Balancing Seafood Risks vs. Benefits

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Presentation Overview

- Benefits of Eating Fish
- Mercury
- Deep Water Horizon-BP Oil Spill
- Fish Advisories
Seafood Choices: Benefits

• **Fetus**
  Duration of gestation & Birth weight  +?

• **Infant/Child**
  Visual acuity and sensory motor development  ++
  Cognitive development  ++
  Sleep patterns  +
  Allergy/Asthma  0
  ADHD  0

IOM, 2006
Modest fish consumption (e.g., 1-2 servings per wk), especially species higher in [EPA and DHA], reduces risk of coronary death by 36% and total mortality by 17%.... Intake of 250 mg/d of EPA and DHA appears sufficient for primary protection.”

JAMA 2006; 296(15): 1885-1899.

120,000 lives saved each year !!!
Six year follow-up of subjects (≥65 yrs of age)

Subjects (3,718) that consumed fish:
- 1 meal/week had 10% slower cognitive decline
- 2 meals/week had 13% slower cognitive decline

Dietary Recommendations

- National Academy of Sciences (NAS) - 2002
  - EPA + DHA = 140 mg/d (nursing/pregnant)

- Dietary Guidelines for Americans - 2010
  - 8-12 oz fish/wk (EPA + DHA = 250 mg/d)

- American Heart Association (AHA)
  - 2 servings (2-3 oz per serving) of fatty fish/week
  - EPA + DHA = 1,000 mg/d (heart disease patients)
If you consume 8 oz/wk (raw weight), what % of recommended EPA + DHA levels do you get?

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic Salmon</td>
<td>455</td>
</tr>
<tr>
<td>Swordfish</td>
<td>255</td>
</tr>
<tr>
<td>Channel Catfish</td>
<td>98</td>
</tr>
<tr>
<td>Lt. Tuna (Canned)</td>
<td>31</td>
</tr>
</tbody>
</table>

**Legend:**
- NAS
- DG10
- AHA
U.S. Fish Consumption - 2009

- Shrimp: 4.1 lbs/person
- Canned Tuna: 2.5
- Salmon: 2.0
- Pollock: 1.5
- Tilapia: 1.2
- Catfish: 0.9
- Crab: 0.6
- Cod: 0.4
- Flatfish: 0.4
- Clams: 0.4

Per capita: 15.8

NFI, 2010
Effects of Fish on Omega-3 Status

- Fatty Acids (mg/L)

- Month

- EPA Salmon
- EPA Tilapia
- DHA Salmon
- DHA Tilapia
Mercury

- Crosses placenta; Enters breast milk
- Clearance from body ~1 year
- Risk to fetuses and infants exposed at high levels incl. abnormalities in memory, attention, and language skills
- FDA’s Action Level (AL) = 1,000 ppb
- EPA’s RfD is 20-25% of the FDA’s AL
NHANES (1999-2002) - Mercury

- 5.7% of U.S. women (16-49 yrs.) have levels of mercury in their blood that exceeds the RfD (>5.8 µg/L)

CDC. 2004.
NHANES Blood Mercury Levels

The BMDL from Faroe Island study

RfD
EPA Projection

- 10% (~400,000 babies of the 4 million born annually) may be exposed to excessive mercury when in the womb

Mahaffey, EPA 2005
Mercury Toxicity in Adults

- Patients living in San Francisco
- Consumers of higher Hg fish
- Symptoms including fatigue, headache, decreased memory, decreased concentration, muscle and joint pain
- Symptoms gone after diet change

Hightower and Moore, 2003
Effects of Fish on Mercury Status

- Blood mercury (ppb)
- Hair mercury (ppm)

- Salmon (Blood)
- Tilapia (Blood)
- Salmon (Hair)
- Tilapia (Hair)

Month vs. Mercury levels for salmon and tilapia in blood and hair.
Mercury and CHD

## Mercury Residues - Swordfish

<table>
<thead>
<tr>
<th>Size (lbs)</th>
<th>Mercury (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-150</td>
<td>650</td>
</tr>
<tr>
<td>150-200</td>
<td>845</td>
</tr>
<tr>
<td>200-250</td>
<td>851</td>
</tr>
<tr>
<td>250-300</td>
<td>926</td>
</tr>
<tr>
<td>300-400</td>
<td>1636</td>
</tr>
</tbody>
</table>

Unpublished, Sustainable Seafood Forum, 2007
Selenium

- “Many… imagine that selenium ‘protects’ against mercury toxicity…. Selenium is not a ‘tonic’ that counteracts some undefined toxic mechanism of mercury…. selenium is the target of mercury toxicity.” N. Ralston, 2011 (personal communication)

- Exciting research but at the rodent level

- Fate of mercuro-seleno complex?
Deep Water Horizon-BP Oil Spill

- NOAA, FDA, State Agencies tested crab, finfish, oysters, and shrimp for agents:
  - Dioctyl sodium sulfate (dispersant)
  - Polycyclic aromatic hydrocarbons
- 1,730 samples – 13 positive DOSS but well below the 100 ppm limit for finfish and 500 ppm limit for shrimp, crab and oysters
- 6,817 mi² closed (2.8%) to recreational and commercial fishing (5/2/11)
Fish Advisories
“...if pregnant women were to ... replace fish high in mercury with fish low in mercury [and higher in omega-3 fatty acids], cognitive development benefits...could be achieved with virtually no nutritional losses.”

Harvard School of Public Health
Why Eat Fish?

Fish provides many nutrients that are important for good health. Nutrients include: protein, vitamins (A, D), minerals (iodine, calcium, iron, selenium), omega-3 fatty acids (DHA and EPA) and antioxidants (astaxanthin). Fish is generally lower in saturated fats than meats. During pregnancy and nursing, many of these nutrients that the mother consumes are directly shared through the placenta to the developing fetus or through the milk to the nursing infant. The omega-3 fatty acid, DHA, is important for healthy brain and eye development in babies.
Choose a State from the map or select one from the list to view local fish consumption advice.
iPhone app    Fish4Health

Fish4Health™

Advice for Pregnant or Nursing Women, Women Who May Become Pregnant & Children (2-6 years)

Why Eat Fish?
How Much Fish to Eat?
Fish Consumption Advice
Before Eating Your Catch
Avoid Eating Raw Fish

Fish Consumption Advice

Best Choices
Eat 6 to 12 ounces per week

Lowest Mercury
Eat up to 12 ounces per week

Moderate Mercury
Eat up to 4 ounces per week

High Mercury/PCB
Do not eat

Excessive mercury/PCB can pass through the placenta or mother’s milk and harm your baby. Do not eat fish from the high mercury/PCB category. If you eat 4 ounces from the moderate category, don’t eat any more fish from this category until the next week.

View All Fish
MyLog Seafood Calculator

**Settings**

- **Body Weight:**
  - pounds
  - kilograms
  - 100

- **EPA + DHA Target Intake:**
  - 140 mg/day
  - 500 mg/day

- **Display Units for Report:**
  - ounces
  - grams

- **Daily Notifications:**
  - On
  - Off

**List of Fish**

- **Best**
  - Mackerel, Atlantic
  - Mackerel, Chub
  - Mackerel, Spanish
  - Mahi Mahi (Dolphin)

- **Marlin
  - Monkfish
  - Mullet**
iPhone app  Fish4Health
Conclusions

- Women that are pregnant or nursing:
  - eat 8-12 oz/wk of seafood
  - avoid seafood that is higher in pollutants
  - eat seafood that provides healthy nutrients

- For the general population (including men and post-menopausal women):
  - eat 8-12 oz/wk of seafood
  - eat seafood that provides healthy nutrients
  - use some caution to limit pollutants