Health Benefits of Omega-3 Fatty Acids

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Objective:
• Summarize the probable mechanism of action of omega-3 fatty acid supplements in the body
• Define the benefits and risks in omega-3 fatty acid supplementation
• Recommend omega-3 fatty acid supplementation in appropriate patients.

Overview
• What are fatty acids?
• Mechanism of action of omega-3 fatty acid supplements in the body
• Benefits and risks of omega-3 fatty acid supplementation in selected conditions

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Interactive Question

- Do you currently take an omega 3 (or fish oil) supplement?
  - Yes
  - No

Omega 3 Supplements

- Only 25% of the U.S. population reports getting daily omega 3 from food
- 37% of adults, 31% of kids take supplements daily
- $600 million in sales for fish oils (2009)
- 5th best selling supplement

Functions of Fatty Acids

- Energy
- Cell membranes
- Regulation of BP and heart rate
- Nervous system
- Hemostatic regulation
- Precursors for the formation of prostaglandins, thromboxane, and leukotrienes
**Health Benefits of Omega-3 Fatty Acids**

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### Naming of Fatty Acids

ω-3 or n-3

### Essential Fatty Acids

- Cannot be synthesized \textit{de novo}
- \textit{alpha-linolenic acid} (ALA)
- \textit{linoleic acid} (LA)

### Omega-6 vs Omega-3

- Average daily intakes: 14 g LA, 1.33 g ALA, 0.04 g EPA, and 0.07 g DHA.
- American ratios range from 10:1 - 17:1 for the omega-6:omega-3
- Unknown ideal balance of pro-inflammatory to anti-inflammatory
  - Suggested ratio 5:1 or less

### Comparing Cooking Fats

<table>
<thead>
<tr>
<th>Fat</th>
<th>Saturated</th>
<th>Omega6</th>
<th>Omega3</th>
<th>Mono</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lard</td>
<td>100%</td>
<td>23%</td>
<td>5%</td>
<td>72%</td>
</tr>
<tr>
<td>Butter</td>
<td>30%</td>
<td>12%</td>
<td>5%</td>
<td>73%</td>
</tr>
<tr>
<td>Palm Oil</td>
<td>28%</td>
<td>41%</td>
<td>5%</td>
<td>26%</td>
</tr>
<tr>
<td>Corn Oil</td>
<td>22%</td>
<td>37%</td>
<td>5%</td>
<td>30%</td>
</tr>
<tr>
<td>Soybean Oil</td>
<td>21%</td>
<td>34%</td>
<td>5%</td>
<td>34%</td>
</tr>
<tr>
<td>Canola Oil</td>
<td>18%</td>
<td>31%</td>
<td>5%</td>
<td>36%</td>
</tr>
<tr>
<td>Olive Oil</td>
<td>16%</td>
<td>38%</td>
<td>5%</td>
<td>40%</td>
</tr>
</tbody>
</table>
Poll Question

- Algae is a source of omega-3 fatty acids
  a. True
  b. False

Omega-3 Fatty Acids

- n-3 polyunsaturated fatty acids (PUFAs)
- alpha-linolenic acid (ALA)
  - seeds, vegetable oils (canola, flaxseed, and soybean), green leafy vegetables, nuts, and beans
- eicosapentaenoic acid (EPA, 20:5 n-3) and docosahexaenoic acid (DHA, 22:6 n-3)
  - Fish oil; fatty fish such as salmon, mackerel, herring, and tuna; algae

Proven Uses of DHA/EPA Supplements

Hypertriglyceridemia

- ↓ TG 45-50%, ↓ VLDL 50%, ↑ LDL 17-32% (larger more buoyant form), ↑ HDL 3-13%
- MOA: inhibition of hormone-sensitive lipase and VLDL secretion, increased apo B liver degradation and increased lipoprotein lipase activity
- Dose: 2 - 4 grams/day (EPA & DHA, divided)
**Cardiovascular Disease Prevention**

- "Supportive but not conclusive research shows that consumption of EPA and DHA omega-3 fatty acids may reduce the risk of coronary heart disease."
- Allowed FDA labeling for EPA/DHA supplements

**Secondary Prevention of CV Disease**

- GISSI-Prevenzione - 850–882 mg of EPA + DHA ethyl esters; decreased death, MI, sudden death
- GISSI-HF - same dose; 14% decrease in relative risk of death
- JELIS - 1,800 mg/d of EPA ethyl esters; 19% reduction in major events, 24% in unstable angina

**Compare the Numbers Needed to Treat to Prevent an MI**

<table>
<thead>
<tr>
<th></th>
<th>EPA/DHA</th>
<th>Statin (4S)</th>
<th>Statin (CARE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 yrs</td>
<td>28</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>3 yrs</td>
<td>48</td>
<td>5.4 yrs</td>
<td>5 yrs</td>
</tr>
</tbody>
</table>

**Primary Prevention of CV Disease**

- Data are less clear
- Epidemiologic data - reduced risk of CV disease with high dietary consumption
- Studies - reduced risk but not statistically significant
Selected Recommendations

<table>
<thead>
<tr>
<th>Organization (Year)</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Dietetic Association (2006)</td>
<td>Two 4-ounce servings of fish per week (preferably fatty fish); 1 gram of EPA + DHA supplements may be recommended for secondary prevention</td>
</tr>
<tr>
<td>AHA (2002)</td>
<td>No documented CVD: should eat oily fish twice/week and foods rich in alpha-linolenic acid (ALA) (walnuts, canola, soy, and flaxseed) Documented CVD: should eat approximately 1 gram of EPA and DHA per day, preferably from oily fish, but also in supplement form</td>
</tr>
<tr>
<td>International Society for the Study of Fatty Acids and Lipids (2004)</td>
<td>Recommends adequate omega-6 intake of 2% energy, healthy ALA as 0.7% energy, and for cardiovascular health, a minimum of 500 mg EPA and DHA per day</td>
</tr>
<tr>
<td>USDA (2005)</td>
<td>Recommends 8 ounces per week (2 servings) of fish high in EPA and DHA content to decrease risk of CVD</td>
</tr>
<tr>
<td>WHO (2003)</td>
<td>Recommends 1 to 2 servings of fish per week each containing 200 to 500 mg EPA and DHA</td>
</tr>
</tbody>
</table>

For Cardiovascular Protection

- Primary prevention
  - At least 500 mg EPA+DHA/day
- Secondary prevention
  - 1 gm EPA + DHA/day
- Heart failure
  - 1 gm EPA + DHA/day

Is the Ideal Combo EPA and Aspirin?

1 gm EPA + 160 mg aspirin


Rheumatoid Arthritis

- 15 trials
- Decreased tender joint count, ↓ NSAID use, may ↓ steroid requirement
- 2.6 - 6 grams/day
- 8-12 weeks for efficacy

www.ahrq.gov/clinic/epcsums/o3lipidsum.pdf
Brain Health

- DHA is important for fetal and infant brain and visual development
- At least 200 mg daily during pregnancy
- Breastfeeding is best source for infants, some formulas contain


ADHD

- Mixed results in studies
  - Two ADHD subgroups (oppositional and less hyperactive/impulsive children) improved after 15-week 0.5 g/day EPA
  - Combinations of DHA, EPA, and gamma-linolenic acid [GLA, an omega-6] reduced symptomatology
  - Several negative studies


Depression

- EPA appears more effective than DHA
- Effective for depressed mood but not mania
- 1-3 gm/day
- Best studied as supplement to antidepressants


Cystic Fibrosis

- Fat malabsorption - essential fatty acid deficiency
- 8 small studies
  - Improved lung function
  - Decreased sputum volume
  - Decreased inflammatory markers
  - Decreased antibiotic use
- Dose: ?

Arch Bronconeumol. 2010;46(9):70-7.
Not Effective or Equivocal Data

Not Effective
- Migraine headaches
- Psoriasis
- Male infertility
- Enhancing immunity in people with HIV
- Alzheimer’s

Positive & negative studies
- Atrial fibrillation
- Schizophrenia
- Multiple sclerosis
- Asthma
- Raynaud’s
- Cognitive decline

Poll Question
- Which of the following is a possible adverse effect of fish oils?
  a. Fatty liver
  b. Seizures
  c. Ventricular fibrillation
  d. Bowel obstruction

Potential for Harm - Proarrhythmia
- Patients with implantable cardioverter defibrillators
  - 200 patients with an ICD and sustained VT or VF, fish oil 1.8 g/day
  - Recurrent VT/VF events were more common in patients receiving fish oil

Adverse Effects
- Usually minor
  - diarrhea, heartburn, indigestion, abdominal bloating, fishy burps
- ? environmental toxins
  - Trace PCBs
Health Benefits of Omega-3 Fatty Acids

Interactions
- Potential bleeding/bruising issue
  - Anticoagulants
  - Antiplatelet agents
- Potential blood pressure lowering and slowing of heart rate
  - Antihypertensives

Selecting Omega 3 Supplements
- Liver oils may contain more contaminants
- Consider refrigerating liquids to avoid oxidation
- Watch for excess amounts of added fat soluble vitamins
- Can open soft gels if difficult to swallow
- Enteric coating and refrigerating may help fishy burps

Higher Concentration = Less Volume

<table>
<thead>
<tr>
<th>Example Products</th>
<th>Tested DHA/EPA content</th>
<th># for 1g or 4g/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmanex MarineOmega (softgel)</td>
<td>150 mg EPA + 100 mg DHA</td>
<td>4/16</td>
</tr>
<tr>
<td>GNC Triple Strength Fish Oil (softgel)</td>
<td>647 mg EPA + 253 mg DHA</td>
<td>1/4</td>
</tr>
<tr>
<td>Vitamin Shoppe Omega-3 Fish Oil Lemon Lime Flavor (liquid)</td>
<td>735 mg EPA + 480 mg DHA/tsp</td>
<td>1 tsp/3 tsp</td>
</tr>
</tbody>
</table>

Omega 3 Supplements
- Important to know the EPA and DHA content
- ALA (from flax) is not a substitute for EPA/DHA

Example from Consumerlab.com

Omega 3 Supplements
- Vegetarians - algae source
- Look for verified or tested product
  - USP (usp.org)
  - Consumer labs

Global Organization for EPA and DHA Omega-3s (GOED)
- Petitioning the Institute of Medicine to establish clearer Dietary Reference Intakes for EPA and DHA in the US and Canada
- Quality standards
  - goedquality.com

Consumer Labs
- Best Buys
  - Kirkland Signature Enteric Coated Fish Oil Omega 3
  - Swanson EFA's Super EPA
  - NSI Liquid Omega-3 Purified Fish Oil
- Less than labeled
  - Natural Factors RxOmega-3 Factors EPA 400mg/DHA 200 mg
  - NOW Neptune Krill Oil
  - The Simpsons Berry Squirts

Ongoing Research
- Autism
- Bipolar disorder
- HIV-infected patients w/ hypertriglyceridemia
- Depression
- Prostate cancer
- Breast cancer
- Asthma
- Alzheimer's disease
- COPD
- Macular degeneration
- Hepatitis C
- PTSD
- Metabolic Syndrome
For More Information

- National Center for Complementary and Alternative Medicine
  - nccm.nih.gov
- Office of Dietary Supplements
  - ods.od.nih.gov
- AHRQ Technical Reviews
- Consumer Labs
  - consumerlabs.com
- Omega-3 Learning Consortium
  - omega3learning.uconn.edu
- Excellent review article

Conclusions

- GRAS
- Strong evidence of efficacy
  - hypertriglyceridemia, secondary prevention of CVD
- Moderate evidence
  - RA, maternal and child health, and mental health
- Dietary consumption may be better than supplement
  - Primary prevention of CVD

Notes

Notes