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(54) **Title**: ARRAY OF AGE-TAILORED INFANT FORMULA WITH OPTIMUM PROTEIN CONTENT AND LACTOSE CONTENT

(57) **Abstract**: The present invention relates to an array of infant formula for providing an age-tailored nutrition system to an infant, it comprises a first infant formula between 0 to 100 days, a second infant formula between 100 to 180 days, and an optional third infant formula between 180 days to 1 year, wherein the content of protein in the second infant formula is lower than in the first infant formula; the content of lactose in the second infant formula is higher than in the first infant formula; the content of protein in the optional third infant formula is lower than in the second infant formula; and the content of lactose in the optional third infant formula is higher than in the second infant formula array of infant formula for providing an age-tailored nutrition system to an infant comprising a first infant formula between 0 to 100 days and a second infant formula between 100 to 180 days, wherein the content of protein in the second infant formula is lower than in the first infant formula; and the content of lactose in the second infant formula is higher than in the first infant formula. The array of the invention also relates to its preparation method and uses.

Array of age-tailored infant formula with optimum protein content and lactose content

Field of the invention

The present invention relates to an array of infant formula which are specifically designed to address the needs of infants between 0 and 180 days, especially between 0 to 100 days, optionally between 180 days to 1 year. In particular, the invention provides an array of infant formula for infants between 0 and 180 days, especially between 0 to 100 days, optionally between 180 days to 1 year, each infant formula having age-specific protein content and lactose content.

Background of the invention

The composition of the human milk varies naturally according to the age of the infant. Such variations affect not only the overall energy density but also greatly affect the relative infant formula of the milk in the diverse nutrients. For example, the protein content and lactose content of human breast milk varies during breastfeeding according to the age of the infant, especially the age of the infant between 0 and 6 months. So far however the exact composition of human breast milk and its evolution over time remains an area of dispersed knowledge and of some conflicting information.

It is therefore important to develop infant formula which replicates human breast milk in terms of nutritional properties.

Infant formula, follow-up formula and grown-up milks which are aimed at different age groups of 0 to 6 months, 6 months to 12 months, and 12 months to 3 years respectively are well known. These formulas aim to meet the requirements of infants and young children at the different ages.

An age-tailored nutrition system for infants is described in WO 2009/068549, wherein the protein nature and content are adapted to specific age groups.

However, there is still a need to develop an array of infant formula which replicates human breast milk in more fine divided phases, especially human breast milk between 0 to 100 days and from 100 to 180 days as far as possible in terms of nutritional properties.

There is especially a need to develop an array of such infant formula that correspond specifically to the need of some particular population, such as Chinese, because the time point of 100 days is very important for an infant in the Chinese convention, and may correspond to a change in the traditional nutritional pattern for infants.

Object of the invention

It is an object of the invention to follow the nutritional evolution curve of human breast milk between 0 to 180 days, especially human breast milk between 0 to 100 days.

Summary of the invention

Thus, in one aspect, the invention provides an array of infant formula for providing an age-tailored nutrition system to an infant, it comprises a first infant formula between 0 to 100 days, a second infant formula between 100 to 180 days, and an optional third infant formula between 180 days to 1 year, wherein
the content of protein in the second infant formula is lower than in the first infant formula;
the content of lactose in the second infant formula is higher than in the first infant formula;
the content of protein in the optional third infant formula is lower than in the second infant formula; and

the content of lactose in the optional third infant formula is higher than in the second infant formula.

In another one aspect, the invention provides a method of providing nutrition to an infant, comprising:
(i) feeding to the infant for initial 100 days of life the first infant formula,
(ii) feeding to the infant for the remainder of the first 180 days of life the second infant formula, and optionally
(iii) feeding to the infant for the remainder of the first 1 year of life the optional third infant formula.

In still another aspect, the invention provides use of the array of infant formula in reducing obesity or diabetes or the risk thereof later in life, or in reducing cardiovascular diseases or the risk thereof later in life.

The invention may be targeted, in another aspect, to some particular groups of populations that have similar or related dietary and/or genetic background (for example such as the Chinese population).

Detailed description of the invention

In the present specification, the following words are given a definition that must be taken into account when reading and interpreting the description, examples and claims.

Infant: according to the Commission Directive 91/321/EEC of 14 May 1991 on infant formula and follow-on formula, article 1.2 (a), the term "infants" means children under the age of 1 year. This definition is adopted in the present specification.

The term "infant formula" means foodstuffs intended for particular nutritional use by infants and satisfying by themselves the nutritional requirements of this category of persons. It has to be understood that infants can be

fed solely with infant formula, or that the infant formula can be used by the carer as a complement of human milk.

Probiotic: according to the paper Probiotics in Man and Animals, J. Appl Bacteriol. 66: 365-378, a probiotic is defined as a live microbial feed supplement which beneficially affects the host animal by improving its intestinal microbial balance.

In order to mimic human breast milk, we carried out an investigation in China to characterize the nutrients composition of Chinese mother milk. Some results of protein, lactose, fat, energy density and mineral nutrients in our statistical report of breast milk of Chinese lactating mothers are briefly provided below.

Study design

This is an observational, cross sectional, multi-center study aiming at evaluating nutrients composition of breast milk and nutrition intake of Chinese lactating mothers in 3 cities in China.

Study population

• Number of subjects

Total 540 healthy subjects were enrolled, allowing a drop-out rate of 10 percent. They were comprised of:

- 480 Lactating mothers in 3 cities (Beijing, Suzhou and Guangzhou)
- 30 mothers per city for each of the 5 time points (5-11 days, 1 month, 2 months, 4 months and 8 months)

Inclusion/Exclusion criteria

• Inclusion: Healthy Chinese lactating mothers without history of acute and chronic diseases; exclusively breast feeding mothers during 4 months after delivery were enrolled.

• Exclusion: Chinese lactating mothers having history of psychopath tendencies and having no dietary memory.

Results

Summary statistics of Minerals

months	N	Min	Mean	SD	Max
Energy density (kcal/100ml)					
0	86	38.00	58.58	10.42	89.0
1	88	38.00	64.03	12.20	98.0
2	90	29.00	62.26	14.19	99.0
4	90	33.00	58.01	13.28	94.0
8	89	25.00	58.66	14.15	96.0
Fat (g/100ml)					
0	86	0.70	2.87	1.10	6.2
1	88	0.90	3.59	1.35	7.3
2	90	0.20	3.48	1.58	7.9
4	90	0.60	3.09	1.44	7.2
8	89	0.50	3.18	1.56	7.6
Lactose (g/100ml)					
0	86	5.00	6.76	0.51	7.9
1	88	5.60	6.98	0.38	7.7
2	90	6.00	7.16	0.29	7.8
4	90	6.20	7.23	0.31	8.0
8	89	6.60	7.28	0.33	8.2
Protein (g/100ml)					
0	86	0.60	1.32	0.34	2.3
1	88	0.20	1.06	0.22	1.9
2	90	0.50	0.90	0.15	1.4
4	90	0.10	0.80	0.12	1.1
8	89	0.20	0.77	0.15	1.3
Calcium (mg/kg)					
0	90	192.00	303.32	52.45	419.00
1	90	151.00	293.16	46.27	397.00
2	90	206.00	309.27	42.99	432.00
4	90	198.00	287.44	39.99	406.00
8	90	150.00	267.59	43.43	462.00
Copper (mg/kg)					
0	90	0.16	0.56	0.15	0.93
1	89	0.26	0.49	0.14	1.10
2	90	0.15	0.35	0.09	0.59
4	90	0.13	0.31	0.07	0.47
8	86	0.11	0.28	0.09	0.64
Iodine (μg/kg)					
0	89	53.00	293.63	157.29	946.00
1	89	62.00	223.35	121.47	618.00
2	85	51.00	188.09	91.33	680.00
4	88	51.00	175.28	75.99	484.00
8	90	59.00	185.96	96.35	594.00
Phosphorus (mg/kg)					

0	90	66.00	143.79	33.64	214.00
1	90	73.00	147.88	24.64	228.00
2	90	93.00	136.08	19.48	182.00
4	90	88.00	118.02	18.39	192.00
8	90	35.00	113.58	19.45	198.00
Potassium (mg/kg)					
0	90	438.00	665.89	111.00	1001.00
1	90	423.00	600.34	79.03	832.00
2	90	375.00	537.10	63.30	715.00
4	90	352.00	489.12	61.36	649.00
8	90	356.00	459.26	47.94	614.00
Sodium (mg/kg)					
0	89	8.70	36.28	22.57	122.00
1	89	9.70	23.77	19.09	128.00
2	90	6.00	14.30	6.75	51.00
4	90	4.10	13.26	6.88	45.00
8	90	3.90	12.05	9.24	81.00
Zinc (mg/kg)					
0	90	0.89	3.87	1.52	9.90
1	90	0.91	2.85	1.16	7.30
2	90	0.66	1.98	0.68	4.10
4	89	0.52	1.47	0.61	3.50
8	86	0.57	1.25	0.50	2.90

According to above results, the inventors performed statistical analysis and surprisingly found: (1) the contents of protein and energy density in breast milk gradually decrease and the content of lactose gradually increases in the first 12 months, especially in the first 6 months; and (2) the contents of many mineral nutrients in breast milk gradually decrease in the first 12 months, especially in the first 6 months. Moreover, the ratio of calcium and phosphorus gradually increase in this period. Based on these unexpected findings, the present invention provides modified contents of protein, lactose, mineral nutrients in infant formula to improve nutritional condition of an infant.

Thus, in one embodiment of the invention, the invention provides an array of infant formula for providing an age-tailored nutrition system to an infant, it comprises a first infant formula between 0 to 100 days, a second infant formula between 100 to 180 days, and an optional third infant formula between 180 days to 1 year, wherein

the content of protein in the second infant formula is lower than in the first infant formula;
the content of lactose in the second infant formula is higher than in the first infant formula;
the content of protein in the optional third infant formula is lower than in the second infant formula; and
the content of lactose in the optional third infant formula is higher than in the second infant formula.

In one embodiment of the invention, the invention provides an array of infant formula, wherein
said first infant formula comprises a protein content of between 1.9 and 2.9g/100kcal, preferably between 2.2 and 2.7g/100kcal, more preferably between 2.4 and 2.6g/100kcal and a lactose content of between 9.2 and 13.8 g/100kcal, preferably between 10.5 and 12.6 g/100kcal, more preferably between 11.3 and 11.9g/100kcal of the first infant formula,
said second infant formula comprises a protein content of between 1.9 and 2.9g/100kcal, preferably between 2.1 and 2.6g/100kcal, more preferably between 2.3 and 2.5g/100kcal and a lactose content of between 9.2 and 13.8 g/100kcal, preferably between 10.3 and 12.5 g/100kcal, more preferably between 11.1 and 11.6g/100kcal of the second infant formula, and
said optional third infant formula comprises a protein content of between 1.9 and 2.9g/100kcal, preferably between 2.0 and 2.5g/100kcal, more preferably between 2.2 and 2.4g/100kcal and a lactose content of between 9.2 and 13.8 g/100kcal, preferably between 10.2 and 12.4 g/100kcal, more preferably between 11.0 and 11.5g/100kcal of the optional third infant formula.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the energy density in the second infant formula is lower than in the first infant formula, and the energy density in the optional third infant formula is lower than in the second infant formula, and

said first infant formula comprises a energy density of between 63 and 67 kcal/100ml, preferably between 65 and 66 kcal/100ml,
said second infant formula comprises a energy density of between 63 and 67 kcal/100ml, preferably between 64 and 65 kcal/100ml, and
said optional third infant formula comprises a energy density of between 63 and 65 kcal/100ml, preferably between 64 and 65 kcal/100ml.

In one embodiment of the invention, the invention provides an array of infant formula, wherein
said first infant formula comprises a fat content of between 4.4 and 5.8g/100 kcal, preferably between 4.8 and 5.3 g/100 kcal, more preferably between 5.0 and 5.2 g/100 kcal of the first infant formula,
said second infant formula comprises a fat content of between 4.4 and 5.8g/100 kcal, preferably between 4.7 and 5.4 g/100kcal, more preferably between 4.9 and 5.2 g/100kcal of the second infant formula, and
said optional third infant formula comprises a fat content of between 4.4 and 5.8g/100 kcal, preferably between 4.6 and 5.3 g/100 kcal, more preferably between 4.8 and 5.3 g/100kcal of the optional third infant formula.

In one embodiment of the invention, the invention provides an array of infant formula,
wherein each of said first, second and optional third infant formula comprises suitable amounts of mineral nutrients selected from the group consisting of calcium, iodine, phosphorus, potassium, sodium, copper and zinc,
wherein the content of at least one of said mineral nutrients in the second infant formula is lower than in the first infant formula, and the content of said at least one mineral nutrient in the optional third infant formula is lower than in the second infant formula.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the contents of at

least two, preferably at least three, more preferably at least four, particularly preferably at least five of said mineral nutrients in the second infant formula are lower than in the first infant formula, and the contents of said at least two, preferably at least three, more preferably at least four, particularly preferably at least five of said mineral nutrients in the optional third infant formula are lower than in the second infant formula.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the contents of iodine, phosphorus, potassium, sodium, copper and zinc in the second infant formula are lower than in the first infant formula, and the contents of said mineral nutrients in the optional third infant formula are lower than in the second infant formula.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the contents of calcium, iodine, phosphorus, potassium, sodium, copper and zinc in the second infant formula are lower than in the first infant formula, and the contents of said mineral nutrients in the optional third infant formula are lower than in the second infant formula.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the content of iodine in the first infant formula is from 50.0 μg/100kcal to 16.5 μg/100kcal, preferably from 25.0 μg/100kcal to 16.5 μg/100kcal, the content of iodine in the second infant formula is from 16.5 μg/100kcal to 14.0 μg/100kcal, and the content of iodine in the optional third infant formula is lower than 14.0 μg/100kcal.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the content of phosphorus in the first infant formula is from 70 mg/100kcal to 42 mg/100kcal, preferably from 52 mg/100kcal to 42 mg/100kcal, the content of phosphorus in the second

infant formula is from 42 mg/100kcal to 38 mg/100kcal, and the content of phosphorus in the optional third infant formula is lower than 38 mg/100kcal.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the content of potassium in the first infant formula is from 170 mg/100kcal to 85 mg/100kcal, preferably from 118 mg/100kcal to 85 mg/100kcal, the content of potassium in the second infant formula is from 85 mg/100kcal to 80 mg/100kcal, and the content of potassium in the optional third infant formula is lower than 80 mg/100kcal.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the content of sodium in the first infant formula is from 58 mg/100kcal to 25 mg/100kcal, preferably from 51 mg/100kcal to 25 mg/100kcal, the content of sodium in the second infant formula is from 25 mg/100kcal to 22 mg/100kcal, and the content of sodium in the optional third infant formula is lower than 22 mg/100kcal.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the content of copper in the first infant formula is from 120 μg/100kcal to 62 μg/100kcal, preferably from 109 μg/100kcal to 62 μg/100kcal, the content of copper in the second infant formula is from 62 μg/100kcal to 55 μg/100kcal, and the content of copper in the optional third infant formula is lower than 55 μg/100kcal.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the content of zinc in the first infant formula is from 1.5 mg/100kcal to 0.7 mg/100kcal, the content of zinc in the second infant formula is from 0.7 mg/100kcal to 0.6 mg/100kcal, and the content of zinc in the optional third infant formula is lower than 0.6 mg/100kcal.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the content of calcium in the first infant formula is from 140 mg/100kcal to 98 mg/100kcal, preferably from 108 mg/100kcal to 98 mg/100kcal, the content of calcium in the second infant formula is from 98 mg/100kcal to 95 mg/100kcal, and the content of calcium in the optional third infant formula is lower than 95 mg/100kcal.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the ratio of calcium and phosphorus in the first infant formula is lower than in the second infant formula, and the ratio of calcium and phosphorus in the second infant formula is lower than in the optional third infant formula.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the ratio of calcium and phosphorus in the first infant formula is from 2.0:1 to 2.2:1, preferably from 2.1:1 to 2.2:1.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the ratio of calcium and phosphorus in the second infant formula is from 2.2:1 to 2.4:1.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the ratio of calcium and phosphorus in the optional third infant formula is from 2.4:1 to 2.5:1.

In one embodiment of the invention, the invention provides an array of infant formula, wherein each of the first, the second and the optional third infant formula comprises long-chain polyunsaturated fatty acids selected from docosahexaenoic acid (DHA), arachidonic acid (ARA), or eicosapentaenoic acid (EPA), and/or comprises medium-chain triglycerides and/or milk fat globule membranes (MFGM), or any mixtures thereof.

In one embodiment of the invention, the invention provides an array of infant formula, wherein each of the first, the second and the optional third infant formula comprises vitamins, lactoferrin, probiotics, prebiotics, proteins associated with milk fat globule membrane (MFGM), hydrolysed or non-hydrolysed protein, carbohydrates, maltodextrin, or any mixtures thereof.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the probiotics in the first and second infant formula are selected from the list comprising *L. helveticus* CNCM I-4095, *B. longum* CNCM I-2618, *B. breve* NCC2950, *L. paracasei* ST11 CNCM I-2116, *B. longum* BB536 ATCC BAA-999, *B. Longum* BL999, *L. acidophilus* L92 FERM BP.4981 or any mixtures thereof, preferably in an amount of 10^4-10^7 cfu/g, most preferably 10^6cfu/g.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the probiotics in the optional third infant formula are selected from the list comprising *B. longum* CNCM I-2618, *B. breve* CNCM I-3865, *B. lactis* CNCM I-3446, *B. longum* ATCC BAA-999 (Bb536), *L. lactis* SL31 CNCM I-4154, *L. paracasei* ST11 CNCM I-2116 or any mixtures thereof, preferably in an amount of 10^6-10^8 cfu/g, most preferably 10^7cfu/g.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the first infant formula has a protein source comprising whey and optionally casein proteins and has a whey:casein ratio between 100:0 and 60:40 and a protein content between 1.9 and 2.9 g protein/100 kcal, and the second infant formula has a protein source comprising whey and casein proteins and has a whey:casein ratio between 70:30 and 50:50 and a protein content between 1.9 and 2.9 g protein/100 kcal with the proviso that either the protein content or the whey:casein ratio of the second formula or both is/are lower than for the first formula.

In one embodiment of the invention, the invention provides an array of infant formula, wherein each of the first, the second and the optional third infant formula are in the form of a powder to be reconstituted or a concentrate to be diluted.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the first, the second and the optional third infant formula are packed in single dose units, each unit comprising sufficient nutritional composition to prepare a single serving upon reconstitution with water.

In one embodiment of the invention, the invention provides an array of infant formula, wherein the single dose units are in a form of a capsule or a can.

In one embodiment of the invention, the invention provides an array of infant formula for use in improving the nutritional condition of an infant from 0 to 180 days, especially from 0 to 100 days.

In one embodiment of the invention, the invention provides use of the array of infant formula for preparation of a kit for improving the nutritional condition of an infant from 0 to 180 days, especially from 0 to 100 days.

In one embodiment of the invention, the invention provides a method of providing nutrition to an infant, comprising:
(i) feeding to the infant for initial 100 days of life the first infant formula,
(ii) feeding to the infant for the remainder of the first 180 days of life the second infant formula, and optionally
(iii) feeding to the infant for the remainder of the first 1 year of life the optional third infant formula.

In one embodiment of the invention, the invention provides the array of infant formula for use in reducing obesity or diabetes or the risk thereof later in life.

In one embodiment of the invention, the invention provides the array of infant formula for use in reducing cardiovascular diseases or the risk thereof later in life.

The array of infant formula of the invention works in synergy such that optimal health effects are observed when the array of infant formula of the invention is used consequently.

Mimicking human breast milk to the best possible extent has been considered as a guidance as for the infant formula of the conventional infant at each individual age of the infant. However the array of infant formula of the invention allows to more closely follow the infant formula of human breast milk by proposing to have 2 individual ages between 0 to 180 days, i.e. one age between 0 to 100 days and another age between 100 to 180 days, whereas standard infant formula conventionally have one age between 0 to 6 months.

In one embodiment the first infant formula is intended for and/or specifically designed to fulfills the needs of infants between 0 and 100 days and the second infant formula is intended for and/or specifically designed to fulfills the needs of infant of more than 100 days. That embodiment can combine with the other features of the claimed invention.

Also, the array of infant formula of the invention optimizes the protein, lactose and/or fat intake of the infants between 0 to 180 days. It has been hypothesized from on-going related studies that this optimization can relate to long term health benefits such as lower occurrence of infections, improved immune function and

immune defenses, lower occurrence of allergies, better gut functions, better gut maturation, optimum growth, avoidance of over-weight later in life and/or better brain development.

It is hypothesized that the optimized fat intake over time allows not only for the best caloric intake and best fatty acids profile and intake (for example fatty acid that have been shown to relate to brain development), but also that the fat enables the transport and intake of lipo-soluble nutrients which play an important role in growth and development. The fat acts indeed as a carrier to lipo-soluble nutrients. As an illustration, providing an optimized fat content in the infant formula over a long period of time indirectly enhances the intake of lipo-soluble vitamins, or other nutrients (such as lipidic components of milk fat globule membranes) over an extended period of time.

The fat in the nutritional infant formula may be selected from milk and/or vegetable fat. Typical vegetable fats include palm olein, high oleic sunflower oil, high oleic safflower oil, canola oil, fish oil, coconut oil, bovine milk fat or any mixtures thereof.

Additionally, any of the infant formula may comprise prebiotics. If present, the prebiotic is preferably present in the infant formula in an amount 1 to 20wt%, preferably 2 to 15wt% on a dry matter basis.

A prebiotic is a non-digestible food ingredient that beneficially affects the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon, and thus improves host health. Such ingredients are non-digestible in the sense that they are not broken down and absorbed in the stomach or small intestine and thus pass intact to the colon where they are selectively fermented by the beneficial bacteria. Examples of prebiotics include certain oligosaccharides, such as

fructooligosaccharides (FOS) and galactooligosaccharides (GOS). A combination of prebiotics may be used such as 90% GOS with 10% short chain fructo-oligosaccharides such as the product sold under the trade mark Raftilose® or 10% inulin such as the product sold under the trade mark Raftiline®.

A particularly preferred prebiotic is a mixture of galacto-oligosaccharide(s), N-acetylated oligosaccharide(s) and sialylated oligosaccharide(s) in which the N-acetylated oligosaccharide(s) comprise 0.5 to 4.0% of the oligosaccharide mixture, the galacto-oligosaccharide(s) comprise 92.0 to 98.5% of the oligosaccharide mixture and the sialylated oligosaccharide(s) comprise 1.0 to 4.0% of the oligosaccharide mixture. This mixture is hereinafter referred to as "CMOS-GOS".

Preferably, any of the infant formula of the array for the invention contain from 2.5 to 15.0 wt% CMOS-GOS on a dry matter basis with the proviso that the infant formula comprises at least 0.02 wt% of an N- acetylated oligosaccharide, at least 2.0 wt% of a galacto-oligosaccharide and at least 0.04 wt% of a sialylated oligosaccharide.

Suitable N-acetylated oligosaccharides include GalNAcα1,3Galβ1,4Glc and Galβ1,6GalNAcα1,3Galβ1,4Glc. The N-acetylated oligosaccharides may be prepared by the action of glucosaminidase and/or galactosaminidase on N-acetyl-glucose and/or N-acetyl galactose. Bqually, N-acetyl-galactosyl transferases and/or N-acetyl-glycosyl transferases may be used for this purpose. The N-acetylated oligosaccharides may also be produced by fermentation technology using respective enzymes (recombinant or natural) and/or microbial fermentation. In the latter case the microbes may either express their natural enzymes and substrates or may be engineered to produce respective substrates and enzymes. Single microbial cultures or mixed cultures may be used. N-

acetylated oligosaccharide formation can be initiated by acceptor substrates starting from any degree of polymerisation (DP) from DP=1 onwards. Another option is the chemical conversion of keto-hexoses (e.g. fructose) either free or bound to an oligosaccharide (e.g. lactulose) into N-acetylhexosamine or an N-acetylhexosamine containing oligosaccharide as described in Wrodnigg, T. M.; Stutz, A.E. (1999) Angew. Chem. Int. Ed. 38:827-828.

Suitable galacto-oligosaccharides include Galβ1,6Gal, Galβ1,6Galβ1,4Glc, Galβ1,6Galβ1,6Glc, Galβ1,3Galβ1,3Glc, Galβ1,3Galβ1,4Glc, Galβ1,6Galβ1,6Galβ1,4Glc, Galβ1,6Galβ1,3Galβ1,4Glc, Galβ1,3Galβ1,6Galβ1,4Glc, Galβ1,3Galβ1,3Galβ1,4Glc, Galβ1,4Galβ1,4Glc and Galβ1,4Galβ1,4Galβ1,4Glc.

Synthesised galacto-oligosaccharides such as Galβ1,6Galβ1,4Glc, Galβ1,6Galβ1,6Glc, Galβ1,3Galβ1,4Glc, Galβ1,6Galβ1,6Galβ1,4Glc, Galβ1,6Galβ1,3Galβ1,4Glc and Galβ1,3Galβ1,6Galβ1,4Glc, Galβ1,4Galβ1,4Glc and Galβ1,4Galβ1,4Galβ1,4Glc and mixtures thereof are commercially available under the trademarks Vivinal® and Elix'or®. Other suppliers of oligosaccharides are Dextra Laboratories, Sigma-Aldrich Chemie GmbH and Kyowa Hakko Kogyo Co.,Ltd. Alternatively, specific glycosyltransferases, such as galactosyltransferases may be used to produce neutral oligosaccharides.

Suitable sialylaled oligosaccharides include NeuAcα2,3Galβ1,4Glc and NeuAcα2,6Galβ1,4Glc. These sialylated oligosaccharides may be isolated by chromatographic or filtration technology from a natural source such as animal milks. Alternatively, they may also be produced by biotechnology using specific sialyltransferases either by enzyme based fermentation technology (recombinant or natural enzymes) or by microbial fermentation technology. In the latter case microbes may either express their natural enzymes and substrates or may be engineered to produce respective

substrates and enzymes. Single microbial cultures or mixed cultures may be used. Sialyl-oligosaccharide formation can be initiated by acceptor substrates starting from any degree of polymerisation (DP) from DP=1 onwards.

The infant formula may optionally contain other substances which may have a beneficial effect such as nucleotides, nucleosides, and the like. Nucleotides may be selected from cytidine monophosphate (CMP), uridine monophosphate (UMP), adenosine monophosphate (AMP), guanosine monophosphate (GMP) or any mixtures thereof.

Any of the nutritional infant formula may also comprise at least one probiotic bacterial strain.

Examples of suitable probiotic micro-organisms include yeasts such as *Saccharomyces*, *Debaromyces*, *Candida*, *Pichia* and *Torulopsis*, moulds such as *Aspergillus*, *Rhizopus*, *Mucor*, and *Penicillium* and *Torulopsis* and bacteria such as the genera *Bifidobacterium*, *Bacteroides*, *Clostridium*, *Fusobacterium*, *Melissococcus*, *Propionibacterium*, *Streptococcus*, *Enterococcus*, *Lactococcus*, *Staphylococcus*, *Peptostrepococcus*, *Bacillus*, *Pediococcus*, *Micrococcus*, *Leuconostoc*, *Weissella*, *Aerococcus*, *Oenococcus* and *Lactobacillus*. Specific examples of suitable probiotic micro-organisms are: *Saccharomyces cereviseae*, *Bacillus coagulans*, *Bacillus licheniformis*, *Bacillus subtilis*, *Bifidobacterium bifidum*, *Bifidobacterium infantis*, *Bifidobacterium longum*, *Enterococcus faecium*, *Enterococcus faecalis*, *Lactobacillus acidophilus*, *Lactobacillus alimentarius*, *Lactobacillus casei subsp. casei*, *Lactobacillus casei Shirota*, *Lactobacillus curvatus*, *Lactobacillus delbruckii subsp. lactis*, *Lactobacillus farciminus*, *Lactobacillus gasseri*, *Lactobacillus helveticus*, *Lactobacillus johnsonii*, *Lactobacillus rhamnosus* (*Lactobacillus GG*), *Lactobacillus sake*, *Lactococcus lactis*, *Micrococcus varians*, *Pediococcus acidilactici*, *Pediococcus pentosaceus*, *Pediococcus acidilactici*, *Pediococcus halophilus*, *Streptococcus*

faecalis, *Streptococcus thermophilus*, *Staphylococcus carnosus*, and *Staphylococcus xylosus*.

Preferred probiotic bacterial strains include *Lactobacillus rhamnosus* ATCC 53103 obtainable from Valio Oy of Finland under the trade mark LGG, *Lactobacillus rhamnosus* CGMCC 1.3724, *Lactobacillus paracasei* CNCM 1-2116, *Bifidobacterium lactis* CNCM 1-3446 sold *inter alia* by the Christian Hansen company of Denmark under the trade mark Bb 12 and *Bifidobacterium longum* ATCC BAA-999 sold by Morinaga Milk Industry Co. Ltd. of Japan under the trade mark BB536.

The amount of probiotic, if present, is preferably present in an amount of 10^3 to 10^{12} cfu/g, more preferably 10^6 to 10^{11} cfu/g, even more preferably 10^4 to 10^9 cfu/g, most preferably 10^7 to 10^9 cfu/g infant formula or per mL of infant formula. In one preferred embodiment, any of the nutritional infant formula of the array comprises $2x10^7$ cfu/g. Most preferably, the probiotic is *Bifidobacterium lactis*.

In an embodiment, the amount of probiotics present in the infant formula of the array may likewise preferably vary as a function of the age of the infant child.

The array of the invention aims to match closely the nutritional evolution curve of human breast milk, at least with respect to the protein, lactose, fat content and energy density.

Thus, in an embodiment, each of the first, second or the optionally third infant formula of the array of the invention is within at least 80%, preferably at least 90%, more preferably at least 95% of the average protein, lactose, fat content and energy density of human breast milk at the corresponding ages.

The nutritional infant formula may be prepared in any suitable manner. For example, an infant formula may be prepared by blending together a protein source, a carbohydrate source such as lactose, and a fat source in appropriate proportions. If used, emulsifiers may be included in the blend. The vitamins and minerals may be added at this point but are usually added later to avoid thermal degradation. Any lipophilic vitamins, emulsifiers and the like may be dissolved into the fat source prior to blending. Water, preferably water which has been subjected to reverse osmosis, may then be mixed in to form a liquid mixture.

The liquid mixture may then be thermally treated to reduce bacterial loads. For example, the liquid mixture may be rapidly heated to a temperature in the range of about 80°C to about 110°C for about 5 seconds to about 5 minutes. This may be carried out by steam injection or by heat exchanger; for example a plate heat exchanger.

The liquid mixture may then be cooled to about 60°C to about 85°C for example by flash cooling. The liquid mixture may then be homogenized for example in two stages at about 7 MPa to about 40 MPa in the first stage and about 2 MPa to about 14 MPa in the second stage. The homogenized mixture may then be further cooled to add any heat sensitive components such as vitamins and minerals. The pH and solids content of the homogenized mixture are conveniently standardized at this point.

The homogenized mixture is transferred to a suitable drying apparatus such as a spray drier or freeze drier and converted to powder. The powder should have a moisture content of less than about 3% by weight. Alternatively, the homogenized mixture is concentrated.

If it is desired to add probiotic(s), they may be cultured according to any suitable method and prepared for addition to the infant formula by freeze-drying or spray-drying for

example. Alternatively, bacterial preparations can be bought from specialist suppliers such as Christian Hansen and Morinaga already prepared in a suitable form for addition to food products such as infant formula. Such bacterial preparations may be added to the powdered infant formula by dry mixing.

The capsules may be disposable capsules equipped with opening means contained within the capsule to permit draining of the reconstituted formula directly from the capsule into a receiving vessel such as a young child bottle. Such a method of using capsules for dispensing an infant or young child nutritional infant formula is described in WO2006/077259. The different nutritional infant formula forming part of the array of the invention may be packed into individual capsules and presented to the consumer in multipacks containing a sufficient number of capsules to meet the requirements of an infant for one week for example. Suitable capsule constructions are disclosed in WO2003/059778.

In one embodiment the invention is particularly adapted to fulfils the specific needs of a Chinese population of infants and/or infant having an asian genetic background. In one embodiment the invention is specifically adapted to populations having similar “Chinese-type” of dietary habits. In one embodiment the invention promotes the most adapted growth and/or most adapted development of the immune, neuronal and/or gastro-intestinal functions, especially in the said populations.

In one aspect, the invention applies to the general population. In another aspect the invention can particularly apply in groups of population having common genetic origins and/or ethnic origins and/or common dietary habits such as a Chinese, Asian , Indian, and/or Mongoloid populations. In particular in light of the results reported hereby the Chinese population is of specific interest for the invention.

In one embodiment the invention specifically responds to the traditional dietary and cultural changes in the nutrition of the (lactating) mothers and/or infants at or around the age of 100 days, especially among some populations (e.g. Chinese or asian populations). These changes, surprisingly reflected in the human breast milk compositions, require specific adaptation of the infants around the same age of 100 days while preserving the most appropriate balance of nutrients at the specific age.

The present invention is further illustrated hereinafter by means of the following non-limiting examples.

Examples

Example 1

An array of age-tailored infant formula is given in the table below, wherein energy density means energy of 100ml standard milk liquid consisting of 13.08g infant formula and 90ml water:

	Age range	0 to 100 days	100 to 180 days	180 days to 1 year
Basics	Reconstitution RTD Volume (ml)	100 to 200	100 to 200	230
	Energy density (kcal/100 ml)	63-67	63-67	63
Protein	Content (g/100kcal)	1.9 to 2.9	1.9 to 2.9	1.9
	Content (g/l)	11.1 to 17.1	11.1 to 17.1	11.1
	Whey:Casein	70:30	70:30	50:50
	Functional proteins	.	.	
Carbo-hydrates	Type	Lactose	Lactose	Lactose
	Content (g/100kcal)	9.2 to 13.8	9.2 to 13.8	10.6
	Content (g/l)	54.0 to 81.2	54.0 to 81.2	62.3
Lipids	Type	Milk&Veg.	Milk & Veg.	Milk & Veg.

	Content (g/100kcal)	4.4 to 5.8	4.4 to 5.8	5.6
	content (as % of total energy)	45.9 to 52.2	45.9 to 52.2	45.8
	Content (g/l) LC-PUFA	25.8 to 34.0 DHA + ARA	25.8 to 34.0 DHA + ARA	32.8 DHA + ARA
Soluble Fibers	Content (g/100kcal)			
Probiotics	Type	*B.lactis*	*B.lactis or Bifido Longum* ATCC BAA-999	
	Content	2x 10^7cfu/g	2x 10^7cfu/g or 10^9 cfu/g	
Nucleotides	CMP (mg/100 kcal)	1.1	1.1	-
	UMP	0.7	0.7	-
	AMP	0.7	0.7	-
	GMP	0.2	0.2	-
	NucleoPremix			-
Minerals (/100kcal)	Na (mg)	40	24	21
	K (mg)	105	81	70
	Na/K (molar ratio)	*0.65*	*0.5*	*0.5*
	(Na+K)/Cl molar ratio	*1.71 to 1.81*	*1.71 to 1.81*	*1.71*
	Cl (mg)	87 to 92	61 to 65	56
	Ca (mg)	100	97	90
	P (mg)	47	42	37
	Mg (mg)	7	7	7
	Mn (µg)	5	5	5
	Ca/P	2.13	2.31	2.43
	Fe (mg)	0.7	0.7	1
	I (µg)	25	15	13
	Cu (µg)	100	60	53
	Zn (mg)	1.2	0.65	0.55
	Se (µg)	3 to 4	3 to 4	3
	F (µg)			-
Vitamins (/100kcal)	Vit. A (mg RE)	0.09 to 0.1125	0.09 to 0.1125	0.09
	Beta carotene (µg)			
	Vit. D (mg)	0.0015	0.0015	0.0015
	Vit. E (mg)	1.3	1.3	1.3
	Vit. K1 (µg)	8	8	8
	Vit. C (mg)	15	15	15
	Vit. B1 (mg)	0.07 to 0.1	0.07 to 0.1	0.1
	Vit. B2 (mg)	0.1	0.1	0.1

	Niacin (mg)	0.5	0.5	0.5
	Vit. B6 (mg)	0.05	0.05	0.05
	Folic acid (μg)	15 to 16	15 to 16	15
	Pantothenic Acid (mg)	0.7 to 0.8	0.7 to 0.8	0.8
	Vit. B12 (μg)	0.2	0.2	0.2
	Biotin (μg)	2	2	2
	Choline (mg)	20	20	20
	Inositol (mg)	25	25	20
	Taurine (mg)	8	8	6
	Carnitine (mg)	1.5	1.5	-

Example 2

An array of age-tailored infant formula is given in the table below:

	0 to 100 days	100 to 180 days	180 days to 1 year
Nutrient	per 100kcal	per 100kcal	per 100kcal
Energy (kcal)	100	100	100
Protein (g)	2.5	2.3	2.0
Fat (g)	5.6	5.3	5.1
Linoleic acid (g)	0.79	0.79	0.79
α-Linolenic acid (mg)	101	101	101
Lactose (g)	13.2	12.8	11.2
Minerals (g)	0.37	0.37	0.37
Na (mg)	40	23	21
K (mg)	100	80	75
Cl (mg)	64	64	64
Ca (mg)	100	96	92
P (mg)	46	41	37
Ca/P ratio	2.17	2.34	2.48
Mg (mg)	7	7	7
Mn (μg)	8	8	8
Se (μg)	2	2	2
Vitamin A (μg RE)	105	105	105
Vitamin D (μg)	1.5	1.5	1.5
Vitamin E (mg TE)	0.8	0.8	0.8

Vitamin K1 (μg)	8	8	8
Vitamin C (mg)	10	10	10
Vitamin B1 (mg)	0.07	0.07	0.07
Vitamin B2 (mg)	0.15	0.15	0.15
Niacin (mg)	1	1	1
Vitamin B6 (mg)	0.075	0.075	0.075
Folic acid (μg)	9	9	9
Pantothenic acid (mg)	0.45	0.45	0.45
Vitamin B12 (μg)	0.3	0.3	0.3
Biotin (μg)	2.2	2.2	2.2
Choline (mg)	10	10	10
Fe (mg)	1.2	1.2	1.2
I (μg)	24	15	13
Cu (μg)	95	60	54
Zn (mg)	1.25	0.65	0.58
3'sialyllactose (mg)	30	30	30
6'sialyllactose(mg)	6	6	6
LNnT (mg)	30	30	30
2FL (g)	0.3	0.3	0.3

It was shown that feeding an array of nutritional infant formula as exemplified above, the dietary need of infants children were met, in particular with regards to protein, lactose, fat and energy. Also, the infant formula were a close match of human breast milk at the different ages.

Claims

1. An array of infant formula for providing an age-tailored nutrition system to an infant, it comprises a first infant formula between 0 to 100 days, a second infant formula between 100 to 180 days, and an optional third infant formula between 180 days to 1 year, wherein
the content of protein in the second infant formula is lower than in the first infant formula;
the content of lactose in the second infant formula is higher than in the first infant formula;
the content of protein in the optional third infant formula is lower than in the second infant formula; and
the content of lactose in the optional third infant formula is higher than in the second infant formula.

2. The array of infant formula according to claim 1, wherein
said first infant formula comprises a protein content of between 1.9 and 2.9g/100kcal, preferably between 2.2 and 2.7g/100kcal, more preferably between 2.4 and 2.6g/100kcal and a lactose content of between 9.2 and 13.8 g/100kcal, preferably between 10.5 and 12.6 g/100kcal, more preferably between 11.3 and 11.9g/100kcal of the first infant formula,
said second infant formula comprises a protein content of between 1.9 and 2.9g/100kcal, preferably between 2.1 and 2.6g/100kcal, more preferably between 2.3 and 2.5g/100kcal and a lactose content of between 9.2 and 13.8 g/100kcal, preferably between 10.3 and 12.5 g/100kcal, more preferably between 11.1 and 11.6g/100kcal of the second infant formula, and
said optional third infant formula comprises a protein content of between 1.9 and 2.9g/100kcal, preferably between 2.0 and 2.5g/100kcal, more preferably between 2.2 and 2.4g/100kcal and a lactose content of between 9.2 and 13.8 g/100kcal, preferably between 10.2 and 12.4 g/100kcal, more preferably between 11.0 and 11.5g/100kcal of the optional third infant formula.

3. The array of infant formula according to claim 1 or 2, wherein the energy density in the second infant formula is lower than in the first infant formula, and the energy density in the optional third infant formula is lower than in the second infant formula, and
said first infant formula comprises a energy density of between 63 and 67 kcal/100ml, preferably between 65 and 66 kcal/100ml,
said second infant formula comprises a energy density of between 63 and 67 kcal/100ml, preferably between 64 and 65 kcal/100ml, and
said optional third infant formula comprises a energy density of between 63 and 65 kcal/100ml, preferably between 64 and 65 kcal/100ml.

4. The array of infant formula according to any one of claims 1 to 3, wherein
said first infant formula comprises a fat content of between 4.4 and 5.8g/100 kcal, preferably between 4.8 and 5.3 g/100 kcal, more preferably between 5.0 and 5.2 g/100 kcal of the first infant formula,
said second infant formula comprises a fat content of between 4.4 and 5.8g/100 kcal, preferably between 4.7 and 5.4 g/100 kcal, more preferably between 4.9 and 5.2 g/100 kcal of the second infant formula, and
said optional third infant formula comprises a fat content of between 4.4 and 5.8g/100 kcal, preferably between 4.6 and 5.3 g/100 kcal, more preferably between 4.8 and 5.3 g/100 kcal of the optional third infant formula.

5. The array of infant formula according to any one of claims 1 to 4,
wherein each of said first, second and optional third infant formula comprises suitable amounts of mineral nutrients selected from the group consisting of calcium, iodine, phosphorus, potassium, sodium, copper and zinc,
wherein the content of at least one of said mineral nutrients in the second infant formula is lower than in

the first infant formula, and the content of said at least one mineral nutrient in the optional third infant formula is lower than in the second infant formula.

6. The array of infant formula according to claim 5, wherein the contents of at least two, preferably at least three, more preferably at least four, particularly preferably at least five of said mineral nutrients in the second infant formula are lower than in the first infant formula, and the contents of said at least two, preferably at least three, more preferably at least four, particularly preferably at least five of said mineral nutrients in the optional third infant formula are lower than in the second infant formula.

7. The array of infant formula according to claim 5 or 6, wherein the contents of iodine, phosphorus, potassium, sodium, copper and zinc in the second infant formula are lower than in the first infant formula, and the contents of said mineral nutrients in the optional third infant formula are lower than in the second infant formula.

8. The array of infant formula according to any one of claims 5-7, wherein the contents of calcium, iodine, phosphorus, potassium, sodium, copper and zinc in the second infant formula are lower than in the first infant formula, and the contents of said mineral nutrients in the optional third infant formula are lower than in the second infant formula.

9. The array of infant formula according to any one of claims 5-8, wherein the content of iodine in the first infant formula is from 50.0 μg/100kcal to 16.5 μg/100kcal, preferably from 25.0 μg/100kcal to 16.5 μg/100kcal, the content of iodine in the second infant formula is from 16.5 μg/100kcal to 14.0 μg/100kcal, and the content of iodine in the optional third infant formula is lower than 14.0 μg/100kcal.

10. The array of infant formula according to any one of claims 5-9, wherein the content of phosphorus in the first infant formula is from 70 mg/100kcal to 42 mg/100kcal, preferably from 52 mg/100kcal to 42 mg/100kcal, the content of phosphorus in the second infant formula is from 42 mg/100kcal to 38 mg/100kcal, and the content of phosphorus in the optional third infant formula is lower than 38 mg/100kcal.

11. The array of infant formula according to any one of claims 5-10, wherein the content of potassium in the first infant formula is from 170 mg/100kcal to 85 mg/100kcal, preferably from 118 mg/100kcal to 85 mg/100kcal, the content of potassium in the second infant formula is from 85 mg/100kcal to 80 mg/100kcal, and the content of potassium in the optional third infant formula is lower than 80 mg/100kcal.

12. The array of infant formula according to any one of claims 5-11, wherein the content of sodium in the first infant formula is from 58 mg/100kcal to 25 mg/100kcal, preferably from 51 mg/100kcal to 25 mg/100kcal, the content of sodium in the second infant formula is from 25 mg/100kcal to 22 mg/100kcal, and the content of sodium in the optional third infant formula is lower than 22 mg/100kcal.

13. The array of infant formula according to any one of claims 5-12, wherein the content of copper in the first infant formula is from 120 μg/100kcal to 62 μg/100kcal, preferably from 109 μg/100kcal to 62 μg/100kcal, the content of copper in the second infant formula is from 62 μg/100kcal to 55 μg/100kcal, and the content of copper in the optional third infant formula is lower than 55 μg/100kcal.

14. The array of infant formula according to any one of claims 5-13, wherein the content of zinc in the first infant formula is from 1.5 mg/100kcal to 0.7 mg/100kcal,

the content of zinc in the second infant formula is from 0.7 mg/100kcal to 0.6 mg/100kcal, and the content of zinc in the optional third infant formula is lower than 0.6 mg/100kcal.

15. The array of infant formula according to any one of claims 5-14, wherein the content of calcium in the first infant formula is from 140 mg/100kcal to 98 mg/100kcal, preferably from 108 mg/100kcal to 98 mg/100kcal, the content of calcium in the second infant formula is from 98 mg/100kcal to 95 mg/100kcal, and the content of calcium in the optional third infant formula is lower than 95 mg/100kcal.

16. The array of infant formula according to any one of claims 5-15, wherein the ratio of calcium and phosphorus in the first infant formula is lower than in the second infant formula, and the ratio of calcium and phosphorus in the second infant formula is lower than in the optional third infant formula, and
the ratio of calcium and phosphorus in the first infant formula is from 2.0:1 to 2.2:1, preferably from 2.1:1 to 2.2:1,
the ratio of calcium and phosphorus in the second infant formula is from 2.2:1 to 2.4:1, and
the ratio of calcium and phosphorus in the optional third infant formula is from 2.4:1 to 2.5:1.

17. The array of infant formula according to any one of claims 5-16, wherein each of the first, the second and the optional third infant formula comprises long-chain polyunsaturated fatty acids selected from docosahexaenoic acid (DHA), arachidonic acid (ARA), or eicosapentaenoic acid (EPA), and/or comprises medium-chain triglycerides and/or milk fat globule membranes (MFGM), or any mixtures thereof.

18. The array of infant formula according to any one of claims 5-17, wherein each of the first, the second and the

optional third infant formula comprises vitamins, lactoferrin, probiotics, prebiotics, proteins associated with milk fat globule membrane (MFGM), hydrolysed or non-hydrolysed protein, carbohydrates, maltodextrin, or any mixtures thereof.

19. The array of infant formula according to 18, wherein the probiotics in the first and second infant formula are selected from the list comprising *L. helveticus* CNCM I-4095, *B. longum* CNCM I-2618, *B. breve* NCC2950, *L. paracasei* ST11 CNCM I-2116, *B. longum* BB536 ATCC BAA-999, *B. Longum* BL999, *L. acidophilus* L92 FERM BP.4981 or any mixtures thereof, preferably in an amount of 10^4-10^7 cfu/g, most preferably 10^6cfu/g, and the probiotics in the optional third infant formula are selected from the list comprising *B. longum* CNCM I-2618, *B. breve* CNCM I-3865, *B. lactis* CNCM I-3446, *B. longum* ATCC BAA-999 (Bb536), *L. lactis* SL31 CNCM I-4154, *L. paracasei* ST11 CNCM I-2116 or any mixtures thereof, preferably in an amount of 10^6-10^8 cfu/g, most preferably 10^7cfu/g.

20. The array of infant formula according to any one of claims 1-19, wherein the first infant formula has a protein source comprising whey and optionally casein proteins and has a whey:casein ratio between 100:0 and 60:40 and a protein content between 1.9 and 2.9 g protein/100 kcal, and the second infant formula has a protein source comprising whey and casein proteins and has a whey:casein ratio between 70:30 and 50:50 and a protein content between 1.9 and 2.9 g protein/100 kcal with the proviso that either the protein content or the whey:casein ratio of the second formula or both is/are lower than for the first formula.

21. The array of infant formula according to any one of claims 1-20, wherein each of the first, the second and the optional third infant formula are in the form of a powder to be reconstituted or a concentrate to be diluted.

22. The array of infant formula according to any one of claims 1-21, wherein the first, the second and the optional third infant formula are packed in single dose units, each unit comprising sufficient nutritional composition to prepare a single serving upon reconstitution with water.

23. The array of infant formula according to claim 22, wherein the single dose units are in a form of a capsule or a can.

24. The array of infant formula according to any one of claims 1-23 for use in improving the nutritional condition of an infant from 0 to 180 days, especially from 0 to 100 days.

25. Use of the array of infant formula according to any one of claims 1-24 for preparation of a kit for improving the nutritional condition of an infant from 0 to 180 days, especially from 0 to 100 days.

26. A method of providing nutrition to an infant, comprising:
(i) feeding to the infant for initial 100 days of life the first infant formula according to any one of claims 1-23,
(ii) feeding to the infant for the remainder of the first 180 days of life the second infant formula according to any one of claims 1-23, and optionally
(iii) feeding to the infant for the remainder of the first 1 year of life the third infant formula according to any one of claims 1-23.

27. Use of the array of infant formula according to any one of claims 1 to 23 in reducing obesity or diabetes or the risk thereof later in life and in reducing cardiovascular diseases or the risk thereof later in life.

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

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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)

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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)

CPRSABS;CNABS;DWPI:protein, whey, carbonhydrate, formula, infant, tailored, months, casein, age

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 103209602 A (NESTEC SA) 17 July 2013 (2013-07-17) claims 1-16, paragraphs 56-88 of description, example 2	1-27
X	CN 101873806 A (NESTEC S.A.ET AL.) 27 October 2010 (2010-10-27) claims 1-35	1-26

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 July 2014	**09 September 2014**
Name and mailing address of the ISA/ **STATE INTELLECTUAL PROPERTY OFFICE OF THE P.R.CHINA(ISA/CN)** **6,Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088 China** Facsimile No. **(86-10)62019451**	Authorized officer **WANG,Wenqing** Telephone No. **(86-10)62411177**

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2013/089285

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 103209602 A	17 July 2013	CA 2816413 A1	24 May 2012
		WO 2012065813 A1	24 May 2012
		MX 2013005364 A	28 June 2013
		IL 225887 D0	27 June 2013
		EP 2452574 A1	16 May 2012
		SG 189997 A1	28 June 2013
		AU 2011331412 A1	23 May 2013
		TW 201223457 A	16 June 2012
		US 2013236596 A1	12 September 2013
		EP 2640200 A1	25 September 2013
CN 101873806 A	27 October 2010	RU 2010126149 A	10 January 2012
		CA 2706636 A1	04 June 2009
		CN 103054029 A	24 April 2013
		EP 2476322 A2	18 July 2012
		MX 2010005586 A	11 June 2010
		EP 2272381 A2	12 January 2011
		RU 2463810 C2	20 October 2012
		EP 2272381 A3	29 June 2011
		AU 2008328864 A1	04 June 2009
		EP 2433506 A2	28 March 2012
		EP 2224826 A1	08 September 2010
		CN 103039793 A	17 April 2013
		US 2011195144 A1	11 August 2011
		JP 2011504365 A	10 February 2011
		EP 2433507 A2	28 March 2012
		EP 2433506 A3	07 May 2014
		CN 103005453 A	03 April 2013
		WO 2009068549 A1	04 June 2009
		EP 2433507 A3	07 May 2014
		US 2014037787 A1	06 February 2014
		AU 2008328864 B2	19 June 2014
		US 2014037788 A1	06 February 2014
		KR 20100103468 A	27 September 2010
		CN 101873806 B	30 April 2014