Calculating Mercury Intake from the USDA's new Food Pyramid Recommendations

By David Wallinga, MD, Director of Food and Health Program, Institute for Agriculture and Trade Policy, dwallinga@iatp.org.

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USDA's new Food Pyramid has been criticized, by Harvard professor Dr. Carlos Arturo Camargo Jr. among others, for leaving out any guidance on how to replace unhealthy foods with healthy foods.

We were amazed that the Food Pyramid actually points people towards the consumption of fish that the FDA and the EPA have explicitly warned people against eating, due to high levels of mercury contamination.

For example, the section of the Food Pyramid website devoted to meat, bean, nuts and fish, guides people to certain "finfish", shellfish and canned fish (see below, and at http://www.mypyramid.gov/pyramid/meat.html) including swordfish and mackerel, in addition to fresh tuna and other fish.

Finfish such as:	*Shellfish such as:*	*Canned fish such as:*
catfish	clams	anchovies
cod	crab	clams
flounder	crayfish	**tuna**
haddock	lobster	sardines
halibut	mussels	
herring	octopus	
mackerel	oysters	
pollock	scallops	
porgy	squid (calamari)	
salmon	shrimp	
sea bass		
snapper		
swordfish		
trout		
tuna		

Yet the March 2004 joint FDA/EPA fish consumption advisory (http://www.fda.gov/bbs/topics/news/2004/NEW01038.html) advises specifically against ANY consumption of swordfish – in addition to shark and tilefish and king mackerel – due to their high level of mercury contamination. The advisory applies to all women who may become pregnant, pregnant women, nursing mothers, and young children. With respect to mackerel, the Food Pyramid fails to distinguish more-contaminated king mackerel from less-contaminated Atlantic or chub mackerel.

What are the Health Implications?

A 35 year-old woman who is very active, using the interactive My Pyramid portion of the USDA's website is instructed to eat 6 ounces of meat, beans, poultry or fish *per day*. Our calculations show how much mercury such a woman, of average weight (132 lbs) might ingest relative to the EPA's maximum recommended levels, using the FDA's own data on mercury contamination in fish (http://www.cfsan.fda.gov/~frf/sea-mehg.html), which we've reproduced here in Table 1.

1) We assume a 35 year-old woman of standard weight weighs 60 kg, or 132 lbs.

2) We assume the implicit serving size from the FDA/EPA fish advisory, 6 ounces.

3) Using FDA data, swordfish monitoring shows average methyl mercury contamination of .99 ppm, also expressed at .99 micrograms (ug) per gram of swordfish.

4) Since there are 28.35 grams per ounce, we know a 6 oz. serving amounts to just over 170 grams of swordfish in one meal. Similarly, a 3 oz. meal would contain half as much, or about 85 grams.

5) So, 170 grams of swordfish x 0.99 ug MeHg/g = 168.3 ug of methylmercury ingested.

Now, to compare mercury ingested with the swordfish meal with EPA's recommended levels:

6) The EPA's reference dose or "safe" maximum dose for ingesting methyl mercury is **0.1 µg/kg-bw/day, or 0.7 µg/kg-bw/week**.

7) A 35 year-old woman weighing 60 kg. or 132 lbs would have a maximum recommended methyl mercury dose of 6 ug per day or 42 µg per week.

8) The amount by our average woman following the Food Pyramid could exceed the EPA's "safe" dose as follows:

   - 168.3 ug of methylmercury in a swordfish meal ÷ 6 ug/day = about 28.

     In other words, with one swordfish meal this woman could ingest 28 times more methylmercury than is the maximum daily amount that EPA recommends.

   - 168.3 ug of methylmercury in a swordfish meal ÷ 42 ug/week = around 4.

     In other words, with one swordfish meal, this woman could ingest 4 times more methylmercury than the EPA would recommend for an entire week.

A woman eating a 3 oz. serving of swordfish would “only” exceed the EPA’s reference dose by about half as much.

TABLE 1: From FDA website, http://www.cfsan.fda.gov/~frf/sea-mehg.html

Mercury Levels in Commercial Fish and Shellfish

Return to Advisory on Mercury in Seafood

See also Mercury in Fish: FDA Monitoring Program

Table 1. Fish and Shellfish With Highest Levels of Mercury

SPECIES	MERCURY CONCENTRATION (PPM)				NO. OF SAMPLES	SOURCE OF DATA
	MEAN	MEDIAN	MIN	MAX		
MACKEREL KING	0.73	NA	0.23	1.67	213	GULF OF MEXICO REPORT 2000
SHARK	0.99	0.83	ND	4.54	351	FDA SURVEY 1990-02
SWORDFISH	0.97	0.86	0.10	3.22	605	FDA SURVEY 1990-02
TILEFISH (Gulf of Mexico)	1.45	NA	0.65	3.73	60	NMFS REPORT 1978

Incidentally, assuming the FDA's six ounce serving, and using the FDA's own data on mercury contamination in the species of fish listed in the Food Pyramid, one could also exceed the EPA reference dose for weekly ingestion of methylmercury by eating fish species expected to have greater than about .25 parts per million of mercury contamination, on average. This would preclude eating halibut, sea bass, snapper, sea trout, and tuna (except canned “light tuna) from the Food Pyramid list, in addition to the swordfish and king mackerel mentioned earlier.

The Food Pyramid implicitly recommended list doesn’t clearly distinguish between kinds of tuna, but this distinction is important. Fresh tuna steaks and canned albacore or “white” tuna both have average mercury contamination of more than .35 ppm, according to FDA data. Canned light or skipjack tuna, by contrast, only has about a third as much mercury and can be more safely consumed.

IATP was the first entity to put out a consumer fish guide, called the Smart Fish Guide (www.iatp.org/foodandhealth), that incorporated scientific information about fish contamination with both mercury and PCBs, along with sustainability information, into one set of recommendations.