Long chain omega-3 polyunsaturated fatty acids, inflammation and disease: should we be taking a supplement?

Lynnette Ferguson, Bobbi Laing, Laurence Eyres, Mike Agnew and Raphael Aggio*
Fish Oil Claims Not Supported by Research
By ANAHAD O'CONNOR MARCH 30, 2015 5:06 PM
Long chain omega-3 polyunsaturated fatty acids

Docosahexaenoic acid DHA

Eicosapentaenoic acid EPA
Essential Fatty Acid Families

**ω-6 family**

- **H₃C**
- **C18:2 ω-6**
- **Linoleic**
  - Corn Oil
  - Safflower Oil
  - Sunflower Oil
- **H₃C**
- **C20:4 ω-6**
  - Meat
  - Eggs
  - Brains

**ω-3 family**

- **H₃C**
- **C18:3 ω-3**
  - α-Linolenic
    - Flaxseed Oil
    - Canola Oil
    - Soybean Oil
- **H₃C**
- **C20:5 ω-3**
  - Eicosapentaenoic
    - EPA
- **H₃C**
- **C22:6 ω-3**
  - Docosahexaenoic
    - DHA

**Thrombotic**

- Inflammatory

**Less thrombotic**

- Less inflammatory

- Oily Fish
- Fish Oil Capsules
Modern recommendations

- Remove trans FA
- Reduce saturated fat
- Not too much omega-6
- At least 1 g LC PUFA per day Omega-3
- No oxidised fat
- Adequate antioxidants and anti-inflammatories
How Omega-3s Help the Heart:

By maintaining flexible blood cells and vessels
By reducing risk of thrombosis
By reducing blood viscosity
By reducing blood triglycerides
By reducing blood pressure
By maintaining cardiac rhythm
Ratios of Fatty Acids in the current NZ Diet

Current Diet (est)

- Saturated fats
- Trans fats

Desirable Diet

- MUFA
- n-6 PUFA
- n-3 PUFA
Evolution of the Human Diet

- 4.000.000 y
- 100.000 y
1850 1950 2000

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<tr>
<th></th>
<th>1850</th>
<th>1950</th>
<th>2000</th>
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<tbody>
<tr>
<td>Total fat</td>
<td>35 %</td>
<td>40 %</td>
<td></td>
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<tr>
<td>P:S</td>
<td>0.75:1</td>
<td>0.5:1</td>
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</tr>
<tr>
<td>ω6:ω3</td>
<td>10:1</td>
<td>20:1</td>
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- 25 %
- 30 %
1:1
A new risk factor for CVD

- Reflects a person’s long chain omega-3 PUFA status
- Expressed as a percentage of EPA + DHA/total FA in the red blood cells.
- An index of 8 is associated with a 90% reduction in the risk of sudden death from CHD
**Omega-3 Index**

_Harris and von Schacky, Preventive Medicine 2004_

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### Greatest Protection

- Stavanger\(^1\): > 9.5%: No Added Protection?
- GISSI-P\(^2\): ≈ 9-10%
- CHS\(^3\): 8.8%
- DART\(^4\): ≈ 8-9%
- SCIMO\(^5\): 8.3%
- 5 epi. studies: ≈ 8%
- PHS\(^6\): 7.3%
- Seattle\(^7\): 6.5%

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### Least Protection

- PHS\(^6\): 3.9%
- SCIMO\(^5\): 3.4%
- Seattle\(^7\): 3.3%

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Lester’s Oil Study

• Long chain omega – 3 PUFA oil, containing Vitamin D, Co-Enzyme Q10, Zeaxanthin, Leutin and Astaxanthin versus a medium chain triglyceride “control”

• Double blinded, randomised, placebo controlled, cross-over intervention trial, 12 weeks in duration

• 30 healthy participants started and 27 finished.

• Blood, Urine and Faecal samples collected.

• Stool diary and Food Variety Score, Quality of Life.
The tested supplement contained a distilled, concentrated, standardised omega-3 ethyl ester with guaranteed levels of EPA and DHA.

**AsureQuality Certificate of analysis**

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<th>GMP</th>
<th>NZHM</th>
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<tr>
<td>Per soft gel</td>
<td>Per soft gel</td>
</tr>
<tr>
<td>EPA: 264</td>
<td>EPA:269</td>
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<tr>
<td>DHA: 185</td>
<td>DHA:194</td>
</tr>
<tr>
<td>Omega 3: 538</td>
<td>Omega 3:558</td>
</tr>
<tr>
<td>Mercury: &lt;0.01</td>
<td>Mercury: &lt;0.01</td>
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</tbody>
</table>
Medium chain triglycerides

Hexanoic acid (caproic acid)

Octanoic acid (Caprylic acid)

Decanoic acid (capric acid)

Lauric acid (dodecanoic acid)

Recommended as a placebo control
Flow Chart for Lester’s Oil Study

1. Pre-screening, randomisation, n=15
2. LO intervention 4 weeks
3. Washout 4 weeks
4. “Placebo” intervention 4 weeks

1. Pre-screening, randomisation, n=15
2. “Placebo” intervention 4 weeks
3. Washout 4 weeks
4. Lester’s oil intervention 4 weeks
Key: **Red**: Supplement first (Group B)  
**Black**: Supplement second (Group A)
The effect of treatment on C20.5 (EPA)
The effect of treatment on C22.5 (DPA)
The effect of treatment on C22.6 (DHA)
The effect of treatment on omega-3 index
Medium Chain Triglyceride Oil: An Intended Placebo with Unexpected Adverse Effects

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Where to from here:
Currently writing the more positive papers from fatty acid analyses of the treatment with the supplement
Ditto on the vitamin D and considerations of antioxidants
Repeating the study with a different placebo and longer time of supplementation in subjects with Inflammatory bowel disease

Thank you for your attention