

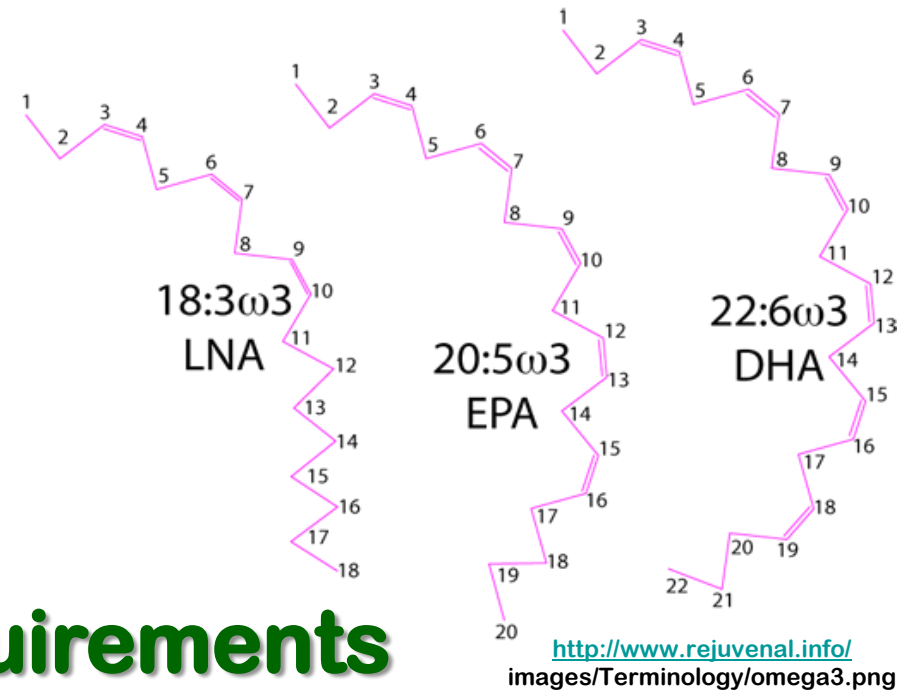


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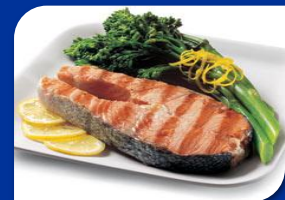
# Omega-3 requirements - *length matters!*

**Professor Peter Howe**

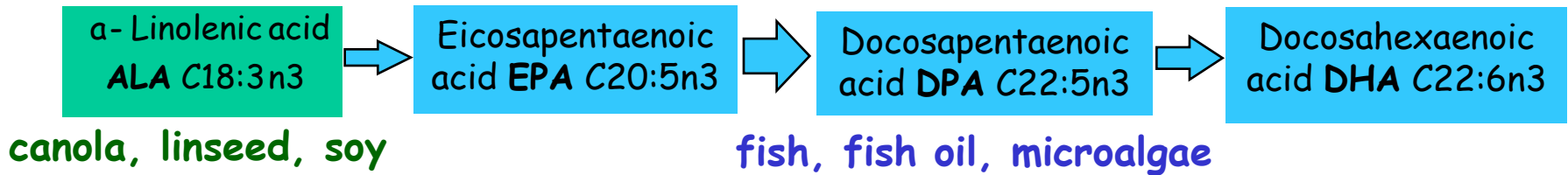
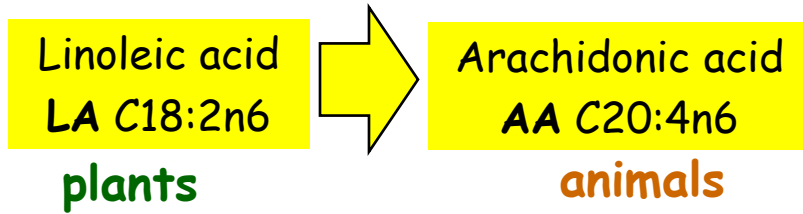
Nutritional Physiology Research Centre  
University of South Australia

*Food Industry Forum for Nutrition Research*

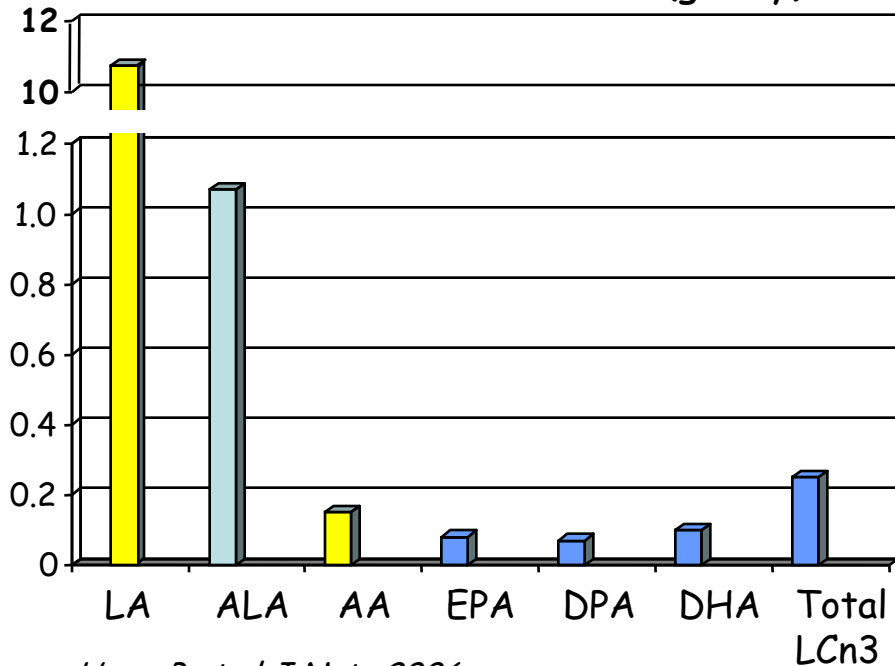
30<sup>th</sup> August 2012



# Polyunsaturated fatty acids (PUFA) – essential nutrients

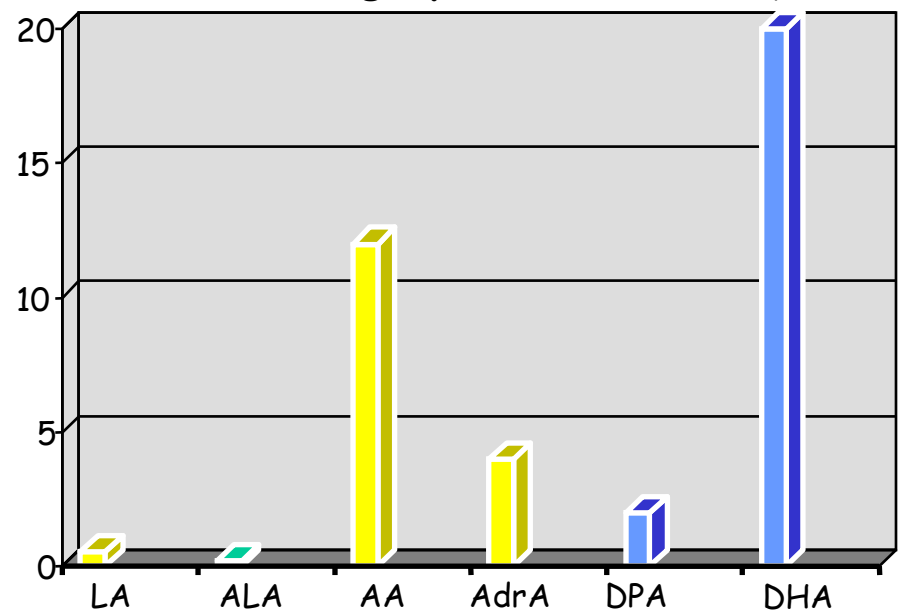


Australian adult intakes (g/day)



Howe P et al J Nutr 2006

Brain PUFA fingerprint (% total fatty acids)



Sinclair A -personal communication

# Health benefits of Long Chain Omega-3 PUFA

**Enhancing early infant development & growth**

**Promoting fitness (physical, mental, reproductive)**

**Counteracting chronic disease (prevention, treatment)**

## ***Cardiovascular disease***

*lipids (TG, HDL)*

*blood pressure*

*arterial compliance*

*endothelial dilatation*

*platelet aggregation*

*heart rate*

*heart rate variability*

arrhythmia

atherosclerosis

ischemic heart disease

heart failure

kidney damage

stroke

## ***Cancer?***

## ***Diabetes***

*insulin resistance*

*abdominal adiposity*

## ***Inflammatory disorders***

psoriasis/dermatitis

rheumatoid arthritis

inflammatory bowel disease

immune renal disease

periodontal disease

osteoporosis?

asthma?

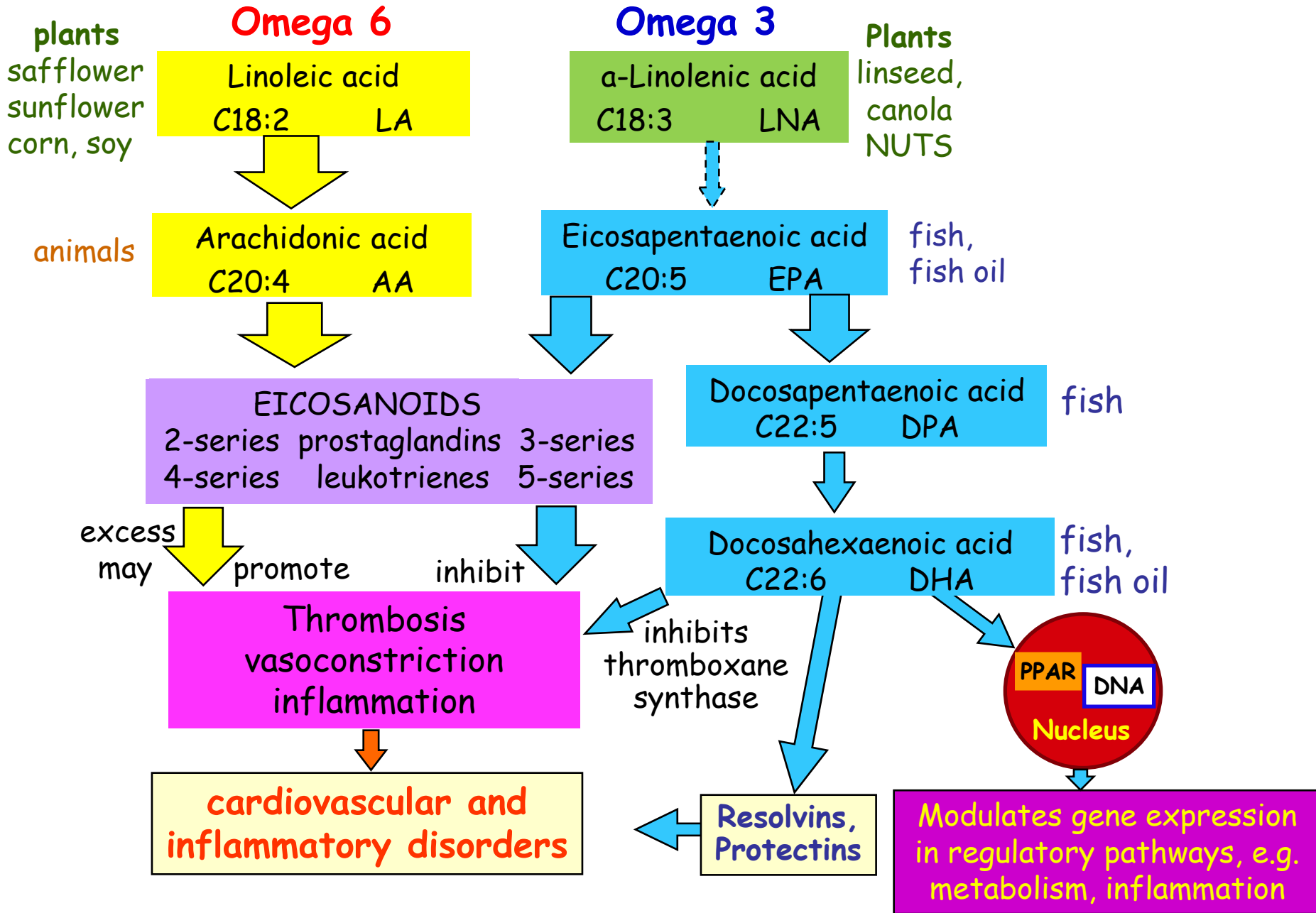
## ***Behavioural disorders***

depression, bipolar disorder

cognitive impairment, ADHD

schizophrenia, autism

# Physiological effects of PUFA



# Health benefits of ALA: short chain (plant) Omega-3

## Ⓡ *heart disease?*

*US National Academy of Sciences, Institute of Medicine:-*

$\alpha$ -Linolenic acid is not known to have any specific functions other than to serve as a precursor for synthesis of EPA and DHA.

The essential role of  $\alpha$ -linolenic acid appears to be as a precursor for synthesis of EPA and DHA.

Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (Macronutrients) (2005)

## < *prostate cancer?*

## < *eye disease?*

Following up Nurses Health and Health Professionals studies, Cho et al (AJCN 2001;73:209) found that men and women in the highest (1.45g/d) vs lowest (0.75g/d) quintile of ALA intake were 1.4 times more likely to have age-related macular degeneration.

# Omega-3 intakes - how much do we need?

<u>Recommendations:-</u>	<u>ALA (g/day)</u>	<u>LC omega-3 (mg/day)</u>
US/Canada (IOM 2005)	1.1 - 2.2 (f)	Nil
	1.6 - 3.2 (m)	Nil
Australia (NHMRC 2005)	0.8 - 2.2 (f)	90 - 430 <i>(includes DPA)</i>
	1.3 - 2.2 (m)	160 - 610 <i>(includes DPA)</i>
NHF (2008)	2	500 <i>(or 2 fish meals/wk)</i>
EFSA (2009)	2	250

## Estimated daily intakes:-


United States (Nelson, 1999)	1.3	150
Australia (Howe et al, 2006)	1.1	175 <i>(246 including DPA)</i>
Norway	?	370
Japan (Dolocek, 1992)	2.1	1600
Greenland Inuits	?	7000























"EVERY DAY YOU SHOULD EAT SOMETHING FROM EACH OF THE FIVE BASIC FOOD GROUPS: FRIED BLUBBER, BOILED BLUBBER, STEWED BLUBBER, BAKED BLUBBER AND RAW BLUBBER."

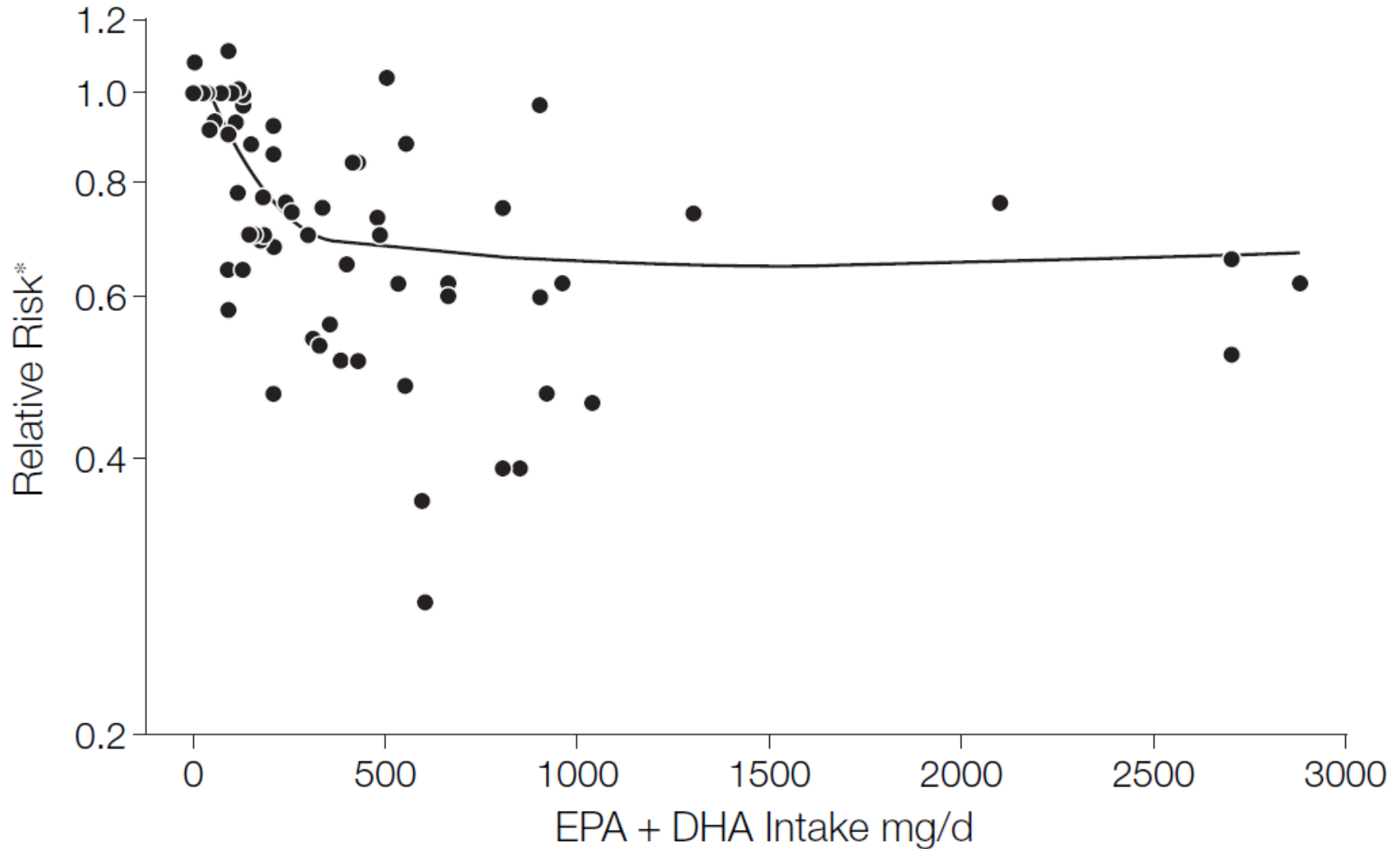
# Early evidence of heart health benefits

 = 2 ESKIMOS

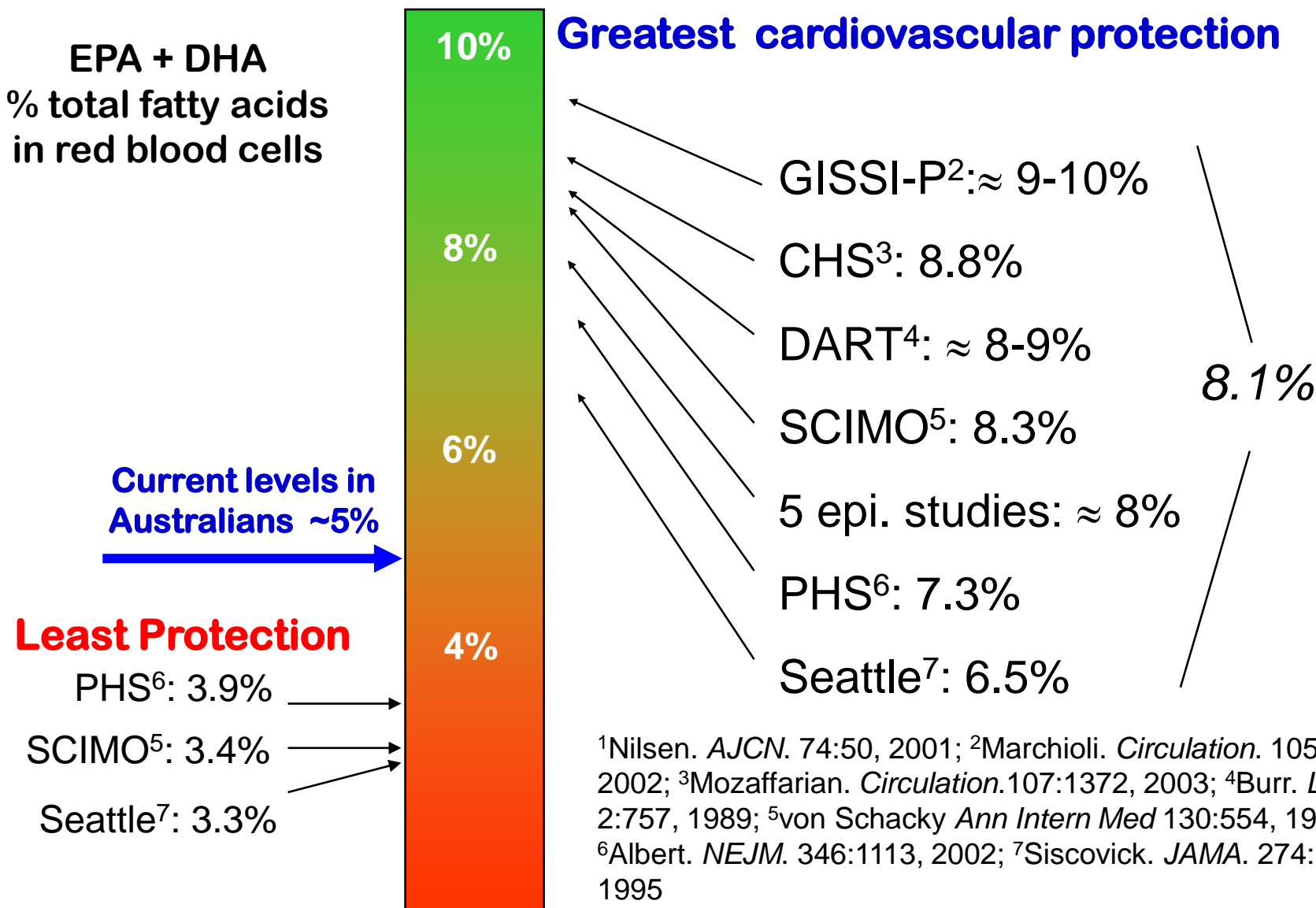
 = 2 DANES

Acute Myocardial Infarction	3 	40 
Apoplexy	25 	15 
Multiple Sclerosis	0	2 
Psoriasis	2 	40 
Thyrotoxicosis	0	7 
Bronchial Asthma	1 	25 
Diabetes	1 	9 
Cancer	46 	53 
Peptic Ulcer	19 	29 
Epilepsy	16 	6 
Psychosis	10 	8 

# Intake of Fish or Fish Oil and Relative Risks of CHD Death in Prospective Cohort Studies and Randomized Clinical Trials



# Omega-3 Index - a new marker of health status

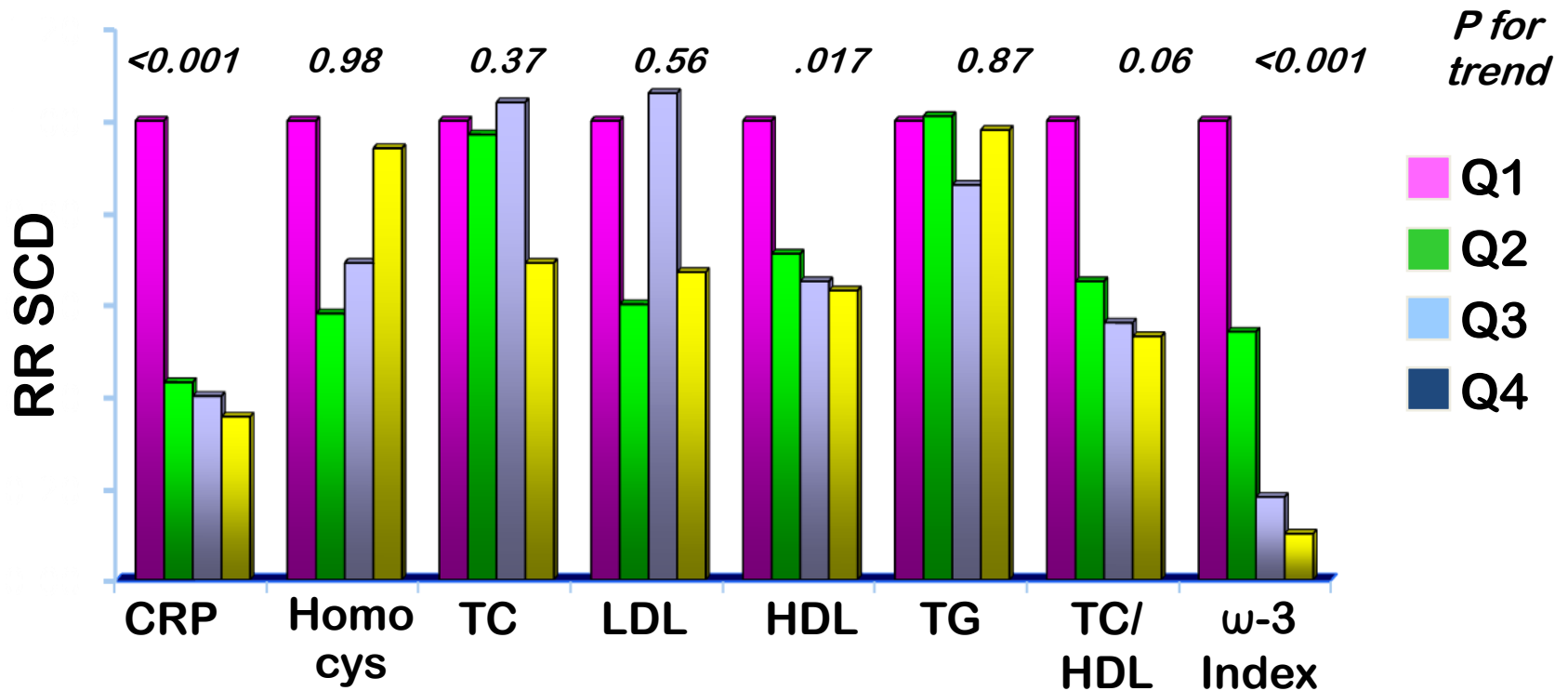


# Omega-3 Index

*How does it compare with traditional CHD risk factors?*

## Physicians' Health Study

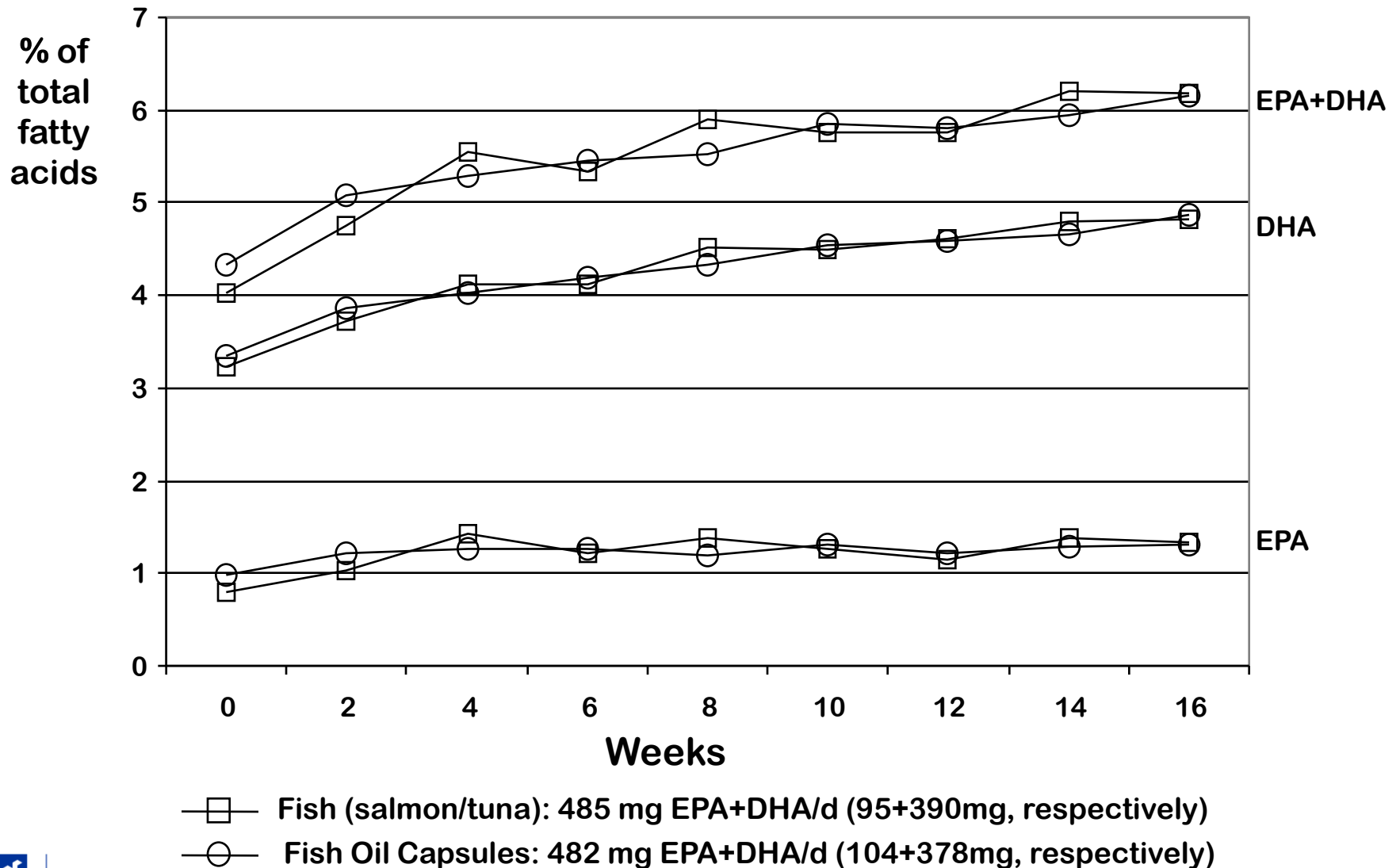
Relative Risk for Sudden Cardiac Death by Risk Factor



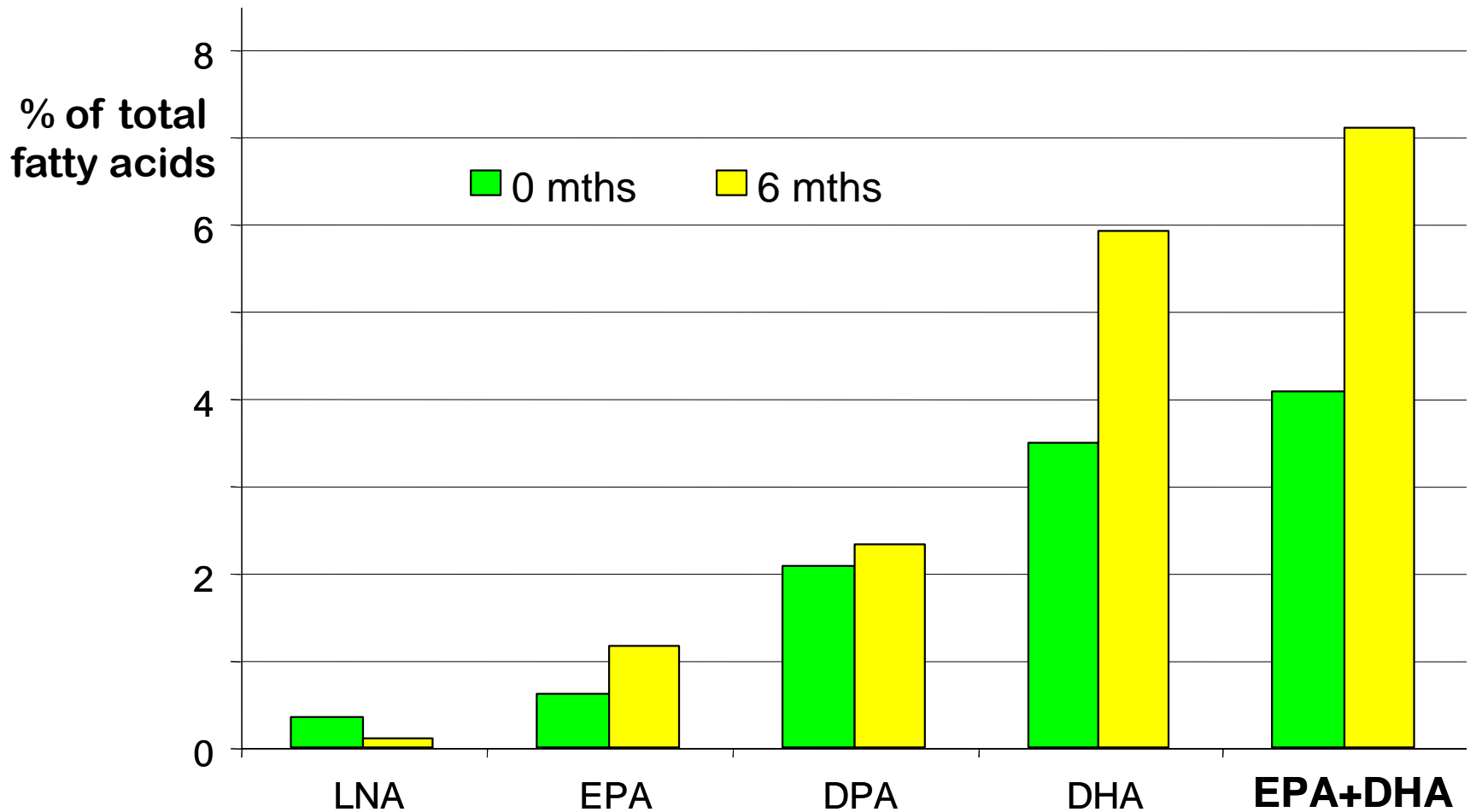
Data from Albert CM et al.  
*Circulation* 2002;105:2595  
and *NEJM* 2002;346:1113

Figure courtesy of WS Harris

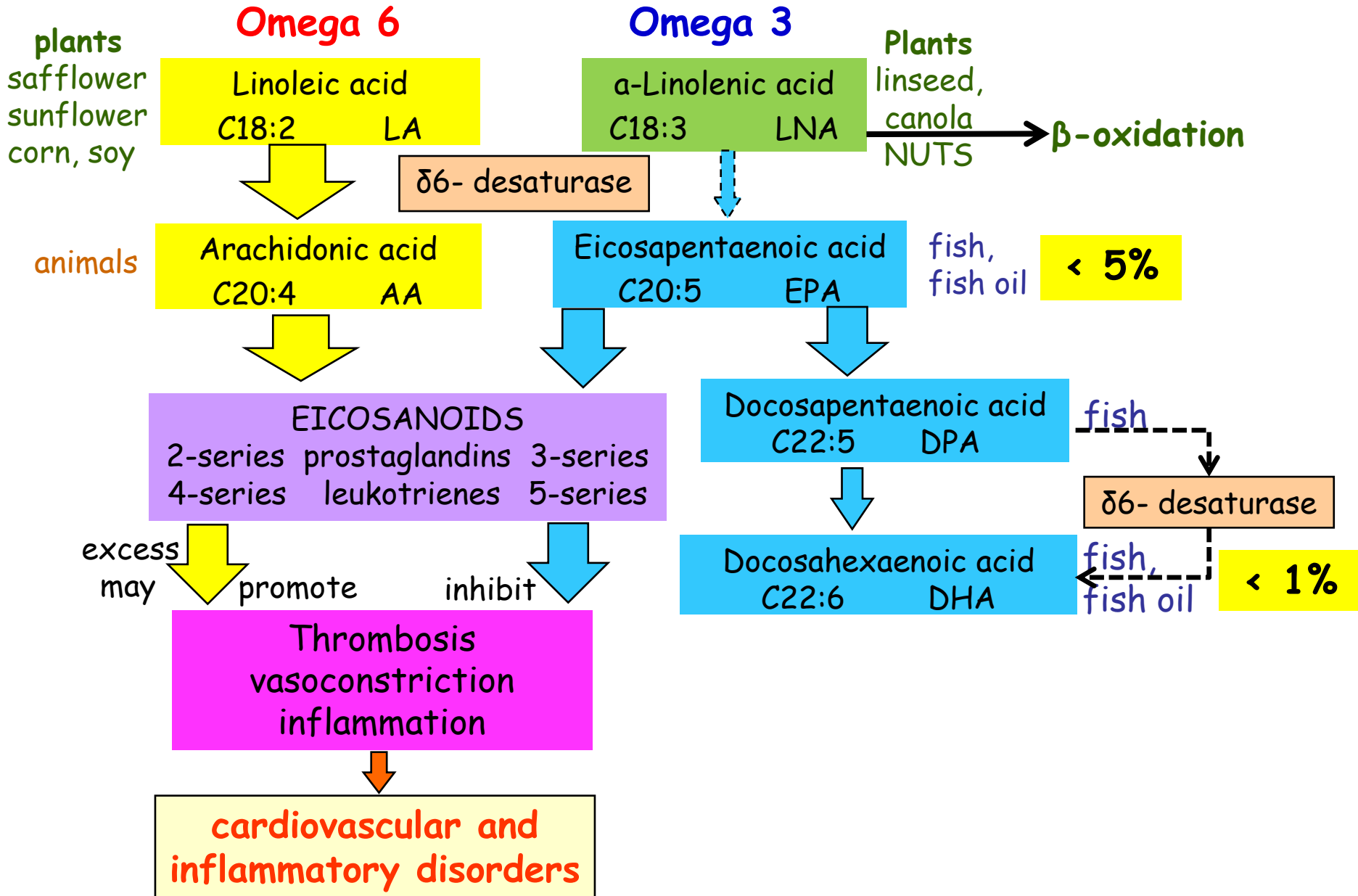
# Increasing the Omega-3 Index by consuming 500mg/day (the target intake) from either fish or fish-oil capsules



# Eating processed foods enriched with LC n-3 PUFA (~800mg/d) increases the Omega-3 Index



# Can ALA satisfy the requirement for n-3 LC PUFA?

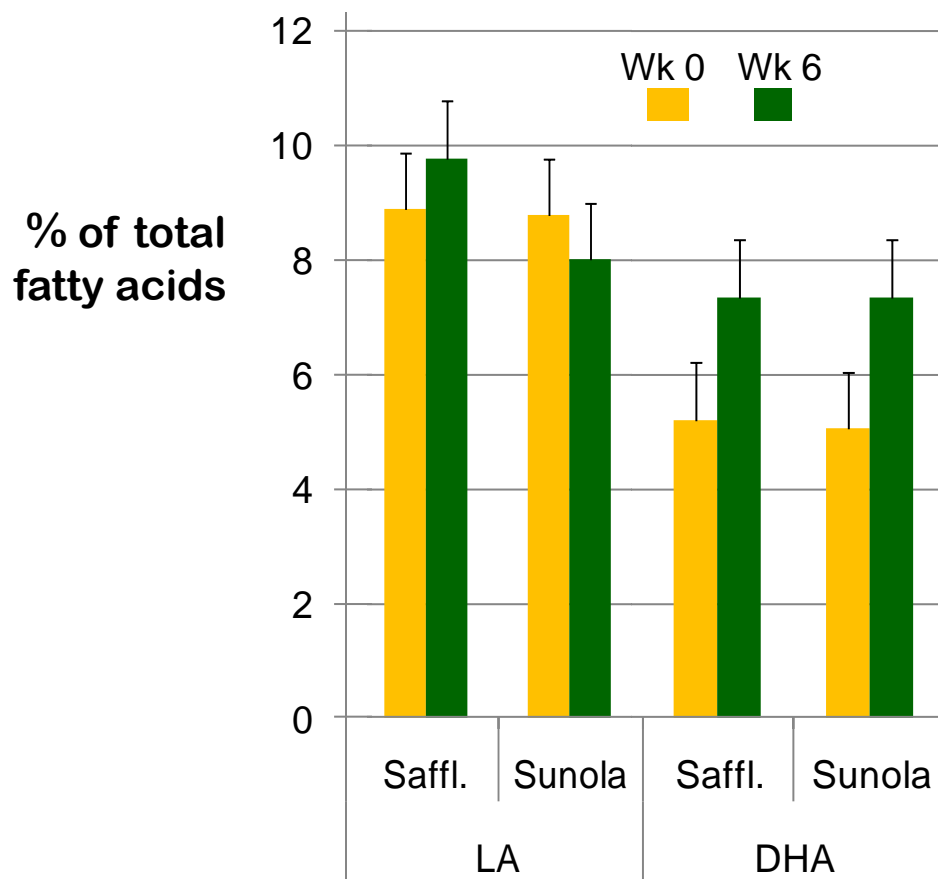


## *Are vegetarian diets adequate?*

Erythrocyte fatty acids (mg/g)	Vegans (18)	Controls (18)
16:0	14	16
16:0	207	206
18:0	20 <sup>b</sup>	29
18:0	151	150
22:0	17	14
24:0	39	36
18:1	139	135
24:1	49	54
18:2 $\omega$ 6 LA	113 <sup>b</sup>	87
20:2 $\omega$ 6	7 <sup>c</sup>	4
20:3 $\omega$ 6	13	12
20:4 $\omega$ 6 AA	126	125
22:4 $\omega$ 6	43 <sup>b</sup>	23
22:5 $\omega$ 6	6	6
20:5 $\omega$ 3 EPA	1 <sup>b</sup>	8
22:5 $\omega$ 3 DPA	21 <sup>c</sup>	26
22:6 $\omega$ 3 DHA	19 <sup>b</sup>	58
<b>Omega-3 Index: EPA + DHA</b>	<b>2.0%</b>	<b>6.6%</b>

# The n6/n3 Ratio: *does LA (n6) compete with DHA (n3) for incorporation into erythrocytes?*

RBC fatty acids before and after supplementation with 4g/d tuna oil (~1g DHA/d) together with 30g/d of either safflower oil (~20g LA/d) or Sunola oil (~2g LA/d)



# Getting the LC omega-3 message across

ALA is *not* equivalent to EPA, DPA or DHA

*This is explicit in*

- Nutrient content claim for omega-3

***Source of  $\omega$ 3:*** 200 mg  $\alpha$ -linolenic acid  
or 30 mg of EPA and DHA per serve

***Good source:*** 60 mg of EPA and DHA per serve

- Nutrient Reference Values for omega-3 (AI and SDT for LC n3)
- Nutrition education material
  - *but explanatory health claims in labels and advertising are not permitted*

# Getting the LC omega-3 message across



- ✓ Under 115 calories per bar
- ✓ No artificial flavours or colours
- ✓ **Good source** of omega 3's
- ✓ Contains chia seeds
- ✓ Low sodium
- ✓ Made with the goodness of wholegrain oats

<http://www.slimsecrets.com.au/index.php/supa-secrets-kids-snacks/ballistic-berry-supa-wired-chewy-snack-bar/>



A White loaf with whole CHIA seeds added for extra nutrients makes our CHIA White Loaf a super bread! A **source of omega-3 polyunsaturated fats for helping maintain a healthy body and mind**, as well as protein and fibre to keep you feeling full for longer periods of time.

Just two slices of COBS Bread's CHIA Loaves provide **100% of the daily intake of omega-3 fats for children and women and 90% for men.**

<http://www.cobsbread.com/product.aspx?id=2190>

# Getting the LC omega-3 message across

## NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL A NEW FOOD GUIDANCE SYSTEM FOR AUSTRALIA – FOUNDATION AND TOTAL DIETS

Revised Draft Report for Public Consultation

### *Fish*

Fish was modelled as one group that included fish both high and low in n-3 fatty acids. NHMRC literature reviews provided sufficient evidence to suggest a limit on consumption to the equivalent of one serve per week due to environmental concerns.

... Although not modelled specifically for nutrients with an AI, outputs of the modelling indicated that the estimated means of LCn-3 fatty acids and vitamin D provided in the model were less than the AI.



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## Conclusions

- LC Omega-3 PUFA mediate a wide range of health benefits
- Benefits of ALA (plant omega-3) are uncertain
- Target intake for LC Omega-3 PUFA is ~500 mg/day
- Omega-3 Index is a marker of LC Omega-3 intake and heart health
  - *increased by regular consumption of seafood or fish oil*
  - *relatively unaffected by intakes of ALA or LA (plant omega-6)*
- Food Standards Code distinguishes between ALA and LC-Omega-3
- This is not always reflected in advertising

