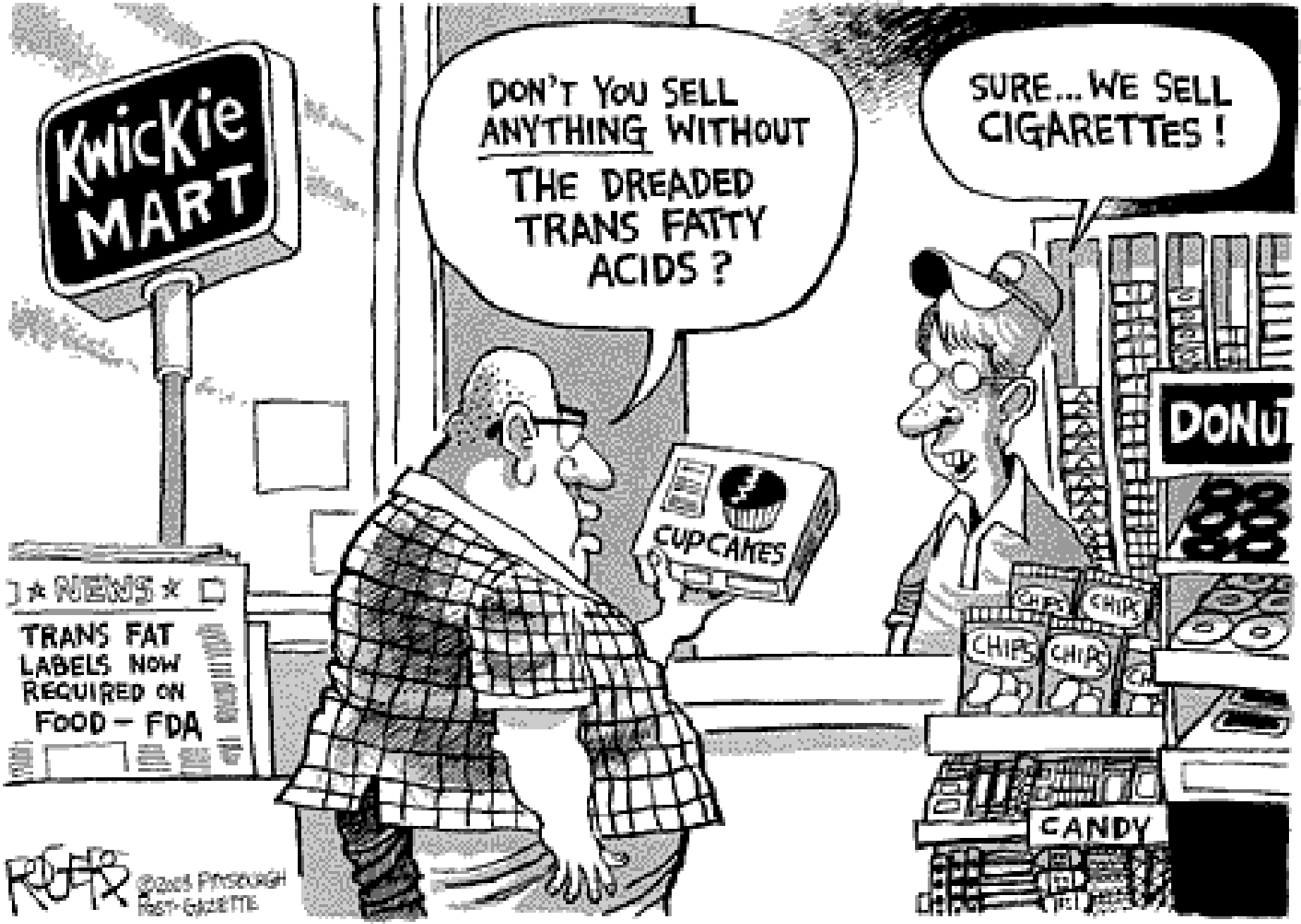
# *New Oils for a Trans Free Solution*

4th Global Oils and Fats Forum
September 8-9, 2005

Michael Erickson
*Cargill Dressings, Sauces and Oils*
*Technical Services Manager*


KWICKIE MART
DON'T YOU SELL ANYTHING WITHOUT THE DREADED TRANS FATTY ACIDS?
SURE... WE SELL CIGARETTES!
CUPCAKES
DONUT
CHIPS
CHIPS
CHIPS
CHIPS
CANDY
NEWS
TRANS FAT LABELS NOW REQUIRED ON FOOD - FDA
©2003 PITTSBURGH POST-GAZETTE

# The Elusive “Drop-In” Solution

Soybean Oil

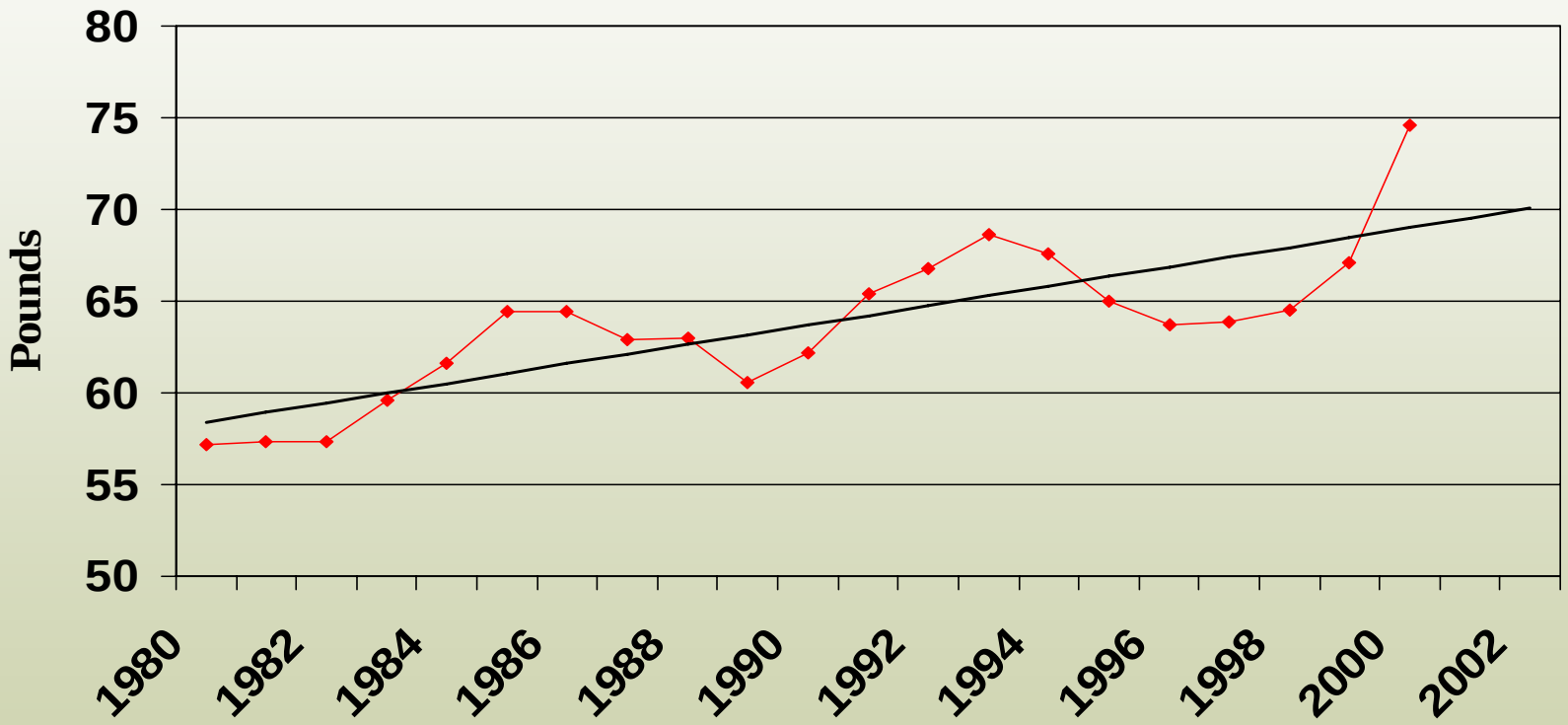
All Purpose Shortening


All Purpose Shortening

Soybean Oil


***Cargill Dressing, Sauces and Oils***

# Per Capita Fat Consumption




**Oil Crop Situation and Outlook Yearbook** / OCS-2003

***Cargill Dressing, Sauces and Oils***

# Importance of Fats

- Most concentrated source of energy, supplying 9 Cal/gram
  - Carbohydrates supply 4 Cal/gram
  - Proteins supply 4 Cal/gram
- Supply essential fatty acids
- Carrier for fat soluble vitamins
- Contribute to satiety
- Improve palatability

***Cargill Dressing, Sauces and Oils***

# Saturated Fatty Acids

| Name | No. C Atoms | Mpt °F | Typical Source |
|---|---|---|---|
| Butyric | 4 | 18 | Butterfat |
| Caproic | 6 | 26 | Butterfat |
| Caprylic | 8 | 62 | Coconut, Palm Kernel Oils |
| Capric | 10 | 89 | Coconut, Palm Kernel Oils |
| Lauric | 12 | 112 | Coconut, Palm Kernel Oils |
| Myristic | 14 | 130 | Coconut, Palm Kernel Oils |
| Palmitic | 16 | 145 | Most Fats & Oils |
| Stearic | 18 | 158 | Most Fats & Oils |
| Arachidic | 20 | 168 | Peanut Oil |
| Behenic | 22 | 176 | Peanut Oil |

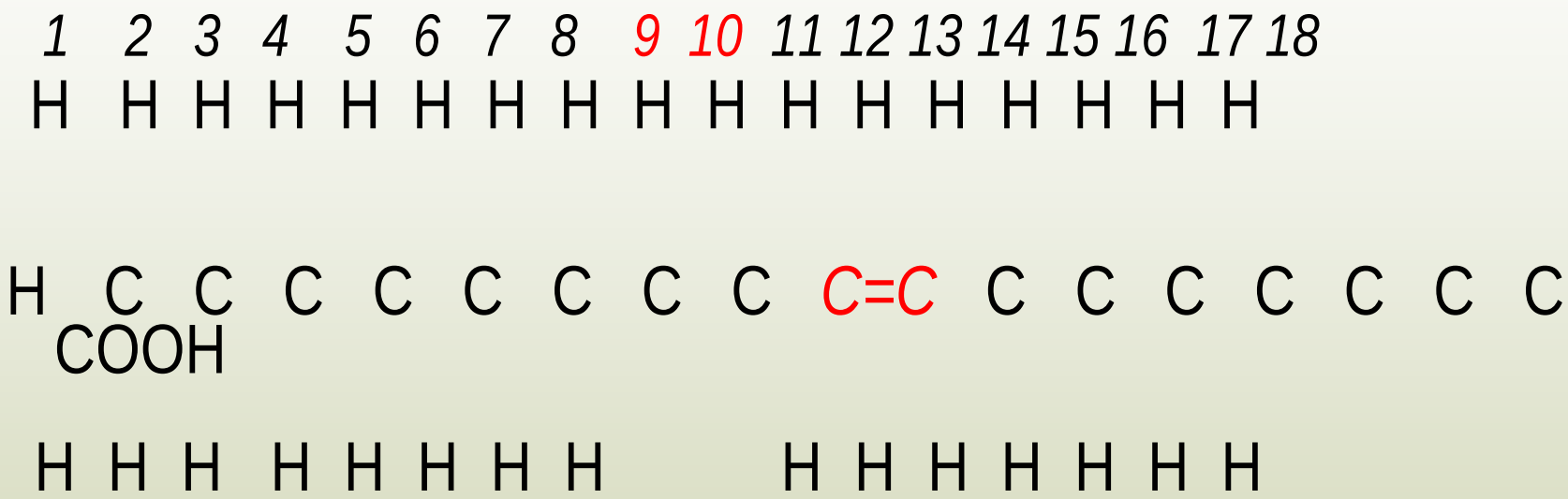
***Cargill Dressing, Sauces and Oils***

# Unsaturated Fatty Acids

| Name | Double Bonds | Mpt °F | Typical Source |
|---|---|---|---|
| Oleic | 1 | 61 | Most Fats & Oils |
| Elaidic *trans*-9 | 1 | 111 | Part. Hydro'd Oils & Fats |
| Vaccenic *trans*-11 | 1 | 102 | Butterfat |
| Linoleic | 2 | 20 | Most Vegetable Seed Oils |
| Linolenic | 3 | 9 | Soybean, Canola Oils |

***Cargill Dressing, Sauces and Oils***

# C18 Fatty Acids – Oleic Acid

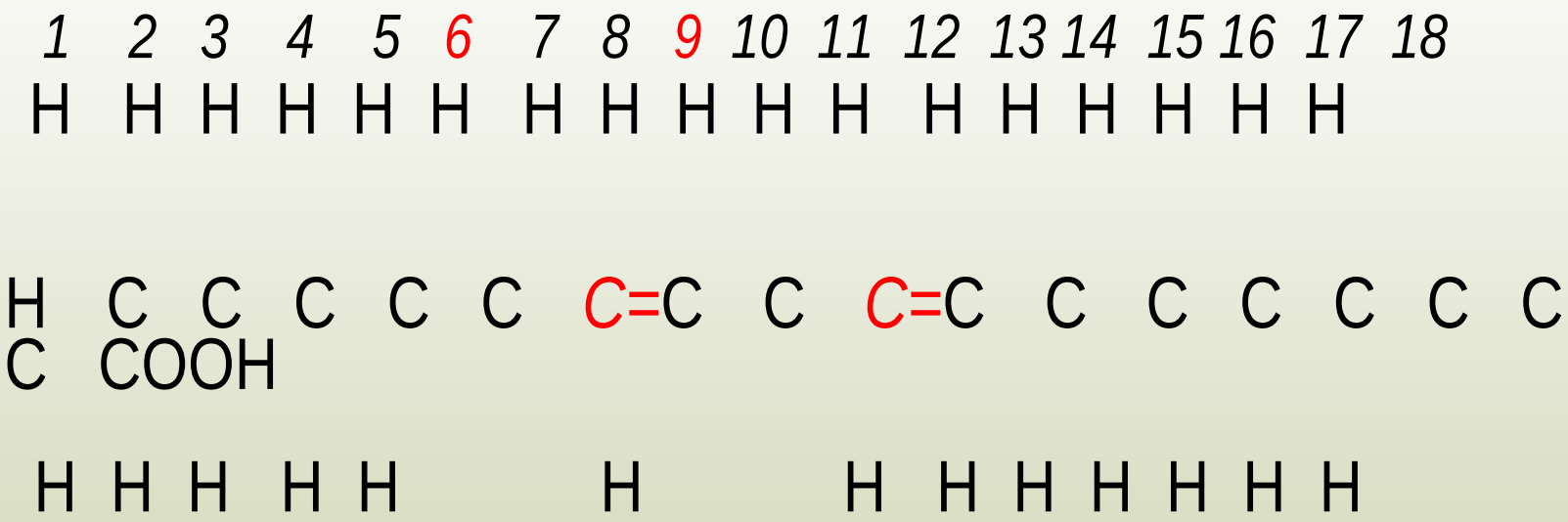



*Mono*unsaturated Fatty Acid

Omega-*9* Fatty Acid

***Cargill Dressing, Sauces and Oils***

# C18 Fatty Acids – Linoleic Acid

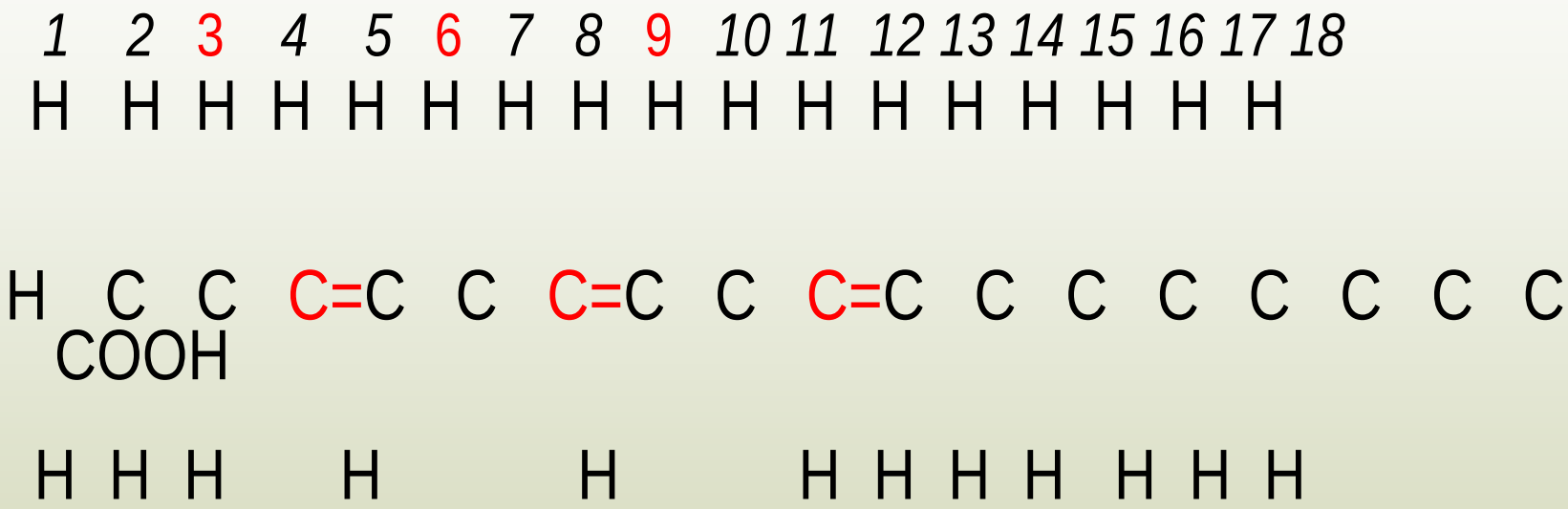



*Di-* or Poly**unsaturated** Fatty Acid

Omega-6 Fatty Acid

***Cargill Dressing, Sauces and Oils***

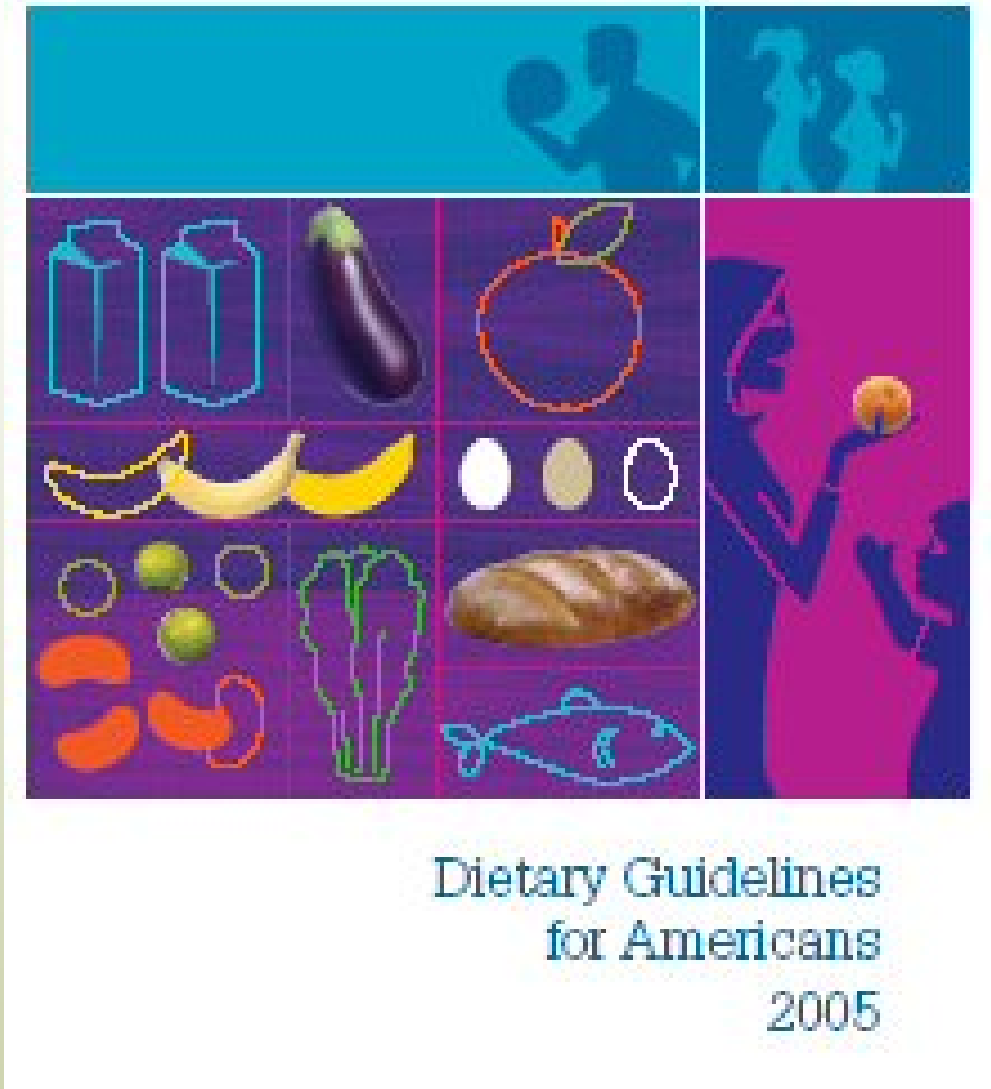
# C18 Fatty Acids – α-Linolenic

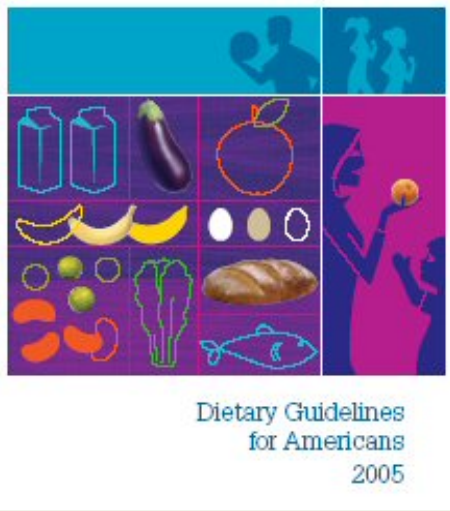



Tri- or Polyunsaturated Fatty Acid

Omega-3 Fatty Acid

***Cargill Dressing, Sauces and Oils***

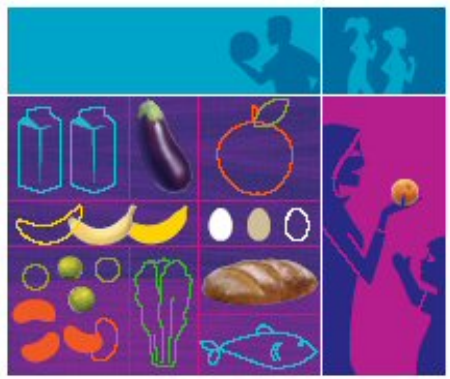

Dietary Guidelines
for Americans
2005




# Fats – Recommended Intake

- Targets (Total En%)
  - 20-35% for adults
  - 30-35% for children 2-3 years
  - 25-35% for children and adolescents 4-18 years
- <10 En% from SF
- <300 mg/day cholesterol
- TF consumption as low as possible

***Cargill Dressing, Sauces and Oils***




# Fats - Key Recommendations

- ✓ Consume less than 10 percent of calories from saturated fatty acids and less than 300 mg/day of cholesterol, and keep *trans* fatty acid consumption as low as possible.
- ✓ Keep total fat intake between 20 to 35 percent of calories, with most fats coming from sources of polyunsaturated and monounsaturated fatty acids, such as fish, nuts, and vegetable oils.
- ✓ Limit intake of fats and oils high in saturated and/or *trans* fatty acids, and choose products low in such fats and oils.

# 2005 Dietary Guidelines Advisory Committee Report

- "An n-6 PUFA intake between 5 to 10 percent of energy may confer beneficial effects on coronary artery disease mortality."
- "An $\alpha$-linolenic acid intake between 0.6 to 1.2 percent of calories will meet requirements for this fatty acid and may afford some protection against CVD outcomes."
- IOM (2002) recommended that up to 10 percent of the AMDR for $\alpha$-linolenic acid can be consumed as EPA and/or DHA

# MyPyramid
April 19, 2005


- Most of the fats you eat should be polyunsaturated (PUFA) or monounsaturated (MUFA) fats
- The MUFAs and PUFAs found in fish, nuts and vegetable oils do not raise LDL (“bad”) cholesterol levels in the blood
- Saturated fats, trans fats, and cholesterol tend to raise “bad” (LDL) cholesterol levels in the blood, which in turn increases the risk for heart disease. To lower risk for heart disease, cut back on foods containing saturated fats, trans fats, and cholesterol.

***Cargill Dressing, Sauces and Oils***

# *FDA News*

FOR IMMEDIATE RELEASE
P03-54
July 10, 2003

## FDA to Encourage Science-based Labeling and Competition for Healthier Dietary Choices

*Issues guidance on review process for qualified health claims on food labels as part of initiative on better information to guide nutrition choices*

# Omega-3 Fatty Acids & Coronary Heart Disease

**Docket No. 2003Q-0401**

**September 8, 2004**

## Claim Statement(s)

Supportive but not conclusive research shows that consumption of EPA and DHA omega-3 fatty acids may reduce the risk of coronary heart disease. One serving of [Name of the food] provides [ ] gram of EPA and DHA omega-3 fatty acids. [See nutrition information for total fat, saturated fat, and cholesterol content.]

# Monounsaturated Fatty Acids From Olive Oil and Coronary Heart Disease

**Docket No. 2003Q-0559**

**November 1, 2004**

**Claim Statement**

Limited and not conclusive scientific evidence suggests that eating about 2 tablespoons (23 grams) of olive oil daily may reduce the risk of coronary heart disease due to the monounsaturated fat in olive oil. To achieve this possible benefit, olive oil is to replace a similar amount of saturated fat and not increase the total number of calories you eat in a day. One serving of this product contains [x] grams of olive oil.

# Lipid Related Bioactives

- Omega-3 fatty acids
  - Prevent CHD, hypertension, type 2 diabetes, renal disease, rheumatoid arthritis, ulcerative colitis and aids brain development and growth
  - DHA recently approved for incorporation into infant formula
  - Sources include fish and microalgae

# Lipid Related Bioactives

- Alpha-linolenic acid
  - Reduces blood pressure, lowers TGs and cholesterol, retards tumor growth, essential for optimal neurological development during fetal and post natal growth
  - Sources include flax, canola and walnuts

# Lipid Related Bioactives

- Gamma-linolenic acid ($\omega$-6)
  - Disease prevention, reduces inflammation, effective at treating atopic eczema, certain cancers, alcoholism, hyperactivity, and CVD
  - Sources include evening primrose, borage and hempseed oils

# Major Deteriorative Reactions Affecting Food Lipids

- Autoxidation
  - Primary reaction of concern
  - Affects flavor, color, nutritive value
  - Low activation energy (4-14 kcal•mol$^{-1}$)

    Shahidi and Wanasundara, *Food Sci. Technol., Int.*, 1996
  - Reaction rate not significantly reduced by cold storage
- Photoxidation
  - Controlled by proper packaging

# Oxidation Rate is a Function of Unsaturation

| Oxygen Uptake | |
|---|---|
| Oleate | 1 |
| Linoleate | 40-50 |
| Linolenate | 100 |

| Peroxide Formation | |
|---|---|
| Oleate | 1 |
| Linoleate | 12 |
| Linolenate | 25 |

Hsieh and Kinsella, *Adv. Food Nutr. Res.*, 1989

# Evolution is Not New

- Hellman's/Best Foods Mayonnaise
  - Winterized cottonseed oil to soybean oil
- Crisco Vegetable Oil
  - Partially hydrogenated and winterized soybean oil to soybean salad oil
- McDonald's French Fries
  - Tallow to partially hydrogenated soybean oil to …

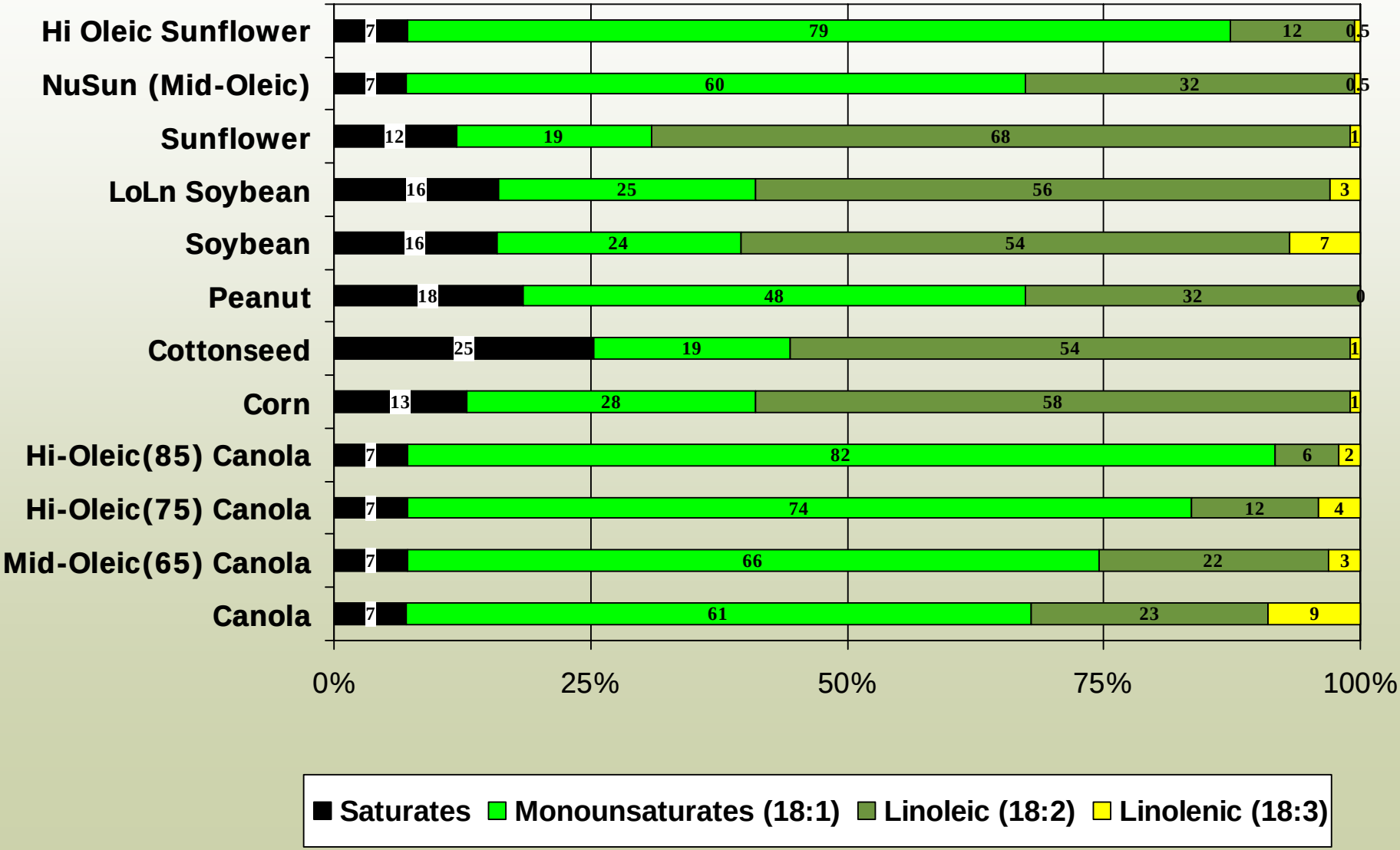
# Evolution of Options to Inhibit Oxidation

- Partial hydrogenation to reduce unsaturation
- Synthetic antioxidants (introduced in late ’40s)
- Development of molecular distillation for recovery of tocopherol concentrates
- Extraction methods to recover antioxidant compounds from spice oleoresins
- Trait enhanced oils

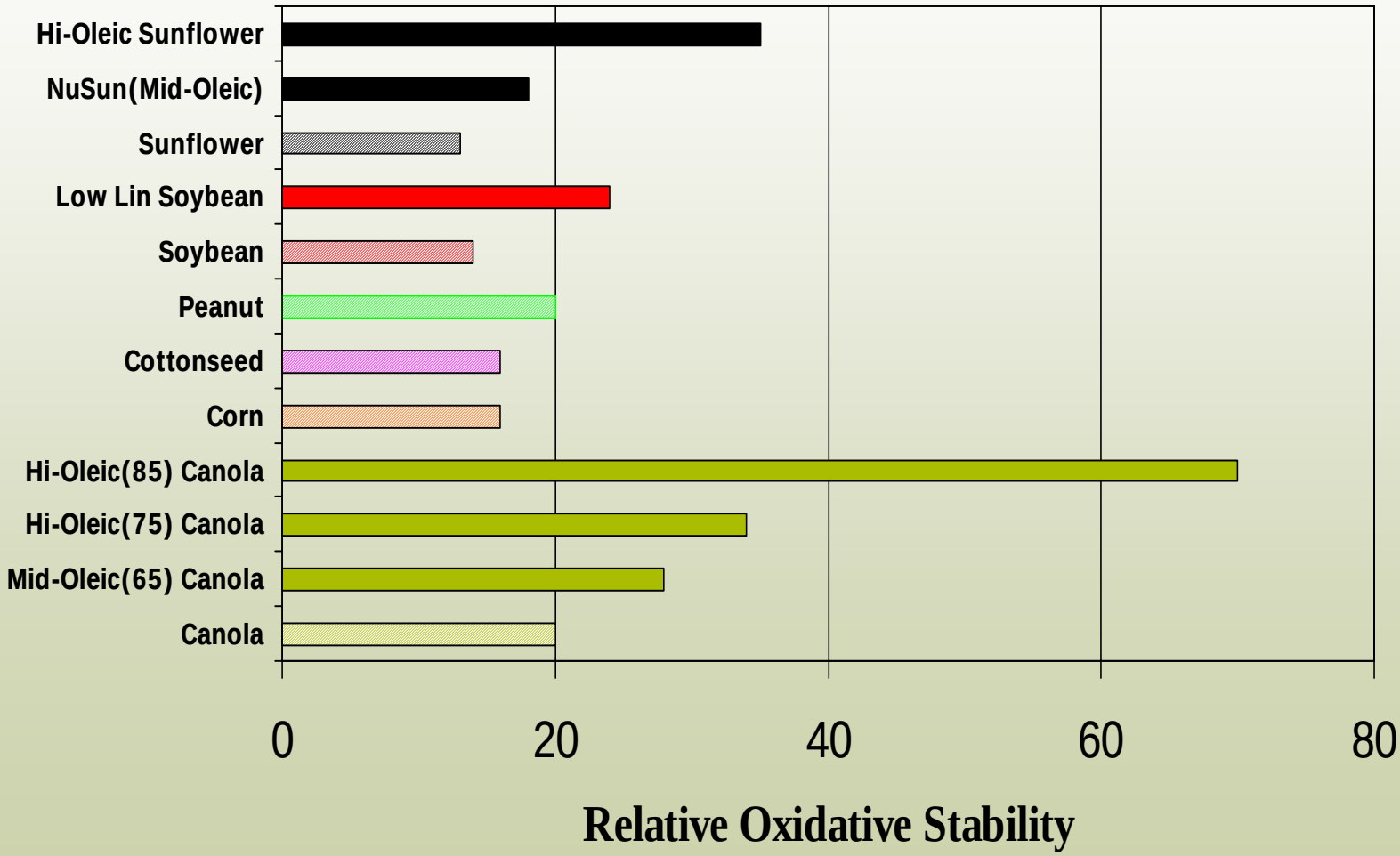
# Step Changes in Edible Oil Processing

- Refining improvements
  - Bleaching conditions and filter media
  - Deodorizations technologies
  - Chelating agents
  - Focus on key quality parameters to as a benchmark for production of higher stability oils and shortenings
- Handling improvements
  - Nitrogen sparging and blanketing
  - Ocean transportation and storage
  - Customer handling systems

# Typical Fatty Acid Compositions



# Trait Enhanced Oils Offer Improved Stability



# Trait Enhanced Oils

- Available now
  - Mid and hi oleic canola (GM)
  - Mid and hi oleic sunflower (non-GM)
  - Low linolenic soybean oil (GM & non-GM)
- 5-10 Years
  - Mid-oleic soybean (GM)
  - Hi saturate soybean (GM)

***GM = genetically modified via recombinant DNA technology***

# *Trans* Free Options When a Semi-solid Structure is Required

- "Naturally" saturated fats
  - *Native – tallow, lard, palm, palm kernel, coconut*
  - *Hard fractions*
- Fully hydrogenated fats
- Gelling agents
- Further tailoring via interesterification
- Hybrid systems

# Questions

*Thank you for your attention*

Michael Erickson
*Cargill Dressings, Sauces and Oils*
*Technical Services Manager*
*Michael_Erickson@cargill.com*