Babies need complex lipids

Milk from mammals contains globules of fat. The outer layer of these globules is called the milk fat globule membrane (MFGM). MFGM contains bioactive components such as certain proteins and complex milk lipids including phospholipids and gangliosides.

MFGM Lipid benefit platforms

Evidence suggests that MFGM and its components may play an important role in brain development and cognition, protection and digestive health. Human milk is the ideal way to feed a baby, but when an infant is unable to be breastfed, then cow’s milk ingredients can provide an alternative source of complex lipids through its MFGM.

Milk fat globule membrane (MFGM)

Triglycerides

Primary membrane from the endoplasmic reticulum

Bilayer from plasma membrane

Phospholipids: (PC, PE, PI, PS, SM)*

Gangliosides

*Phosphatidylcholine (PC), Phosphatidylethanolamine (PE), Phosphatidylinositol (PI), Phosphatidylserine (PS), Sphingomyelin (SM)

Lopez et al. 2010

Brain development & cognition

The brain is a lipid rich organ, and complex lipids such as phospholipids and gangliosides, comprise up to 35% of the total lipids in the brain. These complex lipids are critically important for the optimal development of the brain and visual function.1

Protection

Complex lipids provide a barrier to infection in the gut. They bind to bacteria and viruses, such as Rotavirus*, preventing them from attaching to the baby’s gut wall and starting an infection. The infant immune system is inexperienced. Complex lipids help prime and balance the immune system so it doesn’t over or under react to challenges.2

Digestive health

An infant’s gut wall starts off immature. Complex lipids help mature the gut more rapidly by providing the building material for new cell membranes.3

Source: 1 McJarrow et al., 2009, Jiminez-Flores & Brisson, 2008, Xu & Zhu, 2005
2 Sprong et al., 2001, Rueda, 2007, Moeller et al., 2008
3 Hintze et al., 2011.

Lopez et al. 2010

*Rotavirus is the more common cause of diarrhoea in children.

Fonterra supports the aim and intent of WHO Code for the Marketing of Breast Milk Substitutes. The WHO states that breast milk is the ideal source of nutrition for infants and that breast milk substitutes are safe & nutritious alternatives to breast milk for infants whose mothers cannot or choose not to breastfeed.

The information in this brochure is designed to give a brief overview of the nature, characteristics and potential benefits of our ingredients as at the date of preparation. It does not constitute representations or warranties as to such characteristics, the functionality, product claims or potential applications of our ingredients and you must assuage yourself of these matters having regard to our detailed product specifications, your specific circumstances and applicable market requirements.
SureStart™ ingredients inspired by human milk composition

Human milk contains more MFGM components, including gangliosides and phospholipids, than standard infant formula. Cow’s milk provides one of the closest phospholipid profiles, in particular sphingomyelin content, to human milk and is the only alternative source of gangliosides.

SureStart™ MFGM Lipids are inspired by the MFGM profile of human milk for use in paediatric applications.

Our innovative ingredient SureStart™ MFGM Lipid 100 can be used to achieve an infant formula composition closer to that of human milk.

Cow’s milk has the closest phospholipid profile to human milk*[^3]

*S when considering commercial sources of phospholipids


Levels of gangliosides in human milk, cow’s milk and infant formulas (µg/g).

| Source: Nakao (1998), Ma et al. (2015a), Ma et al. (2015b) |

<table>
<thead>
<tr>
<th>Human Milk</th>
<th>Cow’s Milk</th>
<th>Milk Based Infant Formula</th>
<th>Soy Based Infant Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>10</td>
<td>5</td>
<td>0</td>
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Supplementation with SureStart™ MFGM Lipid

SureStart™ MFGM Lipid 100 is a source of MFGM complex lipid components that are patent protected (in some countries) for cognitive development and protection against rotavirus infection.

<table>
<thead>
<tr>
<th>Patent</th>
<th>Description</th>
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<tbody>
<tr>
<td>WO 2009/051502</td>
<td>Complex lipids for maintaining or increasing growth or cognitive development in a foetus, infant or child (up to 12 years). More specifically focused on gangliosides with or without another complex milk lipid (dependent on level).</td>
</tr>
<tr>
<td>WO 2009/020405</td>
<td>Use of milk fat fractions, including complex milk lipids gangliosides and phospholipids, for the treatment or prevention of rotavirus infection (all ages).</td>
</tr>
<tr>
<td>WO 2006/041316</td>
<td>Infant formula (0-12months only) containing: 1. Beta serum, or 2. Low lactose beta serum (BPC50), or 3. Polar lipid enriched and/or neutral lipid depleted beta serum (BPC60, PGC80 or BPC70).</td>
</tr>
</tbody>
</table>

1. Claims and granted status may differ by country.

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*[^3]: Source: Nakao (1998), Ma et al. (2015a), Ma et al. (2015b)
Clinical Studies

Research trials have demonstrated that MFGM complex lipids support brain development and cognition in infants.

Trial A
A pilot study using MFGM complex lipids shown to support brain development and cognition.

Effect of ganglioside (GA)-enriched infant formula vs standard infant formula on brain development.

Results
Research suggests supplementation with an MFGM Lipid ingredient supported developmental and cognitive benefits in infants.

*p<0.05  Source: Gurnida et al, 2012

Trial B (CLING study)
A 12-month trial with 432 healthy infants demonstrated statistically significant improvements in some measures of cognitive development.

Effect of MFGM-enriched infant formula vs standard infant formula in first 12 months of life on cognitive development.

Results
Infants consuming a formula supplemented with SureStart™ MFGM Lipid 100 demonstrated:

- Significantly higher general adaptive behaviour* score (BSID**- III®), which includes measures of social and motor skills, self-direction, communication and self-care assessments, compared to infants fed a standard formula.
- Normal growth and tolerance.

The CLING study supports previous studies*** showing that MFGM supplementation in infancy supports cognitive development.

*p<0.05  ** Bayley Scale of Infant Development  *** Timby et al. 2014 and Li et al. 2018  Source: Xia et al (2018)

Conclusion
MFGM provides bioactive components such as complex milk lipids, including gangliosides and phospholipids, that support brain development and cognition. SureStart™ MFGM Lipid 100 has been clinically tested to support brain development and cognition in infants.
Awarded for innovation

Our NZMP SureStart™ MFGM Lipid 100 ingredient has been recognised throughout the industry for innovation and ingenuity.

- Winner in the 2018 NutraIngredients Awards Asia ‘Ingredient of the Year – Infant Nutrition’ category
- Finalist in the 2017 NutraIngredients Awards Europe ‘Ingredient of the Year – Infant Nutrition’ category
- Winner in the 2016 NZ Innovation Awards ‘Innovation in Food & Beverage’ category
- Finalist in the 2016 NZ Innovation Awards ‘Supreme Innovator’ category

As well as unmatched ingredients, we offer a range of high-quality business services that bring expert capability to your business when and where you need it.

NZMP SureStart™ ingredients are made using world-leading technology, by people with decades of experience and unmatched expertise you can trust.

Products using NZMP SureStart™ can carry our front and back of pack customer marks, giving your consumers’ confidence in the authenticity of the product they are purchasing. They support our reputation for safety and paediatric expertise.

We have the capability to produce ingredients at scale giving you the security of your supply. This allows you to take advantage of new opportunities and meet the growing demand of your products.

The global dairy price market is extremely volatile, and this can affect your margins, your forecasts, and your ability to be competitive.

That’s why we offer a range of Risk & Commercial Solutions, to help you mitigate and manage your exposure to dairy ingredient price fluctuations by giving you price certainty and supply security of your dairy ingredients.

These Risk & Commercial Solutions are easy to add to your ingredient purchase. Talk to us today about how we can help you.

Turn our advantage into your business advantage

NZMP SureStart™ ingredients are made using world-leading technology, by people with decades of experience and unmatched expertise you can trust.

Products using NZMP SureStart™ can carry our front and back of pack customer marks, giving your consumers’ confidence in the authenticity of the product they are purchasing. They support our reputation for safety and paediatric expertise.

As well as unmatched ingredients, we offer a range of high-quality business services that bring expert capability to your business when and where you need it.

Security of supply

Risk & Commercial

Talk to the paediatric dairy ingredient experts

We’re passionate about sharing our deep dairy expertise to help you grow your business. Talk to us today about your paediatric dairy ingredient needs.

To find out more or to purchase our ingredients please visit surestartnutrition.com