Evolution and Extinction-A
Short History of yellow fats in
Australasia

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Oils and Fats specialist group
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Spreads

- It’s a war
The Menace of Margarine: The Rise and Fall of a Social Problem
A paper written in 1982

Agriculture versus Industry
Vested Interests
The Butter mystique
Hippolyte Meges Mouries 1869

- Made an emulsion of beef tallow Oleo stock and milk/salt
Invention-Oleomargarine (tallow)

- 1869-Mege Mouriere France-patent to Jorgens(Unilever)
- Hydrogenation by Normann
- Stork margarine-hydrogenated fish oil hardstock
- Marrickville Sydney.1908 Albert Abel
- In November 1920 George Hanson Abel, started Abels Ltd in Newmarket, Auckland, to produce margarine and shortenings for the baking industry.
- Related to the Abels of Marrickville margarine-Sydney
- 1930’s Vegetable Oils, Provincial Traders, Meadowlea Foods
- Since 1932, Nuttelex is a Melbourne based family business

Abels Newmarket 1974

Also owners of ETA Foods

- 200 people on site
- 90% market share
- 3x Hydrogenation reactors - bomb threat to Newmarket
- Now just a memory
- Chefade, Kremelta Miracle, Praise Dressings
- Eta nuts and peanut butter
Margarine Act 1908 NZ

- Prohibited the colouring, flavouring or the addition of vitamins to imitate butter!
- Pre 1972, pleasant tasting refrigerator spreadable products were not known
- Similar restrictive legislation in Australia (Victoria), Canada and USA
- The Dairy Lobby was very strong-resisted margarine for many years
- Medical lobby resulted in a provison to the Act to allow the manufacture of a specific composition Polyunsaturated margarine
heart disease epidemic: mortality NZ men 1948-2010
Launch of Polyunsaturated Margarine-an exception to Margarine Act NZ 1973

- Miracle, Meadowlea, Dixiebell-launched on NZ market
- Initially slow then took off
- More expensive than butter
- Sales rose –because its spreadable
- Quality formulations with tight fatty acid composition
- Moisture-15.6-15.8%
- Vitamin E added to balance PUFA
- Vitamins A&D added to simulate butter
- Beta carotene gave nice colour
- Quality flavours ex Accomplished flavour houses
Advert from 70’s

- US Miracle-name adopted in Australasia
Butter versus Poly Margarine

**Butter**
- 63% saturates
- 3-4% trans
- 80% fat

**PUM Margarine 1974**
- <20% saturates
- >40 % linoleic acid (omega-6)
- 10-15% trans
- 80% fat

<table>
<thead>
<tr>
<th>Spreadable Oils &amp; Fats</th>
<th>Rank ($)</th>
<th>Dollars (mn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meadowlea Spread Original 500g</td>
<td>1</td>
<td>$ 7.3</td>
</tr>
<tr>
<td>Olivani Lite 500g</td>
<td>2</td>
<td>$ 5.8</td>
</tr>
<tr>
<td>Olivani Spread 500g</td>
<td>3</td>
<td>$ 5.2</td>
</tr>
<tr>
<td>Sunrise Spread 500g</td>
<td>4</td>
<td>$ 5.1</td>
</tr>
<tr>
<td>Flora Light 500g</td>
<td>5</td>
<td>$ 4.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Butter</th>
<th>Rank ($)</th>
<th>Dollars (mn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mainland Butter Salted 500g</td>
<td>1</td>
<td>$ 7.6</td>
</tr>
<tr>
<td>Anchor Butter 500g</td>
<td>2</td>
<td>$ 7.6</td>
</tr>
<tr>
<td>Ferleaf Butter Salted 500g</td>
<td>3</td>
<td>$ 5.1</td>
</tr>
<tr>
<td>Fernleaf Semi-Soft Butter 500g</td>
<td>4</td>
<td>$ 3.5</td>
</tr>
<tr>
<td>Country Soft 500g</td>
<td>5</td>
<td>$ 3.0</td>
</tr>
</tbody>
</table>

Source: Euromonitor, January 2006 & Aztec Scan Data.
Spreadability

Comparison of Solid Fat Contents

- Δ Δ NZ Summer Milkfat
- O O NZ Spring Milkfat
- • • Polyunsaturated Margarine

Solid Fat Content (%) vs. Temperature (°C)
When trans fats were ok!

- 1972 Repeal of 1908 Margarine act and introduction of polyunsaturated margarine due to the medical lobby
- Science and technology of hydrogenation-maximising trans acids.
- Buttermark and NZDB attack margarine as the product of evil alchemists (Mr Pettigrew)
- Work begins on spreadable butter-Robert Norris and DRI milkfat section
Formulation of Polyunsaturated

- Blend of polyunsaturated oils with hardstock-SFC and m.pt.
- GLC control vital for labelling and compliance
- Vitamins A, D and E
- Skim Milk
- Beta carotene/annatto colour
- Flavours
- Antioxidant
- salt
Hydrogenation of vegetable oils

- Low pressure important
- Selective nickel catalysts
- Raw material-SBO, CSO, palm olein, Canola
- End point critical-IV controlled but SFC and mpt crucial
- Minimising saturates and maximising trans
Selective hydrogenation

- Trans maximisation
- Saturates minimisation
Hardstocks

<table>
<thead>
<tr>
<th>Hydrogenated ‘hardstock’</th>
<th>Iodine value</th>
<th>Solid fat at 20°C (%)</th>
<th>mpt</th>
<th>Trans (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybean</td>
<td>65</td>
<td>80</td>
<td>45</td>
<td>40</td>
</tr>
<tr>
<td>Palm olein</td>
<td>48</td>
<td>86</td>
<td>47</td>
<td>39</td>
</tr>
<tr>
<td>Canola</td>
<td>65-70</td>
<td>80</td>
<td>45</td>
<td>42</td>
</tr>
</tbody>
</table>
Composition of soft tub margarine (non-polyunsaturated) with medium *trans* (9-10%) fatty acids.

<table>
<thead>
<tr>
<th>Component</th>
<th>Kg</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybean or canola</td>
<td>9303</td>
<td>45</td>
</tr>
<tr>
<td>Hydrogenated palm olein/soy/canola (high <em>trans</em>)</td>
<td>4569</td>
<td>22.4</td>
</tr>
<tr>
<td>Palm olein</td>
<td>2448</td>
<td>12</td>
</tr>
<tr>
<td>Distilled monoglyceride</td>
<td>25</td>
<td>0.12</td>
</tr>
<tr>
<td>Lecithin</td>
<td>25</td>
<td>0.12</td>
</tr>
<tr>
<td>Mixed tocopherols (70%)</td>
<td>1.1</td>
<td>50 ppm</td>
</tr>
<tr>
<td>Beta carotene (30%)</td>
<td>0.556</td>
<td>8.1 ppm</td>
</tr>
<tr>
<td>Vitamin A palmitate</td>
<td>0.343</td>
<td>_</td>
</tr>
<tr>
<td>Vitamin D3</td>
<td>0.061</td>
<td>_</td>
</tr>
<tr>
<td>Flavours: dairy aroma</td>
<td>to suit</td>
<td></td>
</tr>
<tr>
<td>Skim milk (or water)</td>
<td>3555</td>
<td>17.42</td>
</tr>
</tbody>
</table>
Composition of soft tub margarine (olive based) with no *trans* fatty acids.

<table>
<thead>
<tr>
<th>Component</th>
<th>Kg</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canola or soybean</td>
<td>168</td>
<td>16.8</td>
</tr>
<tr>
<td>Olive oil (RBD or EVOO)</td>
<td>300</td>
<td>30.0</td>
</tr>
<tr>
<td>Interesterified palm stearine/palm kernel blend</td>
<td>137</td>
<td>13.7</td>
</tr>
<tr>
<td>Fully hardened palm oil</td>
<td>6</td>
<td>0.6</td>
</tr>
<tr>
<td>Emulsifier (DMG)</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Lecithin</td>
<td>0.5</td>
<td>0.05</td>
</tr>
<tr>
<td>Vitamins A &amp; D</td>
<td>0.0003</td>
<td>-</td>
</tr>
<tr>
<td>Colour (Annatto)</td>
<td>0.09</td>
<td>-</td>
</tr>
<tr>
<td>Flavours</td>
<td>to suit</td>
<td></td>
</tr>
<tr>
<td>Salt</td>
<td>15</td>
<td>1.5</td>
</tr>
</tbody>
</table>
Mea culpa-whoops!
Margarines had 10-15% trans fat
Subtle dairy industry advertising!

Above is shown the typical way in which margarine is manufactured. Butter on the other hand comes fresh every morning from the butter fields, untouched except by rosy-cheeked dairymaids who insist it for your satisfaction.
Miracle Margarine production at Abels-our scientific response

SAY MARGARINE IS GOOD FOR YOU

ONE MORE TIME
Innovation stories for Fats Industry

- Polyunsaturated margarine 1973
- Refining, bleaching fractionating and interesterifying tallow and coconut oil
- Selective hydrogenation-maximising trans
- Palm oil substituting for tallow in industrial products 1980
- Spreadable butter 1988-hard fraction into pastry butter-first SSHE plant brought into NZ from Denmark
- Dairy blends-Country Soft 1988
- Avocado oil 2000
- Quality NZ EV olive oil 2000-2015
- Flaxseed-the growing functional ingredient
- Marine oils production and purification, utilisation
Fractionated butter-from NZDB/DRI

- Pastry Butter- 4 fractions
- Stearine/hardstock side product from spreadable butter manufacture
- Expensive
- Spreadable butter was difficult to sell at a margin
Spreadable butter

- Perfidious Albion (the POMS)
- They thought they saw a bit of butter,
- Spread upon the bread
- They looked again and saw
- A broken rule instead
- The British people shall not be exposed to this they said
- And so it was doomed!
- 6 NZDB UK directors jailed
Spreads and Dairy blends

1989 design of Country soft for Anchor farm Products
Dairy Blends

- Percent of vegetable oil/hardstock
- SFC profile required
- Cultured cream-flavours in the aqueous phase
- Cream receipt and handling
- Vacreation/Flavourtech
- Moisture content
- Eutectics with palm olein, CNO and PKO
Avezzo-the expensive wedding of olive and avocado oils.
A market failure—why???

- Wrong timing-2001-too soon
- Insufficient promotion, benefits and utility
- Too expensive, too niche
- A crowded chiller cabinet competing with Unilever and Goodman
Boutique oils used

- Olive oil-pomace or EV or RBD?
- Avocado oil-Green?
- Fish oil-omega-3 concentrates
- Flaxseed
- Rice Bran Oil-small current niche in NZ
- Macadamia nut oil
- Coconut oil-coming?
- High carotene palm oil for colouring
- Canola for omega-6/omega-3 ratio
Omega-3 margarine/spreads

- Level required?
- Stability and flavour
- Cost
Omega 3—also a market fizzer

Spread
Plant Sterol spreads
Interesterification

- Hardstock mix-FHPKO and FHPO is a good fast crystalliser
- Palm strn/HCNO acceptable but slow
- NaOMe still mainly used but enzymatic techniques slowly becoming more economic
- Blends made with Int Hstock have more saturates than with PHVO
Interesterified hardstock
Processing

- Water chill process - Abels home made. Until 1976
- Diacooler drum complector ex G&A-only now used for bakery fats-great for slow crystallisers-palm and tallow
- Votator ex USA (Anton Bailey)
- Gerstenberg perfector (Denmark)
- Schroder Kombinator (Germany)
- Narrow annulus/resting tube Perfectors (SPX)
Old Diacooler setup
Packaging of margarine—what’s next?

- Packed in different form
Future variants?

- No hydrogenated fats
- Omega-6:3 ratio-ALA, EPA and DHA
- Probiotics
- Bioactives
- Flavours-lactic fermentation
- Exotic oils-macadamia, borage, omega-3 canola (GM), CNO

- Market will remain price sensitive and cost driven and always in the shadow of butter.