Food safety: issues, science and politics

Centre for Science and Environment
South Asia Media Briefing
Food safety: why

- Food is health
- But safety in food is compromised
- Food is ‘adulterated’
- Food is ‘contaminated’
- Food is ‘bad’ -- without nutrition
- Food is about business – big business in our kitchen
- Has to be regulated for safety and nutrition
- Is it?
1. Pesticides in our food

Toxins used in agriculture
In our water, our food
In our bodies – health implications
But no concern, no standard, no regulation when we started in 2003
Pesticides in bottled water
February 4, 2003
What we did?

- Randomly selected (bought in markets) 17 brands in Delhi. 13 brands in Mumbai region. 2 samples of each.

- Tested samples for organochlorine and organophosphate pesticides using the internationally established protocol of USEPA. Used gas chromatograph (GC) with electron-capture detector (ECD) using a capillary column.
Selling health, not water: a dream or a nightmare?

• Contained up to 5 different pesticide residues
• All brands, except one, contained pesticide residues
• In Delhi average of all samples were 36.4 times higher than the EEC standards
• In Mumbai, relatively better, average of all samples was 7.2 times the standards.
• Highest pesticide residue: 0.0552 mg/l – 104 times the maximum residue level specified.
Ranking: Delhi

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Ranking Mumbai

![Graph showing pesticide residues in different brands of water]

- Red bars represent Total pesticides.
- Blue line indicates Maximum residue limit (0.0005 mg/l).

Brands from left to right: Aquafina, Macblue, Bailey, Kinley, Seagull, Sheetal, Bisteri, Brilliant, Bally, Apurna, Royal Aqua, Best, Oxyrich.
Regulations before 2003

- Weak. Ambiguous
  Written to suit industry interests.
- Bureau of Indian Standards (BIS) sets norms:
  - Drinking water norms: pesticides to be “absent”. In case of no alternative source 0.001 mg/l.
  - Packaged and mineral water norms: pesticides to be “below detectable limits”.
  - But says that when you go detecting for pesticides use less-sensitive equipment. Use GC-ECD with packed column, not capillary column used across the world.
• July 2003, BIS notified new pesticide norms for bottled water – individual pesticide limit 0.1 ppb and total pesticide limit of 0.5 ppb
Soft drink: 2003

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What we did in 2003

- 12 brands of cold drinks. Bought in Delhi markets. 3 bottles each.

- Tested in laboratory. Used GC-ECD and GC-NPD, capillary column. Tested samples using established protocol of USEPA.

- Tested for 16 organochlorine pesticides; 12 organophosphorus and 4 synthetic pyrethroids.
What we found?

• **All** samples tested contained pesticide residues. **All** deadly pesticides. **All** high as compared to EEC standards for single pesticides.

• DDT and metabolites – 15 times higher
• Lindane – 21 times higher
• Chlorpyrifos – 42 times higher
• Malathion – 87 times higher
Two giants of the corporate world
Double standard
Global giants

- Checked for pesticides in bottles manufactured and sold in US. None found.
Scandalous regulations: ‘Fixed’ / Non-existent

- Worse than bottled water industry. It had poor norms for pesticides. But at least mandatory norms existed.
- No norms for this ‘food’ industry. Virtually let off. Why???
- Bottled water norms in 1998. Made mandatory saying ‘food’ consumed by many. Why were soft drinks not included? Amnesia? Deliberate?
Quick recap: Events 2003-2006

- August 5 2003: CSE releases study on pesticide residues in soft drinks.

- August 5 2003: PepsiCo and Coca-Cola do joint press conference. They question CSE lab; dismiss our findings say that there are no pesticides in their drinks. They test regularly. They put out adverts saying they are clean.

- August 2003: Joint Parliamentary Committee constituted to investigate the CSE findings and to examine safety standards for beverages.
JPC and what?

• **Says:** CSE study is correct
• **Says:** Standards should be made for beverages
• **Says:** Pesticide regulations must be revamped in the country to keep in mind people’s health
• Then what?
What has happened since?

Bureau of Indian Standards (BIS):

Its sectional committee comprises of all relevant parties – top government scientists (NIN, CIFTI, NIOH), government officials (ministry of food processing, ministry of health), Companies (Coca-Cola, PepsiCo – through CIFTI, CII etc) consumer and environmental groups.

Committee meets more than 20 times in from 2003 to 2006. Adopts bottled water standard as standard for soft drink

All issues related to standards discussed. But Industry with Ministry of Health blocks it.
Health ministry: what is cooking?

- February 2004: Central Committee on Food Standards (CCFS) meets. Endorses JPC report. Says it will set final standards.

- June 2004: Pesticide Residue Sub-Committee of CCFS meets. Decides to do year-long monitoring.


- 2005: National Expert Committee meets. Decides to test samples of sugar. This will be pilot study.

- 2006: Still testing. Officials say that as this is pilot study, no timeframe on when final standards will be set. But why test raw sugar, when companies use refined sugar? No answer.
Bottom-line: 2006 no standard

- Department of Consumer Affairs tells BIS not to “rush”. Says health ministry not on board. Companies are objecting.

- Ministry of Health says more research is needed. Says pilot study will be completed soon.

“Good science” is the convenient tool to obstruct action.

Companies win. We lose. Acceptable?
We test 57 soft drink samples from 25 different manufacturing plants, spread over 12 states – roughly 30 per cent plants covered.

We collect samples from different cities – where our reporters travel – from Burnihat in Meghalaya to Ahmedabad in Gujarat, Palakkad in Kerala to Jalandhar in Punjab.
What we find?

- Pesticide residues found in all soft drinks tested.
- A cocktail of 3-6 pesticides was present in all samples.
- Average amount of pesticide residues found in all the samples was 11.85 parts per billion (ppb) — **24 times higher** than the BIS standards for total pesticides in soft drinks (0.5 ppb).

- Brand drink Pepsi-cola contained **30 times higher** residues on an average.
- Brand drink Coca-Cola contained **27 times higher** residues on an average.
Brand-pest-jacked?

Pesticide residues — Brand-wise

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“We are safe: Aamir drinks it”

Refresh your faith.

Now, refresh your thirst.

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“We make soft drinks for millions of people across the globe that include our own family and friends. Would we have offered our products to our loved ones unless we were sure that they are safe for consumption?

As a matter of fact, at every step in the manufacturing process, our products go through a series of stringent tests. All these tests are carried out by a team of highly trained analysts. That apart, we encourage independent tests by accredited international labs. The most recent ones conducted were by the highly reputed TNO of The Netherlands and Britain’s prestigious Central Science Lab. Interestingly, the latter was an Outlook magazine initiative. And, like all other accredited tests showed, these also proved that our products are safe for consumption. Little wonder, we can offer you our soft drinks without hesitation or fear.

In sum, we take extreme precautions to ensure that only the best is enjoyed by our families. And you.”

Quality... Trust... That’s Our Promise
Standard: finally

- **August 2008:** Ministry of Health notifies pesticide standards for soft drinks – 1 ppb for individual pesticides and 5 ppb total pesticide – 10 times higher than bottled water
- **World’s first standard**
- **CSE pushing for more stringent standard**
2. Why worry

• But why should we care about pesticides in our food?

• Why should we care about pesticides in soft drinks and not juices?

• What are we doing to regulate pesticide usage and pesticide in food and water?
Poison vs nutrition

- We ‘ingest’ pesticide because we need food
- Trade-off between poison and nutrition

- Question is
- How to regulate the right dose
- How to make sure our exposure to pesticide is not ‘unsafe’
“The right dose differentiates the poison and remedy”

- Regulation across the world defines the acceptable daily intake (ADI) of pesticide –
  - what is safe to take daily,
  - over a lifetime,
  - for what age/bodyweight.

- ADI is the touchstone of pesticide risk management. **Cannot exceed ADI, otherwise deadly.**
Determine safe limit

Determine ADI (acceptable daily intake) of pesticides
— Tests on rats for toxicity (NOAEL/LOAEL)
— Safety factor: 100 times more for humans
<table>
<thead>
<tr>
<th>Name of pesticide</th>
<th>Production 2000-01 (tonnes)</th>
<th>JMPR-ADI (mg/kg bw)</th>
<th>YEAR OF REVIEW</th>
<th>US-EPA CRfd (mg/kg bw)</th>
<th>US-EPA Arfd (mg/kg bw)</th>
<th>YEAR OF REVIEW</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.D.T.</td>
<td>3766</td>
<td>0.005 (Conditional)</td>
<td>1983</td>
<td>0.0005</td>
<td></td>
<td>1994</td>
</tr>
<tr>
<td>MALATHION</td>
<td>5103</td>
<td>0.3</td>
<td>1997</td>
<td>0.024</td>
<td>0.5</td>
<td>2000</td>
</tr>
<tr>
<td>METHYL PARATHION</td>
<td>1979</td>
<td>0.003</td>
<td>1995</td>
<td>0.00002</td>
<td>0.00011</td>
<td>1999</td>
</tr>
<tr>
<td>Dichlorovos--D.D.V.P.</td>
<td>2648</td>
<td>0.004</td>
<td>1993</td>
<td>0.00017</td>
<td>0.01666</td>
<td>1998</td>
</tr>
<tr>
<td>MONOCROTOPHOS</td>
<td>8118</td>
<td>0.0006</td>
<td>1995</td>
<td>0.00005</td>
<td></td>
<td>1986</td>
</tr>
<tr>
<td>PHORATE</td>
<td>6044</td>
<td>0.0005</td>
<td>1996</td>
<td>0.00017</td>
<td>0.00083</td>
<td>1999</td>
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<td>ETHION</td>
<td>3456</td>
<td>0.002</td>
<td>1990</td>
<td>0.0005</td>
<td>0.0017</td>
<td>1999</td>
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<tr>
<td>ENDOSULPHAN</td>
<td>7462</td>
<td>0.006</td>
<td>1998</td>
<td>0.006</td>
<td></td>
<td>1993</td>
</tr>
<tr>
<td>CYPERMETHRIN</td>
<td>3388</td>
<td>0.05</td>
<td>1996</td>
<td>0.01</td>
<td></td>
<td>1996</td>
</tr>
<tr>
<td>ACEPHATE</td>
<td>3347</td>
<td>0.01</td>
<td>2002</td>
<td>0.0012</td>
<td>0.005</td>
<td>2000</td>
</tr>
<tr>
<td>CHLORPYRIPHOS</td>
<td>7000</td>
<td>0.01</td>
<td>1999</td>
<td>0.0001</td>
<td>0.0017</td>
<td>1999</td>
</tr>
<tr>
<td>LINDANE</td>
<td>473</td>
<td>0.005</td>
<td>2002</td>
<td>0.0047</td>
<td></td>
<td>1993</td>
</tr>
<tr>
<td>ENDRIN</td>
<td>0.0002 (PTDI)</td>
<td>1994</td>
<td>0.0003</td>
<td></td>
<td></td>
<td>1988</td>
</tr>
<tr>
<td>DIELDRIN</td>
<td>0.0001 (PTDI)</td>
<td>1994</td>
<td>0.00005</td>
<td></td>
<td></td>
<td>1987</td>
</tr>
<tr>
<td>CARBARYL</td>
<td>0.008</td>
<td>2001</td>
<td>0.014</td>
<td></td>
<td></td>
<td>1993</td>
</tr>
</tbody>
</table>
Step 2: Limits for residues

Determine ADI (acceptable daily intake)
- Tests on rats for toxicity (NOAEL/LOAEL)
- Safety factor: 100 times more for humans

Set MRL (maximum residues limit)
- Based on field tests on crops
- Best-possible residue
- Compare with other countries’ MRL
2: calculate limit of residue

- Supervised crop trials. Determine what is the best-possible residue level on crops.

- What is least amount of residue that is feasible.

- Used to determine the Maximum Residue Level (MRL) for each crop for pesticide used on them.

- The MRL is not the safety standard. It is legal limit that is allowed on the crop/food. **SAFETY IS DEFINED BY ADI. MRL MUST BE WITHIN ADI**
Step 3: Determine intake

**Determine ADI (acceptable daily intake)**
- Tests on rats for toxicity (NOAEL/LOAEL)
- Safety factor: 100 times more for humans

**Set MRL (maximum residues limit)**
- Based on field tests on crops
- Best-possible residue
- Compare with other countries’ MRL

**DIETARY INTAKE (TMDI- Theoretical Maximum Daily Intake)**
The sum of what we eat: diet by section of population

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Step 3: Determining exposure

- Critical step: have to determine what we will eat and how much. Our diet.
- WHO/FAO compiles diet charts from governments.
- Most governments collect their own data.
- Daily pesticide intake arrived:
  - Average diet *(Theoretical intake)*
  - Accurate diet *(Estimated intake)*
  - Or total diet *(Measured intake)* on cooked food.
## Diets of the world: WHO/FAO regional diets
(in grams per person per day)

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Middle eastern</th>
<th>Far eastern</th>
<th>African</th>
<th>Latin American</th>
<th>European</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>430.8</td>
<td>452.3</td>
<td>318.4</td>
<td>252.2</td>
<td>226.3</td>
</tr>
<tr>
<td>Root and tubers</td>
<td>61.8</td>
<td>108.5</td>
<td>321.3</td>
<td>159.3</td>
<td>242.0</td>
</tr>
<tr>
<td>Pulses</td>
<td>24.6</td>
<td>19.8</td>
<td>17.8</td>
<td>23.1</td>
<td>12.1</td>
</tr>
<tr>
<td>Total sugars and honey</td>
<td>95.8</td>
<td>50.5</td>
<td>42.7</td>
<td>104.3</td>
<td>107.3</td>
</tr>
<tr>
<td>Total nuts and oilseeds</td>
<td>12.8</td>
<td>50.0</td>
<td>34.2</td>
<td>57.5</td>
<td>29.9</td>
</tr>
<tr>
<td>Total vegetable oils and fats</td>
<td>40.3</td>
<td>14.2</td>
<td>23.3</td>
<td>21.8</td>
<td>38.6</td>
</tr>
<tr>
<td>Total stimulants</td>
<td>8.2</td>
<td>1.7</td>
<td>0.6</td>
<td>5.5</td>
<td>14.4</td>
</tr>
<tr>
<td>Total spices</td>
<td>2.5</td>
<td>3.0</td>
<td>1.8</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Total vegetables</td>
<td>233.1</td>
<td>179.0</td>
<td>77.1</td>
<td>150.5</td>
<td>371.8</td>
</tr>
<tr>
<td>Total fish and seafood</td>
<td>13</td>
<td>34.7</td>
<td>36.5</td>
<td>45</td>
<td>46.3</td>
</tr>
<tr>
<td>Eggs</td>
<td>14.6</td>
<td>13.1</td>
<td>3.7</td>
<td>11.9</td>
<td>37.6</td>
</tr>
<tr>
<td>Total fruits</td>
<td>204.4</td>
<td>85.4</td>
<td>94.7</td>
<td>271.3</td>
<td>212.4</td>
</tr>
<tr>
<td>Milk and milk products</td>
<td>132.3</td>
<td>32.7</td>
<td>42.2</td>
<td>167.8</td>
<td>340.8</td>
</tr>
<tr>
<td>Meat and offals</td>
<td>71.3</td>
<td>47.0</td>
<td>30.4</td>
<td>78.0</td>
<td>217.3</td>
</tr>
<tr>
<td>Total animal oils and fats</td>
<td>1</td>
<td>1.9</td>
<td>0.7</td>
<td>5.5</td>
<td>10.7</td>
</tr>
<tr>
<td>Total diet in grams per person per day</td>
<td>1346.1</td>
<td>1093.8</td>
<td>1045.3</td>
<td>1354.1</td>
<td>1907.6</td>
</tr>
</tbody>
</table>

Source: World Health Organization

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### What We Eat:
Daily per capita intake of food commodities in India as per 2001 food balance sheet of FAO

<table>
<thead>
<tr>
<th>Product</th>
<th>Per capita supply (kg/year)</th>
<th>Per capita supply (gm/day)</th>
<th>Percentage of total diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cereals</td>
<td>162</td>
<td>445</td>
<td>37.1</td>
</tr>
<tr>
<td>Total pulses</td>
<td>11</td>
<td>29</td>
<td>2.4</td>
</tr>
<tr>
<td>Total vegetables</td>
<td>87.32</td>
<td>239</td>
<td>19.9</td>
</tr>
<tr>
<td>Total spices</td>
<td>1.97</td>
<td>5.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Total fruits</td>
<td>40.66</td>
<td>111</td>
<td>9.3</td>
</tr>
<tr>
<td>Total meat</td>
<td>5.2</td>
<td>14.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Eggs</td>
<td>1.54</td>
<td>4</td>
<td>0.4</td>
</tr>
<tr>
<td>Fish</td>
<td>4.43</td>
<td>12</td>
<td>1.0</td>
</tr>
<tr>
<td>Milk, excluding butter</td>
<td>65.49</td>
<td>179</td>
<td>15.0</td>
</tr>
<tr>
<td>Total sugar and honey</td>
<td>38.3</td>
<td>105.0</td>
<td>8.7</td>
</tr>
<tr>
<td>Animal Fats (ghee, butter)</td>
<td>2.25</td>
<td>6</td>
<td>0.5</td>
</tr>
<tr>
<td>Vegetable Oils</td>
<td>9.49</td>
<td>26</td>
<td>2.2</td>
</tr>
<tr>
<td>Oil Crops</td>
<td>7.1</td>
<td>19</td>
<td>1.6</td>
</tr>
<tr>
<td>Treenuts</td>
<td>0.68</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td>Total stimulants</td>
<td>0.74</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td>Approximate average per capita daily diet</td>
<td>1200.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


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## Average daily intake of food commodities by a 10 kg child in India (data in grams/day)

<table>
<thead>
<tr>
<th>Age and sex groups</th>
<th>Cereals</th>
<th>Pulses</th>
<th>Leafy vegt.</th>
<th>Roots and tubers</th>
<th>Other vegt.</th>
<th>Fruits</th>
<th>Condiments &amp; spices</th>
<th>Meat, fish and egg</th>
<th>Milk products</th>
<th>Fats/oils</th>
<th>Sugar</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3 yrs male</td>
<td>126</td>
<td>21</td>
<td>8</td>
<td>41</td>
<td>16</td>
<td>18</td>
<td>4</td>
<td>9</td>
<td>163</td>
<td>8</td>
<td>21</td>
<td>434</td>
</tr>
<tr>
<td>1-3 yrs female</td>
<td>113</td>
<td>19</td>
<td>5</td>
<td>35</td>
<td>16</td>
<td>23</td>
<td>5</td>
<td>10</td>
<td>165</td>
<td>7</td>
<td>18</td>
<td>417</td>
</tr>
<tr>
<td>Average for 10 kg child (1-3 years child)</td>
<td>119</td>
<td>20</td>
<td>7</td>
<td>38</td>
<td>16</td>
<td>20</td>
<td>4</td>
<td>10</td>
<td>164</td>
<td>7</td>
<td>19</td>
<td>425</td>
</tr>
</tbody>
</table>

Regulating toxins

Determine ADI (acceptable daily intake)
- Tests on rats for toxicity (NOAEL/LOAEL)
- Safety factor: 100 times more for humans

Set MRL (maximum residues limit)
- Based on field tests on crops
- Best-possible residue
- Compare with other countries’ MRL

Cross check
- Ensure exposure is lower than ADI

DIETARY INTAKE (TMDI-Theoretical Maximum Daily Intake) The sum of what we eat: diet by section of population

Multiplier by diet (exposure)
ADI: determining exposure

- Remember that pesticides standards are about total exposure. That means we have to know what we eat and how much we eat. And how much pesticide is allowed in the food we eat.

- The food basket is also the pesticide basket. It’s a trade-off: between nutrition and poison.

- Exposure = MRL x Diet (what we eat and how much)

- If we calculate what the law today allows: then…

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ADI cannot be exceeded.

- ADI calculation **must** at the time of registration.
- If daily intake is below ADI. Pesticide will be registered.
- If intake exceeds ADI then:
  - A. Go back to MRL -- review and rework the legal limits allowed in food residues. Remove the use from some crops. Adjust. Public health at stake.
  - B. If ADI cannot be established, set the MRL at “no detection” – no residue allowed.
Our pesticide quota
Our daily bread..

- Pesticide regulation is about managing the nutrition-poison tradeoff
- We ingest pesticides because we need to eat food
- The pesticide basket is also the food basket.
- If pesticide quota over-consumed then we have no space for anything outside essential diet
- Cannot allow pesticides in non-essential foods like soft drinks
Regulations: post-JPC

1. Register pesticides only after Maximum Residue Limit (MRL) has been fixed. Amend the insecticide Act 1968 to include provision for making this mandatory

Happening? Yes and no

Weak compliance and weak systems

But pesticide management bill 2008 (in Parliament) includes provision to register only after MRL has been set

Needs to be pushed
2. Review MRL of pesticides periodically to ensure that allowed usage is within the Acceptable Daily Intake (ADI)

No

Discussion started in 2011 in FSSAI
Nothing done
Has to be pushed and implemented
Health is compromised
Government not in compliance with JPC
3. Fix MRL of ‘deemed’ pesticide – registered but without MRL -- without further delay

Not yet
Says being done. List is being prepared
Many old pesticides
4. Collect information about use of banned pesticides and check this practice

Says being done

But enforcement poor

Endosulfan banned by court

Still in use
5. Do an annual monitoring of food commodities for pesticides residues

**Being done:** Agriculture ministry national programme on pesticide monitoring; health ministry/FSSAI tests

Pesticides have mysteriously ‘disappeared’

Negligible residues found

**ALL IS WELL??**
All is not well

• Regulations need to be strengthened
• Need to ensure new pesticides – more toxic, but less pesticide – are also monitored
• Need to make sure all studies are available with full information about what tests done and what pesticides checked and where samples have been picked up
• Cannot afford to take this health-risk
Health-risk

• Do not die because of pesticide contamination

• Doctor does not certify death due to pesticide

• Difficult to write cause: pesticide

• But definite trigger in body – reduces immune response; leads to cancer and other diseases
• Body burden studies

• 1. Blood in farmers of Punjab
• 2. Endosulfan in Kerala
Pesticide in blood: 2005

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Why Punjab...

• We sent a colleague to investigate.

• Came back with reports of trains with cancer patients from Punjab going to Rajasthan for treatment.
CSE study in Punjab

- Selected two districts – Bhatinda and Ropar – based on high pesticide use and media reports on cancer patients.

- A team of scientists from the PML visited four villages - Mahi Nangal, Jajjal and Balloh in Bhatinda and Dher in the district of Ropar - in Punjab between October 4-7, 2004.

- Collected 20 blood samples from randomly selected people

- Exposure was apparent.
  Pesticides were all around.
Results...... shocking

- We found 15 different kinds of pesticides in the 20 blood samples we tested.
- Each blood sample contained a cocktail of 6-13 different pesticides

And we found it in very high amount
Results...... shocking

How many bodies have been trespassed? Which pesticides do they have in their blood?

How much of which pesticides in blood?

<table>
<thead>
<tr>
<th></th>
<th>Organochlorine pesticides</th>
<th>Organophosphorous pesticides</th>
<th>Total pesticides</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HCH</td>
<td>Heptachlor</td>
<td>Aldrin</td>
</tr>
<tr>
<td>Average pesticides in Punjab blood samples (mg/l)</td>
<td>0.057</td>
<td>0.006</td>
<td>0.0062</td>
</tr>
</tbody>
</table>
Results...... shocking

• But... How High?

• Levels of organochlorine pesticides (OCs) were found to be 15-605 times higher than those found in the blood samples of the US population as tested by the US Centre for Disease Control and Prevention (CDC)
Organophosphates

- In addition organophosphates constituted more than 60% of the total pesticide residues in the blood samples from Punjab.

- This finding is disturbing because......
- Organophosphates are now getting added in body to the earlier contamination of Organochlorines.
- Organophosphates have far higher toxicity that the older Organochlorines.
Organophosphates

- What does it mean in terms of health effect on humans?
  - Do we know what these pesticides are doing to the people of Punjab?
  - Do we know if the rates of cancer are higher in Punjab because of these toxins?
  - No, we don’t........
What are the health implications?

• We cannot say for certain.
• The effects of specific chemicals can vary among individuals.
• The science of pesticide in body and its linkage with human health is still developing.
• Moreover, we don't carry only one pesticide in our bodies. We carry a cocktail.
• And, virtually nothing is known about the combined health impacts of dozens of these chemicals in the body at the same time.
What are the health implications?

- What we do know is that toxicological tests (tests on animals) starkly show the clear linkage between pesticides and a range of health problems: from developmental disorders to fertility problems, from neurological disorders like Parkinson’s disease to cancer.
What are the health implications?

- But we cannot say this for the people of Punjab.
- Because death certificates never cite pesticide exposure as a cause of death.

- No truth. No connection. No liability.
What do we do then?

- Slowly, world is moving beyond finding linkages between pesticides and disease they cause. It is no more important.
- It is understood that these toxins will have implications, even if we cannot prove it by scientific means.
- What is more important is to know how much and how many of these chemicals are trespassing human bodies.
- The bottom line is simple: No chemicals can be allowed to trespass our bodies.
Way ahead: Regulate these toxins

- The UK’s Royal Commission on Environmental Pollution in 2003 stated “where chemicals are found in elevated concentrations in biological fluids such as breast milk, they should be removed from the market immediately”
- Many researchers, scientists and NGOs now believe that body burden studies may hold the key to a full-proof system of regulating the use of pesticide and other chemicals
- It is no more about testing pesticides in food and then regulating pesticide use.
- It is now about testing pesticides in human bodies and then regulating and controlling their use.
Monitoring and regulation

- We must have **Chemical Trespass law** - a law to prevent trespassing of human bodies by chemicals and to hold manufacturers accountable.
- We must have a system in place for regular monitoring of pesticides in human bodies for the whole country.
- The data generated from these studies must be used for regulating pesticides. Informing people of risks. Holding companies responsible, not just for sale, but wise use.
- We must register only those new pesticides that have a higher ADI, than what is already registered. Move towards safer chemicals.
Denial must stop

- The fact is that we don’t know enough.
- But denial cannot be the way ahead.

- We know that use of pesticides is intensive; it is pervasive; there is no effort to educate farmers on what is wise and safe use.
- We now know that pesticide residues are in blood of farmers of Punjab; there is no standard for pesticides in blood; but we know that what has been found has no comparison; it is high.
- We are finding newer pesticides in blood -- what should not have been there; these have higher toxicity; will impact; but we don’t know how.
What happened?

- Difficult to say
- Pesticide contamination a big issue in Punjab
- Assembly election ‘cancer and pesticide’ was issue; government promised relief

- But is this enough?
- No
- Need to ensure regulation is strengthened; more awareness about risks
Endosulfan: 2001 ongoing

- Enormous pain
- People debilitated
- People with neurological, reproductive deformities
- Why?

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Sheelavathi
• Guruva’s grandchild
• Kittana
Quick recap: 10 years of struggle

1. CSE tested 2001: found endosulfan
2. Industry tested 2001: did not find anything
3. ICMR asked NIOH to test: 2002: finds and makes link between health and pesticide
4. Industry very angry. Filed SLAPP cases against activists; CSE; even now any study provokes furious response
5. 2011: Supreme bans pesticide
2003: When endosulfan was given clean chit once again

- 2003: Dubey Committee submits report.
- Says: “There is no link between the use of endosulfan in PCK (Plantation Corporation of Kerala) plantations and health problems reported from Padre”.
- Central government accepts report.
- October 2003: Informs Supreme Court that “it was found that endosulfan was being misused for catching fish by local people”.
- Case closed.
Cleared?

- Dubey report says that the report of the Fredrick Institute of Plant Protection and Toxicology (FIPPAT) “established that there was no detectable level of endosulfan in human blood..cow milk..water sample…”
- This report helped Dubey clear endosulfan.
But what did FIPPAK do?

- Information in our hands that it suppressed information, fudged its calculations....

- A. it found residues in blood but did not report
- B. it found both alpha and beta endosulfan but did not report
- C. it underreported the amount of pesticide it had found in leaf and soil.
You can find and not report

- The graph for HB18

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- Reported: total endosulfan sulfate less than 0.001 ppm.
- Found: Alpha+ beta (did not report).
- When we calculated what was really found:

**HB 18: 0.186 ppm of endosulfan residues**

(higher than what NIOH reported: 0.078 ppm of total endosulfan residues in human blood)
Why Padre matters so much

- Industry contends:
  - A. Endosulfan is not found in Padre
  - B. Endosulfan is not persistent. It breaks down very quickly in the environment. Therefore, cannot be a problem
  - C. Cannot find alpha+beta isomers. Will disintegrate into sulphate

But why is fight so virulent?

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Padre establishes link

- One case where link is clear – single pesticide, exposure over years, horrendous health impacts

- One case where liability is clear – single pesticide – cause and effect

- Denial at all costs. Denial at any cost
• 20 years. Spraying twice a year. Pesticide brought down through runoff or seepage, accumulated in soil, surface water, wells, crops cultivated from this water, on this soil, feed people.
What does this show..

• “This is the first study to measure the effects of endosulfan on the male reproductive system. Decades of spraying this, and only this, pesticide provided a unique opportunity to analyse impact.” Says science editor of *Environmental Health Perspectives* from US

• Does not suit industry

• Shows their poison for poison
3. New gen-food battle

- Not just contamination but how food is processed and manufactured
- Not just contamination but what we eat; what we should **not eat**
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?
The study

- Vanaspati oil – 7 brands
- Vegetable oils
  - 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)
  - Desi ghee (1)
- Butter (1)

- Test methodology – Internationally used methodology of the Association of Official Analytical Chemists for fatty acids analysis
• 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 transfats in cooking oil is set at 2 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: Gujarat Co-op. Milk Marketing Federation Ltd
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%
- GAGAN: Amrit Banaspati Co Ltd, 14.82%
- 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
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 ovulatory infertility
- Cancer -- increased risk to breast cancer
Bans across the world

- Growing concern and action against trans fats

- World Health Organisation (WHO) has recommended that governments around the world phase out partially hydrogenated oils if trans-fat labeling alone does not lead to significant reductions. WHO also recommends that the trans fatty acids consumption should be less than 1% of the total daily energy intake.
India: still drafting

• Discussions started in late 2004 in Health ministry ‘Oils and Fats sub-committee”
  Agreed trans fat is a problem.
• In April 2007 sets standard: 15% as limit
• Nothing happens
• In March 2009 (post-CSE study) finalizes standard: 10% trans fat; bring down to 5% in 3 years

• Standard sent to FSSAI to finalise/issue
• In June 2010 draft standard finalised once again: 10% and bring down to 5% in 3 years
  • But still nothing has happened.
India: Risk yes but label

- India has labelling rules: made for companies
  1. Say if you are making nutrition claim – saying food is healthy – then only you must include quantity of trans fat on package
  2. If less than 0.2 trans-fat per serving of food then you can claim zero-trans fat
  3. If you are using hydrogenated vegetable oil label how much – can put range

- No standard. Companies get away
CSE analysis found that fats—eight times above the Denmark standard. Can have anything. As long as they declare it.

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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
• saturated 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
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>49.37</td>
<td>10.89</td>
<td>6.82</td>
</tr>
<tr>
<td>Safflower</td>
<td>Mustard</td>
<td>Safflower</td>
<td>Groundnut</td>
<td>40.60</td>
<td>39.07</td>
<td>7.09</td>
<td>5.88</td>
</tr>
<tr>
<td>Sunflower</td>
<td>Groundnut</td>
<td>Rice bran</td>
<td>Sesame</td>
<td>38.99</td>
<td>38.05</td>
<td>6.20</td>
<td>3.43</td>
</tr>
<tr>
<td>Olive</td>
<td>Sesame</td>
<td>Blend</td>
<td>Sesame</td>
<td>38.99</td>
<td>33.06</td>
<td>6.62</td>
<td>3.43</td>
</tr>
<tr>
<td>Soybean</td>
<td>Rice bran</td>
<td>Blend</td>
<td>Rice bran</td>
<td>36.43</td>
<td>30.50</td>
<td>2.43</td>
<td>2.50</td>
</tr>
<tr>
<td>Blend</td>
<td>Sunflower</td>
<td>Groundnut</td>
<td>Sunflower</td>
<td>35.23</td>
<td>33.70</td>
<td>1.03</td>
<td>2.20</td>
</tr>
<tr>
<td>Groundnut</td>
<td>Palrn</td>
<td>Blend</td>
<td>Blend</td>
<td>24.91</td>
<td>24.74</td>
<td>0.56</td>
<td>2.20</td>
</tr>
<tr>
<td>Sesame</td>
<td>Blend</td>
<td>Groundnut</td>
<td>Rice bran</td>
<td>18.30</td>
<td>18.01</td>
<td>9.98</td>
<td>1.78</td>
</tr>
<tr>
<td>Rice bran</td>
<td>Desi ghee</td>
<td>Vanaspati</td>
<td>Sesame</td>
<td>9.92</td>
<td>9.53</td>
<td>1.03</td>
<td>1.24</td>
</tr>
<tr>
<td>Vanaspati</td>
<td>Desi ghee</td>
<td>Palm</td>
<td>Sesame</td>
<td>9.43</td>
<td>9.53</td>
<td>0.43</td>
<td>1.24</td>
</tr>
<tr>
<td>Palm</td>
<td>Desi Ghee</td>
<td>Olive</td>
<td>Palm</td>
<td>9.53</td>
<td>6.91</td>
<td>0.42</td>
<td>0.23</td>
</tr>
<tr>
<td>Desi Ghee</td>
<td>Desi Ghee</td>
<td>Butter</td>
<td>Olive</td>
<td>5.93</td>
<td>6.19</td>
<td>0.26</td>
<td>0.23</td>
</tr>
<tr>
<td>Butter</td>
<td>Desi Ghee</td>
<td>Safflower</td>
<td>Safflower</td>
<td>11.44</td>
<td>6.91</td>
<td>0.26</td>
<td>0.23</td>
</tr>
<tr>
<td>Coconut</td>
<td>Desi Ghee</td>
<td>Mangosteen</td>
<td>Mango</td>
<td>11.44</td>
<td>6.91</td>
<td>0.26</td>
<td>0.23</td>
</tr>
</tbody>
</table>

Blend — Blended Safflower + Rice bran oil; Average value of different oils tested by CSE lab
Healthy oil for healthy bodies..

• 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 SF) but mustard (dhaara or kachhi ghani) is better

• Bottom-line: Weak regulators; weak advertising codes
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 ISA mark mandatory and revise standards for health and safety.

Regulate our oil for our nutrition and health. Not company profit
What’s in your Honey?

September 15 2010

Centre for Science and Environment
New Delhi
Sample

- 12 branded honey sample – 10 domestic brands and 2 imported brands
- Dabur Honey of Dabur India Ltd, which holds over 75% of the market share
- **Imported brands:**
  - Capilano Pure & Natural Honey of Capilano Honey Ltd, Australia. This company is the market leader in Australia
  - Nectaflor Natural Blossom Honey of Narimpex AG, Switzerland.
Antibiotics

- Tested for six antibiotics (from five classes) that are reportedly used for disease control and as growth promoters in commercial honey production

- **Oxytetracycline (OTC):** used against bacterial foul brood diseases. *EIC standard: 10 ppb*

- **Chloramphenicol:** banned from use in food-producing animals in many countries because of toxicity. *EIC standard: 0.3 ppb*

- **Ampicillin:** Not recommended for honeybees, but reportedly used against bacterial diseases. *No EIC standard*
Antibiotics

- **Erythromycin**: used for poultry, and now reportedly being used in beekeeping. **No EIC standard**
- **Enrofloxacin and Ciprofloxacin**: synthetic antibiotics used as a growth promoter in cattle, now being used in beekeeping as well. **No EIC standard**
Results

• Multiple antibiotics (2 to 5) in high amounts were found in 11 out of the 12 samples.
• All 11 samples failed the EIC standards for exported honey.
• The two imported honey samples were also highly contaminated with antibiotics. Both would have failed their own domestic standards.
• The fact that more than one antibiotic was found in the samples indicates most are blended honey from multiple sources. So one does not know from where the honey has been sourced.
Results

<table>
<thead>
<tr>
<th>Antibiotic detected</th>
<th>% samples tested positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxytetracycline</td>
<td>50</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>25</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>67</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>8</td>
</tr>
<tr>
<td>Enrofloxacin</td>
<td>83</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>42</td>
</tr>
</tbody>
</table>
Brand-wise results

- **DABUR HONEY:** Had 3 antibiotics. It had 91.3 μg/kg OTC, which is nine times the EIC standard; 26.6 μg/kg of ampicillin and 88.7 μg/kg of enrofloxacin. **Sample non-compliant with EIC standards.** Would be rejected if placed for exports.
Brand-wise results

- **CAPILANO PURE & NATURAL HONEY:** Three antibiotics detected. Chloramphenicol is banned for food production in Australia.

- **NECTAFLOR NATURAL BLOSSOM HONEY:** Of the six antibiotics tested, the highest number—five—detected.

- Sample non-compliant with EIC export standards as well as Australian standards.
2 questions and implications

• 1. Antibiotics are medicine so why are we concerned with antibiotics in food?
• 2. Why are antibiotics found in honey? What is the implication for the food we eat?
Health implications

- Chronic health impact due small doses of antibiotics being ingested over long period

- Antibiotic resistance in microorganisms – bugs/bacteria resistant to many antibiotics become super bugs. Our bodies lose ability to fight disease
The changing biodiversity of bees

- **Three trends:**
  - Use of exotic species (*Apis mellifera*) to produce honey wiping out Indian adapted bee (*Apis cerana*)
  - Focus of quantity – extraction of immature honey – coaxing honeybees to produce more
  - Artificial feeding of sugar syrup and antibiotics to produce more honey

**The result:** Changing disease profile; more antibiotics and pesticides use; more of these in honey.

All these because the business of bees have changed
• The business of honey is today controlled by few big companies – packers and exporters.
• They control the domestic production chain; control the individual beekeepers; monopolize the market
• They also import and export honey and they supply honey to all major brands
• The result: we don’t know whether we are eating Chinese honey, Indian honey, High Fructose Corn Syrup, Inverted Sugar or mix and match of all.
International Trade: Honey laundering

- China is the world’s leading producer exporter of honey; at a price that none can match
- But China has had its share of rejection in the EU and USA. While the former banned Chinese honey due to the presence of chloramphenicol in its honey, USA banned Chinese honey as a measure to protect its own beekeepers
- 2001: USA slapped an anti dumping duty of 221% on Chinese honey
- Duty has led to incidents of honey laundering – trans shipments to avoid duty through different countries
Honey laundering: busting rings

China to US, via quick-change ports

ALW FOOD GROUP, re-routed contaminated honey consignments from China through third countries to dodge US customs

**RUSSIA**
- 163 consignments between December 2003 and February 2008, having a declared value of $11.4 million

**MONGOLIA**
- 31 consignments between August, 2005 and April 2007, with a declared value of about $2 million

**INDIA**
- 180 consignments between March 2002 and October 2006, with a declared value of about $10 million

**PHILIPPINES**
- 3 consignments between June 2005 and December 2005, with a declared value of over $250,000

**MALAYSIA**
- 48 consignments between September 2002 and September 2003, with a declared value of about $5 million

**INDONESIA**
- 21 consignments between October 2003 and September 2006, with a declared value of about $2 million
Honey business not sweet

- 2008: US justice department arrests top officials of German food multinational – Alfred L Wolff (ALW)
- Investigations reveal multi-country ring in honey trade – laundering via different countries
- September 2010: US justice department charge sheets 21 individuals and companies
- Indian connection revealed. Name withheld by US justice department
- Independent investigations point to shipments from Tuglakabad Container Depot involving Chinese companies and Indian (Apis India Natural Products)
- Honey scandal unfolding…

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Regulatory implications

- Antibiotic contamination known to government for at least last 5 yrs
- But no action by the food safety regulators
- We care for exports but not for health and safety of Indians
Regulations: Movement ahead?

- 2011: Meeting of FSSAI technical panel has agreed to set standards for antibiotics in honey
- Now standard has to be finalised
- Now standard has to be enforced
- Now standard has to be used to promote ‘intelligent’ good practice in manufacture – small producers, bio-diversity, organic-first
Next-gen food regulations

- How not to eat what is bad food
- Obesity epidemic
- Obesity linked to diseases – non-communicable diseases – from cancer to heart and hypertension
- Fat because of bad food, bad lifestyle
- Fat linked to environmental toxins – double burden. Fat because of bad food; get fatter and more ill because of pesticides and other contaminants..
Tomorrow…

3 pm: Release of our study on junk food: what we have found in the food we love to eat