Dairy fat and the omega 3 – omega 6 ratio

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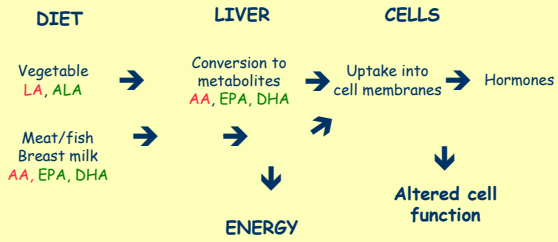
HOW LCPUFA WORK



All fats contain fatty acids - some good, some bad

- Saturates - usually considered 'bad' but only a few actually raise plasma cholesterol
- Mono-unsaturates now known to be able to lower plasma cholesterol as effectively as PUFA.

Omega 6 polyunsaturated fatty acids (PUFA)

- Parent compound: linoleic acid (LA)
- The first essential fatty acid
- Thought of as healthy as it lowers plasma cholesterol
- Most foods that are described as 'polyunsaturated' are simply rich in LA

Omega 3 PUFA

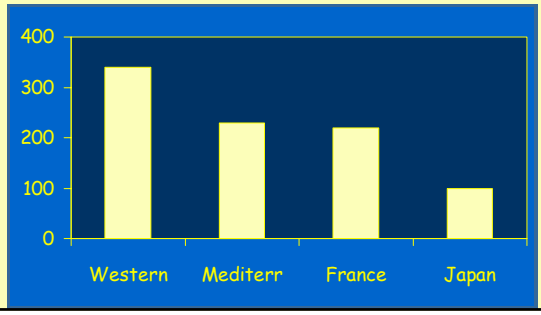
- Parent compound linolenic acid (ALA)
- No effect on plasma cholesterol
- Only recently established as essential in humans
- Gives rise to EPA and DHA – both highly active molecules

What do our current diets look like?

- Moderate to high fat
- High omega 6 PUFA - mostly as LA
- Low in Omega 3 PUFA - of all types
- Moderate saturated fat

and what do they do to us?

Chances per 1000 of eventually dying of heart disease at 65 yrs



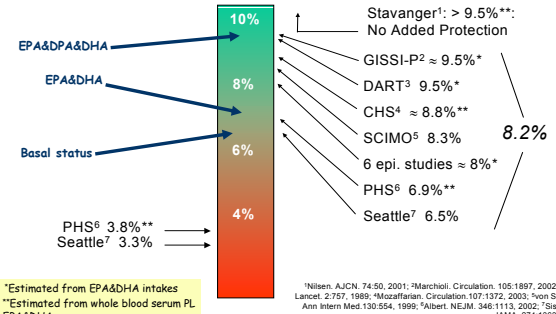
Omega 3 status of Australians

	RBC % total FA
EPA	0.648 (0.412)
DPA	2.038 (0.824)
DHA	3.706 (1.453)
Total LC PUFA	*6.392 (2.689)*

n=86, middle aged males & females, Mean (SD)

The Omega 3 Index

Harris & von Schacky 2004



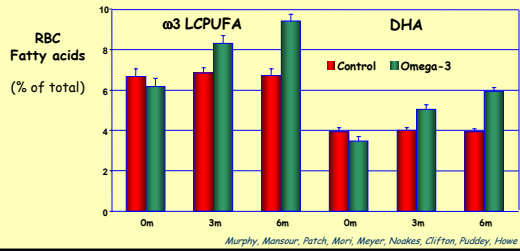
*Estimated from EPA&DHA intakes
**Estimated from whole blood serum PL EPA&DHA

[1]Nilsen. AJCN. 74:50, 2001; [2]Marchioli. Circulation. 105:1897, 2002; [3]Burr. Lancet. 2:757, 1989; [4]Mozaffarian. Circulation.107:1372, 2003; [5]von Schacky Ann Intern Med.130:554, 1999; [6]Albert. NEJM. 346:1113, 2002; [7]Siscovick. JAMA. 274:1363, 1995.

The best way to improve omega 3 LCPUFA status is to consume pre-formed LCPUFA

Low dose ω3 LCPUFA supplementation
- 480 mg DHA/d
- 320 mg EPA/d

} 800 mg/d for 6 months



Murphy, Mansour, Patch, Mori, Meyer, Noakes, Clifton, Puddey, Howe ISSFAL 2004

WHY OMEGA 3 LCPUFA ARE EFFECTIVE IN HEART DISEASE

Beneficial effects of n-3 LCPUFA due to reduction in :

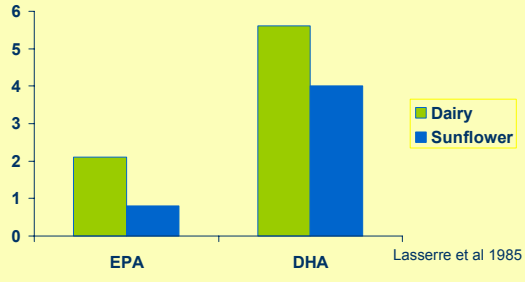
- risk factors
- thrombosis
- atheromatous plaque formation
- Anti-arrhythmic

So what is the current wisdom?

- Reduce saturated fat content
- Increase omega 3 fatty acids

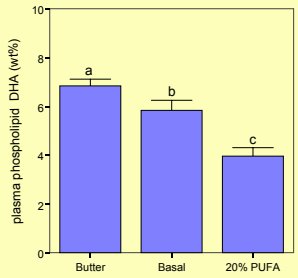
What has all this got to do with dairy diets?

Effect of dairy fat on LCPUFA synthesis (Human)



Lasserre et al 1985

Plasma DHA of rats fed dairy diets



Summary

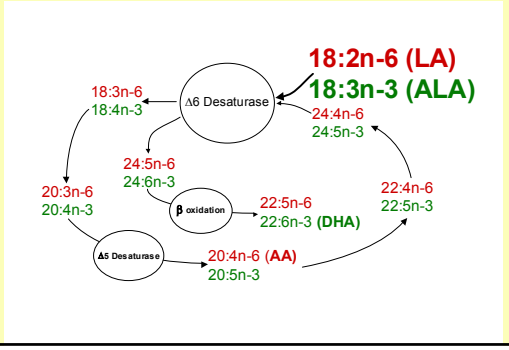
- Butter based diets can be as effective at raising DHA levels as supplementing diets with fish oil

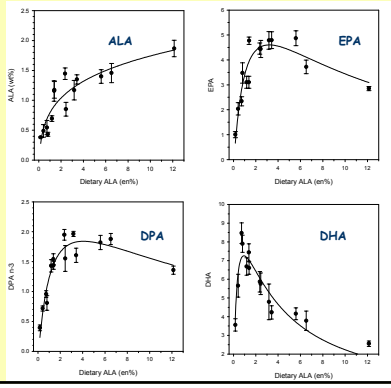
Why is this so?

- Dairy fat is:-
- Low in total PUFA (3%)
- The LA:ALA ratio is low (2:1) favouring synthesis of omega 3 LCPUFA
- Contains small amounts (0.2%) of EPA and DPA
- Contains other lipids thought to influence LCPUFA synthesis (VA, CLA)

Why does low PUFA and low LA:ALA ratio favour DHA accumulation?

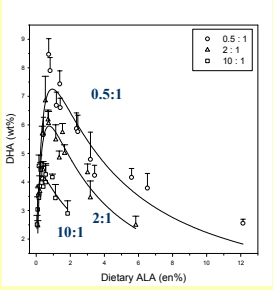
How LCPUFA are made

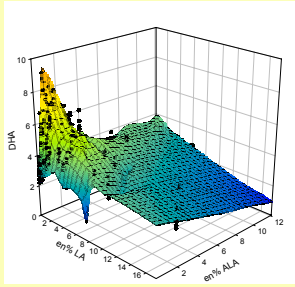




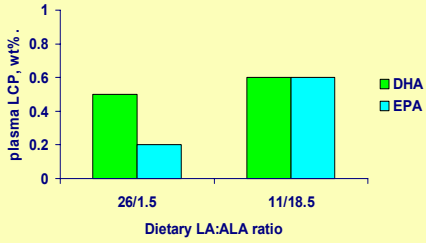
Effect of increasing dietary ALA on plasma PL LCPUFA. (LA:ALA ratio = 0.5:1)

Effect of dietary LA and ALA on Plasma Phospholipid DHA



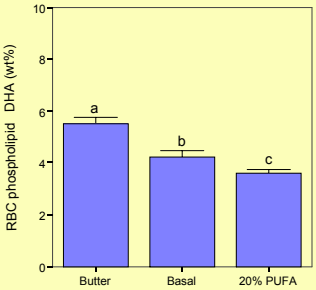


Increasing dietary ALA does not increase adult plasma DHA



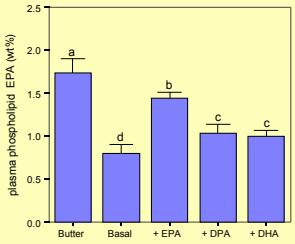
Mantzioris, et al 1994

RBC DHA of rats fed dairy diets cf high PUFA diets

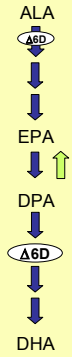


What about other dairy fats?

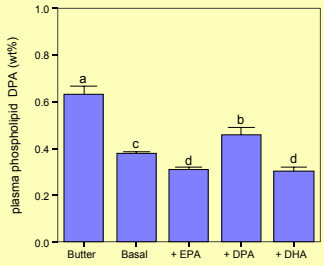
Effect of adding omega 3 LCPUFA on plasma EPA

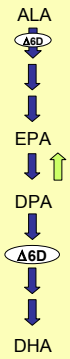


Note that both DPA and DHA increase EPA – retro-conversion?

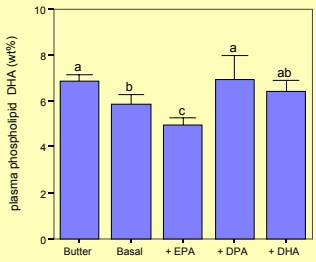


Effect of adding omega 3 LCPUFA on plasma DPA





Effect of adding omega 3 LCPUFA on plasma DHA



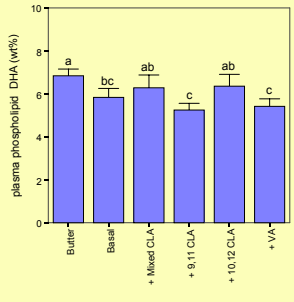
Summary

- Low PUFA diets (dairy) favour DHA accumulation
- Presence of EPA in dairy fat can enhance EPA levels but not DHA
- Presence of DPA in dairy fat can enhance DHA levels but not EPA

What about other mediators in dairy fat?

- Conjugated linoleic acid (CLA)
- Trans vaccenic acid (VA)

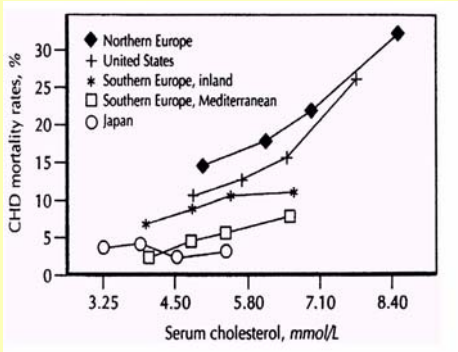
Effect of CLA and related compounds on plasma DHA



Summary

- Dairy based diets may actually favour DHA accumulation
- Consistent with findings in populations consuming French (low PUFA, butter, cheese) and Mediterranean (high MUFA, cheese) diets

What about cholesterol levels?



What about cholesterol levels?

- Renaud showed a rise in total CHOL but HDL-CHOL went up by a similar amount - ratio did not change!
- What is ultimately important is the balance of total risk factors
- What is the CHOL risk when omega 3 benefit is taken into account?
- Need for good trials

Summary

- What does all this mean for Australians?
- There may be real benefits of increasing the omega 3 fatty acid status
- We are not going to suddenly eat more fish or change our diets significantly
- We can however change the base fats in our diets that will allow us to better accumulate EPA/DHA from foods and to make our own EPA/DHA
- This may include dairy

Thanks for your attention