Fat of the matter

An analytical study on the fatty acid profile of the oils we eat and its health and policy implications

Pollution Monitoring Laboratory, Centre for Science and Environment

Study published in Down To Earth (February 1-15, 2009); See www.cseindia.org for full laboratory study
CSE’s Pollution Monitoring Lab

Set up in 2000, with state-of-the-art equipment to test for toxins, pesticides, heavy metals, other contaminants and health matters.

ISO 9001:2000 certified by SWISO, Switzerland

We set it up to investigate issues of public health

Past studies:

• Endosulfan poisoning in Kasaragod - 2000
• Pesticides in bottled water and soft drinks - 2003-06
• Pesticide in blood in Punjab - 2006
• Community service – river pollution, groundwater pollution, ambient air quality monitoring etc - 2007-08
Why test edible oils

Growing health concerns in India about food we eat

We wanted to know

• “Healthiness” of the edible oil and fats?

• Fatty acid profiles of oils and fats?

• Trans fatty acid content in oils and fats? Major health concern
The study

1. Vanaspati – 7 brands
2. Vegetable oils: - 21 brands
   - Soybean (4 brands), Sunflower (4), Safflower (1),
     Groundnut (1), Mustard (4), Coconut (1), Olive (1),
     Sesame oil (1), Rice bran (1) and Palm oil (2), blended
     oil (1 brand)?
3. Desi ghee (1)?
4. Butter (1)

Test methodology – Internationally used methodology of
the Association of Official Analytical Chemists for fatty acids
analysis using GC-FID
Our vanaspati

Industrial product – vegetable oil is partially hydrogenated so the food cooked in this oil does not turn rancid and has a long shelf life. Meets the need of food processing industry.

But trans fatty acids produced in the process -- **hydrogenation is addition of hydrogen atom to break oil’s double bond**. During hydrogenation, the chain is twisted and hydrogen atom ends up on different sides of the chain -- trans (across)

Growing health concern in the world about trans fats

Regulated in developed world – for example, in Denmark, the limit for trans fats in cooking oil is set at 2 per cent.

WHO recommends that the energy intake from trans fats should not be more than 1 per cent
Who makes our vanaspati?

Rath: Agro Tech Foods Ltd affiliated to US ConAgra Foods
Dalda: Bunge Limited, a mega-food giant US multinational
Gemini: Cargill Inc, another US based company
Raag: Adani group and Singapore’s Wilmar International
Jindal: Jindal group, a steel major
Gagan: Amrit Banaspati Company,
Panghat: Mawana Sugars Limited

Amul butter: Gujarat Co-op. Milk Marketing Federation Ltd
Milk Food Desi Ghee: Milk Food Ltd

Not small companies -- global companies, meeting global standards, but not in India
Lab investigation

Trans fats of the land
Levels ranged 9-24 per cent—5-12 times the standard in Denmark

- DALDA: Bunge India Pvt Ltd: 9.4%
- RATH: Agrotech Foods Ltd: 15.9%
- GEMINI: Cargill India Pvt Ltd: 12.72%
- RAAG: Adani Wilmar Ltd: 23.31%
- JINDAL: Jindal oil & fats Ltd: 13.76%
- PANGHAT: Siel edible Oils Ltd (Mawana Sugars Ltd): 23.7%
- MILK FOOD (desi ghee): Milk Food Ltd: 5.3%
- AMUL (butter): Mehsana district Co-operative Milk Producers’ Union Ltd: 3.73%

Denmark’s limit of 2 per cent
Is government concerned?

Late 2004: Oils and Fats sub-committee of CCFS accepts that trans fats are health hazards. Agrees to set standards

August 25, 2006: Chair of sub-committee submits proposal for standard. Data is asked for. Industry says it will give

April 16, 2007: Sub-committee recommends to Central Committee for Food Standards (CCFS) to set a limit of 15 per cent trans fats content. CCFS asks committee to consider the matter again and come back…
January 7, 2008: Sub-committee discusses that the issue is urgent, “in the light of growing presence of multinationals in the fast food business who have taken steps to limit trans-fat in their products in western countries, but will take advantage of the lax regulatory control in the country”. A 3-phase-wise introduction of standards is recommended.

February 18, 2008: The CCFS endorses this recommendation. Wants standards to be set urgently. But asks for data from industry groups.

August 2008: CCFS meets again. Still awaiting data.

January 2009: Data is still awaited. Our health at risk
In September 2008, government notifies food labelling. Says companies that make nutrition and health related claims must include the quantity of trans fats on their package.

Says food which uses hydrogenated vegetable fats, must declare on the label: “contains trans fats”. If a company says it is “trans fats free”, it would mean that the product contains less than 0.2 g of trans fats per serving of food.

But there is no standard. So companies decide to label and get away.
CSE analysis found that Rath vanaspati had 16 per cent trans fats—eight times above the Denmark standard. Can have anything. As long as they declare it.
Mix and match

Indian regulations allow companies to mix – “permissible vegetable oils: cottonseed, kardi, mahua, maize, palm, soyabean, mustard/rapeseed, vegetable oils imported for edible purpose”

Trans fats will depend on the oil used in vanaspati

So, if soyabean oil is used, it will be higher in trans fats

Is this why companies are reluctant to take on standards

Take case of Dalda – says 15-55 % trans fat, we found 9.4 per cent. So, could it be higher in other times when the composition changes?
Why we should care?

Trans fats indicted for bad health

Decrease the amount of good cholesterol (HDL). **Bad for heart**; Increase of 5 g transfats/day = 25 per cent increased risk of cardiovascular disease

**Diabetes**

**Infant and child health** -- can move across the placenta to the child, depending on concentration

**Women’s health** -- evidence linking risk to infertility

**Cancer** -- increased risk to breast cancer

**Geriatrics** -- increased risk to Alzheimer’s disease
Growing concern and action against trans fats

Denmark bans hydrogenated oil; limits trans fats at 2%

January 2008, US Food and Drug Administration decides only to label trans fats in oils; but states protest

In 2005, all restaurants in California go trans fats free voluntarily; In 2008, government makes it mandatory

In 2006, New York bans trans fats in restaurants;

Mc Donald fails to limit trans fats, in 2003, agrees to pay US$ 7 million to American Heart Association

In 2007, case filed against KFC and Burger King…
Know your oil?

**Fortune:** Adani Wilmar Limited  
**Nature Fresh, Gemini:** Cargill India Pvt Ltd, USA  
**Dalda:** Bunge India Pvt. Ltd., USA  
**Saffola, Sweekar, Parachute:** Marico Ltd, India  
**Sundrop:** Agro Tech Foods Ltd (ConAgra Foods)  
**RR Primio:** RR Oomerbhoy Pvt Ltd  
**Dhara:** Dhara company Ltd, NDDB campus, Anand  
**Panghat:** Mawana Sugars Limited  
**TilSona:** Recon Oil Industries Private Ltd  
**Figaro:** Consumer Marketing (India) Pvt. Ltd  
**Shalimar's Classic Basmati:** Shalimar Agro Tech Pvt  
**Palm Gold Active:** Sarda Agro Oil Ltd.  
**Ruchi Gold:** Ruchi Infrastructure Ltd.
What is a healthy oil?

Saturated and unsaturated fats

- Saturated fats have a single bond between carbon atoms
- Unsaturated fats have double bonds between the carbon atoms
  - monounsaturated fats (MUFA)
  - polyunsaturated fats (PUFA)

MUFA includes omega 9. PUFA includes omega-6 and omega-3
What is a healthy oil?

Changing science of healthy oil
Saturated fats were labelled bad – shift to partially hydrogenated vegetable oils – shift to vegetable oils – shift to PUFA – shift to MUFA -- shift to omega 6

Uncertain science used to sell product
Coconut worse on all indicators, but new evidence that it contains good antimicrobial components
Canola (rapeseed) oil seen as good, now science says that it has problems -- retards growth. But combination of rapeseed with butter or ghee good
Omega good -- but how much? In what ratio?
What is a healthy oil?

Generally speaking:
Low on saturated fat; high on MUFA; PUFA is balanced between SF and MUFA; ratio of omega 6/3 good

WHO recommendation for healthy oils
- Ratio of Omega 6/Omega 3: 5-10
- PUFA/SFA: 0.8-1
## How good is our oil on WHO recommendations

<table>
<thead>
<tr>
<th>Brand</th>
<th>PUFA/SFA (WHO: 0.8-1)</th>
<th>Omega 6/ Omega 3 (WHO: 5-10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fortune - Soybean</td>
<td>4.1</td>
<td>8.6</td>
</tr>
<tr>
<td>Nature Fresh - Soybean</td>
<td>3.1</td>
<td>2.1</td>
</tr>
<tr>
<td>Sweekar - Sunflower</td>
<td>1.7</td>
<td>76.3</td>
</tr>
<tr>
<td>Sundrop - Sunflower</td>
<td>4.0</td>
<td>65.3</td>
</tr>
<tr>
<td>RR Primio - Groundnut</td>
<td>1.8</td>
<td>7.5</td>
</tr>
<tr>
<td>Dhara refined - Mustard</td>
<td>6.8</td>
<td>4.1</td>
</tr>
<tr>
<td>Fortune kachi ghani - Mustard</td>
<td>4.6</td>
<td>1.4</td>
</tr>
<tr>
<td>Saffola - Safflower</td>
<td>5.9</td>
<td>88.2</td>
</tr>
<tr>
<td>Saffola gold - Blend</td>
<td>2.2</td>
<td>117.3</td>
</tr>
<tr>
<td>Figaro – Olive</td>
<td>0.6</td>
<td>0</td>
</tr>
<tr>
<td>Shalimar – Rice bran</td>
<td>1.2</td>
<td>4</td>
</tr>
<tr>
<td>Ruchi gold – Palm oil</td>
<td>0.2</td>
<td>23</td>
</tr>
</tbody>
</table>
What we found?

• Variations, often wide, between the different brands of the same type of oil. **No regulation?**

• The MUFA in sunflower from 23 per cent (NatureFresh of Cargil) to 48 per cent (Sundrop of Agrotech)

• In soyabean, omega 6 varies from 28 per cent (Dalda of Bunge) to 54 per cent (Fortune of Adani-Wilmar). The ratio of omega 6 to omega 3 varies from 2 to 8.6

• The biggest variation is in vanaspati where PUFA varies from as low as 1 per cent (Jindal of Jindal) to 40 per cent (Dalda of Bunge)?

• In mustard oil, MUFA varies from 27 per cent (Panghat of Mawana Sugar) to 68 per cent (Fortune of Adani-Wilmar)?
No one oil is best

Sunflower: Good on SFA; PUFA; ok on MUFA; but poor on omega 3 -- ratio of omega 6/3 poor
Soyabean: Good on SFA, low on MUFA, high on PUFA; but good on omega 3
Groundnut: Good on SFA; good on MUFA; balance in SF/PUFA and omega ratio
Mustard: Best on SFA and MUFA and PUFA and omega ratio; but PUFA/SFA ratio not so good
Safflower: high on PUFA and poor omega ratio
Blended oil: worse on omega ratio

Doctors advice: Switch oils; eat in moderation and ban trans fats
Your guidebook to oils

On the basis of results on the fatty acid profile of different oils in the market, CSE presented a matrix which you could use to figure out what to cook your food with. The matrix ranks the oils on the basis of saturated fats—the lesser the better—and unsaturated fats like MUFA, PUFA and essential fatty acids like omega 3, 6 and 9—the more the better. The laboratory study also provided classification of the oils on the basis of WHO’s recommendations. These are based on the ratio of PUFA and saturated fats—the ratio should be between 0.8 and 1. Another ranking is on the basis of ratio of omega 6 and omega 3—this should be between 5 and 10.

<table>
<thead>
<tr>
<th>Saturated fatty acids</th>
<th>Monounsaturated fatty acids</th>
<th>Polyunsaturated fatty acids</th>
<th>Omega 9</th>
<th>Omega 6</th>
<th>Omega 3</th>
<th>PUFA/SFA</th>
<th>Omega6/Omega3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mustard</td>
<td>Olive</td>
<td>Soybean</td>
<td>Olive</td>
<td>65.56</td>
<td>49.07</td>
<td>39.05</td>
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<tr>
<td>Safflower</td>
<td>Mustard</td>
<td>Safflower</td>
<td>Groundnut</td>
<td>40.60</td>
<td>38.99</td>
<td>33.06</td>
<td>1.03</td>
</tr>
<tr>
<td>Sunflower</td>
<td>Groundnut</td>
<td>Sesame</td>
<td>Sesame</td>
<td>38.99</td>
<td>38.99</td>
<td>32.47</td>
<td>1.03</td>
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<tr>
<td>Olive</td>
<td>Sesame</td>
<td>Blending</td>
<td>Blend</td>
<td>34.57</td>
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<tr>
<td>Soybean</td>
<td>Rice bran</td>
<td>Sunflower</td>
<td>Rice bran</td>
<td>35.23</td>
<td>33.70</td>
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</tr>
<tr>
<td>Blend</td>
<td>Sunflower</td>
<td>Palm</td>
<td>Palm</td>
<td>33.70</td>
<td>33.70</td>
<td>24.91</td>
<td>1.03</td>
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<tr>
<td>Groundnut</td>
<td>Palm</td>
<td>Blending</td>
<td>Blend</td>
<td>33.70</td>
<td>33.70</td>
<td>24.91</td>
<td>1.03</td>
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<tr>
<td>Sesame</td>
<td>Rice bran</td>
<td>Vanaspati</td>
<td>Vanaspati</td>
<td>18.30</td>
<td>18.30</td>
<td>9.98</td>
<td>0.56</td>
</tr>
<tr>
<td>Rice bran</td>
<td>Vanaspati</td>
<td>Desi ghee</td>
<td>Desi ghee</td>
<td>18.30</td>
<td>18.30</td>
<td>9.98</td>
<td>0.56</td>
</tr>
<tr>
<td>Vanaspati</td>
<td>Butter</td>
<td>Butter</td>
<td>Butter</td>
<td>15.23</td>
<td>15.23</td>
<td>9.98</td>
<td>0.56</td>
</tr>
<tr>
<td>Palm</td>
<td>Butter</td>
<td>Safflower</td>
<td>Safflower</td>
<td>11.44</td>
<td>11.44</td>
<td>9.98</td>
<td>0.56</td>
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<td>Desi Ghee</td>
<td>Safflower</td>
<td>Mustard</td>
<td>Mustard</td>
<td>7.62</td>
<td>7.62</td>
<td>9.98</td>
<td>0.56</td>
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<tr>
<td>Butter</td>
<td>Coconut</td>
<td>Coconut</td>
<td>Coconut</td>
<td>6.74</td>
<td>6.74</td>
<td>9.98</td>
<td>0.56</td>
</tr>
<tr>
<td>Coconut</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Blend — Blended Safflower + Rice bran oil, Average value of different oils tested by CSE lab
What is our regulation for promoting oil?

Companies say their oil is best. But who is checking? What is the basis

Take: Sunflower (Sundrop) -- pushed as best (low on SFA) but mustard (Dhara or kachhi ghani) is better

Bottom-line: Weak regulators; weak advertising codes
Current regulation

Multiple agency—multiple standards

- **PFA**: Specific standards on different types of oils and fats. Allows mix and match in the different types of oils to be used to make vanaspati. No transfat standards

- **BIS**: Standards on pesticides and heavy metals; no transfat standards

- **Agmark**: Controls the sale of the product, no transfat standards

  + companies have to publish information on different types of fatty acid -- MUFA etc

Companies give range -- get away with fancy advertisements

But are our regulators checking; No mandatory standards; no real checks on quality -- In UK government found mineral oil in sunflower.. *Are we even looking?*
Recommendations

1. Set stringent standards for trans fats in oil urgently; Cannot afford delay and prevarication
2. Fund research on oils in the country to check for oil-food combinations and to research Indian oils
3. Set clear guidelines for companies against advertising for nutrition and health claims for oils
4. Fund public programme for healthy oils -- do not let companies push oils for commercial business
5. Bring oil certification under mandatory provisions -- make ISI mark mandatory and revise standards for health and safety.

Regulate our oil for our nutrition and health. Not company profit.