Report outline

1. Introduction
2. Infant formula market
3. Infant formula industry
4. Dairy ingredients used in infant formula
5. Conclusions
6. Appendix
Market research of infant formula market and industry

- Infant formula market
  - Market development 2010-2015 and forecast 2016-2020
    - Global market
      - Value
      - Volume
      - Growth rates
    - Regional markets
      - Western Europe
      - Eastern Europe
      - North America
      - Asia
      - Latin America
      - Middle East & Africa

- Infant formula industry
  - Key global/regional/local companies
  - Market shares in key markets
  - Estimated volume 2020
  - Strategic alliances
  - New product development and launches with key ingredients

- Dairy ingredients in infant formula
  - Estimated volumes for:
    - SMP
    - DWP
    - Lactose
    - WPC80
    - Emerging dairy ingredients

- Conclusion
  - Analysis and summary
  - Estimated volumes for:
    - SMP
    - DWP
    - Lactose
    - WPC80
    - Emerging dairy ingredients
Infant Milk Formula (IMF) - types and terminology

- Infant formula products are substitutes for breast feeding, covering the whole age span from 0-3 years
- Infant formulas represent a very large share of the overall baby foods market
- Infant formulas are typically classified according to age of baby:

<table>
<thead>
<tr>
<th>Formula</th>
<th>Age</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formula 1</td>
<td>0-6 months</td>
<td>First age / (pre-) Term starter / Standard</td>
</tr>
<tr>
<td>Formula 2</td>
<td>6-12 months</td>
<td>Second age / Follow-on</td>
</tr>
<tr>
<td>Formula 3</td>
<td>1-3 years</td>
<td>Third age / Growing-up / Toddler</td>
</tr>
<tr>
<td><strong>Formula 4 / Special infant formula</strong></td>
<td></td>
<td>Whereas infant formulas are generally based on regular dairy ingredients, Formula 4 is an umbrella for special formulas, such as hypo-allergenic formulas based on hydrolyzed proteins, as well as lactose-free, anti-reflux formulas, etc.</td>
</tr>
</tbody>
</table>
Methodology

• Value and volume figures are mainly sourced from Euromonitor

• Global/regional market value figures are based on calculated USD value figures

• All national market values given in national currencies converted from local currency into USD by 3A

• Conversion of currency for ’10, ’15 and ’20 into USD done using same conversion rate

• Given this methodology country market values in USD are affected by the level of local inflation as well as the value of the local currency vis-à-vis the value of the USD

• National market values in USD will therefore be seen as an approximate figure
Five key growth drivers in IMF

1. Economic growth and job creation
2. Increasing number of women in workforce
3. Middle-class with increased disposable income
4. Increasing spend on premium nutrition
5. Baby population
Regional breakdown of infant formula 2010, 2015 and 2020(F)

Infant formula value sales 2010, 2015 and 2020(F)

Global CAGR

2010-2015: 12%
2015-2020: 9%

USD mio

WE  EE  NA  LA  Asia  MEA

2010  2015  2020

3A Business Consulting
Value distribution - per infant formula category

<table>
<thead>
<tr>
<th>Year</th>
<th>Total global value</th>
<th>Formula-1</th>
<th>Formula-2</th>
<th>Formula-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>USD xx bn</td>
<td>10%</td>
<td>26%</td>
<td>24%</td>
</tr>
<tr>
<td>2015</td>
<td>USD xx bn</td>
<td>9%</td>
<td>38%</td>
<td>22%</td>
</tr>
<tr>
<td>2020(F)</td>
<td>USD xx bn</td>
<td>31%</td>
<td>43%</td>
<td>21%</td>
</tr>
</tbody>
</table>

Special infant formula: 10% (2010), 9% (2015), 31% (2020(F))
Formula-1: 40% (2010), 31% (2015), 29% (2020(F))
Formula-2: 38% (2010), 38% (2015), 43% (2020(F))
Formula-3: 22% (2010), 22% (2015), 21% (2020(F))
A small handful of global companies the ‘Big Four’ dominate the global IF business in 2015

<table>
<thead>
<tr>
<th>Overall ranking</th>
<th>Company</th>
<th>Approx. market share %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nestlé</td>
<td>22</td>
</tr>
<tr>
<td>2</td>
<td>Danone</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>Abbott</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Mead Johnson</td>
<td>5</td>
</tr>
</tbody>
</table>

- Nestlé and Danone are key players in all 4 IMF categories
- Mead Johnson and Abbott have their relative strength in the Formula-1 and Formula-2 product categories. Mead Johnson also have particular strength in special formula category
- In 2012, Nestlé bought Pfizer’s infant nutrition unit for USD 11.9 bn (After Pfizer having itself bought Wyeth)
Volume per market

Global IMF markets in 2015

Volume in '000 MT

- Total
- Western Europe
- Eastern Europe
- North America
- Latin America
- Asia
- Middle East & Africa
Nestlé
- No. 1 globally in infant formula by far

### Key Company Profiles

- Nestlé is a major infant formula company with products designed for infants in all development stages and infant formula sales of more than USD 65 billion in 2015 making it the largest company in the infant formula industry. Nestlé's products include NAN, Nestlé Good Start, S-26 Gold (Wyeth), ranges of products for all stages of infants’ development, and Alfaré, Althera, Alfamino designed to meet nutritional needs of infants with cow’s milk allergies and other food allergies/intolerances.

- Nestlé has three reportable market segments comprised of AMS, EMENA and AOA accounting for 44%, 31% and 25% of net sales in 2015 and had organic growth of 4%.

### Division share of sales, 2015

<table>
<thead>
<tr>
<th>Division</th>
<th>Share of Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powdered and Liquid Beverages</td>
<td>22%</td>
</tr>
<tr>
<td>Nutrition and Health science</td>
<td>17%</td>
</tr>
<tr>
<td>Milk products and Ice cream</td>
<td>16%</td>
</tr>
<tr>
<td>Prepared dishes and Minerals</td>
<td>14%</td>
</tr>
<tr>
<td>Confectionary</td>
<td>13%</td>
</tr>
<tr>
<td>Prepared dishes and Minerals</td>
<td>10%</td>
</tr>
<tr>
<td>Water</td>
<td>8%</td>
</tr>
</tbody>
</table>

### Sales

- Sales in 2015: EUR 85,000 mio
- Sales in 2014: EUR 80,000 mio
- Sales in 2013: EUR 75,000 mio

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3A Business Consulting
Most active national markets of NPL - China by far the most active national market

New Product Launches

Global # of NPL between June 2011-June 2016 = 8,803
### Description:
Aptamil First Infant milk is a nutritionally complete formula for infants between 0-6 months as a supplement or as an alternative to breastfeeding with products coming both in liquid and powdered forms.

### Ingredients include:
- Demineralized whey powder
- Vegetable Oils
- Lactose
- Skimmed milk powder
- Galactooligosaccharides
- Whey Protein Concentrate
- Fructooligosaccharides, etc.

### Description:
Dumex Mamil Gold PreciNutri+ Step 2 is a follow-on infant milk formula specifically tailored to support the nutritional needs of babies after 6 months.

### Ingredients include:
- Skimmed Milk Powder
- Demineralised Whey Powder
- Vegetable Oils
- Lactose
- Galactooligosaccharides
- Whey Protein Concentrate, etc.
### Product examples with ingredients

<table>
<thead>
<tr>
<th>Description</th>
<th>Ingredients include</th>
</tr>
</thead>
<tbody>
<tr>
<td>Similac Advance is a nutritionally complete, milk-based, stage 1 infant formula for use as a supplement or an alternative to breastfeeding in infants between 0-12 months.</td>
<td>Nonfat Milk (Skimmed Milk Powder), Lactose, Whey Protein Concentrate, High Oleic Safflower Oil, Soy oil, Coconut oil, Galactooligosaccharides, etc.</td>
</tr>
<tr>
<td>Similac Sensitive is a 19 Cal/fl oz, nutritionally complete, reduced-lactose infant feeding that is an alternative to standard milk-based formulas for mild tolerance symptoms such as fussiness and gas due to lactose sensitivity.</td>
<td>Water, Maltodextrin, Milk Protein Isolate, High Oleic Safflower Oil, Sugar, Soy Oil, Coconut Oil, Galactooligosaccharides, etc.</td>
</tr>
</tbody>
</table>
SMP volume estimation
- methodology I: extrapolation from reported SMP content

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Value</th>
<th>Volume</th>
<th>% SMP</th>
<th>SMP volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>USD 45 bn</td>
<td>2,400,000 MT</td>
<td>674,000 MT</td>
<td></td>
</tr>
<tr>
<td>Formula-1</td>
<td>USD 14 bn</td>
<td>570,000 MT</td>
<td>12%</td>
<td>68,400 MT</td>
</tr>
<tr>
<td>Formula-2</td>
<td>USD 10 bn</td>
<td>600,000 MT</td>
<td>25%</td>
<td>150,000 MT</td>
</tr>
<tr>
<td>Formula-3</td>
<td>USD 18 bn</td>
<td>1,100,000 MT</td>
<td>40%</td>
<td>440,000 MT</td>
</tr>
<tr>
<td>Formula-4</td>
<td>USD 3 bn</td>
<td>130,000 MT</td>
<td>12%</td>
<td>15,600 MT</td>
</tr>
</tbody>
</table>

- Methodology I calculates SMP volumes based on percentage content of SMP, as reported by industry sources.
- Based on the extrapolation from the IF volumes and reported SMP content, approx. 674,000 MT SMP was applied in infant formula in 2015.
- Most SMP goes into Formula-3, followed by Formula-1, Formula-2 and Formula-4 use an IMF-grade SMP of higher quality due to higher microbiological standards in these IF products.
<table>
<thead>
<tr>
<th>Formula</th>
<th>Volume (MT)</th>
<th>Protein content (avg. 11%)</th>
<th>Whey protein share</th>
<th>DWP share</th>
<th>DWP (100% protein)</th>
<th>DWP (13% protein)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>570,000</td>
<td>62,700</td>
<td>60%</td>
<td>60%</td>
<td>22,600</td>
<td>173,800</td>
</tr>
<tr>
<td>2</td>
<td>600,000</td>
<td>66,000</td>
<td>60%</td>
<td>50%</td>
<td>19,800</td>
<td>152,300</td>
</tr>
<tr>
<td>3</td>
<td>1,100,000</td>
<td>121,000</td>
<td>50%</td>
<td>10%</td>
<td>2,400</td>
<td>18,500</td>
</tr>
<tr>
<td>4</td>
<td>130,000</td>
<td>14,300</td>
<td>50%</td>
<td>10%</td>
<td>700</td>
<td>5,400</td>
</tr>
<tr>
<td>Total</td>
<td>2,400,000</td>
<td>264,000</td>
<td>108,600</td>
<td>45,500</td>
<td>350,000</td>
<td></td>
</tr>
</tbody>
</table>

- Based on above calculations, it has been estimated that 350,000 MT DWP was applied in infant formula in 2015.
- Given the CAGR on IF volumes of 7.5%, DWP demand in infant formula can be estimated to grow approx. 30,000 MT per year towards 2020.
# Whey proteins for infant formula - whey protein concentrate volume estimation

<table>
<thead>
<tr>
<th>Formula</th>
<th>Volume</th>
<th>Protein content (avg. 11%)</th>
<th>Whey protein (WPC)</th>
<th>WPC share</th>
<th>WPC (100% protein)</th>
<th>WPC (80% protein)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>570,000 MT</td>
<td>62,700 MT</td>
<td>60% 15,000 MT</td>
<td>37,600 MT</td>
<td>18,800 MT</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>600,000 MT</td>
<td>66,000 MT</td>
<td>60% 19,800 MT</td>
<td>39,600 MT</td>
<td>24,800 MT</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1,100,000 MT</td>
<td>121,000 MT</td>
<td>60% 21,800 MT</td>
<td>42,100 MT</td>
<td>27,300 MT</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>130,000 MT</td>
<td>14,300 MT</td>
<td>50% 7,200 MT</td>
<td>24,200 MT</td>
<td>8,100 MT</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,400,000 MT</strong></td>
<td><strong>264,000 MT</strong></td>
<td><strong>108,600 MT</strong></td>
<td><strong>63,100 MT</strong></td>
<td><strong>79,000 MT</strong></td>
<td></td>
</tr>
</tbody>
</table>

- Based on above calculations, it can be estimated that 79,000 MT DWP was applied in infant formula in 2015.
- Applying the CAGR of 7.5%, demand for WPC80 in infant formula can be estimated to grow approx. 7,000 MT per year towards 2020.
Lactose volume estimation

- Lactose as a source of carbohydrates is provided both as a pure product as well as in the form of DWP, WPC, SMP, etc., making estimation of added pure lactose somewhat complicated.

- Pure lactose is mainly added in Formula-1, less often in Formula-2 and even less in Formula-3 and Formula-4 using more maltodextrin etc.

- Globally, the demand for lactose amounted to approx. 1,300,000 MT in 2015 of which 35-37% has been estimated to go into infant formula leading to approx. 455,000-480,000 MT lactose being added in infant formula.

- Given that most of the pure lactose going into infant formula is used in formula-1 and formula 2, perhaps volume growth in these infant formula categories, estimated to approx. 5% corresponding to 25,000-27,000 MT annually, can be used as an indicator of growth in demand.
Emerging dairy ingredients

- **Galactooligosaccharides** are prebiotics that raise levels of certain probiotic bacteria supporting healthy gut flora and immune system function. Usage of GOS in infant formula has increased strongly in recent years, with a volume of GOS applied in infant formula amounting to more than 30,000 MT in 2015.

- **Protein Hydrolysates** are easily ingestible dairy proteins as they are partially digested through the breakdown into peptides, thereby permitting better absorption in the stomach and making the protein non-allergenic. Whey Protein Hydrolysate volume used in infant formula in 2015 is estimated to be more than 10,000 MT.

- **α-Lactalbumin** is the primary whey protein found in human breast milk accounting for 20% of total protein and containing all essential amino acids needed by humans, thus making it an important protein for growth in infants. In cow’s milk, β-Lactoglobulin which is not contained in human breast milk accounts for approx. 50%, and α-Lactalbumin for around 20-25%. Some premium infant formulas are produced using α-Lactalbumin for this reason. Estimated use in infant formula is between 2,500-3,000 MT in 2015.

- **Lactoferrin** is a glycoprotein present in both cow and human milk with highest concentrations in the latter. It is an essential factor in immune responses and health and functioning of the intestinal tract. 150-200 MT of Lactoferrin is estimated to have been applied in infant formula in 2015, most of which in Asia.
Global Infant Formula Report – project management and costs

3A Business Consulting team:
- Managing partner - Tage Affertsholt
- Junior consultant – Daniel Pedersen

Report available in PDF format – in total approx. 120 slides – from September 2016

EUR 3,600