% to about 15%, from about 1% to about 10% of the total calorific content of the nutritional composition. In certain exemplary embodiments, the fat component comprises from about 2% to about 7% of the total calorific content of the nutritional composition. In certain exemplary 35 embodiments, the fat component comprises about 5% of the total calorific content of the nutritional composition.

Non-limiting examples of fats suitable for use in the fat component of exemplary nutritional compositions include milk fat (for example skim milk powder and whole milk powder), canola oil, corn oil, coconut oil, fractionated coconut oil, soy oil, olive oil, safflower oil, high GLA safflower oil, high oleic safflower oil, MCT oil (medium chain triglycerides), sunflower oil, high oleic sunflower oil, palm and palm kernel oils, palm olein, marine oils, cottonseed oils, algal and fungal derived oils, and combinations thereof. In certain exemplary embodiments, the fat component comprises milk fat, optionally wherein the fat component consists of milk fat. In certain exemplary embodiments the fat or fats of the fat component is/are unsaturated.

In certain exemplary embodiments, the nutritional composition comprises a carbohydrate component. In certain exemplary embodiments, the carbohydrate component provides from about 20 to about 80 wt%, from about 30 to about 70 wt%, from about 40 to about 60 wt%, or from about 50 to about 55 wt % by dry weight of the composition. In certain exemplary embodiments, the carbohydrate component provides about 54 wt% by dry weight of the composition.

The carbohydrate component may comprise carbohydrates that are simple, complex, or variations or combinations thereof. Generally, any source of carbohydrates may be used so long as it is suitable for use in oral nutritional compositions and is otherwise compatible with any other selected ingredient or feature present in the nutritional composition. Non-limiting examples of a source of carbohydrates which may be suitable for use in the exemplary nutritional compositions described herein include maltodextrin, hydrolyzed or modified starch or cornstarch, glucose polymers, corn syrup, corn syrup solids, rice-derived carbohydrates, sucrose, glucose, fructose, lactose, oligofructose, high fructose corn syrup, honey, sugar alcohols (e.g., maltitol, erythritol, sorbitol), isomaltulose, sucromalt, pullulan, potato starch, and other slowly-digested carbohydrates, dietary fibers including, but not limited to, oat fiber, soy fiber, gum arabic, sodium carboxymethylcellulose, methylcellulose, guar gum, gellan gum, locust bean gum, konjac flour, hydroxypropyl methylcellulose, tragacanth gum, karaya gum, gum acacia, chitosan, arabinogalactins, glucomannan, xanthan gum, alginate, pectin, low and high methoxy pectin, cereal beta-glucans (e.g., oat beta-glucan, barley beta-glucan), carrageenan and psyllium, Fibersol™, other resistant starches, and combinations thereof. In certain exemplary embodiments, the carbohydrate component comprises one or more of sucrose, oligofructose and lactose. In certain exemplary embodiments, the carbohydrate component consists of sucrose, oligofructose and lactose.

In certain exemplary embodiments, the nutritional composition comprises a protein component. In certain exemplary embodiments, the protein component provides from about 5 to about 40 wt%, from about 10 to about 30 wt%, or from about 20 to about 25 wt% by dry weight of the composition. In certain exemplary embodiments, the protein component provides about 23 wt% by dry weight of the composition.

The protein component of the nutritional composition can include various sources of protein, including one source or more than one source. Suitable proteins include, but are not limited to, hydrolyzed, partially hydrolyzed or non-hydrolyzed proteins or protein sources, and can be derived from any known or otherwise suitable source such as milk (e.g., casein, whey), animal (e.g., meat, fish), cereal (e.g., rice, corn), vegetable (e.g., soy, pea, potato), or combinations thereof.

Non-limiting examples of the source of protein include whey protein concentrates, whey protein isolates, whey protein hydrolysates, acid caseins, sodium caseinates, calcium caseinates, potassium caseinates, casein hydrolysates, milk protein concentrates, milk protein isolates, milk protein hydrolysates, skim milk, low fat milk, nonfat dry milk, skim milk powder, condensed skim milk, soy protein concentrates, soy protein isolates, soy protein hydrolysates, pea protein concentrates, pea protein isolates, pea protein hydrolysates, collagen proteins, collagen protein isolates, insect proteins, earthworm proteins, potato protein, rice protein, corn protein, wheat protein, sunflower protein, chickpea protein, quinoa protein, and combinations thereof.

In certain exemplary embodiments, the protein component comprises milk protein, optionally from skim milk and whole milk powder. In certain exemplary embodiments, the protein component consists of milk protein.

In certain exemplary embodiments, the nutritional composition comprises a micronutrient component. In certain exemplary embodiments, the micronutrient component comprises one or more micronutrients selected from: Vitamin A, Vitamin D3, Vitamin E, Vitamin K1, Vitamin C, Folic acid, Vitamin B1, Vitamin B2, Vitamin B6, Vitamin B12, Niacin, Pantothenic acid, Choline, Calcium, Phosphorus, Magnesium, Iron, Zinc, Manganese, Copper, Selenium, and Chromium. In certain exemplary embodiments, the micronutrient component comprises all of Vitamin A, Vitamin D3, Vitamin E, Vitamin K1, Vitamin C, Folic acid, Vitamin B1, Vitamin B2, Vitamin B6, Vitamin B12, Niacin, Pantothenic acid, Choline, Calcium, Phosphorus, Magnesium, Iron, Zinc, Manganese, Copper, Selenium, and Chromium.

In certain exemplary embodiments, the micronutrient component provides from about 0.1 wt% to about 5 wt% by dry weight of the nutritional composition. In certain exemplary embodiments, the micronutrient component provides from about 0.5 wt% to about 4.5 wt%, about 1 wt% to about 4 wt%, about 2 wt% to about 4 wt%, about 3 wt% to about 4 wt%, about 3.5 wt% to about 4 wt% by dry weight of the nutritional composition. In certain exemplary embodiments, the micronutrient component provides about 3.6 wt% by dry weight of the nutritional composition.

Table 1 provides exemplary micronutrients, any one or more of which may be in the micronutrient component. Table 1 also provides exemplary amounts for each micronutrient, when that micronutrient is present in the micronutrient component. That is, in certain exemplary embodiments, the micronutrient component comprises any one micronutrient of Table 1 in the indicated amount, or comprises any combination of two or more micronutrients shown in Table 1 in the indicated amounts. In certain preferred exemplary embodiments all of the micronutrients listed in Table 1 are present in the micronutrient component and in the amounts shown in Table 1:

Table 1

Micronutrient	Unit	Per 100g dry weight of nutritional composition
Vitamin A	mcg	300-350
Vitamin D3	mcg	10-15
Vitamin E	mg	20-30
Vitamin K1	mcg	40-50
Vitamin C	mg	190-200
Folic acid	mcg	820-830
Vitamin B1	mg	1.5-2.5
Vitamin B2	mg	1.5-2.5
Vitamin B6	mg	2.0-3.0
Vitamin B12	mcg	5-10
Niacin	mg	7.5-8.5
Pantothenic acid	mg	7.5-8.5
Choline	mg	320-340
Calcium	mg	1250-1500
Phosphorus	mg	1200-1500
Magnesium	mg	300-330
Iron	mg	10-20

Zinc	mg	20-30
Manganese	mg	1-2
Copper	mg	1-2
Selenium	mcg	75-100
Chromium	mcg	55-75

In certain exemplary embodiments, the nutritional composition comprises an omega-3 fatty acid. In certain exemplary embodiments the omega-3 fatty acid is docosahexaenoic acid (DHA). In certain exemplary embodiments, the omega-3 fatty acid provides about 0.03 wt% to about 0.06 wt% by dry weight of the composition, optionally about 0.04 wt% to about 0.05 wt% by dry weight of the composition. In certain exemplary embodiments, the omega-3 fatty acid provides about 0.047 wt% by dry weight of the composition. In such exemplary embodiments, the omega-3 fatty acid is present in addition to the fat component described elsewhere herein.

In certain exemplary embodiments, the nutritional composition comprises a protein component providing about 20 to about 25 wt% (optionally about 23 wt%) by dry weight of the composition, a carbohydrate component providing about 50 to about 55 wt% (optionally about 54 wt%) by dry weight of the composition, a fat component comprising about 1 wt% to about 3 wt% (optionally about 2 wt%) by dry weight of the composition, and a micronutrient component comprising at least one of the micronutrients of Table 1 in the amounts shown in Table 1, optionally all the micronutrients of Table 1 in the amounts shown in Table 1. In certain exemplary embodiments, the nutritional composition has a total calorific content of about 320 kcal to about 370 kcal (optionally from about 340 to about 350 kcal) per 100g dry weight. In certain exemplary embodiments, the fat component provides from about 1% to about 10% of the total calorific content, optionally about 2% to about 7%, optionally about 5%. In certain exemplary embodiments, the nutritional composition further comprises an omega-3 fatty acid (optionally DHA) which provides about 0.04 wt% to about 0.05 wt% by dry weight of the composition. In certain such exemplary embodiments, the protein component comprises milk protein, the fat component comprises milk fat and the carbohydrate component comprises sucrose, glucose and oligofructose.

In certain exemplary embodiments, the nutritional composition comprises one or more other optional ingredients that may modify the physical, chemical, aesthetic or processing characteristics of the nutritional composition, or serve as additional nutritional components. Many such optional ingredients are known or otherwise suitable for use in medical food or

other nutritional products and may also be used in the nutritional compositions described herein, provided that such optional ingredients are safe for oral administration and are compatible with the essential and other ingredients in the selected product form.

5 In certain exemplary embodiments, the nutritional composition comprises a flowing agent or anti-caking agent to retard clumping or caking of a powder embodiment over time and to make the powder flow easily from its container. Any flowing or anti-caking agents that are known or otherwise suitable for use in a powder are suitable for use herein, non-limiting examples of which include tricalcium phosphate, silicates, and combinations thereof. The
10 concentration of the flowing agent or anti-caking agent will often vary depending upon the product form, the other selected ingredients, the desired flow properties, and so forth.

In certain exemplary embodiments, the nutritional composition comprises a stabilizer. Any stabilizer that is known or otherwise suitable for use in a nutritional composition may also be
15 suitable for use herein, non-limiting examples of which include gums such as xanthan gum and locust bean gum.

In certain exemplary embodiments, the composition is formulated in a product form suitable for oral administration. Oral administration, as defined herein, includes any form of
20 administration in which the composition is introduced into the subject's digestive system, including the stomach and small intestine. For example, oral administration includes nasogastric intubation, in which a tube is run from through the nose to the stomach of the subject to administer food or drugs. Suitable forms of such compositions may include liquids, powders, solids, semi-solids, semi-liquids compositions, provided that such a formulation
25 allows for the effective delivery and consumption of the nutritional composition.

In certain exemplary embodiments, the composition may be a solid, liquid, semi-solid, semi-liquid, or powder. In certain exemplary embodiments, the composition is in the form of a powder. In certain exemplary embodiments the composition is in the form of a powder
30 suitable for reconstitution in a consumable aqueous liquid, preferably water.

A nutritional powder, such as a spray-dried nutritional powder, may be prepared by any combination of known or otherwise effective techniques suitable for making and formulating a spray-dried nutritional powder. The spray-drying step may likewise include any spray-
35 drying technique that is known for or otherwise suitable for use in the production of nutritional powders. Many different spray-drying methods and techniques are known for use

in the nutrition field, of which many are suitable for use in the manufacture of the spray dried nutritional powders herein.

Further examples of composition forms suitable for use herein include snack and meal replacement products, including those formulated as bars; sticks; cookies; breads, cakes, or other baked goods; frozen liquids; candy; breakfast cereals; powders, granulated solids, or other particulates; snack chips or bites; frozen or retorted entrees; and so forth. In certain exemplary embodiments, the nutritional composition can be in a form that falls between solid and liquid, such as puddings, yogurts, or gels.

Examples of suitable liquid nutritional compositions include snack and meal replacement products, hot or cold beverages, carbonated or non-carbonated beverages, juices or other acidified beverages, milk or soy-based beverages, shakes, coffees, teas, and so forth.

These liquid compositions are most typically formulated as suspensions or emulsions, but can also be formulated in any other suitable form such as clear liquids, substantially clear liquids, liquid gels, and so forth.

Nutritional compositions described herein are intended as nutritional supplements. That is, the nutritional compositions provide nutrition in addition to the normal diet of the mother to which the nutritional compositions are administered. It is not intended for the mother to subsist solely on the nutrition provided by the nutritional compositions described herein.

Administration of Nutritional Composition

The nutritional compositions described herein are effective in improving birth and postpartum outcomes, in particular birth size, exclusive breastfeeding, breast milk production and infant growth, when administered to pregnant or breastfeeding mothers.

In certain exemplary embodiments, the nutritional composition is administered to the mother at least once weekly, at least once every 3 days, at least once every 2 days, at least once daily. In certain exemplary embodiments the nutritional composition is administered twice daily.

In certain exemplary embodiments, the nutritional composition is administered in an amount sufficient to provide from about 50 kcal to about 350 kcal per administration, optionally about 100 kcal to about 300 kcal per administration. In certain exemplary embodiments, the

nutritional composition is administered in an amount sufficient to provide about 100 to about 150 kcal per administration, optionally about 126 kcal per administration. In certain alternative exemplary embodiments, the nutritional composition is administered in an amount sufficient to provide from about 220 kcal to about 270 kcal per administration, optionally about 252 kcal per administration.

In certain exemplary embodiments, the nutritional composition is administered in an amount sufficient to provide from about 1 g to about 20 g of protein per administration, optionally about 5 g to about 20 g of protein per administration. In certain exemplary embodiments, the nutritional composition is administered in an amount sufficient to provide about 5 g to about 10 g of protein per administration, optionally about 8 g of protein per administration. In certain alternative exemplary embodiments, the nutritional composition is administered in an amount sufficient to provide from about 10 g to about 20 g of protein per administration, optionally about 17 g of protein per administration.

In certain exemplary embodiments, the nutritional composition is administered in an amount sufficient to provide from about 0.1 g to about 2 g of fat per administration, optionally about 0.5 g to about 1.5 g of fat per administration. In certain exemplary embodiments, the nutritional composition is administered in an amount sufficient to provide about 0.5 g to about 1 g of fat per administration, optionally about 0.7 g of fat per administration. In certain alternative exemplary embodiments, the nutritional composition is administered in an amount sufficient to provide from about 1 g to about 1.5 g of fat per administration, optionally about 1.4 g of fat per administration.

In certain exemplary embodiments, the nutritional composition is administered in an amount sufficient to provide from about 10 g to about 50 g of carbohydrate per administration, optionally about 15 g to about 40 g of carbohydrate per administration. In certain exemplary embodiments, the nutritional composition is administered in an amount sufficient to provide about 15 g to about 25 g of carbohydrate per administration, optionally about 20 g of carbohydrate per administration. In certain alternative exemplary embodiments, the nutritional composition is administered in an amount sufficient to provide from about 35 g to about 45 g of carbohydrate per administration, optionally about 39 g of carbohydrate per administration.

In certain exemplary embodiments, the nutritional composition is administered at least once per day. In certain such exemplary embodiments, the nutritional composition is administered

in an amount sufficient to provide from about 50 kcal to about 350 kcal per day, optionally about 100 kcal to about 300 kcal per day. In certain exemplary embodiments, the nutritional composition is administered in an amount sufficient to provide from about 220 kcal to about 270 kcal per day, optionally about 252 kcal per day.

5

In certain exemplary embodiments wherein the nutritional composition is administered at least once per day, the nutritional composition is administered per day in an amount sufficient to provide from about 1 g to about 20 g of protein per day, optionally about 5 g to about 20 g of protein per day. In certain exemplary embodiments, the nutritional composition

10 is administered in an amount sufficient to provide from about 10 g to about 20 g of protein per day, optionally about 17 g of protein per day.

In certain exemplary embodiments, wherein the nutritional composition is administered at least once per day, the nutritional composition is administered in an amount sufficient to

15 provide from about 0.1 g to about 2 g of fat per day, optionally about 0.5 g to about 2 g of fat per day. In certain exemplary embodiments, the nutritional composition is administered in an amount sufficient to provide from about 1 g to about 2 g of fat per day, optionally about 1.4 g of fat per day.

20 In certain exemplary embodiments, wherein the nutritional composition is administered at least once per day, the nutritional composition is administered per day in an amount sufficient to provide from about 10 g to about 50 g of carbohydrate per day, optionally about 15 g to about 45 g of carbohydrate per day. In certain exemplary embodiments, the nutritional composition is administered in an amount sufficient to provide from about 35 g to

25 about 45 g of carbohydrate per day, optionally about 39 g of carbohydrate per day.

In certain embodiments in which the nutritional composition is administered at least once per day, the nutritional composition is administered in an amount sufficient to provide per day at least 15% of the mother's recommended daily allowance (RDA) of each micronutrient of the

30 micronutrient component in the composition. In certain exemplary embodiments, the nutritional composition is administered in an amount sufficient to provide per day from 15% to 170% of the mother's recommended daily allowance (RDA) of each micronutrient of the micronutrient component in the composition. The RDA of a mother is determined according to the Dietary Reference Intakes (DRIs) published by the United States Institute of Medicine,

35 applicable as of December 2015 and available from the US Food and Nutrition Information

Center at: <https://fnic.nal.usda.gov/dietary-guidance/dietary-reference-intakes/dri-tables-and-application-reports>.

In certain exemplary embodiments, the nutritional composition is administered to a pregnant mother for at least 1 week immediately before the expected due date of the pregnancy. In this context, the expected due date may be calculated by means known in the art, for example as the date corresponding to a 40 week gestational age. In certain exemplary embodiments, the nutritional composition is administered to a pregnant mother for at least 2 weeks, at least 3 weeks, at least 4 weeks, at least 5 weeks, at least 6 weeks, at least 7 weeks immediately before the expected due date of the pregnancy. In certain exemplary embodiments the nutritional composition is administered to a pregnant mother for at least 8 weeks immediately before the expected due date of the pregnancy.

In certain exemplary embodiments, the nutritional composition is administered to a pregnant woman for between 1 week and 15 weeks immediately prior to the expected due date of the pregnancy. In certain exemplary embodiments, the nutritional composition is administered to a pregnant woman for between 2 weeks and 14 weeks, for between 3 weeks and 13 weeks, for between 4 weeks and 12 weeks, for between 5 weeks and 11 weeks, for between 6 weeks and 10 weeks, for between 7 weeks and 9 weeks immediately prior to the expected due date of the pregnancy. In certain exemplary embodiments, the nutritional composition is administered to a pregnant woman for 8 weeks immediately prior to the expected due date of the pregnancy.

Those exemplary embodiments in which the nutritional composition is administered to a pregnant mother for a period immediately prior to the expected due date are particularly advantageous for increasing birth size of the infant.

In certain exemplary embodiments, the nutritional composition is administered to a mother for at least 1 week immediately post-partum (i.e. following birth). In certain exemplary embodiments, the nutritional composition is administered to a mother for at least 2 weeks, at least 3 weeks, at least 4 weeks, at least 5 weeks, at least 6 weeks, at least 7 weeks, at least 8 weeks, at least 9 weeks, at least 10 weeks, at least 11 weeks immediately post-partum. In certain exemplary embodiments, the nutritional composition is administered to a mother for at least 12 weeks immediately post-partum.

In certain exemplary embodiments, the nutritional composition is administered to a mother for between 1 week and 12 months immediately post-partum. In certain exemplary embodiments, the nutritional composition is administered to a mother for between 2 weeks and 8 months, for between 3 weeks and 6 months, for between 4 weeks and 4 months, for
5 between 5 weeks and 16 weeks, for between 6 weeks and 15 weeks, for between 7 weeks and 14 weeks, for between 8 weeks and 14 weeks, for between 10 weeks and 14 weeks immediately post-partum. In certain exemplary embodiments, the nutritional composition is administered to a mother for 12 weeks immediately post-partum.

10 Those exemplary embodiments in which the nutritional composition is administered to a mother for a period immediately post-partum are particularly advantageous for promoting exclusive breastfeeding. Those exemplary embodiments in which the nutritional composition is administered to a mother for a period immediately post-partum are also particularly advantageous for improving infant growth.

15 In certain exemplary embodiments, the nutritional composition is administered to a mother for a period immediately prior to the expected due date and also for a period immediately post-partum. In such exemplary embodiments, the length of the time period immediately prior to the expected due date and the length of the time period immediately post-partum
20 may be any of those time periods just described, in any combination. For example, the nutritional composition may be administered for between 3 weeks and 13 weeks immediately prior to the expected due date and also for at least 8 weeks immediately post-partum. In certain exemplary embodiments, the nutritional composition is administered for at least 8 weeks immediately prior to the expected due date and for at least 12 weeks post-partum.

25 During the periods of administration immediately prior to the expected due date and/or immediately post-partum, the nutritional composition may be administered according to any dosage regime described herein. For example, the nutritional composition may be administered at least once daily for at least 8 weeks immediately prior to the expected due
30 date and for between 10 and 14 weeks post-partum. In certain exemplary embodiments, the nutritional composition is administered twice daily for 8 weeks immediately prior to the expected due date and for 12 weeks immediately postpartum.

In certain exemplary embodiments, the nutritional composition is administered orally.

In certain exemplary embodiments the nutritional composition is administered by the mother to herself. In certain alternative embodiments, the nutritional composition is administered to the mother by a medical practitioner, for example a doctor, nurse, health visitor or carer. In certain exemplary embodiments the mother is nutritionally compromised. In certain
5 embodiments the mother is not nutritionally compromised. In certain embodiments, the mother is healthy.

EXAMPLES

10 Methods

A clinical trial was conducted to evaluate the benefits on birth and postpartum outcomes of maternal nutritional supplementation starting at 8 weeks before delivery to 12 weeks postpartum. The effect on exclusive breastfeeding rate, and on infant anthropometrics at
15 birth and at 4 weeks, 8 weeks and 12 weeks postpartum was evaluated.

Mothers were recruited for the study and randomised between the intervention group and the control group. Recruited mothers were 20-35 years of age. Exclusion criteria were: Mother is allergic or intolerant to any ingredient found in the study product; an adverse
20 maternal, foetal or infant medical history that has potential effects on child's growth and/or development; mother has gestational diabetes and/or pre-eclampsia; mother with contraindications to breastfeeding; gestational weight gain is greater than 14 kg at enrolment; mother had a breast surgery; mother and/or newborn infant has major illness that requires intensive care admission; infant has major congenital anomaly.

Two hundred and twenty eight pregnant women from 26-29 weeks gestation were screened and randomized to intervention and control. The control group (n=114) received standard health advice, and continued to take the prenatal supplement primarily consisting of folic acid (400 mcg), elemental iron (60 mg). Mothers in the control group also received breastfeeding
30 advice during prenatal visits. The intervention group (n=114) received lactation support in conjunction with a maternal nutritional supplement designated S348S0.

The nutritional supplement was provided as a powder and reconstituted in water for administration. The powdered nutritional composition had the ingredients and amounts shown in
35 Table 2.

Table 2

<u>Nutrients</u>	<u>Unit</u>	<u>Per 100 g of powder</u>	<u>Per serving (177 mL)</u>
Energy	kcal	344.0	126
Protein	g	23.1	8.4
Fat (Unsaturated Fat)	g	2.0	0.7
DHA	mg	47.0	17
Carbohydrate	g	53.6	19.6
Vitamin A	mcg	333.0	122
Vitamin D3	mcg	13.7	5
Vitamin E	mg	26.0	9.5
Vitamin K1	mcg	44.5	16.2
Vitamin C	mg	192.0	70
Folic acid	mcg	822.0	300
Vitamin B1	mg	2.1	0.77
Vitamin B2	mg	2.3	0.84
Vitamin B6	mg	2.7	1
Vitamin B12	mcg	6.0	2.2
Niacin	mg	7.8	2.8
Pantothenic acid	mg	8.2	3
Choline	mg	330	120
Calcium	mg	1370.0	500
Phosphorus	mg	1305.0	476
Magnesium	mg	315.0	115
Iron	mg	16.7	6.1
Zinc	mg	27.4	10

The powdered composition was reconstituted in the concentration equivalent to 206 g per
 5 litre of water. For example, 36.5 g of powder was mixed into 150 ml of water, to give a final
 volume of 177 ml reconstituted product. In this nutritional supplement, the fat component
 provides about 5% of the total calorific content.

In the intervention group, the reconstituted nutritional composition was administered as 2
 10 servings of 177ml per day starting at 8 weeks before delivery to 12 weeks postpartum. Two

177 ml servings per day of the reconstituted nutritional composition provided to the mothers the nutrients shown in Table 3.

Table 3

5

Nutrients	Unit	Per two servings 354 mL	Percentage meeting RDA* for lactating mothers
Energy	kcal	252	
Protein	g	16.8	
Fat (Unsaturated Fat)	g	1.4	
DHA	mg	34	
Carbohydrate	g	39.2	
Vitamin A	mcg	244	18.8
Vitamin D3	mcg	10	66.7
Vitamin E	mg	19	80.0
Vitamin K1	mcg	32.4	36.0
Vitamin C	mg	140	116.7
Folic acid	mcg	600	120.0
Vitamin B1	mg	1.54	110.0
Vitamin B2	mg	1.68	105.0
Vitamin B6	mg	2	100.0
Vitamin B12	mcg	4.4	157.1
Niacin	mg	5.6	32.9
Pantothenic acid	mg	6	71.4
Choline	mg	240	43.6
Calcium	mg	1000	100.0
Phosphorus	mg	952	102.9
Magnesium	mg	230	64.5
Iron	mg	12.2	135.6
Zinc	mg	20	166.7

*RDA is Recommended Daily Allowance, determined according to The RDA of a mother is determined according to the Dietary Reference Intakes (DRIs)

published by the United States Institute of Medicine, applicable as of December 2015 and available from the US Food and Nutrition Information Center at:
<https://fnic.nal.usda.gov/dietary-guidance/dietary-reference-intakes/dri-tables-and-application-reports>.

5

For both the intervention group and the control group infant anthropometrics (length, weight, and head circumference) were measured at birth, at week 4 postpartum, at week 8 postpartum, and at week 12 post-partum. Exclusive breastfeeding was monitored in both groups at week 4, week 8 and week 12. Other outcomes were also measured including
10 infant's breast milk intake at weeks 4, 8 and 12 postpartum, breast milk energy content, mother's energy, macro- and micro-nutrient intakes, mother's body weight and BMI at baseline, 48 h post delivery, weeks 4, 8 and 12 postpartum.

Results

15

Two hundred and four women completed the study and 24 women discontinued from the study (10 and 14 from the intervention and control groups, respectively). The two groups of mothers (control and intervention) were not different in terms of sociodemographic characteristics and nutritional status assessed by self-reported pre-pregnant BMI and MUAC
20 (mid upper arm circumference) at enrolment. The percentage of C-section delivery was also comparable between the two groups. For the infants, the two groups had similar gestational age at birth and gender distribution.

Birth size and infant growth

25

At birth, new-borns from mothers in the intervention group were larger for all measures (weight, length and head circumference). Figure 1 shows that new-borns from mothers receiving the nutritional supplement had a greater weight, a longer length, and a larger head circumference compared to new-borns from mothers in the control group. This is indicated
30 by the fact that the mean z-score for the intervention group is higher (closer to zero) for all measures, compared to the z-score of infants from the control group (Figure 1). Administration of the nutritional composition to the pregnant mother therefore led to improved birth size of the new-born.

35 Figure 1 also shows that infants of mothers in the intervention group showed better size after 12 weeks compared to infants of mothers in the control group. For all measures (weight,

length and head circumference) infants from the intervention group showed higher (closer to zero) mean z-scores compared to infants from the control group. Administration of the nutritional composition to the breastfeeding mothers therefore led to improved growth of the infant by 12 weeks of age.

5

Infants of mothers receiving the nutritional composition also exhibited an increase in z-score for head circumference at 12 weeks post-partum when compared to the z-score for the infant when new-born. Table 4 shows that infants in the intervention group had z-scores approximately 0.5 units higher at 12 weeks compared to the same infant at birth. This increase in z-score over time indicates that the infants exhibited a rate of growth faster than the expected median growth rate for the reference population. If the infants had grown at the expected median growth rate, the z-score would have remained the same over time. Therefore, the increase in z-score indicates that infants of mothers receiving the nutritional composition exhibited increased growth rates compared to the reference population.

15

Table 4 also shows that administration of the nutritional composition led to improved growth (as measured by length-for-age) compared to infants of mothers in the control group. In the control group, the infants exhibited a decrease in z-score from birth to 12 weeks of age. This indicates the infants in the control group grew at a rate lower than the expected growth rate in the reference population. This reduced growth rate (as measured by length-for-age) was not observed for infants from mothers receiving the nutritional composition. These infants exhibited a change in z-score of approximately zero, indicating they exhibited growth in length at the expected rate for the reference population. Thus, administration of the nutritional composition led to an increased rate of infant growth in length compared to infants from equivalent mothers who did not receive the composition.

25

Table 4

Change from birth to 12 weeks	Intervention (n=104)	p-value (within group)	Control (n=100)	p-value (within group)
Weight for age z-score	0.02	0.8083	0.14	0.0668
Length for age z-score	-0.08	0.4088	-0.23	0.0317

Head circumference for age z-score	0.51	<.0001	0.44	<.0001
--	------	--------	------	--------

p-value is calculated from paired t-test

Exclusive breastfeeding

5

Mothers in the intervention group were more likely to be exclusively breastfeeding at all time points measured. Figure 2 shows the percentage of mothers in each group that were exclusively breastfeeding at each of week 4, week 8 and week 12 postpartum. The intervention group receiving the nutritional composition showed a higher percentage of mothers were exclusively breastfeeding at each of these time points.

10

Mothers in the intervention group also had a greater likelihood of being able to exclusively breastfeed over 12 weeks than mothers in the control group. This is shown in Figure 3, displaying the odds of exclusive breastfeeding at 12 weeks. The data in Figure 3 indicate that mothers in the intervention group were more than twice as likely to be exclusively breastfeeding at 12 weeks compared to mothers in the control group.

15

Additional outcomes

20 (i) Infant's breast milk intake and energy content

As well as increasing birth size and infant growth, and promoting exclusive breastfeeding, administration of the nutritional supplement to mothers had further observed effects. Figure 4 shows that when the nutritional composition was administered to nutritionally compromised mothers (as indicated by a mid upper arm circumference or MUAC <50th percentile), infants of those mothers had an increased milk intake over 12 weeks compared to infants from nutritionally compromised mothers in the control group. In terms of breast milk energy content, there were no differences over the 12 week postpartum period between the two study groups.

25

30 The significantly higher infant milk intake in mothers of the intervention group who were classified as undernourished (MUAC measured at enrolment < 50 percentile) can likely be attributed to increased breast milk volume in supplemented mothers, since the mean number

of breast-feed episodes and the duration of the breast-feed episodes were comparable between the two study groups.

(ii) Maternal energy and micronutrient intake

5

Mothers receiving the nutritional composition had a greater intake of energy (kcal), protein (g), and carbohydrate (g) but no greater intake of fat (g) compared to mothers in the control group (Figure 5 A-C). Despite this increase in calorie intake, mothers in the intervention group showed no difference in postpartum weight loss compared to mothers in the control group (Figure 6).

10

The higher increase in carbohydrate and protein intakes but not fat intake in the intervention group in this study reflects the macronutrient distribution characteristics of the supplement. However, although the energy consumption was significantly higher than in the control group, mothers in the intervention group experienced similar level of weight loss over the postpartum period, resulting in comparable weight and BMI status between the two study groups at all the study time points. Since physical activity levels were expected not to be different between the two groups, the difference in energy intake coming from increased protein and carbohydrate intakes is likely utilized for breast milk production.

15

20

CLAIMS

1. A method for promoting increased birth size of a new-born, the method comprising administering to a pregnant mother a nutritional composition comprising:
5 a protein component providing about 5 wt% to about 40 wt% by dry weight of the composition;
a carbohydrate component providing about 20 wt% to about 80 wt% by dry weight of the composition;
a fat component providing no more than about 20 wt% by dry weight of the
10 composition; and
a micronutrient component providing about 0.5 wt% to about 4.5 wt% by dry weight of the composition.

2. A method according to claim 1, wherein the method is a method for promoting
15 increased birth weight, birth length and/or head circumference at birth.

3. A method for promoting increased infant size, the method comprising administering to a mother breastfeeding the infant a nutritional composition comprising:
20 a protein component providing about 5 wt% to about 40 wt% by dry weight of the composition;
a carbohydrate component providing about 20 wt% to about 80 wt% by dry weight of the composition;
a fat component providing no more than about 20 wt% by dry weight of the composition; and
25 a micronutrient component providing about 0.5 wt% to about 4.5 wt% by dry weight of the composition.

4. A method according to claim 3, wherein the method is a method for promoting
30 increased infant weight, infant length and/or head circumference of the infant.

5. A method according to claim 3 or claim 4, wherein increased infant size is measurable at 12 weeks of age.

6. A method of promoting exclusive breastfeeding of a new-born or infant by a
35 mother, the method comprising administering to the mother a nutritional composition comprising:

a protein component providing about 5 wt% to about 40 wt% by dry weight of the composition;

a carbohydrate component providing about 20 wt% to about 80 wt% by dry weight of the composition;

5 a fat component providing no more than about 20 wt% by dry weight of the composition; and

a micronutrient component providing about 0.5 wt% to about 4.5 wt% by dry weight of the composition.

10 7. A method according to claim 6, wherein the method promotes exclusive breastfeeding for at least 4 weeks post-partum.

8. A method of increasing breast milk production in a nutritionally-compromised mother, the method comprising administering to the mother a nutritional composition comprising:

15 a protein component providing about 5 wt% to about 40 wt% by dry weight of the composition;

a carbohydrate component providing about 20 wt% to about 80 wt% by dry weight of the composition;

20 a fat component providing no more than about 20 wt% by dry weight of the composition; and

a micronutrient component providing about 0.5 wt% to about 4.5 wt% by dry weight of the composition.

25 9. A method according to claim 8 wherein a nutritionally-compromised mother is a mother having a mid upper arm circumference (MUAC) <50th percentile.

10. A method according to any one of claims 1-9, wherein the nutritional composition has a total calorific content of less than about 450kcal per 100g dry weight.

30

11. A method according to any preceding claim, wherein the fat component provides less than 40% of the total calorific content of the composition, optionally from 1% to 10% of the total calorific content of the composition, optionally 5% of the total calorific content of the composition.

35

12. A method according to any preceding claim, wherein the fat component provides about 0.5 wt% to about 5 wt% by dry weight of the composition, optionally from about 1.5 wt% to about 2.5 wt% by dry weight of the composition.

13. A method according to any preceding claim, wherein the protein component provides from about 20 to about 25 wt% by dry weight of the composition, optionally about 23 wt% by dry weight of the composition.

5

14. A method according to any preceding claim, wherein the carbohydrate component provides about 50 wt% to about 55 wt% by dry weight of the composition, optionally about 54 wt% by dry weight of the composition.

10

15. A method according to any preceding claim, wherein the micronutrient component provides about 3 wt% to about 4 wt% by dry weight of the composition, optionally about 3.6 wt% by dry weight of the composition.

15

16. A method according to any preceding claim, wherein the micronutrient component comprises one or more micronutrients selected from: Vitamin A, Vitamin D3, Vitamin E, Vitamin K1, Vitamin C, Folic acid, Vitamin B1, Vitamin B2, Vitamin B6, Vitamin B12, Niacin, Pantothenic acid, Choline, Calcium, Phosphorus, Magnesium, Iron, Zinc, Manganese, Copper, Selenium, and Chromium.

20

17. A method according to claim 16, wherein the micronutrient component consists of Vitamin A, Vitamin D3, Vitamin E, Vitamin K1, Vitamin C, Folic acid, Vitamin B1, Vitamin B2, Vitamin B6, Vitamin B12, Niacin, Pantothenic acid, Choline, Calcium, Phosphorus, Magnesium, Iron, Zinc, Manganese, Copper, Selenium, and Chromium.

25

18. A method according to claim 16 or claim 17, wherein, when present, each micronutrient in the micronutrient component is present in the composition in the following amounts:

Micronutrient	Unit	Per 100g dry weight of nutritional composition
Vitamin A	mcg	300-350
Vitamin D3	mcg	10-15
Vitamin E	mg	20-30
Vitamin K1	mcg	40-50
Vitamin C	mg	190-200
Folic acid	mcg	820-830
Vitamin B1	mg	1.5-2.5
Vitamin B2	mg	1.5-2.5

Vitamin B6	mg	2.0-3.0
Vitamin B12	mcg	5-10
Niacin	mg	7.5-8.5
Pantothenic acid	mg	7.5-8.5
Choline	mg	320-340
Calcium	mg	1250-1500
Phosphorus	mg	1200-1500
Magnesium	mg	300-330
Iron	mg	10-20
Zinc	mg	20-30
Manganese	mg	1-2
Copper	mg	1-2
Selenium	mcg	75-100
Chromium	mcg	55-75

19. A method according to any preceding claim, wherein the composition further comprises an omega-3 fatty acid in an amount of about 0.03 wt% to about 0.06 wt% by dry weight of the composition, optionally about 0.04 wt% to about 0.05 wt% by dry weight of the composition.

20. A method according to claim 19, wherein the omega-3 fatty acid is docosahexaenoic acid (DHA).

21. A method according to any preceding claim, wherein the composition is administered at least once weekly, optionally at least once every 3 days, optionally at least once every 2 days, optionally at least once daily.

22. A method according to claim 21, wherein the composition is administered twice daily.

23. A method according to any preceding claim, wherein the composition is administered in an amount sufficient to provide from about 50 kcal to about 350 kcal per administration.

24. A method according to claim 23, wherein the composition is administered in an amount sufficient to provide about 100 to about 150 kcal per administration, or alternatively in an amount to provide about 220 kcal to about 270 kcal per administration.

25. A method according to any preceding claim, wherein the nutritional composition is administered in an amount sufficient to provide from about 1 g to about 20 g of protein per administration.

26. A method according to any preceding claim, wherein the nutritional composition is administered in an amount sufficient to provide from about 0.1 g to about 2 g of fat per administration

27. A method according to any preceding claim, wherein the nutritional composition is administered in an amount sufficient to provide from about 10 g to about 50 g of carbohydrate per administration.

28. A method according to any preceding claim, wherein the nutritional composition is administered at least once per day in an amount sufficient to provide from about 50 kcal to about 350 kcal per day.

29. A method according to any preceding claim, wherein the nutritional composition is administered at least once per day in an amount sufficient to provide from about 1 g to about 20 g of protein per day.

30. A method according to any preceding claim, wherein the nutritional composition is administered at least once per day in an amount sufficient to provide from about 0.1 g to about 2 g of fat per day.

31. A method according to any preceding claim, wherein the nutritional composition is administered at least once per day in an amount sufficient to provide from about 10 g to about 50 g of carbohydrate per day.

32. A method according to any preceding claim, wherein the nutritional composition is administered at least once per day in an amount sufficient to provide per day at least 15% of the mother's recommended daily allowance (RDA) of each micronutrient of the micronutrient component in the composition.

33. A method according to any preceding claim, wherein the nutritional composition is administered to the pregnant mother for at least 1 week immediately before the expected due date of the pregnancy, optionally at least 8 weeks immediately before the expected due date of the pregnancy.

34. A method according to any one of claims 2-33, wherein the nutritional composition is administered to the mother for at least 1 week immediately post-partum, optionally at least 4 weeks immediately post-partum, optionally at least 12 weeks immediately post-partum.

5

35. A method according to any one of claims 2-34, wherein the nutritional composition is administered to the mother immediately before the expected due date and immediately post-partum.

10

36. A method according to any preceding claim, wherein the nutritional composition is administered by the mother herself.

Fig 1

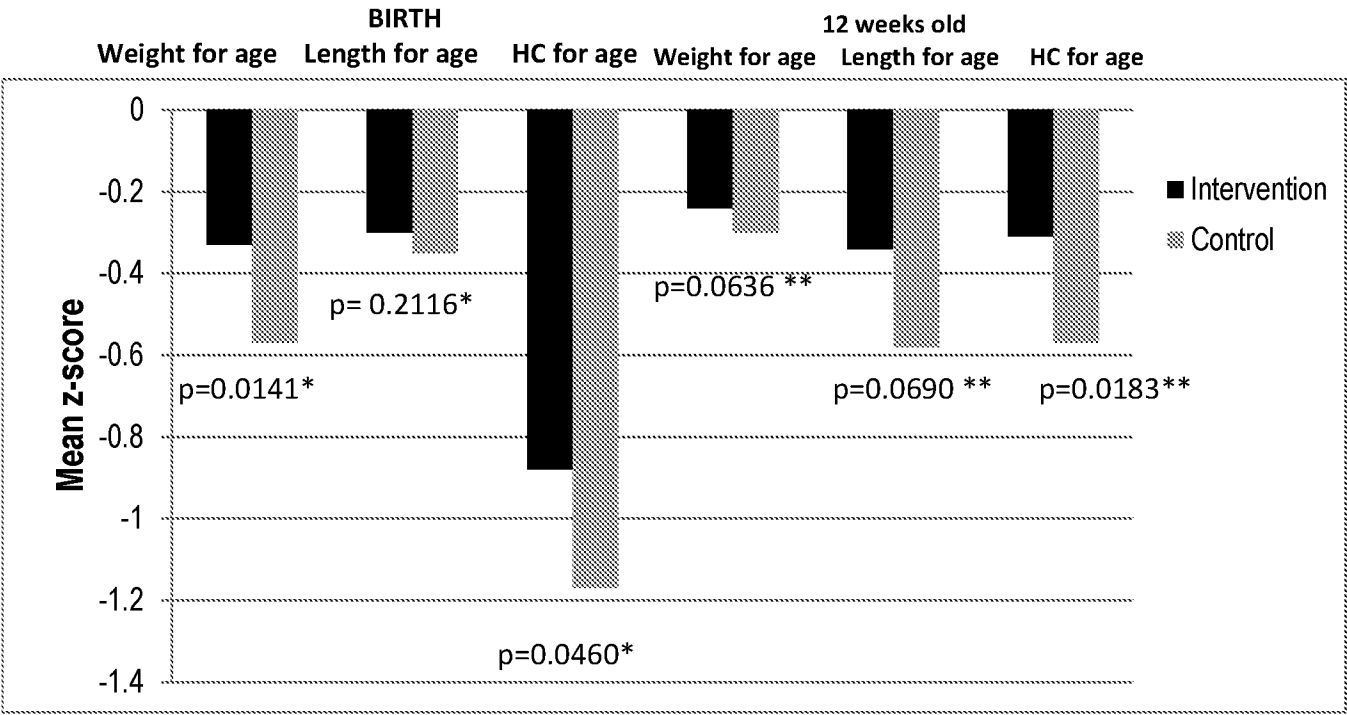


Fig 2

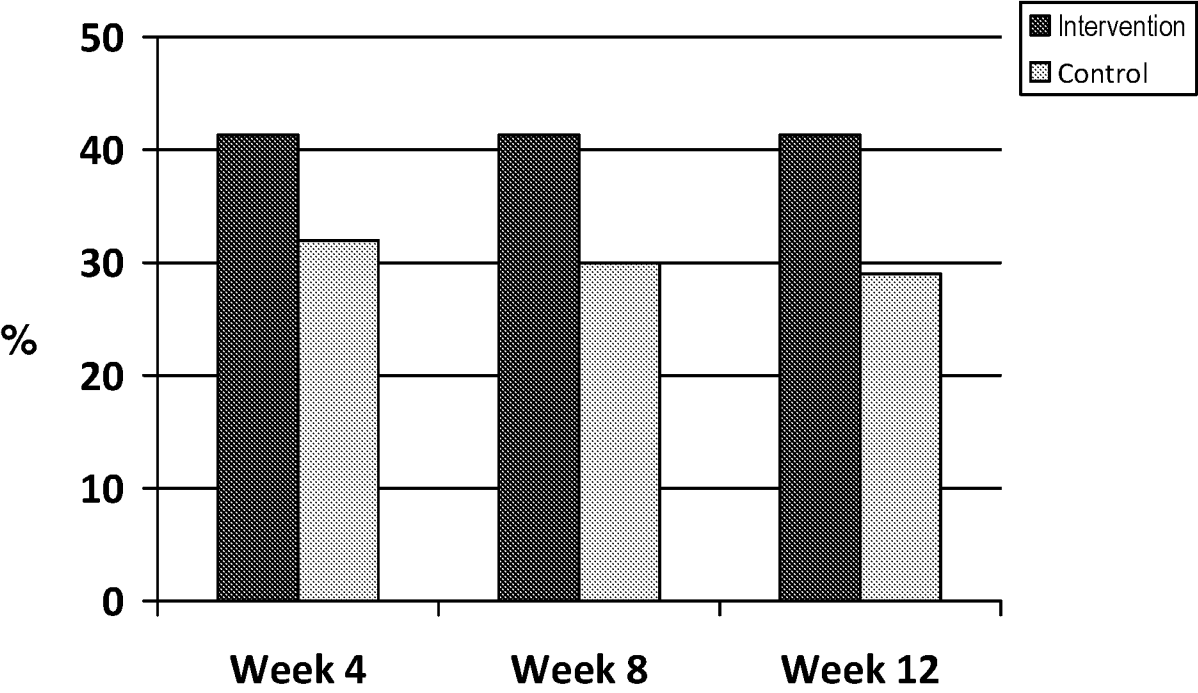


Fig 3

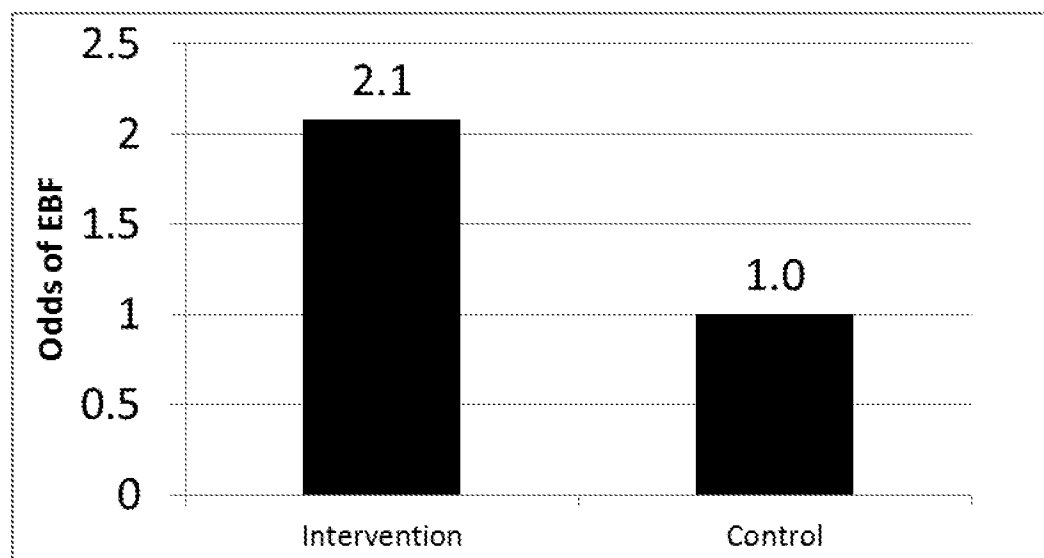


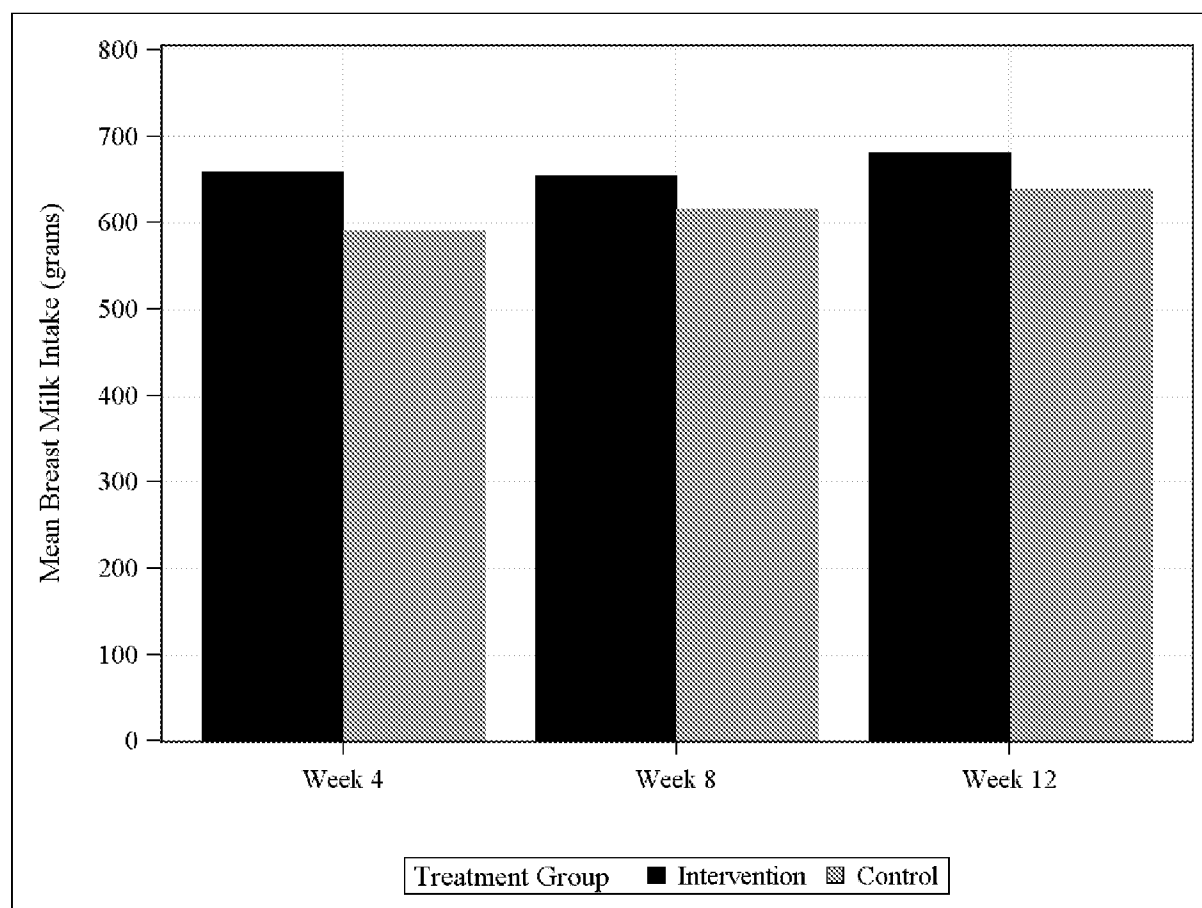
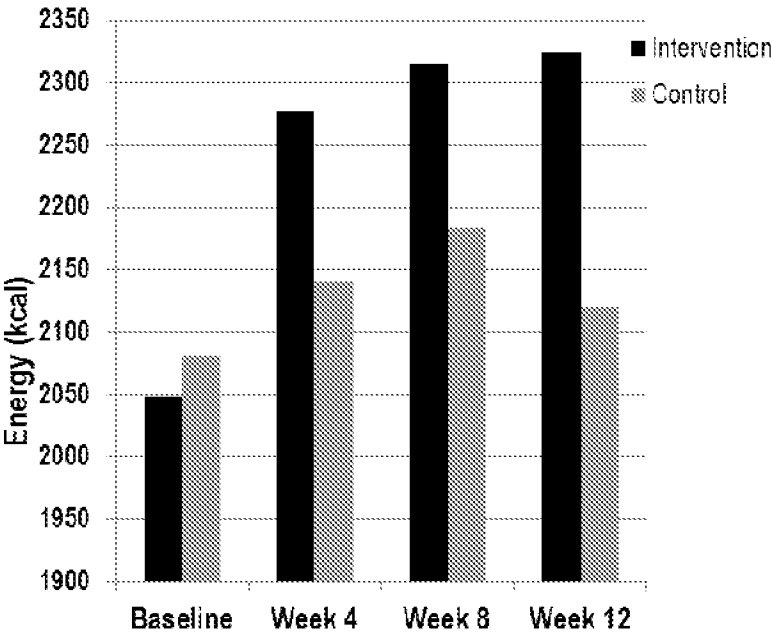
Fig 4

Fig 5

A



B

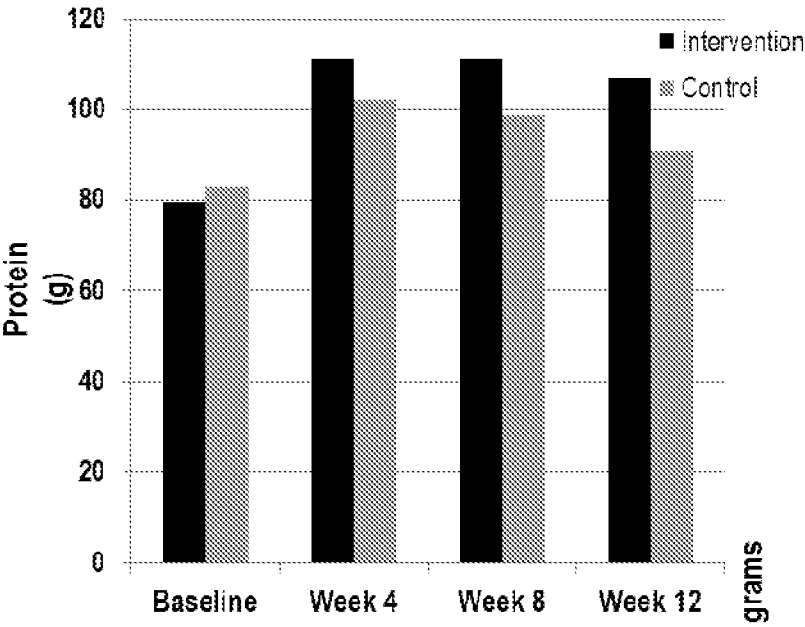


Fig 5 continued

C

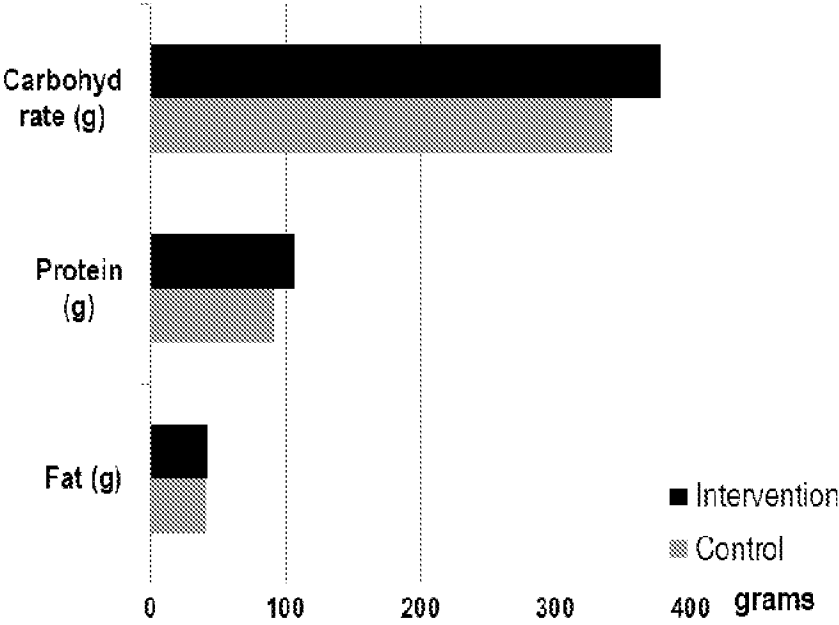
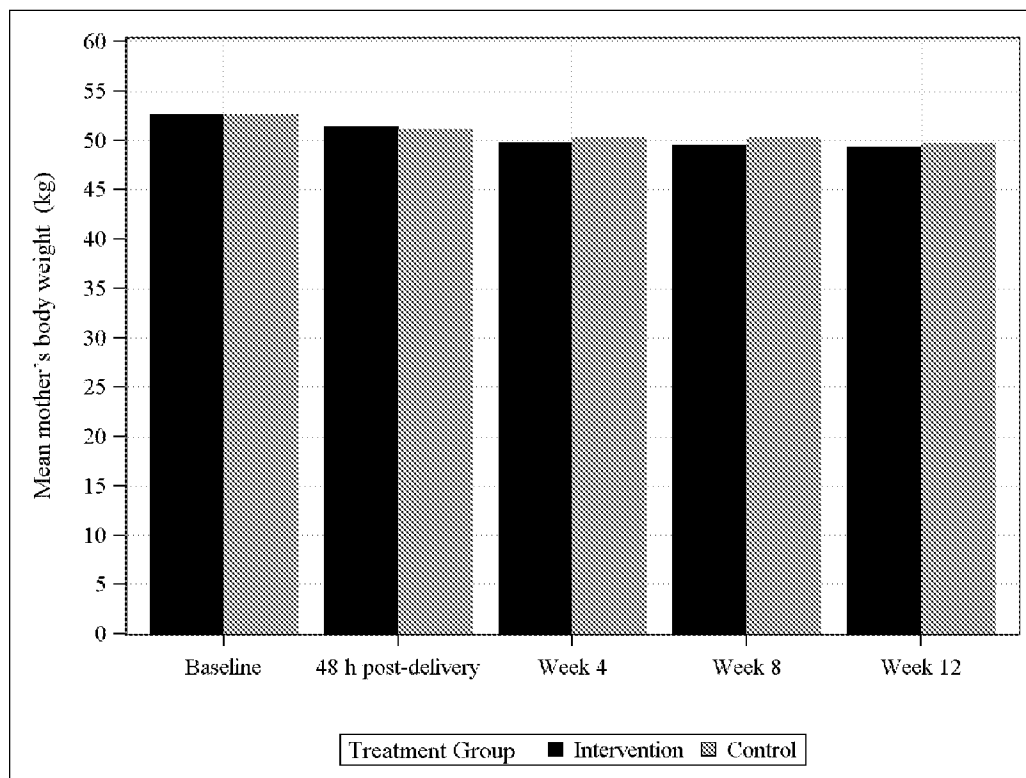
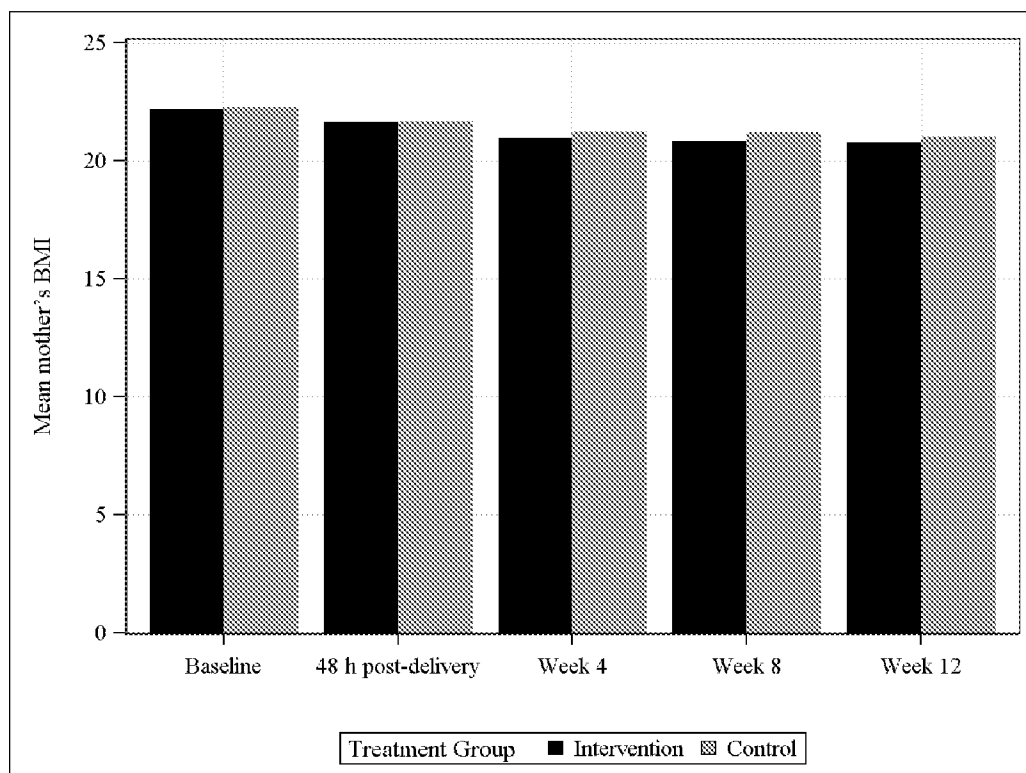


Fig 6**A****B**

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2017/030829

A. CLASSIFICATION OF SUBJECT MATTER INV. A23L33/115 A23L33/12 A23L33/15 A23L33/16 A23L33/17 ADD. A61P3/02 A61P15/14		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) A23L A61P		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, BIOSIS, FSTA, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 710 387 A (UITERWAAL DIRK J D [NL] ET AL) 1 December 1987 (1987-12-01)	1-5,10,11,14-18,21-34,36
Y	column 1, lines 8-14 column 1, line 60 - column 2, line 24 column 2, lines 32-50 column 3, lines 26-38 example III column 9, lines 9-25 <div style="text-align: center; margin-top: 10px;"> ----- -/-- </div>	19,20
<div style="display: flex; justify-content: space-between;"> ☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex. </div>		
* Special categories of cited documents : <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 48%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p> </div> </div>		
Date of the actual completion of the international search <div style="text-align: center; font-size: 1.2em;">2 August 2017</div>		Date of mailing of the international search report <div style="text-align: center; font-size: 1.2em;">09/08/2017</div>
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer <div style="text-align: center; font-size: 1.2em;">Couzy, François</div>

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2017/030829

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012/189734 A1 (TEK KONTHIRITH [FR] ET AL) 26 July 2012 (2012-07-26) paragraphs [0001], [0003], [0005], [0008], [0016] - [0018], [0029], [0032] - [0042], [0043], [0051], [0053] paragraphs [0055] - [0072] -----	3-8,10,11,13-19,21-27,29-32,34-36
Y	US 2008/226745 A1 (VAN ELSWYK MARY [US]) 18 September 2008 (2008-09-18) paragraphs [0001], [0009] - [0027], [0032], [0045], [0052] - [0057], [0084] - [0088] -----	19,20
Y	WO 2007/135141 A1 (NESTEC SA [CH]; HASCHKE FERDINAND [CH]; KRATKY ZDENEK [US]) 29 November 2007 (2007-11-29) page 3, lines 7-14 page 5, lines 6-25 -----	19,20
X	BASSIR ET AL: "Nutritional studies on breast milk of Nigerian women - Supplementing the maternal diet with a protein-rich plant product", TRANSACTIONS OF THE ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE, ELSEVIER, GB, vol. 53, no. 3, 1 May 1959 (1959-05-01), pages 256-261, XP023294252, ISSN: 0035-9203, DOI: 10.1016/0035-9203(59)90005-7 [retrieved on 1959-05-01] the whole document -----	3,5,8,10,11,15,21,23-25,36
A	US 6 228 388 B1 (PARADISSIS GEORGE [US] ET AL) 8 May 2001 (2001-05-08) column 3, lines 22-63 -----	1-36

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2017/030829

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4710387	A	01-12-1987	EP 0183305 A1	04-06-1986
			NL 8403433 A	02-06-1986
			US 4710387 A	01-12-1987

US 2012189734	A1	26-07-2012	AU 2010277679 A1	15-03-2012
			BR 112012008136 A2	25-08-2015
			CA 2768813 A1	03-02-2011
			CN 102497788 A	13-06-2012
			DK 2459013 T3	03-03-2014
			EP 2459013 A1	06-06-2012
			ES 2453072 T3	03-04-2014
			FR 2948537 A1	04-02-2011
			HK 1166244 A1	10-10-2014
			HR P20140238 T1	25-04-2014
			JP 2013500028 A	07-01-2013
			JP 2015221033 A	10-12-2015
			KR 20120051708 A	22-05-2012
			MA 33464 B1	03-07-2012
			MY 153114 A	31-12-2014
			NZ 598437 A	28-03-2014
			PE 13062012 A1	22-09-2012
			PT 2459013 E	25-03-2014
			SG 177753 A1	29-03-2012
			SI 2459013 T1	30-04-2014
			US 2012189734 A1	26-07-2012
			WO 2011012568 A1	03-02-2011

US 2008226745	A1	18-09-2008	AU 2002323409 A1	10-03-2003
			US 2003060509 A1	27-03-2003
			US 2008226745 A1	18-09-2008
			US 2013196008 A1	01-08-2013
			US 2014370130 A1	18-12-2014
			WO 03017945 A2	06-03-2003

WO 2007135141	A1	29-11-2007	AU 2007253309 A1	29-11-2007
			BR PI0711797 A2	06-12-2011
			CA 2653091 A1	29-11-2007
			CN 101472578 A	01-07-2009
			EP 1886680 A1	13-02-2008
			EP 2026791 A1	25-02-2009
			ES 2423682 T3	23-09-2013
			MY 149914 A	31-10-2013
			PT 2026791 E	18-07-2013
			RU 2008150859 A	27-06-2010
			US 2009142314 A1	04-06-2009
			US 2012027738 A1	02-02-2012
			WO 2007135141 A1	29-11-2007
			ZA 200810799 B	31-03-2010

US 6228388	B1	08-05-2001	AT 234610 T	15-04-2003
			AU 5162793 A	12-04-1994
			CA 2144751 A1	31-03-1994
			DE 69332777 D1	24-04-2003
			EP 0662825 A1	19-07-1995
			US 5494678 A	27-02-1996
			US 6228388 B1	08-05-2001
			WO 9406415 A1	31-03-1994
