METHYL MERCURY CONTENT IN FISH- a health risk
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Fish is a popular human food. Over three billion people globally obtain their daily nutrient intake from fish. Over 100 million tons of fish is consumed every year globally.

International Chemical Safety Council of United Nations rates methyl mercury – an organic form of mercury – as one of the six most serious pollution threats to the planet. It is easily absorbed by the human digestive tract and is a potent neurotoxin. Human exposure occurs almost exclusively to methyl mercury (MeHg) from consumption of fish and marine mammals. MeHg contamination in fish poses a great challenge to public health, because fish is a highly nutritious food, with known health benefits.

The sources of Methyl mercury contamination of fish:
Mercury occurs naturally in the environment and can also be released to environment through industrial pollution. Mercury gets into the water from the air and can accumulate in the water bodies such as streams, rivers, sea, oceans. Mercury is converted into methyl mercury in the water, by the action of bacteria. Fish absorbs methyl mercury as they feed in these waters and so it builds up in them. Nearly all types of fish and shell fish contain traces of methyl mercury.

Larger the fish higher the level of methyl mercury; the methyl mercury level in the fish depends on what the fish feeds on and the mercury level in the water. Larger fish that lived longer and feed on other fish will have the highest amount of methyl mercury because they had more time to accumulate it. The large fish that pose the greatest risk are swordfish and tilefish, shark and king mackerel.

Health Effects of Methyl Mercury
The brain and nervous system are the primary target tissues for the effects of MeHg. The groups most vulnerable to the effects of mercury toxicity include women who are pregnant or may become pregnant, nursing mothers and young children.

Box 1

- Mercury occurs naturally in the environment and can also be released to environment through industrial pollution.
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- Mercury is converted into methyl mercury in the water, by the action of bacteria.
- Fish absorbs methyl mercury as they feed in these waters and so it builds up in them. Nearly all types of fish and shell fish contain traces of methyl mercury.
- Larger the fish higher the level of methyl mercury. Larger fish that lived longer and feed on other fish will have the highest amount of methyl mercury because
Though methyl mercury is removed by the body naturally; as it is a very slow process, it may take over a year for the levels to drop significantly. Thus women those who eat fish, that are high in methyl mercury regularly, might get this compound accumulated in the body over time. Thus there is a chance of methyl mercury being accumulated in these women before pregnancy and methyl mercury from the mother can be passed on to the growing fetus during pregnancy and to the infant through the breast milk which is known to have a detrimental effect on the health of growing fetus and young child’s developing brain. Impacts on cognitive thinking, memory, attention, language, and fine motor and visual spatial skills have been seen in children exposed to MeHg methyl mercury in the womb.

MeHg poisoning in adults also have been found to result in marked distal sensory disturbances, constriction of visual fields, ataxia, dysarthria, auditory disturbances, and tremors. Exposure to relatively high doses of methyl mercury for a long period of time may also cause problems in other organs such as the kidneys and heart. The symptoms of methyl mercury poisoning are varied and difficult to detect as they can mimic other illnesses. In relatively mild cases, the condition is barely distinguishable from common ailments.

**Advisory and recommendation for fish consumption**

As there is risk of contamination of mercury in fresh waters from either natural or industrial sources, there are special recommendations available in various countries for fish consumption.

Food and Drug Administration (FDA) and Environmental Protection Agency (EPA) are advising all pregnant women, women of child bearing age who may become pregnant, nursing mothers and young children to avoid fish that are found to be containing high amount of methyl mercury.

The recommendations that assures of reduced exposure to the harmful effects of mercury, given by FDA and EPA are as follows:**(Table-1)

<table>
<thead>
<tr>
<th>Advisory</th>
<th>Type of fish and shell fish (Indian names)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not eat</td>
<td>Swordfish, Tilefish, Shark King mackerel (<em>Vanjiram, Neimeen, Surmai, Visonu</em>) contains high levels of methyl mercury(&gt;0.2 ppm mercury)</td>
</tr>
<tr>
<td>Eat up to 170gm per week</td>
<td>Albacore, White tuna (<em>Soorai, Choora, Chura</em>), locally caught fish#</td>
</tr>
<tr>
<td>Eat up to 340gm per week</td>
<td>Light tuna, Salmon (<em>Raavas, Saaman machhalee</em>), Pollock, catfish and Scallops, Cod, Crab Clamp, Flat fish</td>
</tr>
</tbody>
</table>

(**Ref: Smith K.M & Sanhyoun Nut rev-2005) ppm -parts per million; Note: "Serve smaller portions for children

#-If no advisory available do not consume any other fish during that week

The Joint FAO-WHO Expert Committee recommended methylmercury Provisional Tolerable Weekly Intake (PTWI) is taken as the standard. The standard is 1.6 μg/kg of body weight of an individual per week or 0.228571 μg/kg of body weight/day.
The Indian scenario – Need for Advisory

In India, fish is a major dietary component for over 50 percent, and source of livelihood for over 30 percent of its 1.3 billion population. It is a particularly important nutrition source for the poor. With a huge piscatorian (fish eating) population in India, and with poor pollution prevention measures, control technologies and strategies for reducing mercury uses and releases, one cannot imagine the magnitude of the health impact of methyl mercury on this population. There is a paucity of data available on the MeHg content of fish consumed in India. The need of the hour is to assess the health burden related to methyl mercury poisoning creating awareness about the deleterious effect of methyl mercury on health among health fraternity and public as well.

Mean mercury content in fish in descending order:  
(Source: FDA, Gulf of Mexico report 2000)

<table>
<thead>
<tr>
<th>English name of fish</th>
<th>Mean Mercury content (ppm)</th>
<th>Approximate Indian name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shark</td>
<td>0.979</td>
<td>Sura</td>
</tr>
<tr>
<td>King Mackerel</td>
<td>0.73</td>
<td>Vanjiram, Neimeen, Surmai, Visonu</td>
</tr>
<tr>
<td>Spanish Mackerel</td>
<td>0.45</td>
<td>Vanjiram, Neimeen, Surmai, Visonu</td>
</tr>
<tr>
<td>Tuna</td>
<td>0.354</td>
<td>Soorai, Choora, Chura</td>
</tr>
<tr>
<td>Anchovy</td>
<td>0.017</td>
<td>Nethili, Phansa, Bolingei, Kollathuru, Kati</td>
</tr>
<tr>
<td>Sardine</td>
<td>0.013</td>
<td>Matthi meen, Pedvey, Kavalu</td>
</tr>
</tbody>
</table>

The ways to enjoy fish and the health benefits from it:

Knowledge is power; being informed about those fish that are safe to consume and prudent in the choice of the fish, one can enjoy the health benefits of eating fish. Fish consumption is encouraged as part of a healthy diet because it is a rich source of good quality protein, as well as other nutrients, but low in saturated fat. Fish is one of the important sources of Omega -3 fatty acids hence promoted as heart protective food.

The amount of methyl mercury in the fish cannot be reduced either by cleaning or cooking. Yet as a precautionary measure the fish has to be cleaned and organs-liver and other organs are to be removed before cooking. The smaller the size of fish the safer to consume. If no specific advisory available it is better to follow the FDA recommendations.
**Good News:** Antioxidant Mineral offer protection against toxic effects of methylmercury

Recent research suggests that selenium content in fish is protective against the toxic effects of methylmercury content. Fish with higher ratios of selenium to methylmercury (Se:Hg) are better to eat since the selenium binds to the methylmercury allowing it to pass through the body un-absorbed.

**Fish Pictures**

![Sword fish](image1.png)  ![Tile fish](image2.png)  ![King mackerel (Vanjiram, Neimeen)](image3.png)

![Pollock](image4.png)  ![Cat Fish](image5.png)  ![Flatfish](image6.png)

![Cod fish](image7.png)  ![Clams](image8.png)  ![Scallop](image9.png)

**Trimming and cooking fish to reduce fat and chemical contaminants**

- **Fillet the fish.** Filleting is strongly recommended because removing bones, fatty tissues, and all internal organs will greatly reduce the levels of most contaminants in fish.
- Trim away fatty portions of the fish such as the dorsal, lateral and belly area.
- Remove the skin from fish.
- Do not eat fish eggs. They are very high in fat and may contain contaminants that are associated with fatty tissue.
- Bake, grill, or broil fish on a rack and let the fat drip away. Do not use the juices. Avoid pan-frying in butter or animal fat, or making soups. These methods retain fat-laden juices. If fish is fried then to discard the leftover oil. Some contaminants will become concentrated in reused oil.
- **Since metals do not tend to concentrate in fatty tissue, filleting, trimming fat, or special cooking methods will not reduce the mercury levels.**

*Source: DHSS – 2014 Fish Advisory, page 13*