

Health aspects of trans fats

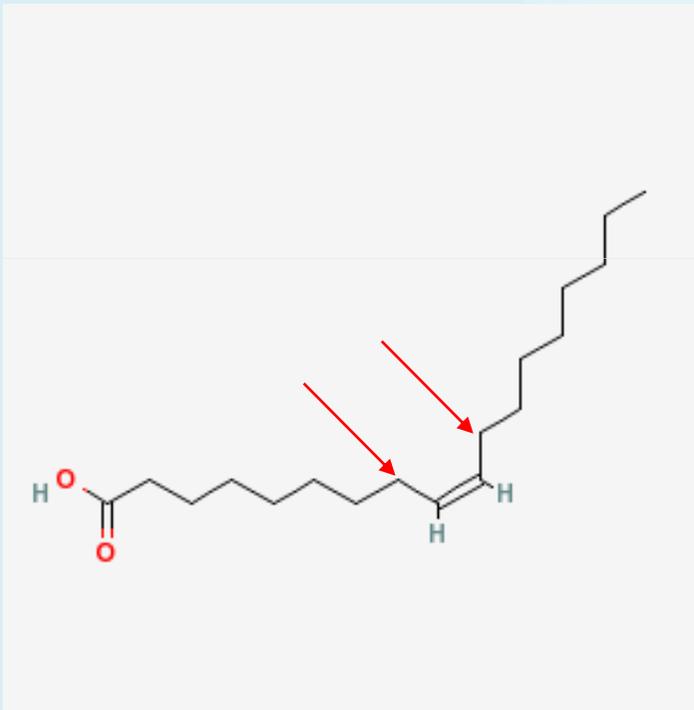
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Head of Research
CANSA
22 October 2009

Introduction

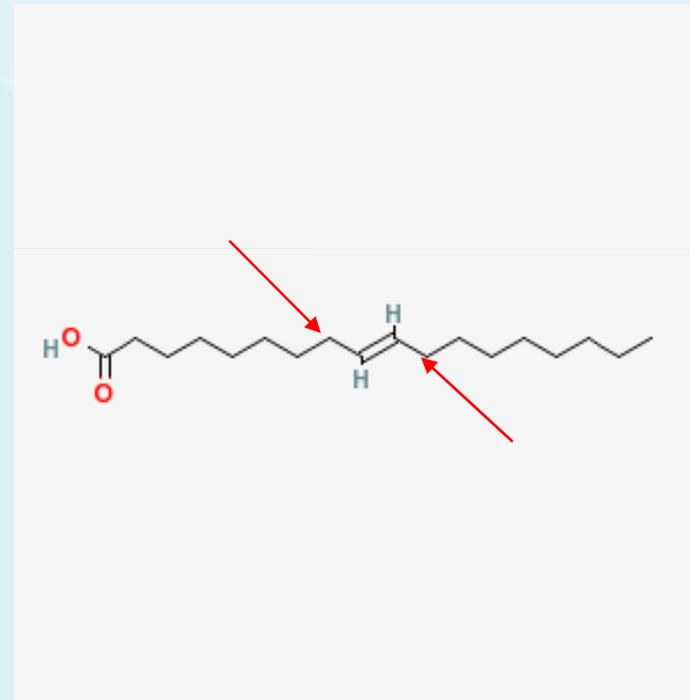
- ***Trans Fatty acids (TFAs) are unsaturated fats with at least one double bond in the trans configuration that are formed during the industrial hydrogenation of vegetable oils for food manufacturing.***
- ***Average consumption in industrialized countries is 4-7% of total dietary fat.***
- ***Major sources of TFAs are fast foods, bakery products, packaged snacks and margarines.***
- ***TFA intake independently predicts risks of both coronary artery disease and diabetes.***

Example of a TFA

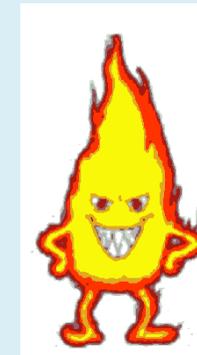
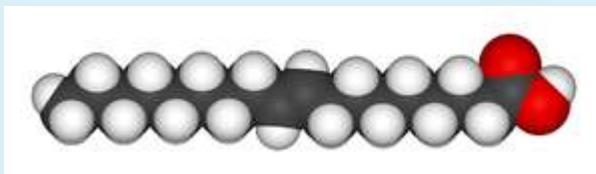
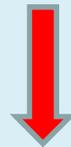
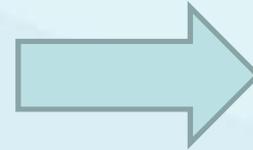
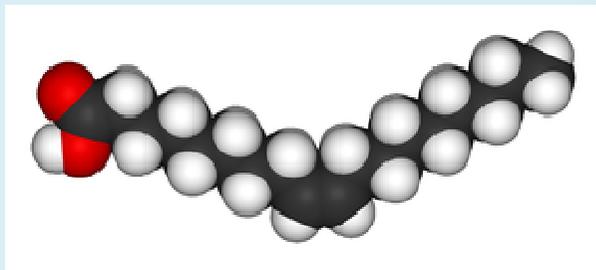
OLEIC ACID
Normal - Cis



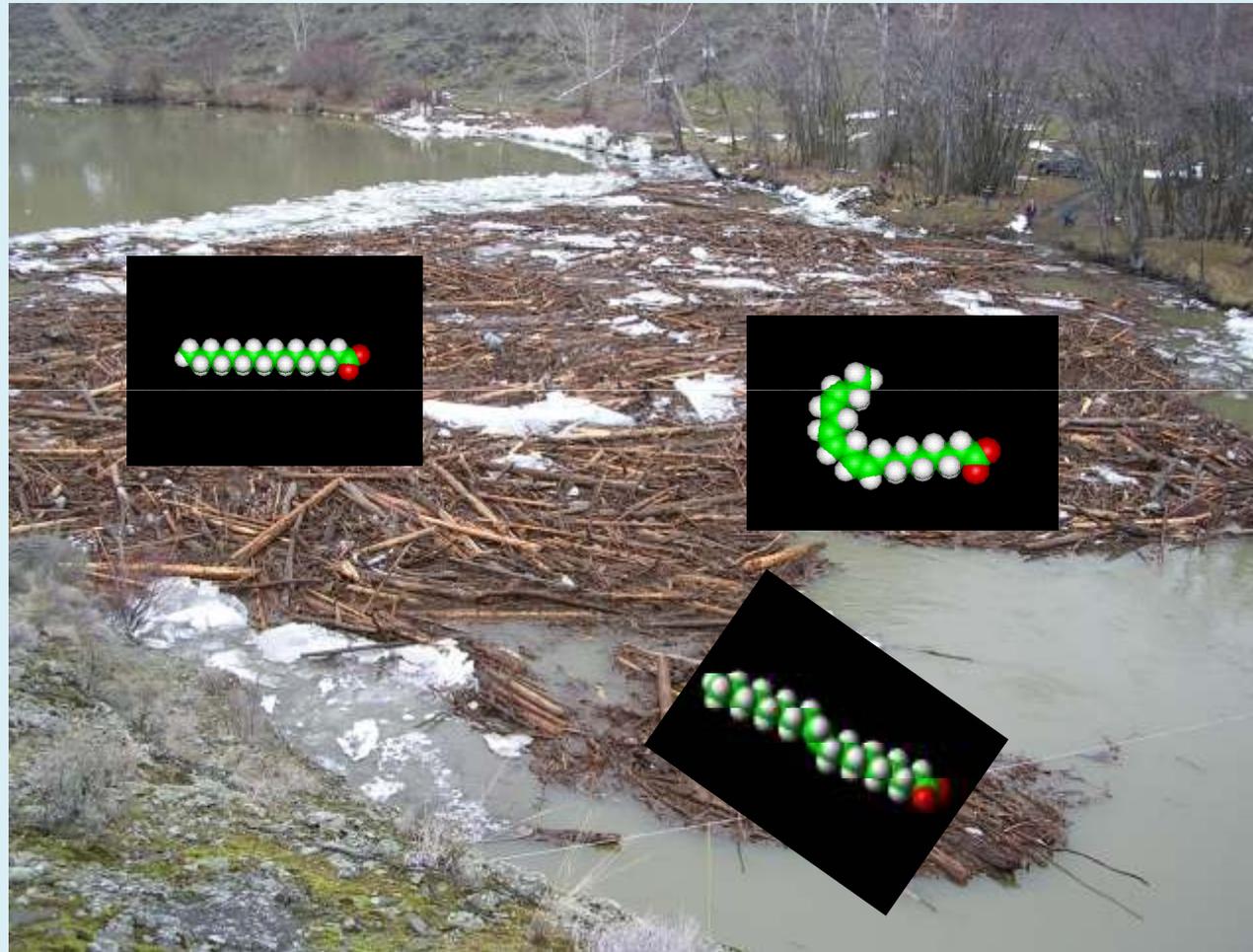
ELAIDIC ACID
Trans



Health implication of TFA



Saturated and trans fats cause “logjam” in membranes. Omega-3 fatty acids “break” the logjam.



General health implications

Consumption of trans fatty acids (TFA) predicts higher risk of coronary heart disease, sudden death, possibly diabetes mellitus as well as increased risk for breast and prostate cancer.

Intake of as little as 6g TFA(1 x teaspoon) per day by a person consuming 2 000 calories in the US can result in 27, 000 deaths per year nationwide

Trans fats are Toxic fats

“Trans fat is a hazardous substance”.

*Thomas Frieden
Health Commissioner –New York*

How is this possible?

Partially hydrogenated vegetable oils have been in the American diet since 1900.

TFA were discovered in this oil more than 50 years ago.

In 1990 Unilever and Katan showed that TFA increased LDL and lowered HDL

Consensus in 1990 was that health effects of SFA and TFA were equally negative

Early 1990's was the watershed for TFA

New epidemiological data suggested that trans fats were actually worse than saturated fats with respect to their effects on heart health.

Willett WC, Stampfer MJ, Manson JE et al., Intake of trans fatty acids and risk of coronary heart disease among women. [Lancet, 1993;341: 581-585](#)

Willett WC, Ascherio A. Trans fatty acids: are the effects only marginal? [Am J Public Health. 1994; 84: 722-724](#)

The Devil is in the details

Poly-unsaturated **PUFA**

GOOD

Essential

Saturated **SFA**

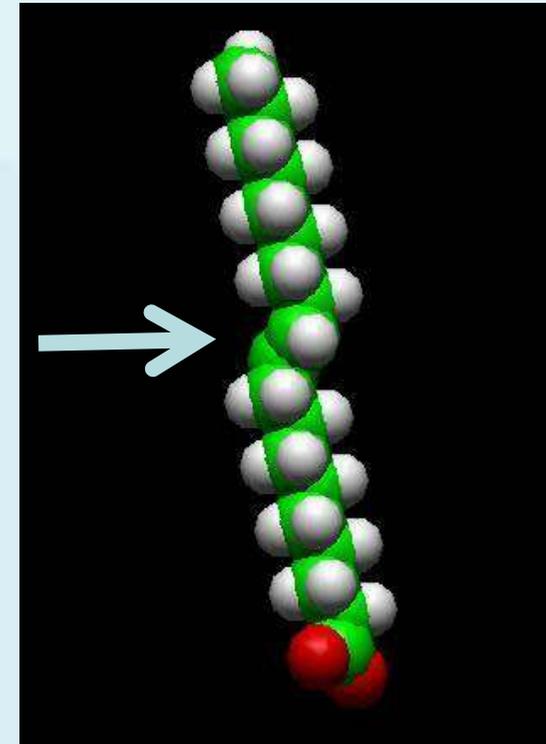
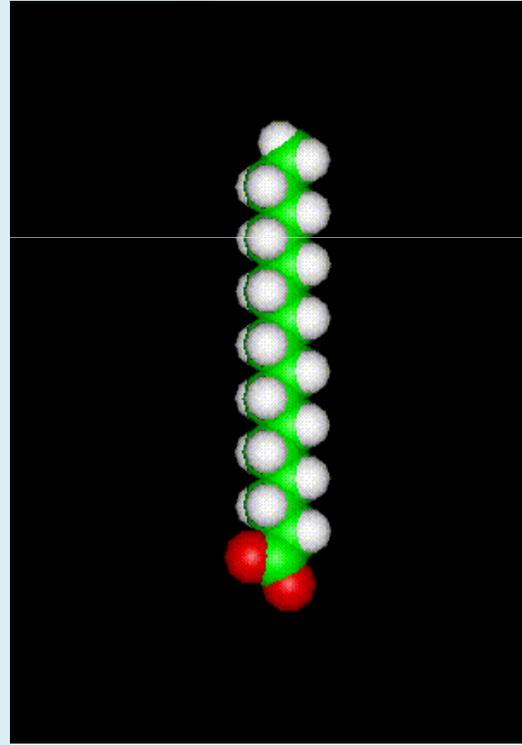
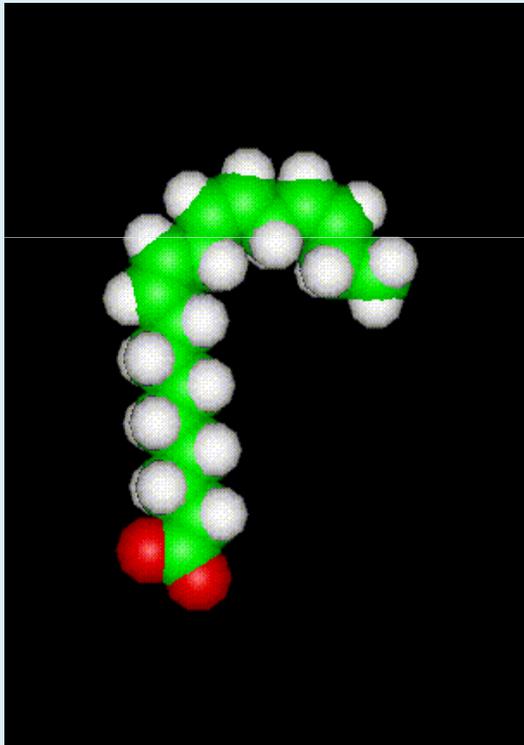
BAD

Not essential

Trans fat **TFA**

UGLY

Artificial/industrial

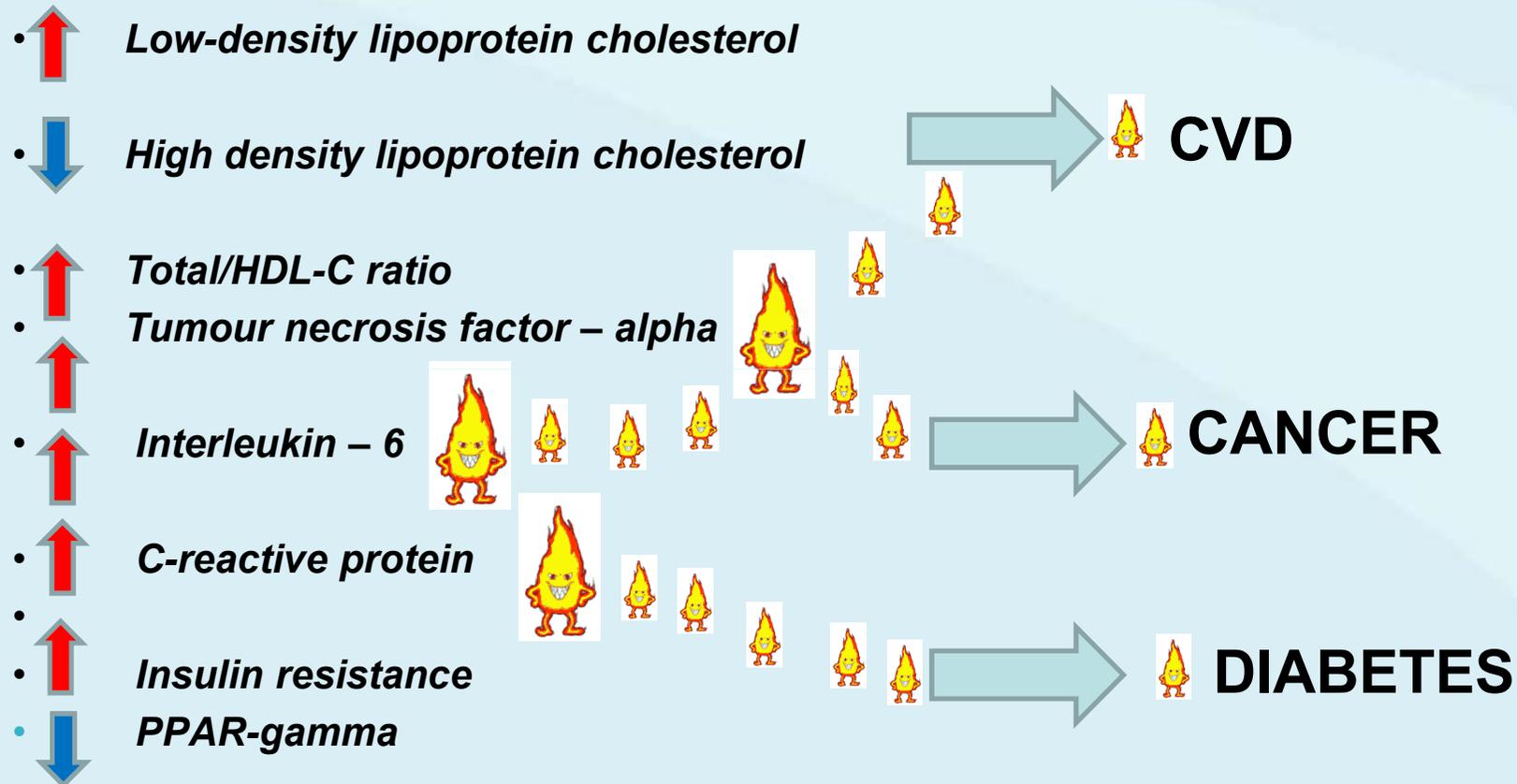


Experimental and observational evidence

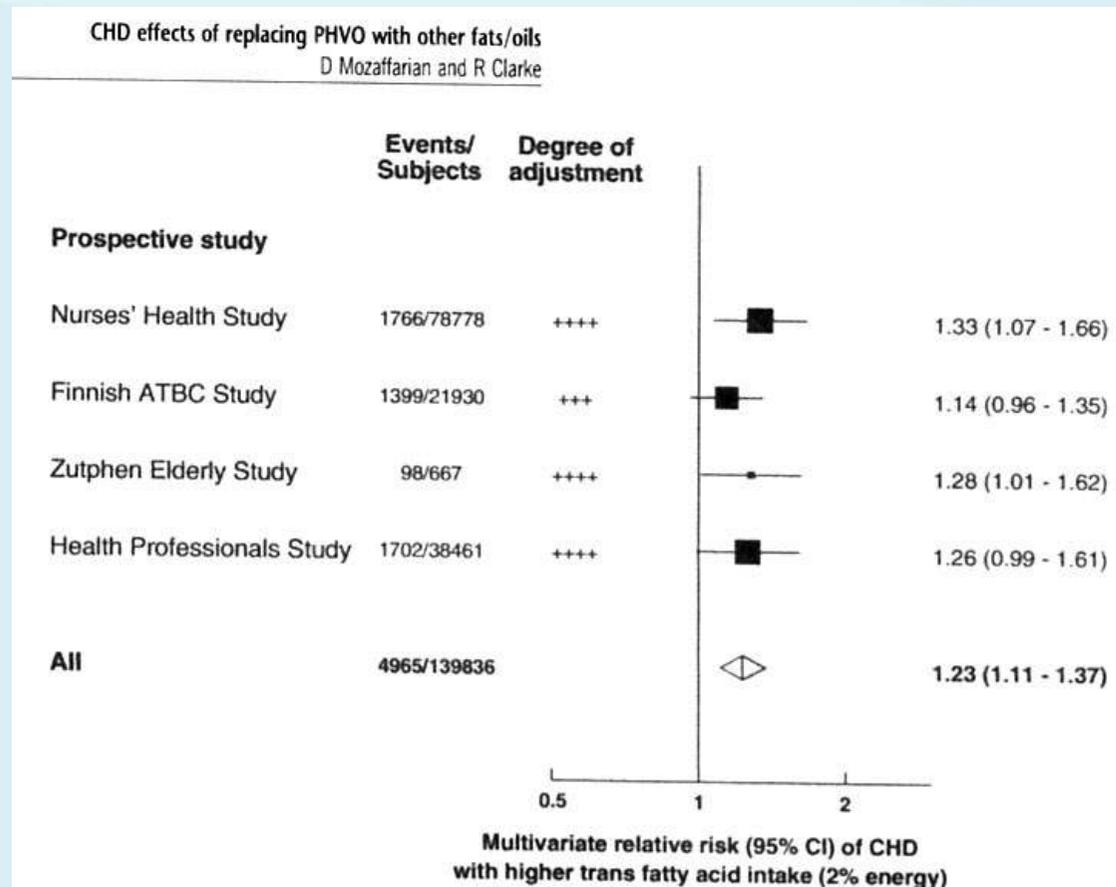


STRIVING FOR A CANCER SMART SOUTH AFRICA

What are the Health aspects?



Increased CHD risk with 2% TFAs



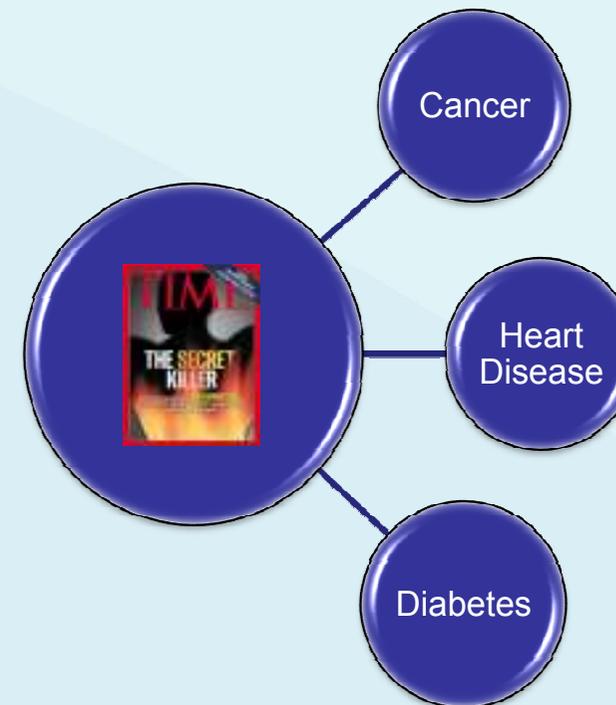
TFA significantly associated with Prostate and Breast cancer

- **Prostate: OR = 1.69**
- *Irena King, Cancer Prevention Programme, Fred Hutchinson Cancer Research Centre*
- *Ancer Epidemiol Biomarkers Prev 2005, 14, 988-992 (18 000)*
- **Prostate: OR = 2.2**
- *Jorge Chavarro et al, Departments of Nutrition and Epidemiology, Harvard School of Public Health, Cancer Epidemiol Biomarkers Prev, 2008, 17, 95 – 101 (15 000)*
- **Breast: 1.75**
- *Veronique Chajes et al., Institute Gustave Roussy, Paris. Am J Epidemiol, 2008, 167, 1312 – 1320. (20 000)*

TFA's are proinflammatory

- ***Systemic inflammation and endothelial dysfunction may be involved in the pathogenesis of atherosclerosis, Acute coronary syndrome, sudden death, insulin resistance, dyslipidemia, and heart failure.***
- ***Evidence from both observational and experimental studies indicates that TFA are proinflammatory.***
- ***Trans fatty acids – effects on systemic inflammation and endothelial function. D. Mozaffarian, Harvard Medical School, Atheroscler Suppl. 2006, 7, 29 – 32.***

Relevance of Inflammation



Exactly how do TFA cause harm?

What is the crucial difference between TFA and SFA?

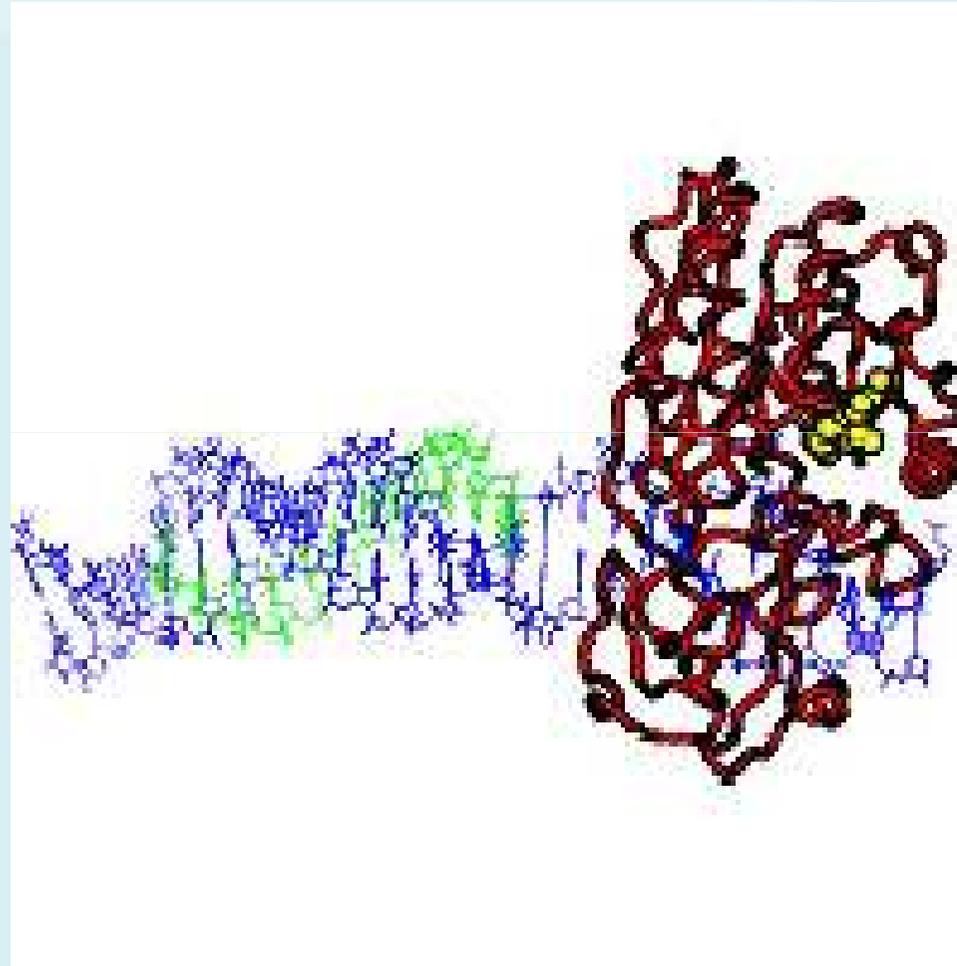
Type of fat	PPAR-gamma	Induce inflammation	Counter inflammation	Activate NF-kappaB
PUFA	Activate	No	Yes	No
MUFA	?	No	Yes	No
SFA	?	Yes	No	Yes
TFA	Inhibit	Yes	No	???

Could the difference be that TFA inhibit PPAR-gamma - while SFA inhibit NF-kappaB.

Why don't we know for sure?

Surely if we are going to replace TFA with SFA we need to know if this is OK –or not.

If TFA are binding to transcription factors like PPAR we need to know the exact details



TFA in South African Margarines

•A study commissioned by CANSA and conducted by the CSIR



40 different margarine samples
bought for analyses of fatty
acids

4th July 2008



Results

- ***TFA were below 2% weight of the total lipid in every single sample of margarine studied.***
- ***This was quite an unexpected result because values of 10,5% have been reported***
- ***(The elimination of trans fats from spreads: How science helped to turn an industry around, O Korver and M B Katan, Nutrition Reviews, Vol. 64, No.6, 275-279, 2006.)***
- ***This is good news for South Africa and signals the willingness of the margarine industry to adapt to changing circumstances and to get rid of TFA.***
- ***All of the Unilever margarines had TFA levels below 0.5% which is excellent.***
- ***Only 7 of the 40 samples had TFA values above 1.0%. It is suspected that these companies are still using hydrogenated oils.***

Conclusions

- *There is general consensus supported by copious peer-reviewed data that TFA's pose a threat to human health and should be removed from food.*
- *The main effect of TFA's appears to be the induction of systemic inflammation.*
- *TFA can act on transcription factors like PPAR-gamma*
- *It is possible that TFA's can be involved in many illnesses related to systemic inflammation like CVD, cancer, diabetes and possibly even obesity.*
- *Some saturated fatty acids such as palmitate activate NF-kappaB leading to systemic inflammation. Consequently it is of concern that replacing TFA with SFA may not eliminate all the problems caused by TFA.*
- *Millions of tons of food containing TFA's have been consumed worldwide and it is of great importance that we understand in detail how TFA's cause pathology. It is surprising that these details appears to be lacking at present. For example, studies on the effects of various fatty acids on gene expression should be the order of the day. This appears not to be the case.*

Special thanks

- *The Unilever Company, Dr Ruth Rabinowitz and the DoH ,Directorate Food Control are to be congratulated for their respective roles to reduce trans fats in food.*
- *This is one of the best initiatives to reduce the risk of non-communicable diseases in South Africa.*
- *CANSA is indeed heartened by these initiatives that have been awaited for a long time and hopefully the effective removal of most industrial trans fats from food in South Africa will translate into a lower incidence of prostate and breast cancer in time.*