What We Know About Bay Fish Contamination

CONTAMINANT CONCENTRATIONS IN FISH FROM SAN FRANCISCO BAY, 2003
Fish Intake, Contaminants, and Human Health
Evaluating the Risks and the Benefits

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Context  Fish (finfish or shellfish) may have health benefits and also contain contaminants, resulting in confusion over the role of fish consumption in a healthy diet.

Conclusions  For major health outcomes among adults, based on both the strength of the evidence and the potential magnitudes of effect, the benefits of fish intake exceed the potential risks. For women of childbearing age, benefits of modest fish intake, excepting a few selected species, also outweigh risks.

JAMA. 2006;296:1885-1899  www.jama.com
Table 2. Levels of n-3 Fatty Acids and Contaminants in Commonly Consumed Fish, Shellfish, and Other Foods

<table>
<thead>
<tr>
<th></th>
<th>EPA + DHA, mg/serving</th>
<th>EPA + DHA, mg/100 g (3.5 oz)</th>
<th>Selenium, µg/g (ppm)</th>
<th>Mercury, µg/g (ppm)</th>
<th>PCBs, ng/g (ppb)</th>
<th>Dioxins, TEQ µg/g (ppt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDA action level</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>1.0</td>
<td>2000</td>
<td>None $</td>
</tr>
<tr>
<td>Anchovy</td>
<td>1165 (2 oz)</td>
<td>2055</td>
<td>0.68</td>
<td>&lt;0.05</td>
<td></td>
<td>0.35 (1997-1998)</td>
</tr>
<tr>
<td>Catfish, farmed</td>
<td>253 (5 oz)</td>
<td>177</td>
<td>0.15</td>
<td>&lt;0.05</td>
<td>&lt;50 (1997)</td>
<td>0.53 (1995-1997)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.51 (1996)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.00 (1995-1996)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.65 (1995)</td>
</tr>
<tr>
<td>Cod, Atlantic</td>
<td>284 (6.3 oz)</td>
<td>158</td>
<td>0.38</td>
<td>0.10</td>
<td></td>
<td>0.05 (1995-1997)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.15 (1995-1996)</td>
</tr>
<tr>
<td>Fish burger, fast</td>
<td>337 (2.2 oz)</td>
<td>546</td>
<td>0.17†</td>
<td>&lt;0.05</td>
<td>8 (2001)</td>
<td>0.01 (2001)</td>
</tr>
<tr>
<td>Fish sticks, frozen</td>
<td>193 (3.2 oz)</td>
<td>214</td>
<td>0.17</td>
<td>&lt;0.05</td>
<td></td>
<td>0.04 (2001)</td>
</tr>
<tr>
<td>Golden bass (tilefish), Gulf of Mexico</td>
<td>1358 (5.3 oz)</td>
<td>905</td>
<td>0.52</td>
<td>1.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Golden bass (tilefish), Atlantic</td>
<td>1358 (5.3 oz)</td>
<td>905</td>
<td>0.52</td>
<td>0.14</td>
<td></td>
<td></td>
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<tr>
<td>Halibut</td>
<td>740 (5.6 oz)</td>
<td>465</td>
<td>0.47</td>
<td>0.25</td>
<td></td>
<td>1.00 (1995-1997)</td>
</tr>
<tr>
<td>Herring, Atlantic</td>
<td>1712 (3 oz)</td>
<td>2014</td>
<td>0.47</td>
<td>&lt;0.05</td>
<td></td>
<td>0.97 (1995-1998)</td>
</tr>
<tr>
<td>Mackerel, Atlantic</td>
<td>1059 (3.1 oz)</td>
<td>1203</td>
<td>0.52</td>
<td>0.05</td>
<td></td>
<td>0.87 (1997-1998)</td>
</tr>
<tr>
<td>Mackerel, King</td>
<td>618 (5.4 oz)</td>
<td>401</td>
<td>0.47</td>
<td>0.73</td>
<td></td>
<td></td>
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<tr>
<td>Mahimahi</td>
<td>221 (5.6 oz)</td>
<td>139</td>
<td>0.47</td>
<td>0.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pollock, Alaskan</td>
<td>281 (2.1 oz)</td>
<td>468</td>
<td>0.43</td>
<td>&lt;0.05</td>
<td></td>
<td>0.01 (1998)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.24 (1998)</td>
</tr>
<tr>
<td>Salmon, farmed</td>
<td>4504 (6 oz)</td>
<td>2648</td>
<td>0.41</td>
<td>&lt;0.05</td>
<td>21 (2001-2003)</td>
<td>0.50 (2001-2003)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15 (2002)</td>
<td>0.87 (2002)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>40 (2002)</td>
<td>0.45 (2002)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>26 (2001)</td>
<td>0.33 (2001)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25 (2001)</td>
<td>0.50 (1997)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>38 (1999)</td>
<td>0.50 (1999-2000)</td>
</tr>
<tr>
<td>Salmon, wild</td>
<td>1774 (6 oz)</td>
<td>1043</td>
<td>0.46</td>
<td>&lt;0.05</td>
<td>3 (2002)</td>
<td>0.03 (2002)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.5 (2002)</td>
<td>0.34 (2002)</td>
</tr>
</tbody>
</table>
Fish Monitoring

• Began in 1994, but some data from 70s
• Every 3 years
• 7 species for trends analysis
• Legacy and emerging contaminants
• Why is there concern?
  - Human Health
  - Wildlife Health
Who Utilizes RMP Data?

- Water Board assessment of Bay Impairment

- OEHHA Consumption Advisories

- Department of Health Services - Risk Communication
## Current Tissue Guidelines

<table>
<thead>
<tr>
<th></th>
<th>Aroclors (ppb)</th>
<th>Mercury (ppm)</th>
<th>DDT (ppb)</th>
<th>Chlordane (ppb)</th>
<th>Dieldrin (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OEHHA Screening Value</td>
<td>20</td>
<td>0.3</td>
<td>100</td>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>Water Board TMDL</td>
<td>10</td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Bay fish species consumed by anglers with recent fish consumption

Anglers reporting no consumption in last 4 weeks not included

From The San Francisco Bay Seafood Consumption Study—Public Summary
Few Contaminants Account for Most Risk Ratio of Amounts in Fish to Benchmark

- Hg
- PCBs
- Dioxins
- Se
- Dieldrin
- DDT
- Chlordane
Daily PBDE dietary intake of the U.S. population by age and gender (Schecter et al., 2006)
White Croaker PCBs
PCBs in Prey Fish

Species

- Croaker
- Sturgeon
- Anchovy
- Herring
- Sardine

Sport Fish

Prey Fish
Hg in Striped Bass
Our best long-term trend indicator
One time series from Yerba Buena Island
Representative of other locations
Noisy trend line
Declines from about 5000 ppb to 2000 ppb (60%) over the 23 year period

From Pulse of the Estuary 2006
National Production History

Decade

- 1851-1860
- 1861-1870
- 1871-1880
- 1881-1890
- 1891-1900
- 1901-1910
- 1911-1920
- 1921-1930
- 1931-1940
- 1941-1950
- 1951-1960
- 1961-1970
- 1971-1980
- 1981-1990
- 1991-2000

Mercury Production (metric t)

- 0
- 5,000
- 10,000
- 15,000
- 20,000

PCB Production (metric t)

- 0
- 30,000
- 60,000
- 90,000
- 120,000
- 150,000

Hg (t)

PCBs(t)
Legacy Pollutants: Amount in Bay
>30x larger than annual inputs
Hg Entering Creeks Rivers and Storm Drains

- Atmospheric Deposition: 27%
- Watershed Surface Sediment Erosion: 34%
- Bed and Bank Erosion: 12%
- Paint: 1%
- Instruments: 13%
- Switches and Thermostats: 6%
- Instruments: 13%
- Auto-Recycling: 0%
- Landfill: 0%
- Industrial Hotspots: 1%
- Railway Lines: 1%
- Fluorescent Lighting: 2%
- Laboratory: 1%
- Gasoline: 1%
- Batteries: 0%
- Dental: 0%
- Other Uses: 0%
Hg Entering Creeks Rivers and Storm Drains

- Bed and Bank Erosion: 12%
- Watershed Surface Sediment Erosion: 34%
- Atmospheric Deposition: 27%
Hg Entering Creeks Rivers and Storm Drains
PCBs Entering Creeks Rivers and Storm Drains
PCBs Entering Creeks Rivers and Storm Drains

- Watershed Surface Sediment Erosion 58%
- Bed and Bank Erosion 6%
- Atmospheric Deposition 5%
PCBs Entering Creeks Rivers and Storm Drains

- Building Demolition and Remodeling 8%
- Transformers and Large Capacitors 5%
- PCBs Still in Use 8%
- Industrial Hotspots 4%
- Railway Lines 2%
- Auto-Recycling 1%
Information Sources

www.sfei.org

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