InFat™ the speciality fat for infant formula with high sn-2 palmitic acid.

**Nutritional benefits:**
- closer to mother’s milk
- better energy uptake
- less constipation
- improved calcium absorption

**Customised composition**

InFat™ – Closer to mother’s milk
Human milk-fat composition

In human breast milk, and in most infant formulas, about 50% of the dietary calories are supplied to newborns as fat. More than 98% of this fat is in the form of triglycerides, which contain saturated and unsaturated fatty acids esterified to glycerol (1). Fatty acids in human milk-fat have a highly specific positional distribution on the glycerol backbone (2). This specific configuration is known to have a major impact on the efficacy of this nutrient absorption. Palmitic acid (C16:0) is the predominant saturated fatty acid, constituting 17-25% of the fatty acids in mature human milk. Of the palmitic acid, 70-75% is esterified to the sn-2 position of the triglyceride (2). In contrast, palmitic acid present in standard vegetable oils is esterified to the sn-1 and sn-3 positions while the sn-2 position is predominantly occupied by unsaturated fatty acids (3).

Human milk-fat absorption

When an infant is breast fed, the hydrolysis of dietary triacylglycerols by endogenous lipases produces sn-2 monoacylglycerols and free fatty acids (4). The importance of the positional distribution of the fatty acids in human milk or infant formula fat applies particularly to palmitic acid since it is one of the major constituents and is relatively poorly absorbed. The unsaturated and short chain saturated fatty acids are well absorbed regardless of their positional distribution (5). The coefficient of absorption of free long chain saturated fatty acids, i.e. palmitic acid and longer, is relatively low (6). This in part due to their melting point above body temperature (~63ºc), thus the tendency of these fatty acids is to form hydrated fatty acid soaps with minerals such as calcium or magnesium at the pH of the intestine (7).

InFat™ – Mimicking mother’s milk

InFat™ is a patented enzymatic process that transforms ordinary vegetable oils into a triglyceride structure that mimics mother’s milk. This process ensures optimal fat and calcium absorption by the infant. The significance of this fatty acid and its position is evident from the fact that this is conserved in all women, regardless of race or nutrition, unlike the general fatty acid profile of human milk.

Absorption of human milk-fat compared to standard infant formula

The superior absorption of human milk fat over standard infant formula has been demonstrated in both human (8-10) and animal models (5, 11). These studies showed that palmitic acid is absorbed from human milk as sn-2 monoacylglycerol (9), and conserved as such through digestion, absorption, and chylomicron triacylglycerol synthesis (10) (Figure 1). Palmitic acid esterified at the sn-1 and 3 positions of the glycerol backbone, as is the case in most standard infant formula, was shown to be poorly absorbed and secreted into faeces as insoluble calcium soaps. This leads to loss of both fatty acids (energy) and calcium (12, 13) (Figure 2).

InFat™ by InFats® International

InFat™ is an advanced basic-fat ingredient, developed to meet the specific needs of the growing infant. It has a fat composition mimicking that of human milk fat, thereby enabling optimised uptake of calcium and energy and easy digestion. These benefits are the result of the fatty acid composition on the glycerol backbone, which ensures high level of palmitic acid at the middle (sn-2) position. The significance of this fatty acid and its position is evident from the fact that this is conserved in all women, regardless of race or nutrition, unlike the general fatty acid profile of human milk.
mother’s milk

The palmitic acid in InFat™ is to a large extent positioned in the second (sn-2) position on the triglyceride, just as in mother’s milk (Figure 3). Clinical studies have shown that infants fed formula based on structured fats with a high level of palmitic acid in the sn-2 position have softer stools compared to infants fed standard vegetable oil formula (15). It has also been shown that the absorption of palmitic acid is improved when using structured fats, as is calcium absorption (8, 16-19). Evidently palmitic acid in the sn-2 position leads to efficient fat absorption and avoidance of soap formation with calcium (20).

There is also an effect on the whole-body bone mass of the infants; it is significantly increased compared to a standard vegetable oil infant formula (15). This suggests that the formula composition may affect the skeletal mineral deposition in infants.

References
AAK is a leading manufacturer of high value-added speciality vegetable fats and oils.

From seven plants in Europe, North and South America the company supplies the global food and confectionery industry. A dedicated plant for the manufacture of InFat™ was opened in Karlshamn, Sweden in 2008.

AAK shares are listed on the OMX Nordic Exchange in Stockholm.

Enzymotec develops and produces innovative lipid based bio-functional ingredients for advanced infant nutrition, clinical nutrition and food supplements.

Enzymotec’s unique ingredients are designed to address the health needs associated with the whole life cycle, starting from babies up to seniors.

The company was established in 1998 and is based in Migdal HaEmeq, Israel, with offices, R&D laboratories and production facilities.

Advanced Lipids is a Joint Venture between Enzymotec and AAK, established in 2007. The cooperation between the two companies goes back to 2003. The Joint Venture offers a unique package, combining both Groups’ advantages in R&D, manufacturing logistics and quality.