Bodil Granroth
Nutrition

Lipids in Infant formula and onwards

Agenda

1. Human Milk
2. Raw materials used in infant formula
3. Processing of vegetable oils
4. Infant formula blends
5. Closer to human milk fat
6. Lipids in Baby Food

Marketing of “breast-milk substitutes”

Breastfeeding is best

“Aggressive marketing of breast-milk substitutes continues to undermine efforts to improve breastfeeding rates. In May 1981, the World Health Assembly (WHA) adopted the International Code of Marketing of Breast-milk Substitutes to limit inappropriate marketing practices. […] The Code and the relevant WHA resolutions are the world’s first real attempt to tackle the harmful effects of marketing of breast-milk substitutes, feeding bottles and teats on a global scale.”
(WHO Status report, 2016)

The WHO publishes an overview of countries’ efforts to implement and enforce adherence to the Code on a regular basis

There is no “standard” human milk

- The composition of breast milk develops during lactation and is further influenced by the mother’s diet
- The genetic variation in the fatty acid-converting enzymes further contributes to differences in the composition of breast milk

Studies of vegans: the fatty acid composition of plasma choline phosphoglycerides, erythrocytes, adipose tissue, and breast milk, and some indicators of susceptibility to ischemic heart disease in vegans and omnivore controls[1–2]

Fatty acid composition of mature human milk in Germany[1–3]

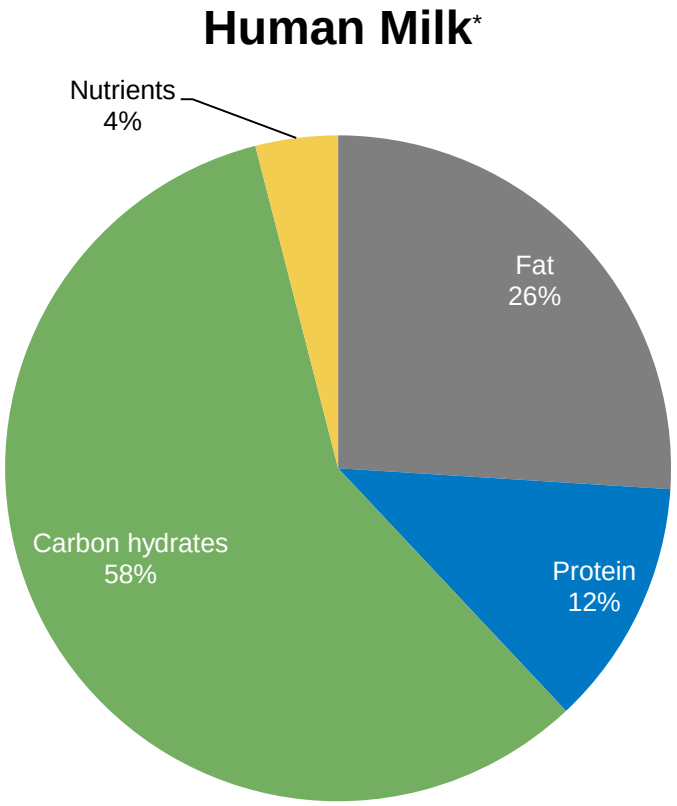
Fatty acid composition of human colostrum and mature breast milk[1,2]

Evaluating the *trans* Fatty Acid, CLA, and Fatty Acid Diversity in Human Milk from Five Regions of China

Breast milk composition: fat content, fatty acid composition in vegetarians and non-vegetarians[1,2]

Fatty acid composition of breast milk from three racial groups from Penang, Malaysia[1–3]

Composition of human milk fat



Human Milk fat

- Triglycerides > 98%
- 0.4% Cholesterol
- ~0.3-1% Phospholipids
- 0.1-0.8% DHA &
- 0.2-1% AA of total FA

* Source *ingredients for the world infant formula market 2004*

Fats for infant nutrition

Fat is a substantial ingredient of infant formula:

- As an energy source
- As the source of essential FAs
  Linoleic C18:2 (omega 6)
  Linolenic C18:3 (omega 3)

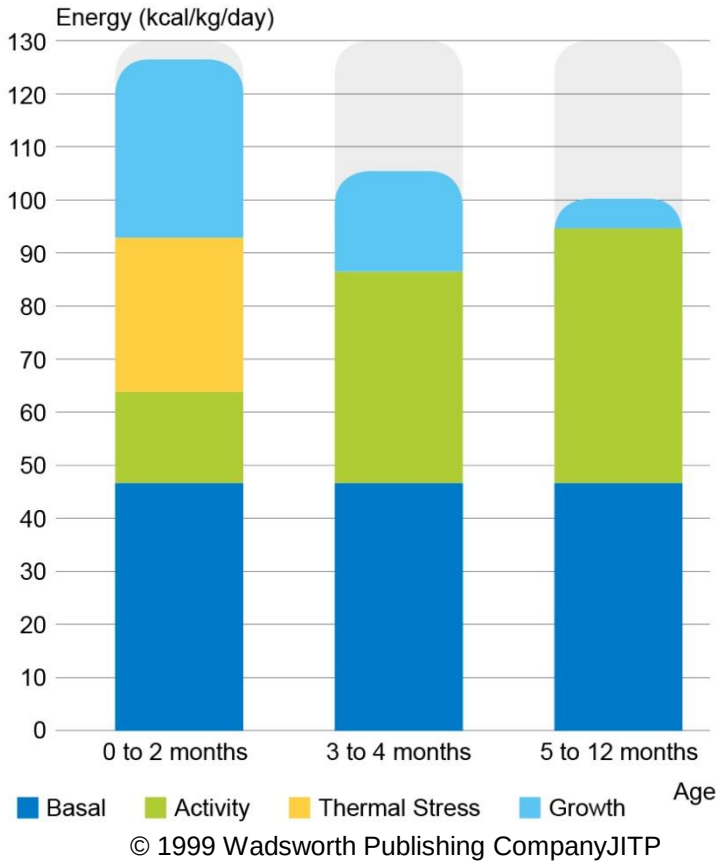
How to copy human milk fat

- Fatty acid composition

Which raw materials are used?

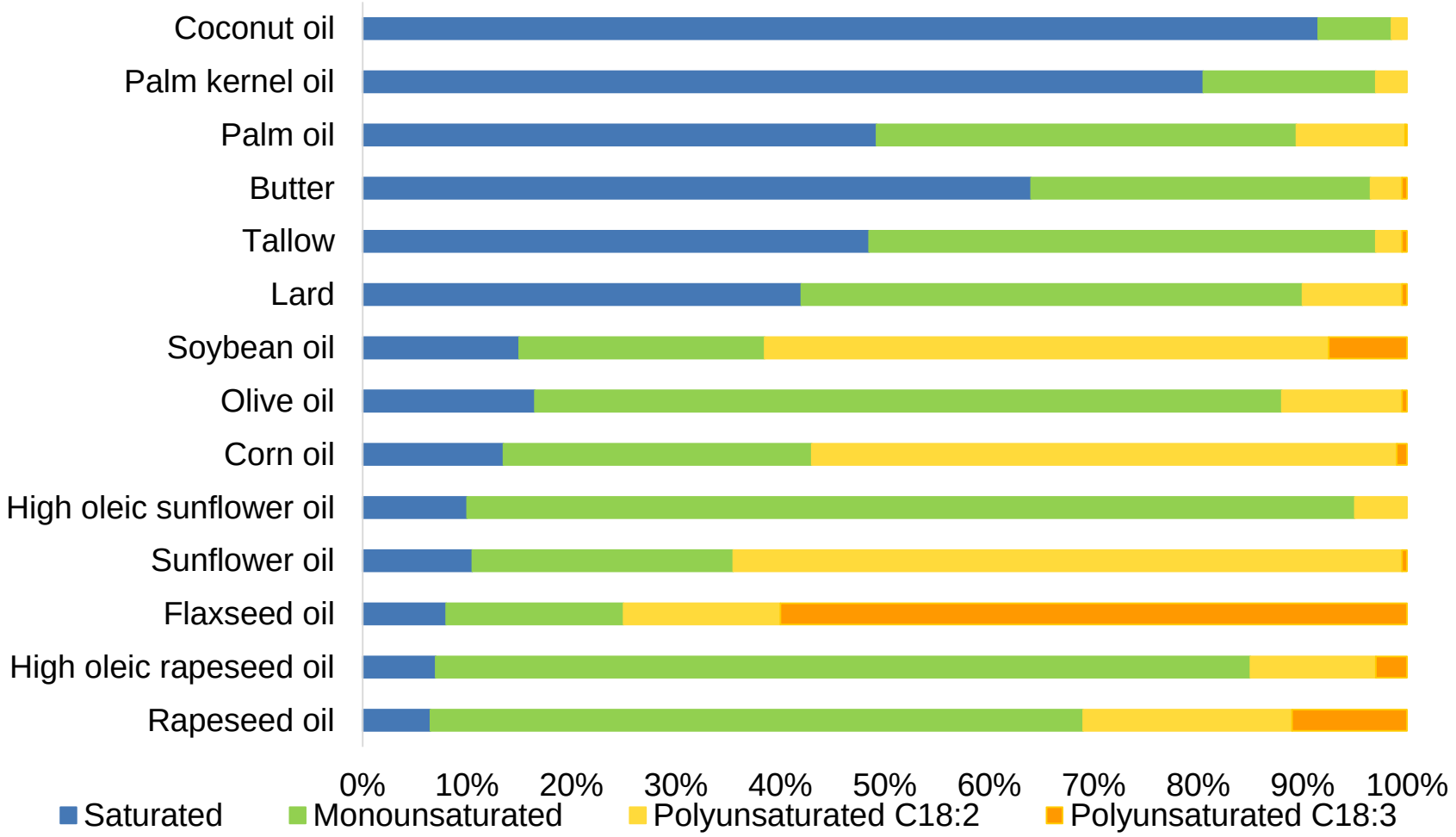
- Rapeseed, soybean and sunflower oil
- Palm oil
- Palm kernel and coconut oil

Non essential fatty acids

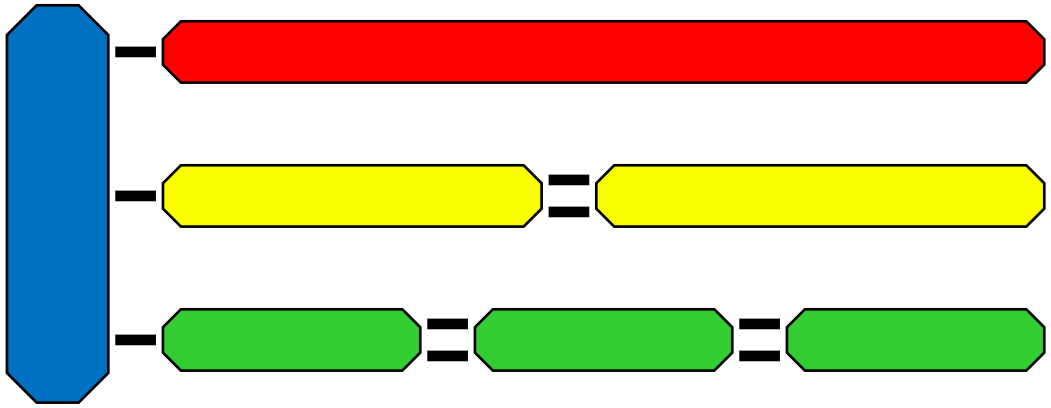


Composition of vegetable oils and fats

- Plants have a unique ability to synthesize a wide range of fatty acids
- Compositions of oils depend on species, growth conditions, season, genetic variety, etc



Structure of triglycerides, fatty acid positions



Outer position, sn-1

Mid position, sn-2, beta, β

Outer position, sn-3

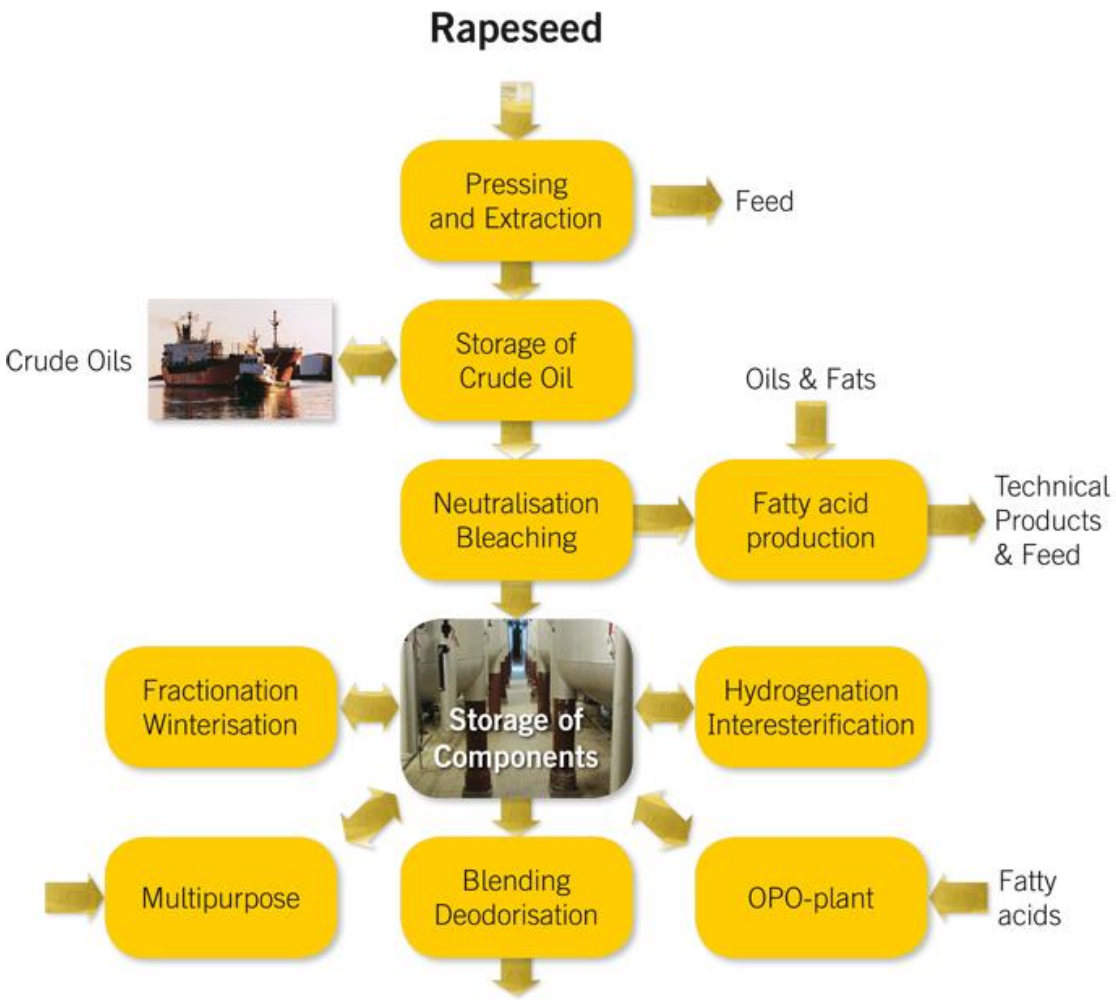
Glycerol

Saturated fatty acid

Monounsaturated fatty acid

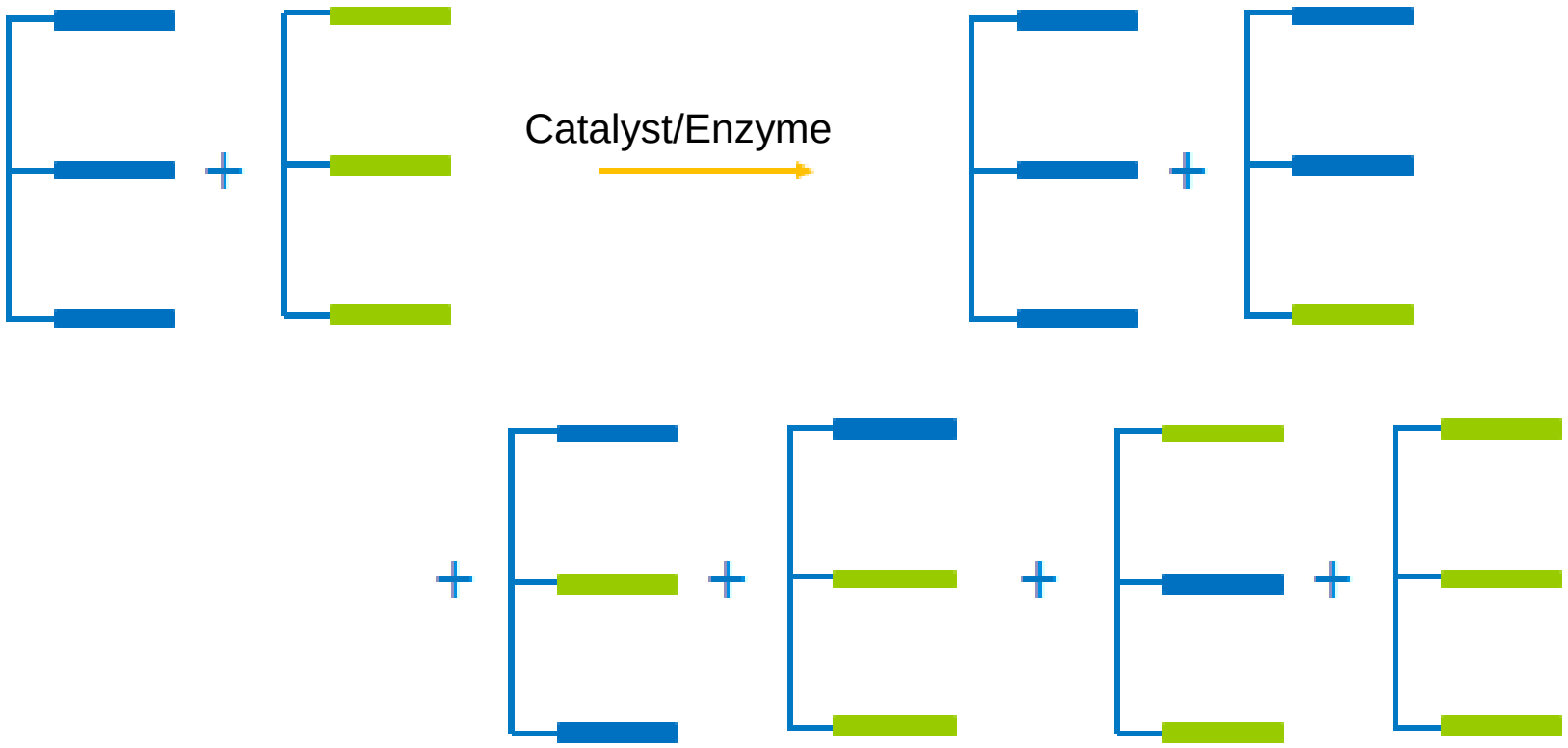
Polyunsaturated fatty acid

Processing of vegetable oils



Interesterification

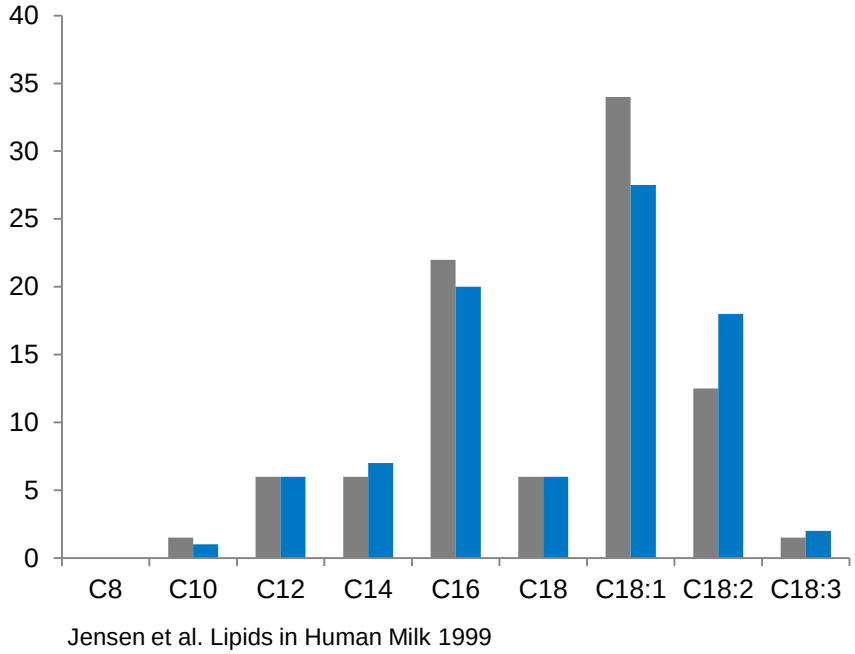
- Fatty acids change place



Infant nutrition blends

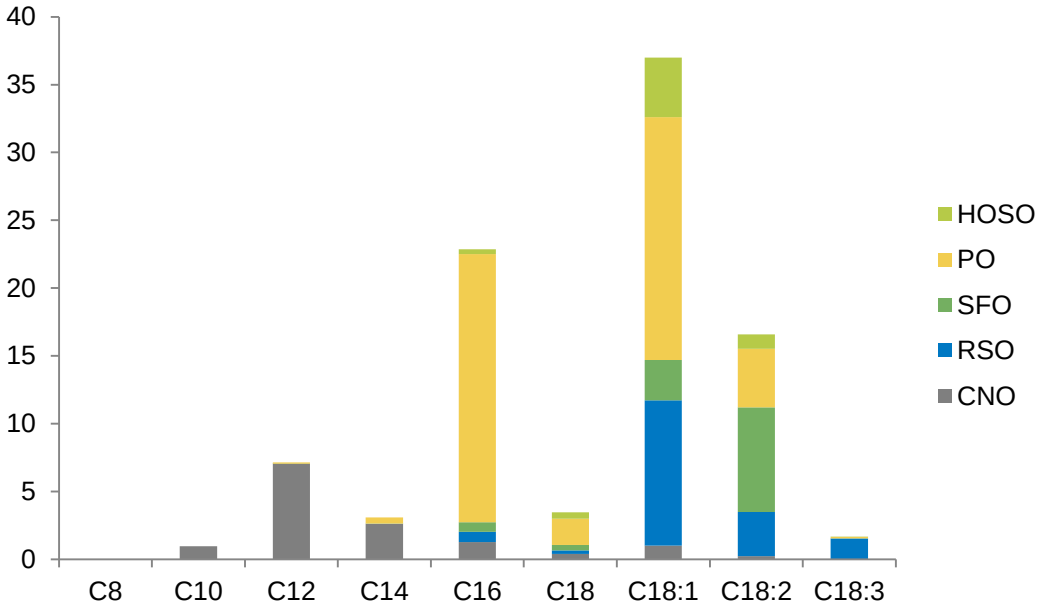
- Specified Fatty Acid profile
  Natural variation of the raw materials
- Specified Quality
  Oxidation parameters, legislation demands
- Security from start to finish
  Contaminant standard

Fatty acid profiles



Jensen et al. Lipids in Human Milk 1999

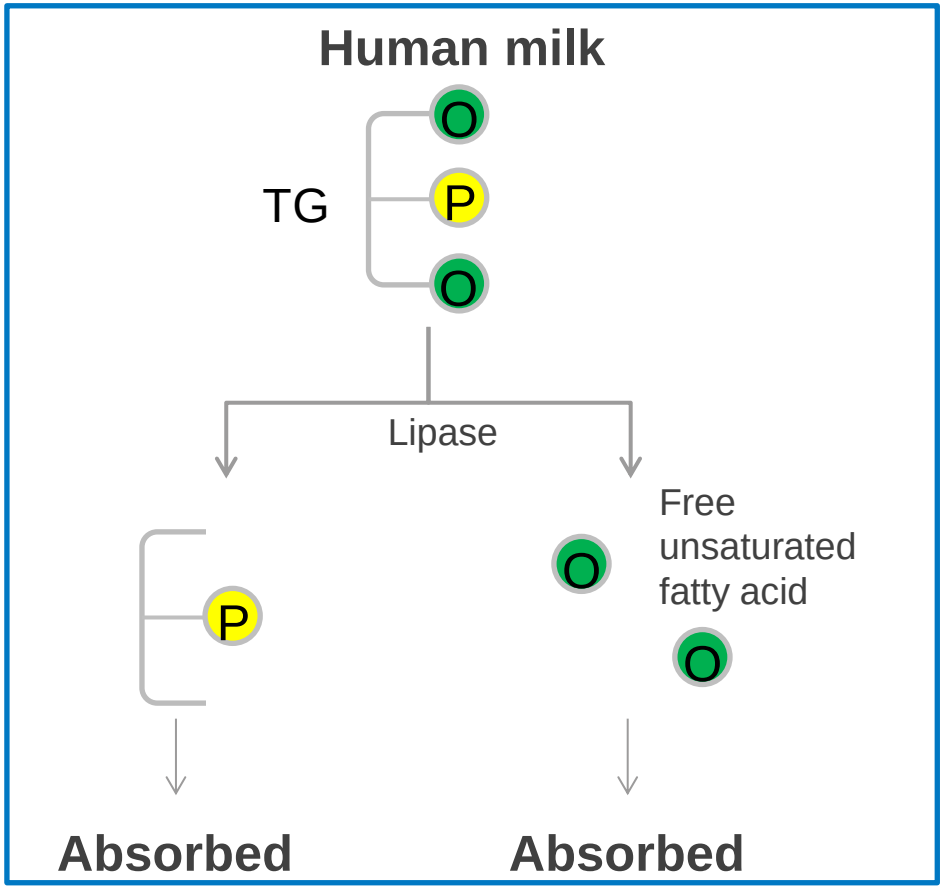
- Fatty acid profile for human milk from mother having a western diet and mothers having an non western diet.
- Coping the FAC profile below in an infant formula

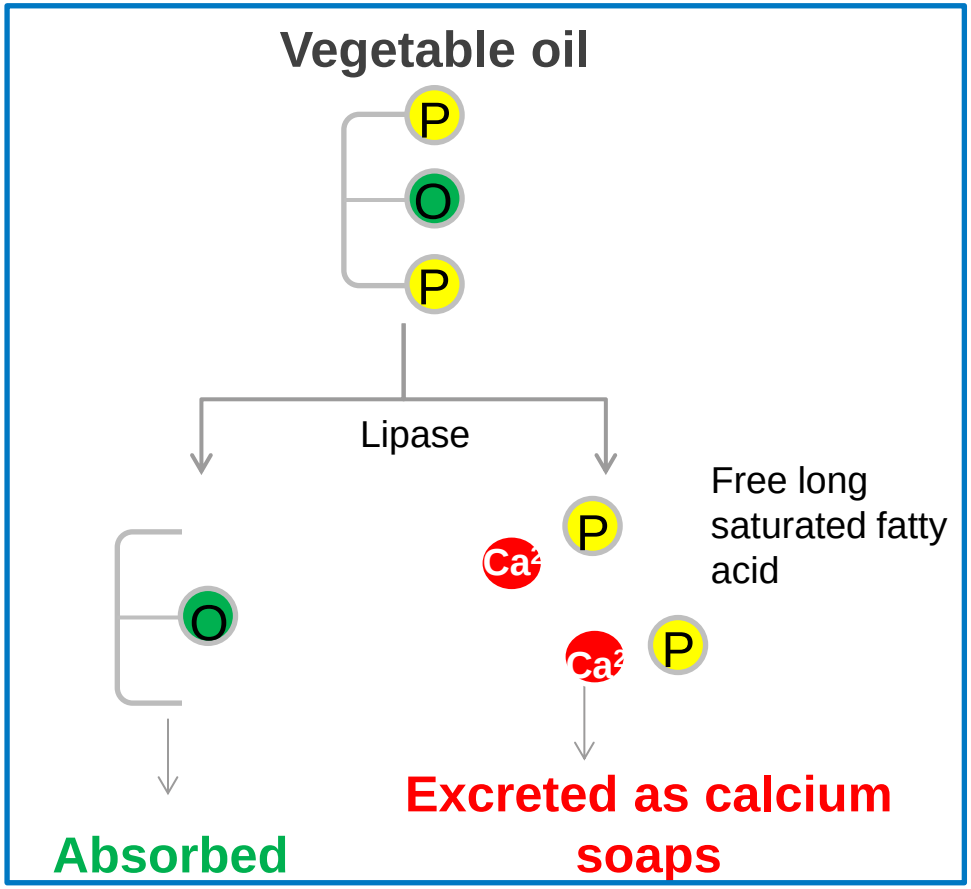


As close as possible to human milk fat

- Fatty acid you can match with natural vegetable oils
- Triglyceride structure differ
  In human milk fat C16 is predominantly in sn-2 position.
  Vegetable fat mostly in sn-1 and 3 position
- Infat enriched with high level of C16 in sn-2 position.
  Enzymatic interesterification process

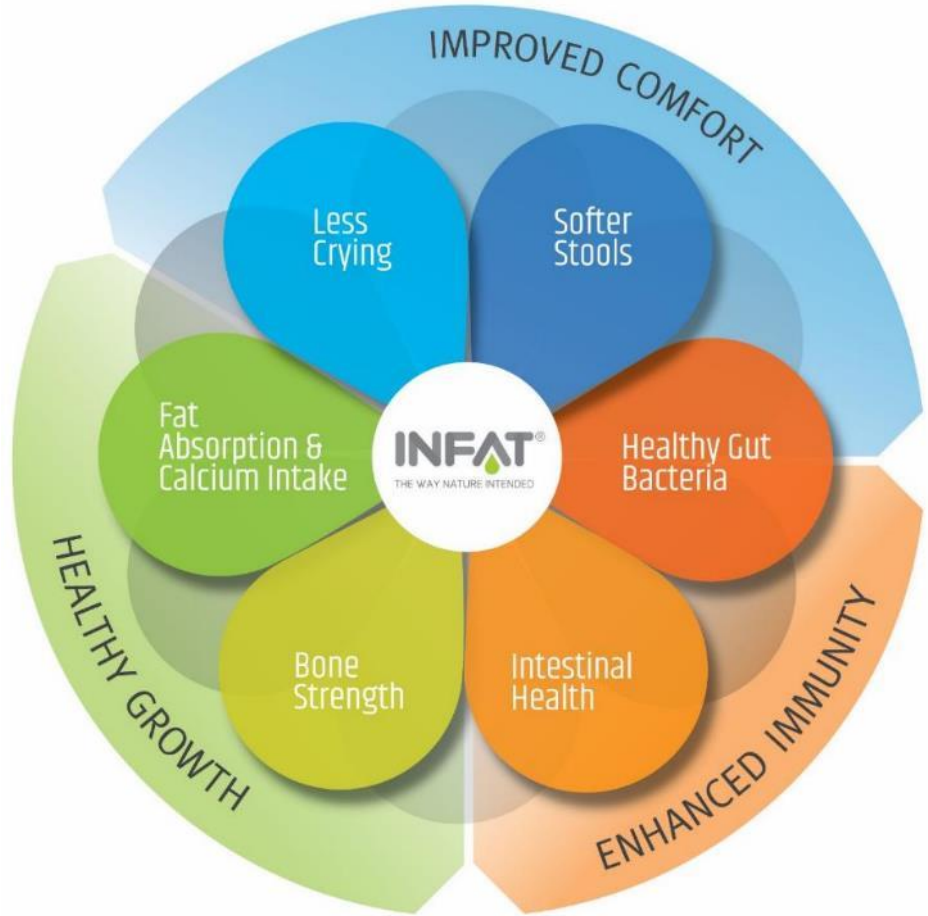
Human Milk vs Vegetable Oil Triglyceride Digestion





Infat® Benefits

Joint venture of AAK & Enzymotec
ADVANCED LIPIDS



www.advancedlipids.com

Baby Food

- Health claim (EU)

‘Essential fatty acids are needed for normal growth and development of children’
A daily intake of 1 % of total energy for linoleic acid (18:2) and 0,2 % of total energy of α-linolenic acid (18:3)

- A growing demand for toddler formula.
  Driven by convenience
  Make sure that the child gets all the nutrients required.

Summary

- Infant formula's goal is to copy human milk.
- Vegetable oils are blended to meet the human milk fat's FAC
- Sn 2 Palmitate can be used to also resemble the human milk fat's structure
- Toddler formula more focus on essential fatty acid levels and balance between omega 3 and omega 6.


Thank you for your attention!
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