Foods with a high fat quality are essential for healthy diets

Dr. H. Zevenbergen
Unilever Research&Development
Agenda

- Main dietary sources of fat
- Basic technology and production of oils, margarines and cooking products
- Improving their nutritional characteristics
- Impact of modern fat and oil products on diet and health
- Conclusions
Main dietary sources of fat
Many different fat-rich products

- **Primary:**
  - Vegetable/plant oils
  - Butter/milk fats
  - Lard/tallow/suet/dripping (derived from animals)
  - Marine

- **Secondary:** (made from one or more of the above)
  - Margarines, Melanges, Reduced fat spreads
  - Butter and Ghee
  - Vanaspati
  - Cooking fats/white fats/shortenings
  - Mayonnaise
Main dietary sources of fat

- **Major contributors to intake of saturated fat**
  - Dairy (cheese, butter, milk)
  - Meat
  - Baked goods and snacks
  - Cooking fats/oils

- **Major contributors to intake of polyunsaturated fat**
  - Vegetable oils
  - Margarines and mayonnaise
Fatty acid composition of common fat rich products

![Bar chart showing fatty acid composition of various products](chart.png)
Oils and fats in perspective

6.5 b people consume about 120 m tons pa
That is almost 20 kg per capita

Annual value of oils and fats market over €120b
Regional consumption patterns

Liquid Oils -  Lard -  Ghee/Vanaspati/Cooking -  Margarine/Butter -
Basic technology and production of oils, margarine and cooking products
Vegetable oil sources

Soybean oil  Sunflower oil  Canola oil  Corn oil

Palm Oil  Olive Oil  Coconut Oil

Palm Kernel  Palm Fruit
Vegetable oil products - farm to table

agriculture

oil milling

crude oils and fats

selective removal of undesirable components

OIL PROCESSING

modification of the physical properties

Table oil

Mayonnaise

Margarine

consumer
What is a margarine?

A structured water-in-oil emulsion with properties like spreadability, stability and mouthfeel.
Consumer requirements of solid fat content in margarine

Solid Fat Content

Temperature °C

Easy to spread from refrigerator

Stable on the table

Desired curve

Melting in the mouth

Consumer requirements of solid fat content in margarine

- Easy to spread from refrigerator
- Stable on the table
- Melting in the mouth
Consumer requirements of solid fat content in margarine

Solid Fat Content

Temperature °C

Fat

Desired curve

Oil

Hans Zevenbergen, Unilever R&D, 28/01/09
Modifications and blending of oils for optimal margarines

- Liquid oils
- Tropical oils
- Full Hydrogenation
- Interesterification
- Fractionation
- Trans-free basis for margarine
Modification of natural fats and oils

**Partial or full hydrogenation**

\[
\begin{align*}
&\text{cis-unsaturates} \rightarrow \text{trans-unsaturates} \rightarrow \text{saturates} \\
&\rightarrow \text{Full hydrogenation does not lead to trans!}
\end{align*}
\]

**Interesterification**

\[
\rightarrow \text{Interesterification leads to rearrangement of the fatty acids on the glycerol backbone}
\]
Improving the nutritional characteristics of products made from oils and fats
Drivers of nutritional improvements for food industry

- Replace SAFA by MUFA or preferably PUFA
- Practically eliminate TFA
- Ensure delivery of essential Omega 3 and 6
- Fortify with fat soluble vitamins A and D
- Preserve natural antioxidants (e.g. vit E)
Improvements in margarine

% of fat


“Best” margarines

PUFA

SAFA

Omega 3

TFA
Trans fat removal: example of industry action for better health

Special Article

The Elimination of Trans Fats from Spreads: How Science Helped to Turn an Industry Around

Onno Korver, PhD, and Martijn B. Katan, PhD

- Based on reports showing an untoward effect of trans on blood lipids in 1990 (studies sponsored by Unilever) Unilever started an extensive development program
- Margarines with very low trans fat content were developed 1993
- Implemented by 1995 in most regions using tropical oils and in US with non–tropical oils.
- Unilever led; most of industry followed
Normal heating does not affect the nutritional quality of oils

- shallow frying for 20 mins at 150-180 C
  - Relative loss of linoleic acid < 1% and α-linolenic acid < 2%
  - No formation of trans-isomers

→ As long as excessive temperatures are avoided, EFA survive cooking.
Impact of modern fats and oils products on diet and health
Impact of modern fat products on health: three examples

1. Oils, margarines and mayonnaise are nutrient-dense sources of essential fats

2. Significant contribution to the required intake of vitamins A, D and E via margarines

3. Relevant impact on LDL-cholesterol level and hence on CHD incidence by soft margarines

→ Potentially significant impact on public health from oils, margarine and mayonnaise
1. Margarines, mayonnaise and vegetable oils are nutrient-dense source of ALA

- Alpha-linolenic acid content (g/100 kcal)
1. Role of margarine recently confirmed by the Netherlands Nutrition Centre

Intake of ALA for large part of the Dutch population is below recommended level

- Margarines (40% fat) are nutrient-dense source of ALA
- Margarine is also nutrient-dense source of fat soluble vitamins
- Therefore Dutch nutrition policy makers have increased the recommended amount of margarine (40% fat) from 20g/d to 30-35g/d (6-7 slices of bread with margarine every day)

Based on Guidelines good nutrition, Oct 2007 www.voedingscentrum.nl
2. Margarines can be significant providers of fat soluble vitamins in the diet

Finnish men 25-64 years

- Vitamin A
- Vitamin D
- Vitamin E

3. Assessing the impact of fat products on blood cholesterol

Meta-analysis of Mensink et al. 2003

3. Butter and fats raise LDL-cholesterol; soft premium margarines and mayonnaise don’t

Fat composition of foods influences their ability to lower or increase blood cholesterol: predicted effect of consumption of 20 g per day

3. Switching butter, vanaspati and palm oil for soft margarines can reduce the risk of CHD

- Per year nearly 8 million people die of CHD
- 1% reduction in LDL-cholesterol level translates to ~1-2% reduction in CHD risk (NCEP, 2001)

- Switching 20 g /day soft margarine for butter or cooking oils/fats is predicted to lower LDL-cholesterol by 3-4%

→ using soft margarines instead of butter or cooking fats worldwide could mean a reduction of annual CHD deaths by more than half a million!
Conclusions

- Oils and fats and products made thereof play an important role in our diets worldwide.
- The food industry has made significant improvements to the nutritional quality of products like margarines and cooking products.
- Switching products from animal fats or cooking fats to soft margarines or oils contributes positively to a healthy diet.
- Despite wide differences in dietary habits, modern products made from fats and oils are essential for healthy diets for children and adults worldwide.
- Many people are not aware of the benefit of soft margarines and cooking products: time to educate and motivate for better health!
Thank you