Is food really a major factor in causing and preventing cancer in man

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Current wisdom

- **Eating a healthy diet can prevent 30-40% of cancer**

Current Wisdom

- A healthy diet teamed up with regular exercise and no smoking can eliminate 80 percent of heart disease and 70 percent of some cancers

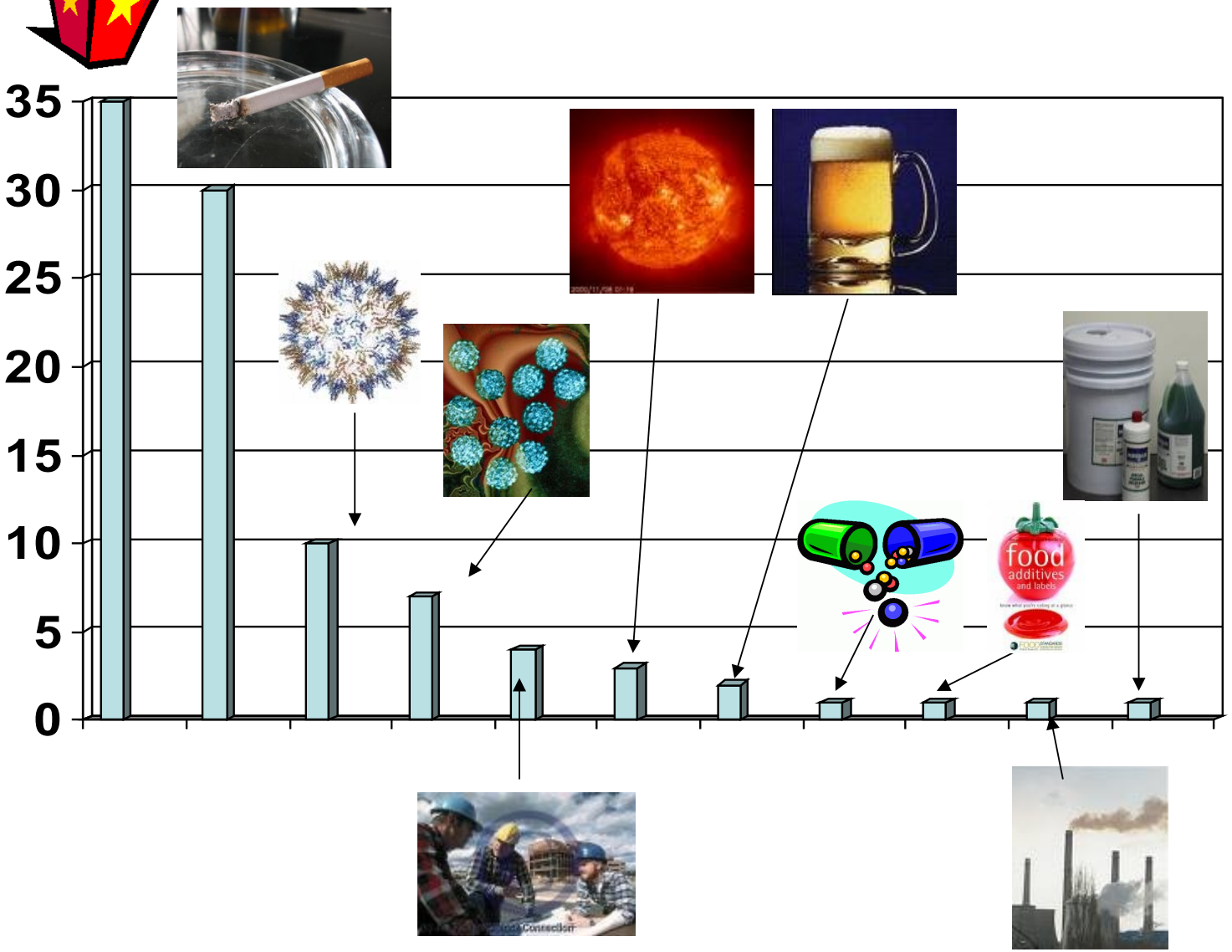
- Walter Willett, Harvard University, *Eat, Drink, and Be Healthy, 2001*

Table 4: Proportions of cancer deaths attributed to various different factors

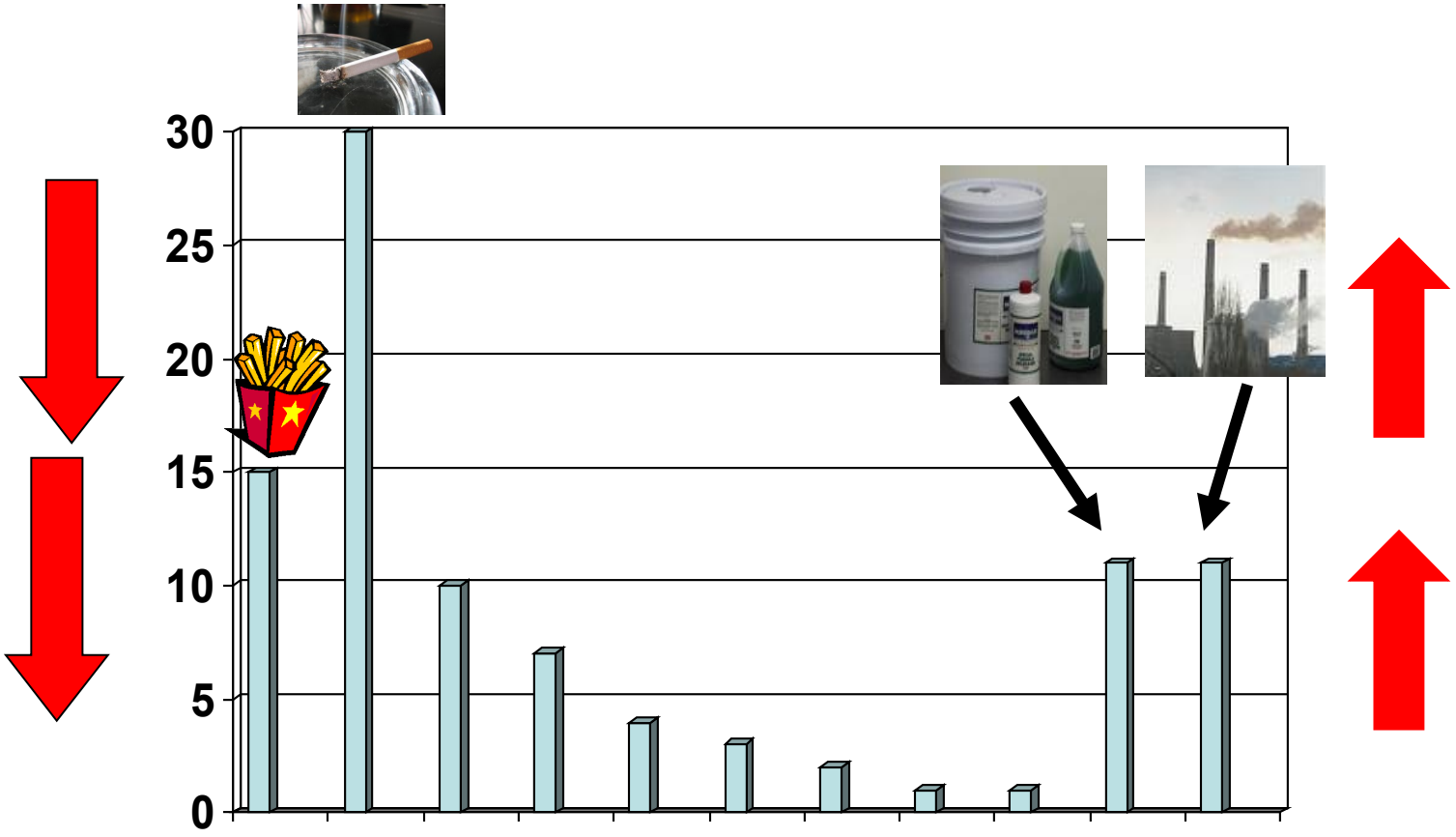
		Percent of all cancer deaths	
	Factor	**Best estimate**	**Range**
1	Tobacco	30	25-40
2	Alcohol	3	2-4
3	Diet	35	10-70
4	Food additives	<1	-5 –2
5	Reproductive and sexual behavious	7	1-13
6	Occupation	4	2-8
7	Pollution	2	<1-5
8	Industrial products	<1	<1-2
9	Medicines	1	0.5-3
10	Geophysical factors	3	1-4
11	Infection	10?	1-?
12	Unknown	?	

Doll R and Peto R, *The causes of cancer: Quantitative estimates of the avoidable risks of cancer in the United States today*, JNCI, 1981, 66, 1192-1308

Causes of cancer



Suggested modification



Current Wisdom

- Most of cancers are due to wrong life-style choices:

- Wrong diet
- Smoking
- Lack of exercise

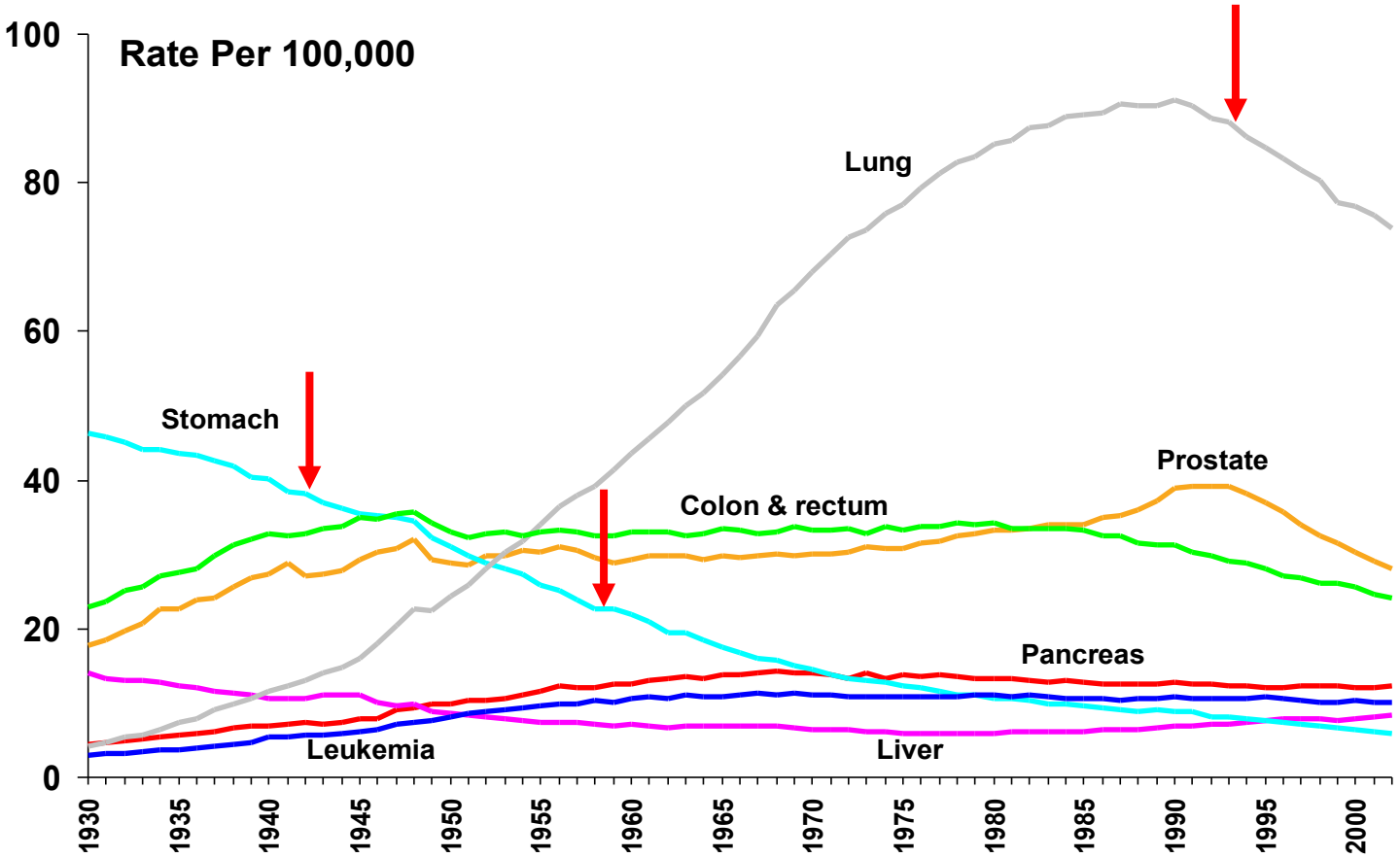
- It is your fault

Current Wisdom

- If poor personal choices cause up to 70% of cancers then health promotion should ultimately solve the cancer problem

Anti-smoking is an unfolding success story

Cancer Death Rates*, for Men, US,1930-2002



*Age-adjusted to the 2000 US standard population.
Source: US Mortality Public Use Data Tapes 1960-2002, US Mortality Volumes 1930-1959, National Center for Health Statistics, Centers for Disease Control and Prevention, 2005.

Four main reasons for doubting that food plays a big role in cancer

- Based on shaky evidence
- Lack of carcinogens
- Lack of proof of prevention
- Conflict of interest of main proponents

Shaky Evidence

- Doll and Peto admit that their estimate of 35% was NOT based on hard fact.
- **“We have made estimates on the basis of extrapolations of uncertain reliability, clinical impressions, and contemporary hypotheses and in some instances the evidence was so shaky that it was not justifiable to make quantitative estimates at all. Our attribution of quantitative avoidable causes depends on opinions and semi-educated guesses”.**

- Doll R and Peto R, The causes of cancer: Quantitative estimates of the avoidable risks of cancer in the United States today, JNCI, 1981, 66, 1192-1308

Example of shaky evidence leading to a fiasco

- Beta-carotene can prevent cancer
- If smokers take extra beta-carotene they will develop less lung cancers. Idea supported by Doll.
- In CARET trial 18 314 smokers given 30 mg beta-carotene daily. A 28% increase in lung cancer found. In the ATBC trial similar results were found for 20 mg beta-carotene per day.
- Optimal daily intake of beta-carotene pegged at 5 mg per day by national cancer institute
- Result shows that “diet-cancer” edifice is on shaky ground.

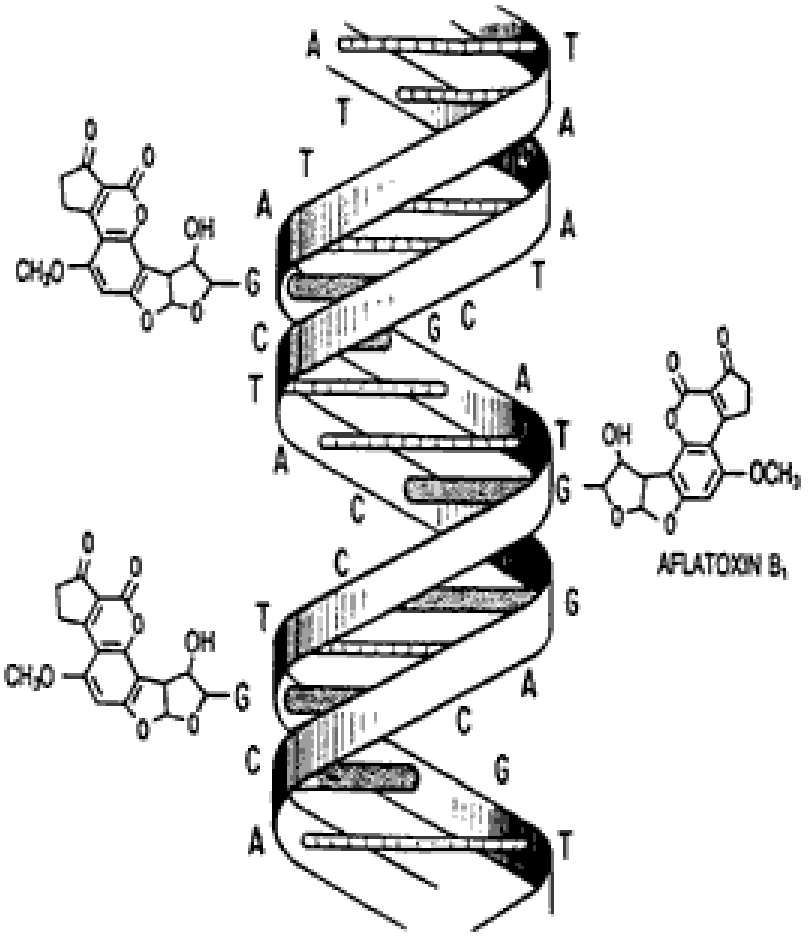
Lack of carcinogens in food

- Logic:

- If there were carcinogens in food they would sooner or later be discovered and removed because food is a highly emotive and regulated industry.

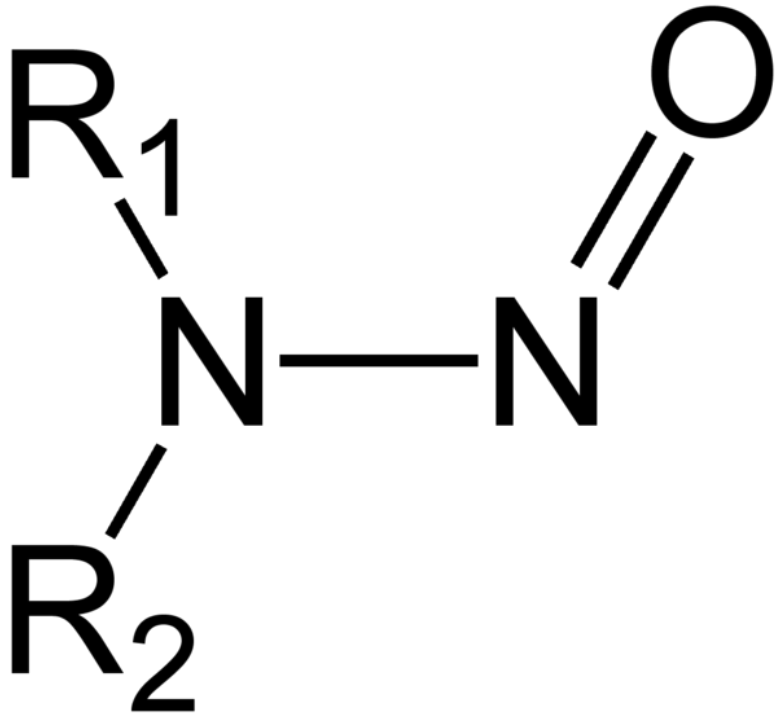
Examples of carcinogens in food

- Aflatoxin B1
- Aflatoxin is a highly toxic chemical made by the fungus *Aspergillus flavus,* which can grow on harvested peanuts and maize which are stored in moist conditions. In 1993 the International Agency for Research on Cancer (IARC) classified aflatoxin B1 as a Group 1 carcinogen, i.e. it can cause cancer in humans. Aflatoxin binds covalently (very tight) to DNA and causes a mutation in codon 249 of the p53 gene, that often leads to primary hepatocellular carcinoma, which is usually fatal.



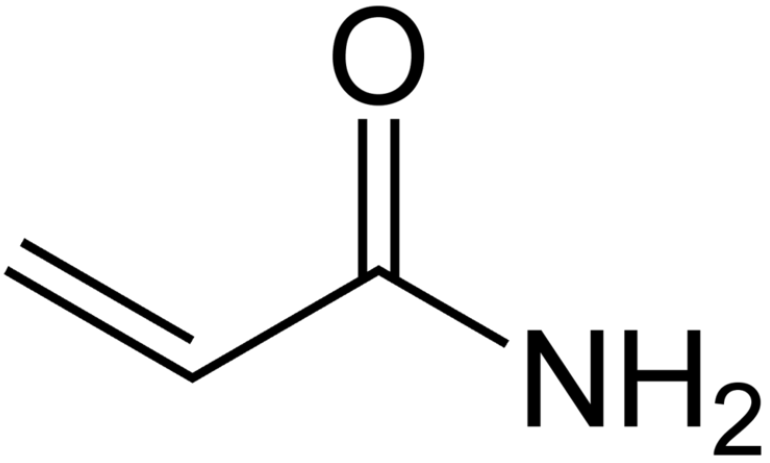
Examples of carcinogens in food

- Nitrosoamines
- Can form when nitrites react with amines in acidic conditions such as in the stomach.
- Reaction is blocked by vitamin C.
- Nitrosamines can cause cancers in animals, but its effect in humans is still not proven



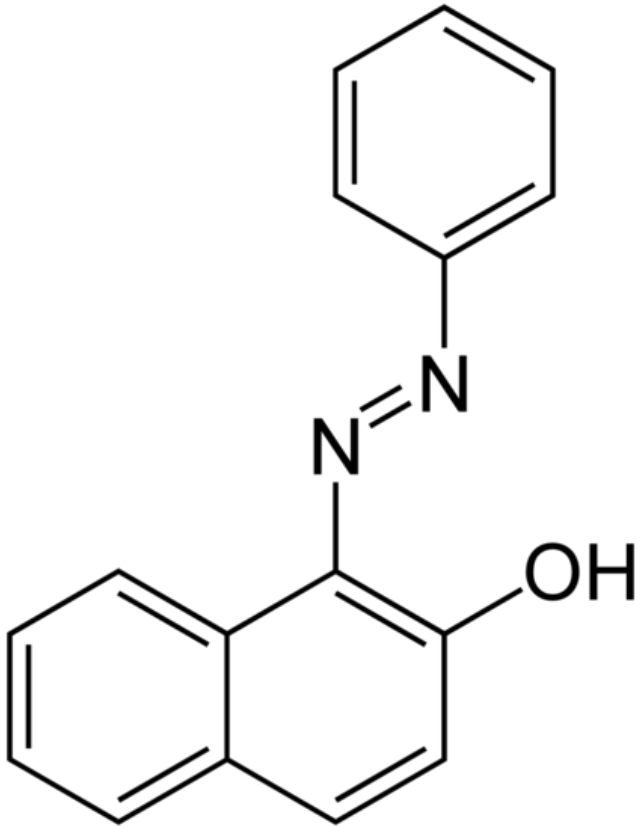
Examples of carcinogens in food

- Acrylamide:
- Acrylamide in fried or baked goods is produced by the reaction between asparagine and reducing sugars (fructose, glucose, etc.) or reactive carbonyls
- According to a 2005 review, acrylamide reliably produces various types of cancer in experimental mice and rats. However, studies in human populations have failed to produce consistent results



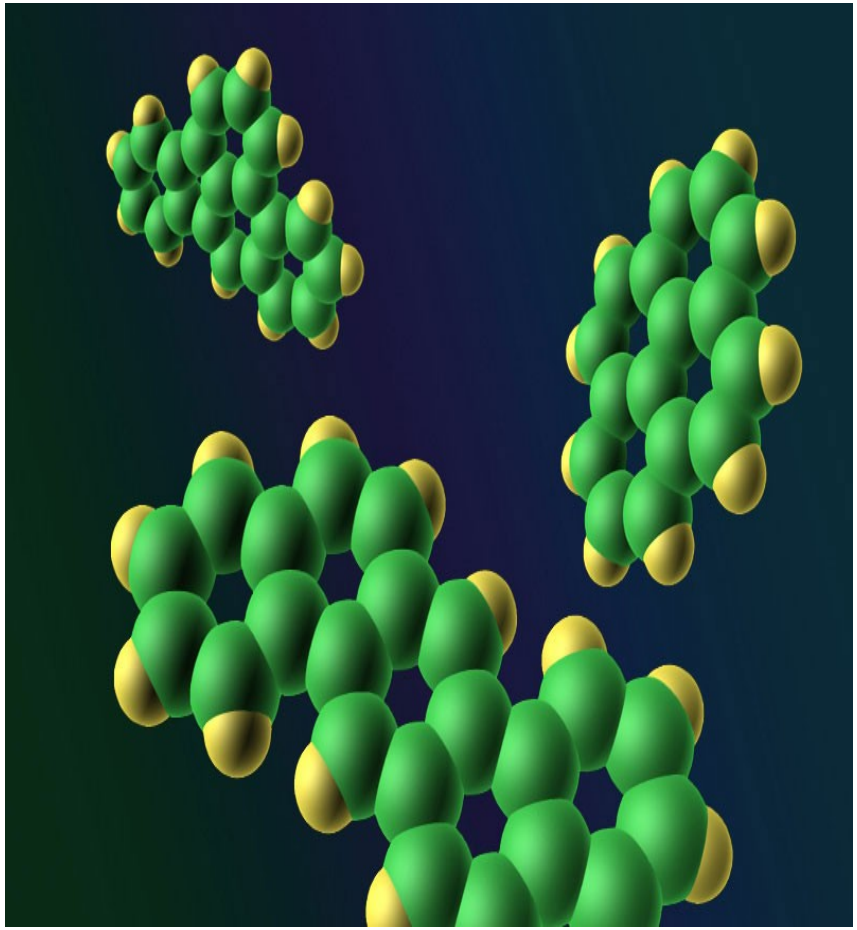
Examples of carcinogens in food

- **SUDAN I**
- The dye has been declared a possible carcinogen. Laboratory tests on rats showed growth of cancerous tumours in the liver. Tumors also developed in the bladder, following a direct injection into the urinary bladder. Tests via oral administration have so far proved negative



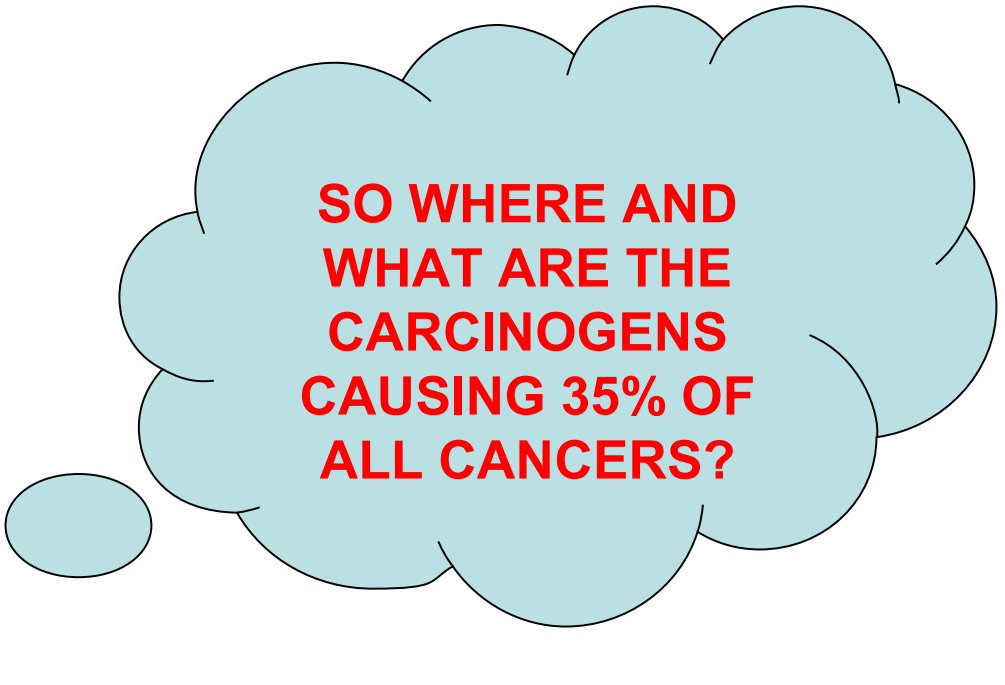
Examples of carcinogens in food

- **Polycyclic aromatic hydrocarbons** (**PAH**s) are chemical compounds that consist of fused aromatic rings and do not contain heteroatoms or carry substituents. These compounds can be point source pollutants (e.g. oil spill) or non-point source (e.g. atmospheric deposition) and are one of the most widespread organic pollutants. Some of them are known or suspected carcinogens, and are linked to other health problems. They are primarily formed by incomplete combustion of carbon-containing fuels such as wood, coal, diesel, fat, or tobacco



Known carcinogens are being kept out of food

- Aflatoxin – tested for
- Nitrosoamines – nitrites kept out
- Acrylamide – tested for
- Sudan dyes – tested for
- PAH – warned against



Lack of Proof of Prevention

- Important prevention messages not supported by current evidence:
- High animal fat intake correlates with high breast cancer. NO
- High fibre intake correlates with lower colon cancer. NO
- High vegetable intake correlates with lower cancer incidence. NO

Lack of Proof of Prevention

- High tomato intake correlates with lower prostate cancer incidence. NO
- Long term multi-vitamin use correlates with lower colon cancer intake. NO
- High folate intake correlates with lower colon cancer rate. NO
- Beta-carotene supplementation decreases lung cancer incidence. NO

Lack of Proof of Prevention – an example

- **Fruit and vegetable intake and risk of major chronic disease.**

- Hung HC,
- Joshipura KJ,
- Jiang R,
- Hu FB,
- Hunter D,
- Smith-Warner SA,
- Colditz GA,
- Rosner B,
- Spiegelman D,
- Willett WC.
- Department of Epidemiology, Harvard School of Public Health, Boston, MA 02115, USA

- **1: J Natl Cancer Inst. 2004 Nov 3;96(21):1577-84.**

- **CONCLUSIONS:**
- Increased fruit and vegetable consumption was associated with a modest although not statistically significant reduction in the development of major chronic disease. The benefits appeared to be primarily for cardiovascular disease and not for cancer.

This is a shocking result

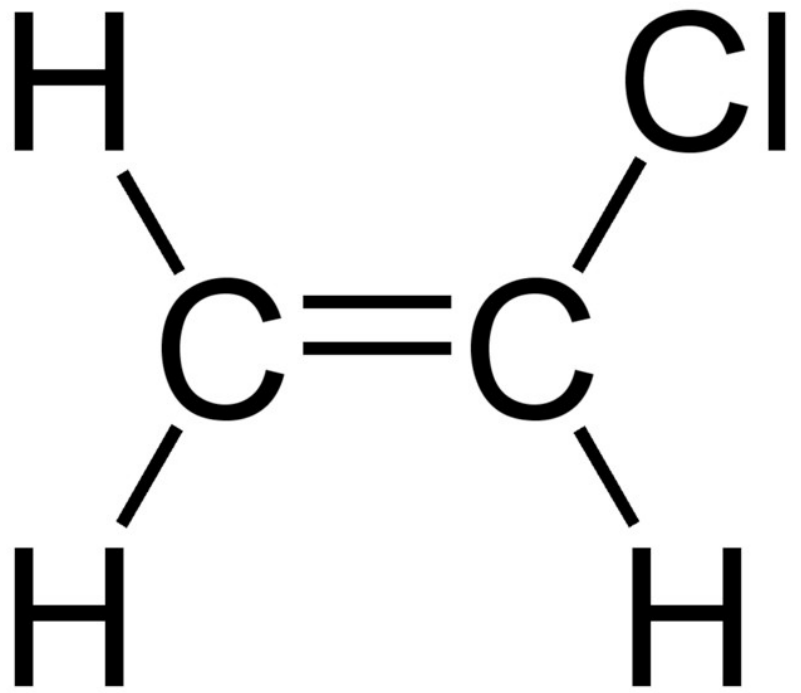
- Lack of Proof of Prevention

Conflict of interest by main proponent

- **DOLL UNDER ATTACK.** The late Oxford University epidemiologist Richard Doll, whose work in the 1950s helped demonstrate that smoking causes lung cancer, received consultancy fees from chemical companies whose products he was evaluating, according to recent revelations. Relying on documents Doll donated to the Wellcome Trust's library in London, the *Guardian* newspaper reported earlier this month that the scientist received up to $1500 per day from Monsanto during the 1980s and nearly $30,000 from the Chemical Manufacturers Association and two chemical companies for a report that largely cleared vinyl chloride as a cancer agent.
- *Science* 22 December 2006: Vol. 314. no. 5807, p. 1847

The case of vinyl chloride

- Vinyl chloride's toxicity limits its use in consumer goods, though it has been historically (until 1974) utilized as an aerosol spray propellant; carcinogenic potential has long been established and the prospective legal liability is comparable to that of asbestos (implicated in the causality of mesothelioma).



Vinyl chloride is BIG business

- Vinyl chloride (VC) is manufactured exclusively for polymerization into polyvinyl chloride (PVC), a plastic used in construction, packaging, electrical, and transportation industries; in household products such as flooring, water pipeing, videodiscs, and credit cards.
- Global PVC production in 2002 was nearly 59 billion pounds (27 million metric tons), valued at US $19 billion.
- Pollution sources include production and fabrication, incineration and landfills.

Vinyl chloride branded a carcinogen

- In a scientific review by the International Agency for Research on Cancer (IARC 1997) found that:

- "Vinyl chloride is a human carcinogen. Its target organs are the liver, brain, lung and haemo-lymphopoietic system…there is no evidence that there is an exposure level below which no increased risk of cancer would occur in humans."

Danger of vinyl chloride played down by Doll

- After the IARC evaluation the chemical industry commissioned Sir Richard Doll to review the epidemiology.
- He downplayed the risk of cancer in all sites other than the liver
- Later he testified that his 1988 report was conducted “on behalf of the Chemical manufacturers Association” for which he received $21 000 as a “donation to a charity in recompense”. The charity was Green College at Oxford, of which Doll is the founder and first warden (president).

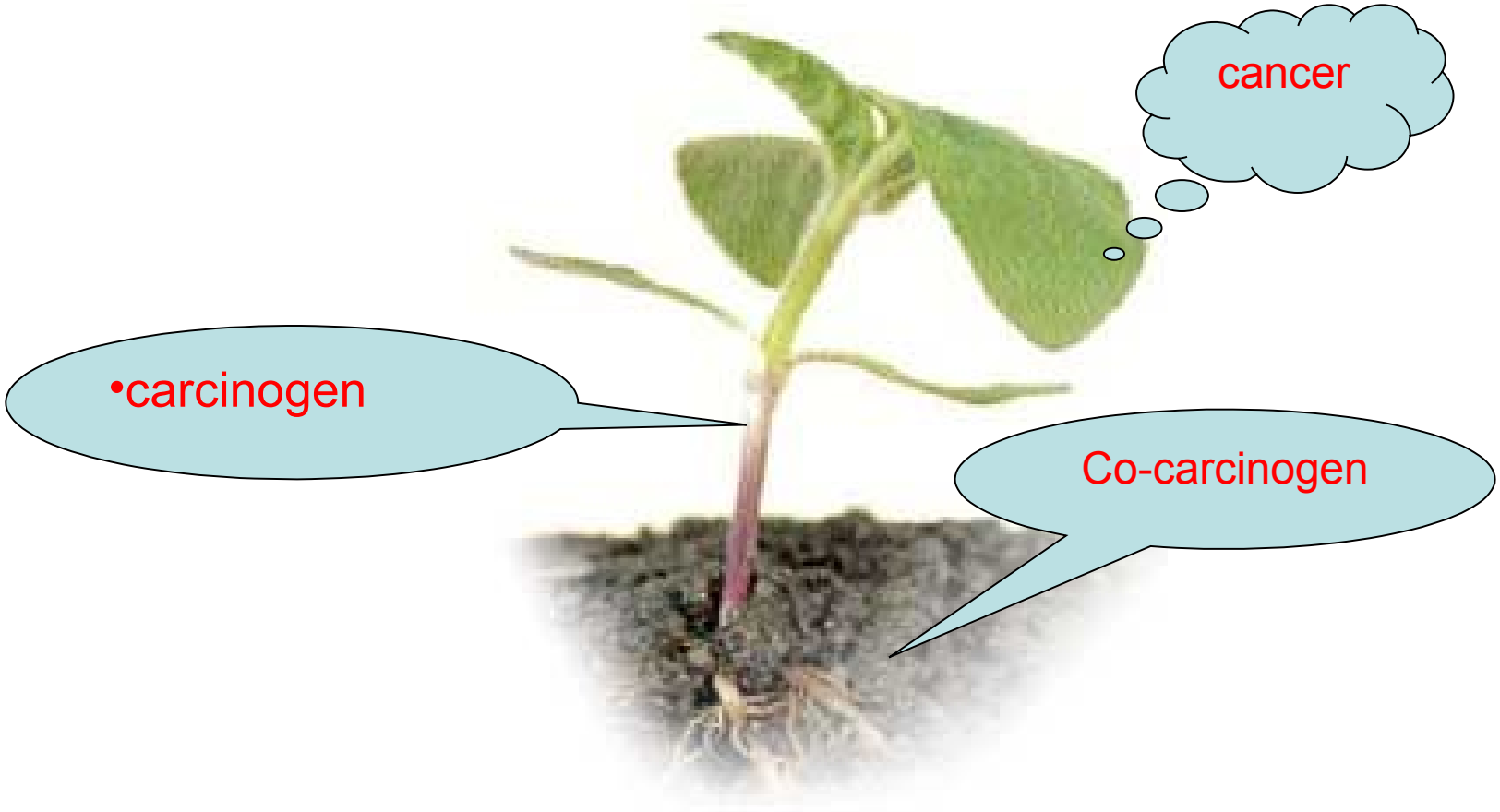
Conclusions

- The time has come to reconsider the causes of cancer
- Food does not seem to play a big role in the cause of cancer
- Man-made chemicals could play a much bigger role in the cause of cancer than suspected
- Human exposure to man-made chemicals could be through food, drink, inhalation.

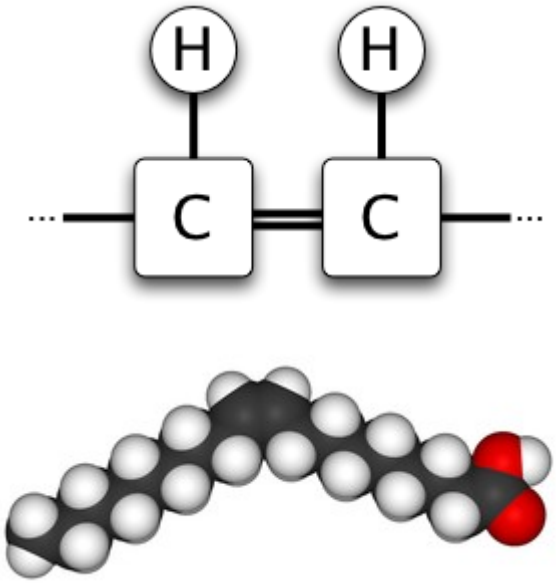
Future Predictions

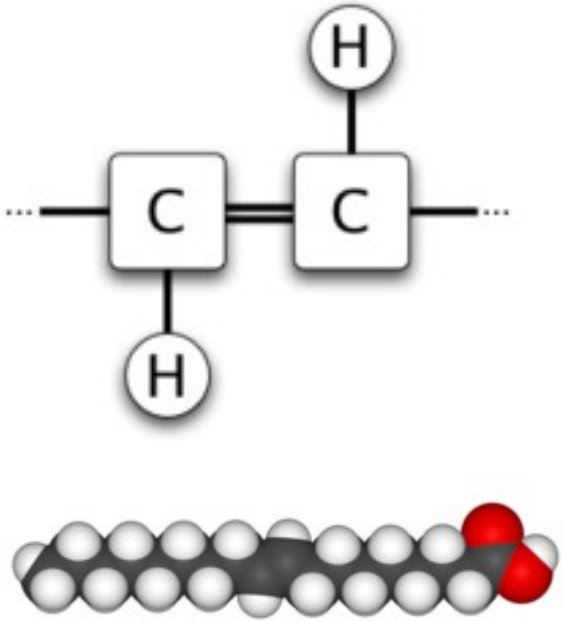
- Some man-made molecules may be co-carcinogens and promote cancer.
- Example: Trans fatty acids (TFA)
- Reasons:
- Now known that TFA induce inflammation markers in blood. Inflammation facilitates carcinogenesis, e.g. TNF-alpha, CRP, IL-6.
- Present in 40% of all food in Western World
- Associated with prostate cancer : Jorge, Chavarro; Meir Stampfer, Hannia Campos, Tobias Kurth, Walter Willett & Jing Ma (2006). "
  A prospective study of blood trans fatty acid levels and risk of
  ". *Proc. Amer. Assoc. Cancer Res.* **47**.

Co-carcinogen



Trans fatty Acids





My idea of what causes cancer

	Causative factor	%
1	Smoking	25
2	Infections: HBV,HPV, H.pylori	20
3	Man-made chemicals	18
4	Genetic pre-disposition	15
5	Endogenous carcinogens vs. endogenous anti-carcinogens	15
6	Food	5
7	UV light	2

New Wisdom

- Most of cancers are due to wrong life-style choices and exposure to man-made carcinogens:
- Wrong diet
- Smoking
- Lack of exercise
- Exposure to man-made carcinogens and co-carcinogens

- It is your fault and it may also be industry's fault