A COMPARISON OF HUMAN MILK & FORMULA

HUMAN MILK

WATER

CARBOHYDRATES

(energy source)
Lactose
Oligosaccharides (see below)

CARBOXYLIC ACID

Alpha hydroxy acid
Lactic acid

PROTEINS

(builds muscles and bones)
Whey protein
Alpha-lactalbumin
HAMLET (Human Alpha lactalbumin Made Lethal to Tumor cells)
Lactoferrin
Many antimicrobial factors (see below)
Casein
Serum albumin

NON-PROTEIN NITROGENS

Creatine
Creatinine
Urea
Uric Acid
Peptides (see below)
Amino Acids (the building blocks of proteins)
Alanine
Arginine
Aspartate
Clycine
Cystine
Glutamate
Histidine
Isoleucine
Leucine
Lycine
Methionine
Phenylalanine
Proline
Serine
Taurine
Theronine
Trytophan
Tyrosine
Valine
Carnitine (amino acid compound necessary to make use of fatty acids as energy source)
Nucleotides (chemical compounds that are the structural units of RNA and DNA)
5'-Adenosine monophosphate (5'-AMP)
3'5'-Cyclic adenosine monophosphate (3'5'-cyclic AMP)
5'-Cytidine monophosphate (5'-CMP)
Cytidine diphosphate choline (CDP choline)
Guanosine diphosphate (UDP)
Guanosine diphosphate-mannose
3'-Uridine monophosphate (3'-UMP)
5'-Uridine monophosphate (5'-UMP)
Uridine diphosphate (UDP)
Uridine diphosphate hexose (UDPH)
Urindine diphosphate-N-acetyl-hexosamine (UDPAH)
Uridine diphosphoglucuronic acid (UDPGA)
Several more novel nucleotides of the UDP type

METAL

Molybdenum (essential element in many enzymes)

FATS

Triglycerides
Long-chain polyunsaturated fatty acids
Docosahexaenoic acid (DHA)
-Linoleic acid
-Alph-linolenic acid (ALA)
-Eicosapentaenoic acid (EPA)
-Coniuquated linoleic acid (rumenic acid)
Free fatty acids
Monosaturated fatty acids
-Oleic acid
-Palmitoleic acid
-Heptadecenoic acid
Saturated fatty acids
-Stearic
-Palmitic acids
-Lauric acid
-Myristic acids
Phospholipids
Phosphatidylcholine
Phosphatidylethanolamine
Phosphatidylinositol
Lysophosphatidylcholine
Lysophosphatidylethanolamine
Plasmalogens
Sphingolipids
Sphingomylelin
Gangliosides
-GM1
-GM2
-GM3
Glucosylceramide
Glycosphingolipids
Galactosylceramide
Lactosylceramide
Globotriaosylceramide (GB3)
Globoside (GB4)
Sterols
Squalene
Lanosterol
Dimethylsterol
Triacyglycerol
Cholesterol
7-dehydrocholesterol
Stigma-and campesterol
7-ketocholesterol
Sitosterol
B-lathosterol
Vitamin D metabolities
Steroid hormones

VITAMINS

Vitamin A
Beta carotene
Vitamin B6
Vitamin B8 (inositol)
Vitamin B12
Vitamin C
Vitamin D
Vitamin E
a-Tocopherol
Vitamin K
Thiamine
Riboflavin
Niacin
Folic acid
Pantothenic acid
Biotin

MINERALS

Calcium
Sodium
Potassium
Iron
Zinc
Chloride
Phosphorus
Magnesium
Copper
Manganese
Iodine
Selenium
Choline
Sulpher
Chromium
Cobalt
Fluorine
Nickel

GROWTH FACTORS

(Aid in the maturation of the intestinal lining)
Cytokines
interleukin-1 (IL-1B)
IL-2
IL-4
IL-6
IL-8
IL-10
Granulocyte-colony stimulating factor (GSF)
Macrophage-colony stimulating factor (MSF)
Platelet derived growth factors (PDGF)
Vascular endothelial growth factor (VEGF)
Hepatocyte growth factor-a (HGF-a)
HGF-B
Tumor necrosis factor-a
-Interferon-y
Epithelial growth factor (EGF)
Transforming growth factor-a (TGF-a)
TGF—B1
TGF-B2
Insulin-like growth factor-I (IGF-1) (somatomedin C)
Insulin-like growth factor-II
Nerve growth factor (NGF)
Erythropoietin

PEPTIDES

(Combinations of amino acids)
HMGF I (Human growth factor)
HMGF II
HMGF III
Cholecystokinin (CCK)
B-endorphins
Parathyroid hormone (PTH)
Parathyroid hormone-related peptide (PTHrP)
B-defensin-1
Calcitonin
Gastrin
Motilin
Bombesin (gastric releasing peptide, also known as neuromedin B)
Neurotensin
Somatostatin

HORMONES

(chemical messengers that carry signals from one cell, or group of cells, to another via the blood)
Cortisol
Triodothyronine (T3)
Thyroxine (T4)
Thyroid stimulating hormone (TSH) (also known as thyrotropin)
Thyroid releasing hormone (TRH)
Prolactin
Oxytocin
Insulin
Corticosterone
Thrombopoietin
Gonadotropin-releasing hormone (GnRH)
GRH
Leptin (aids in regulation of food intake)
Ghrelin (aids in regulation of food intake)
Adiponectin
Feedback inhibitor of lactation (FIL)
Eicosanoids
Prostaglandins (enzymatically derived from fatty acids)
-PG-E1
-PG-E2
-PG-F2
Leukotrienes
Thromboxanes
Prostacyclins

ENZYMES

(catalysts that support chemical reactions in the body)
Amylase
Arysulfatase
Catalase
Histaminase
Lipase
Lysozyme
PAF-acetylthydrolase
Phosphatase
Xanthine oxidase

ANTIPROTEASES

(thought to bind themselves to macromolecules such as enzymes and as result prevent allergic and anaphylactic reactions)
a-1-antitrypsin
a-1-antichymotrypsin

ANTIMICROBIAL FACTORS

(are used by the immune system to identify and neutralize foreign objects, such as bacteria and viruses)
Leukocytes (white blood cells)
Phagocytes
-Basophils
-Neutrophils
-Eosinophils
Macrophages
Lymphocytes
-B Lymphocytes (also known as B cells)
-T lymphocytes (also known as C cells)
sigA (Secretory immunoglobin A) (the most important anti-infective factor)
IgA2
IgG
IgD
IgM
IgE
Complement C1
Complement C2
Complement C3
Complement C4
Complement C5
Complement C6
Complement C7
Complement C8
Complement C9
Glycoproteins
Mucins (attaches to bacteria and viruses to prevent them from clinging to mucosal tissues)
Lactadherin
Alpha-lactoglobulin
Aplha-2 macroglobulin
Lewis antigens
Ribonuclease
Haemagglutinin inhibitors
Bifidus factor (increases growth of Lactobacillus bifidus, which is a good bacteria)
Lactoferrin (binds to iron, which prevents harmful bacteria from using the iron to grow)
Lactoperoxidase
B12 binding protein (deprives microorganisms of vitamin B12)
Fibronectin (makes phagocytes more aggressive, minimizes inflammation, and repairs damage caused by inflammation)
Oligosaccharides (more than 200 different kinds!)

FORMULA

WATER

CARBOHYDRATES

Lactose
Corn Maltodextrin

PROTEIN

Partially hydrolyzed reduced minerals whey protein concentrate (from cow's milk)

FATS

Palm olein
Soybean oil
Coconut oil
High oleic safflower oil (or sunflower oil)
M. alpina oil (Fungal DHA)
C. cohnii oil (Algal ARA)

MINERALS

Potassium citrate
Potassium phosphate
Calcium chloride
Tricalcium phosphate
Sodium citrate
Magnesium chloride
Ferrous sulphate
Zinc sulphate
Sodium chloride
Copper sulphate
Potassium iodide
Manganese sulphate
Sodium selenate

VITAMINS

Sodium ascorbate
Inositol
Choline bitartrate
Alpha-Tocopheryl acetate
Niacinamide
Calcium pantothenate
Riboflavin
Vitamin A acetate
Prydoxine hydrochloride
Thiamine mononitrate
Folic-acid
Phylloquinone
Biotin
Vitamin D3
Vitamin B12

ENZYME

Trypsin

AMINO ACID

Taurine
L-Carnitine (a combination of two different amino acids)

NUCLEOTIDES

Cytidine 5-monophosphate
Disodium uridine 5-monophosphate
Adenosine 5-monophosphate
Disodium guanosine 5-monophosphate
Soy Lecithin

Sourced from Heslett C, Hedberg S, Rumble H. Did you ever wonder what's in...? [Internet]. Canada: UNICEF/WHO Baby-Friendly Hospital Initiative (BFHI); 2012 Apr 30.