

# How Good is the Evidence for the Healthful Reputation of High Linoleic Acid Intake ? - Are Current Intakes of Corn, Soy, Sunflower, Safflower and Cottonseed Oils Safe ? - Eddie Vos - Health-Heart.Org

Abstract.

**How Good is the Evidence for the Healthful Reputation of High Linoleic Acid Intake ?**

Linoleic acid (18:2ω6; LA) is well entrenched as an essential nutrient in mammals since its discovery in 1929. Dietary LA is promoted as healthful primarily because LA supplementation is associated with cholesterol lowering. Two problems are emerging with the "more LA is better" approach.

First, almost no research has been done on 'pure' LA deficiency. That which has been done shows that symptoms of LA deficiency are less severe than observed in combined essential fatty acid deficiency, so we believe the requirement for LA has been over-estimated.

Second, following on the association of high LA diets with cholesterol lowering, a few rarely-reported clinical trials of LA supplementation to reduce heart disease risk have been done but their outcomes are not encouraging; LA supplementation does not appear to be associated with lower all cause mortality.

Trials by Rose et al and by Pearce and Dayton showed no benefit of LA supplementation on heart disease risk and increased cancer incidence, respectively.

Furthermore, Israeli Jews apparently have the highest LA intake in the world but also have a very high risk of cardiovascular disease, cancer and diabetes, a situation termed the "Israeli Paradox" by Berry et al. Lands, Simopoulos, Berry and others relate the high incidence of chronic debilitating diseases experienced in affluent societies to insufficient intake of ω3 polyunsaturates and possibly excessive intake of ω6 polyunsaturates, especially LA.

We agree and, like them, raise the idea that (1) high intakes of LA are not innocuous and that, (2) there is a desirable upper limit on LA intake.

We propose that the dose response effects of LA in an otherwise nutritionally complete diet be carefully examined before setting a recommended LA intake level, and that until then, the LA 3% of energy upper limit proposed by the 1999 ISSFAL working group be prudent.

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## THE REPUTATION

The general perception, since the 1950's, is that saturated fats are bad and that replacing them with poly-unsaturates is good since this lowers cholesterol. Lowered cholesterol is supposed to be good for the cardio-vascular system.

**This view caused various Institutions, Industry and Heart Associations to suggest taking up to or about 10% of one's energy as poly-unsaturates.**

Linoleic Acid is by far the bulk of the "poly's" and because of price, reputation and corn-based animal feeds, it became dominant in Western food supplies, with many consuming over 10% of daily energy (>~22g/day) as LA, expecting this to be heart-healthy.

Such intake exceeds by 5x the 1999 ISSFAL working group Adequate Intake and by 3.3x the Upper Limit.  
-issfal.org.uk/adequateintakes.htm-



### LINOLEIC ACID (LINOLEATE), A CONTROL MOTHER-MOLECULE



LA is feed-stock for the omega-6 family of hormone-like eicosanoids, thromboxanes, etc.

LA is 50% or more of corn, soy, sunflower, safflower and cottonseed oils and must be balanced by sufficient omega-3 oils (fish, canola or flax).

LA lowers total cholesterol in most dietary schemes.

LA can accumulate in human fat tissue up to 30-40% of total fats.

LA is very liquid and chemically reactive but less so than omega-3's.

LA is not synthesized in humans. - unlike mono and saturated fats -

### WHERE IS LINOLEIC ACID ?

To reach the ISSFAL Upper Limit of 3% of energy / 2000kcal (6.7g LA)\*:

OIL	AMOUNT	ω-6/ω-3
corn, cottonseed	2 tsp.	>80
sunflower (regular)	2 tsp.	>200
safflower (regular)	2 tsp.	>200
soybean	3 tsp.	~7
peanut	6 tsp.	>100
canola	6 tsp.	2
flax/linseed	9 tsp.	0.2
olive	15 tsp.	~25

Meats: low LA when not corn-fed and high when corn-fed.

\*) Common intakes are 3x higher; ISSFAL Adequate = 2% of energy.

### Berry EM et al. The Israeli Paradox.

*(Isr J Med Sci; 1996; 32:1134-43 & Nutr Metab Cardiovasc Dis; 2001; 11:181-88)*

Israeli Jews have the world's highest LA diet, ~8% higher than US and ~11% more than in most European countries, an entire population based nutritional experiment. This is combined with an exceptionally low saturated fat and a 25% lower than US total fat intake.

There is a very high incidence of "cardiovascular diseases, hypertension, NIDDM [type 2 diabetes], and obesity", i.e. Syndrome-X, as well as cancer.

Non-Jewish Israelis have ~1.5x less diabetes, 2.3x lower cardiovascular mortality and 3.4x lower cancer rates.

Berry et al present evidence that high LA interferes with the omega-3 and insulin pathways, may lower HDL and promote lipid per-oxidation and cancer. The first reference is a landmark study in need of follow-up by others.

This concept could be renamed "The Linoleic Acid Paradox" as it has world-wide implications.

## Omega-6 (LA) Trials, Review & Theory

### Rose GA et al. Corn Oil in Treatment of Ischaemic Heart Disease. The London Hospital Study. *(BMJ; 1965,1:1531-3).*

Secondary prevention: 80 men randomized. Treatment groups told to avoid animal fat and eggs. Supplied with either corn or olive oil (amounts taken for 2 years about 50 grams: ~30 vs. ~4g LA/d), i.e. British food minus animal fats plus ~27% of energy from oil: "...a rather unpleasant regime".

Result: "major cardiac event" free at 2 years: 72% of control group, 57% of olive and 52% of corn oil group. Mean cholesterol ~25% lower in corn oil group.

The trial was too small to prove harm but sufficient to disprove any possible benefit of corn oil (P=0.001).

Rose et al: "... under the circumstances of this trial corn oil cannot be recommended in the treatment of ischaemic heart disease."

### Pearce ML & Dayton S. Incidence of cancer in men on a diet high in polyunsaturated fat. The Veterans Trial. *(Lancet; March 6 1971: 464-7, a follow-up to Circ; 1969 Vol XL Suppl II: 1-63)*

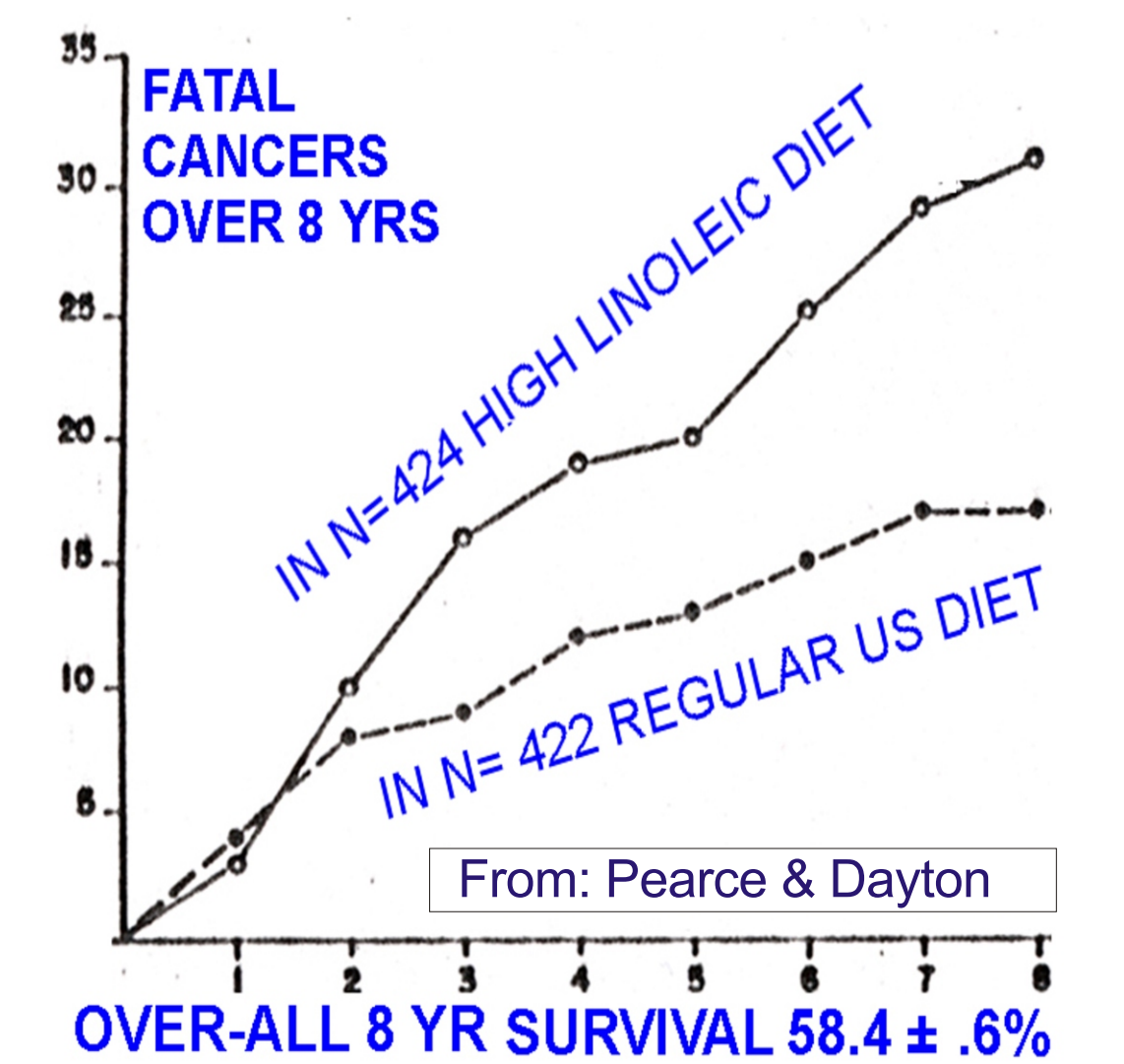
Primary prevention; 846 male veterans randomized for 8 years to 2 kitchens: the treatment half on essentially corn oil, replacing animal/fat products. Analysis of dietary data: ~39% fats as polyunsaturates; ~41 vs. 11 g/d LA. Omega-6 to -3 ratios: ~24 (LA group) vs. ~14.

There were small across the board decreases in cardio events, <~13% cholesterol but no decrease in mortality, 174 (LA group) vs. 178 (control), with 58.4 +/- 0.6% 8 year survivors. Fat-tissue LA more than doubled to >30% while atheroma LA became ~39%, vs. ~34% in controls.

Survival curves were parallel but the cancer death curves separated after 2 years and continued to do so. There was a nearly doubled fatal cancer incidence by 8 years, the end of the intervention.

Pearce & Dayton: "... it is important to remember that no population under study has been consuming a diet high in polyunsaturated fats over long periods of time."

This was the last of the trials where animal fats were replaced with essentially LA, i.e. corn oil. Longer duration trials are needed to establish safety but may no longer be ethical.



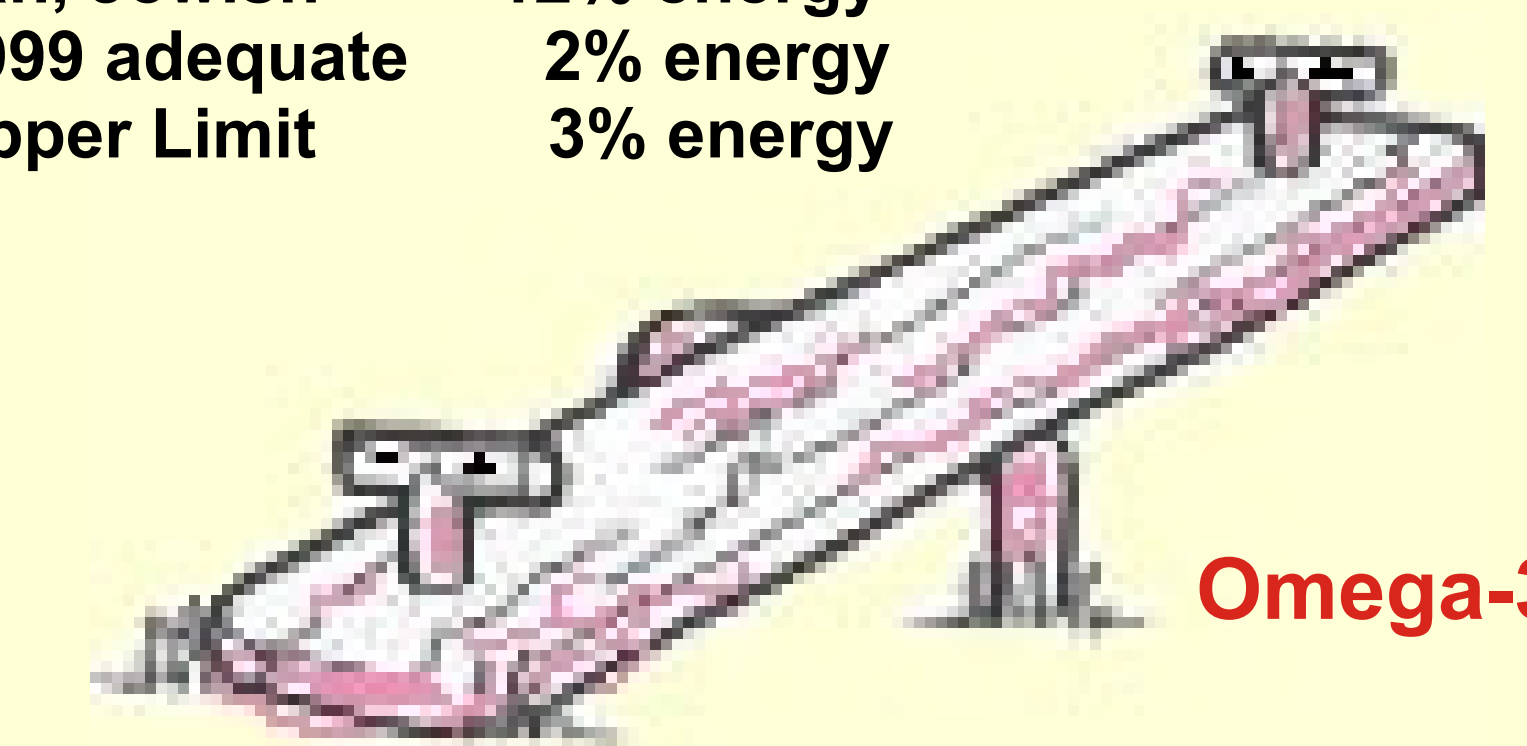
### Ravnskov U. The Questionable role of Saturated and Polyunsaturated Fatty Acids in Cardiovascular Disease.. *(J Clin Epidem; 1998, Vol 51 No 6: 443-60)*

A review of the studies concluding: "...there is little evidence that Saturated Fatty Acids as a group are harmful or that polyunsaturated Fatty Acids as a group are beneficial." The notable exception with benefit is the Lyon Diet Heart Study [secondary prevention with canola oil] where, by far, the largest lipid change was the 68% increase in plasma omega-3 alpha-linolenic acid.

B. Golomb's "dissent" opinion agrees (pages 461-4): "Thus, evidence of benefit to the patient with dietary Saturated Fatty Acid reduction (or Polyunsaturated Fatty Acid augmentation [read: LA]) is not convincing and there are reasons for concerns."

### Linoleic Acid Overload

Am Heart Ass'n, others ~10% energy  
Israel mean, Jewish ~12% energy  
ISSFAL 1999 adequate 2% energy  
ISSFAL Upper Limit 3% energy



**Omega-3 Underweight**

ISSFAL adequate 1.3% energy  
Western countries <0.5% energy

**SUMMARY** Present data suggest that Western diets have higher than prudent amounts of LA which may contribute to the cause of many long-term degenerative diseases.