TUNA SURPRISE:
Mercury in School Lunches

Risk Management Advice for Schools and Parents

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for the
Mercury Policy Project

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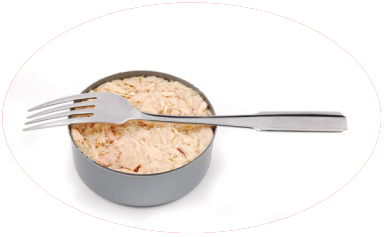
Executive Summary

Canned tuna is the largest source of methylmercury in the US diet, contributing 32 percent of the total, and is a major source of mercury exposure for children. US children eat twice as much tuna as they do of any other seafood product; while the average American eats only about 100 grams of tuna (less than four ounces) a month, some tuna-loving children eat much more than that. Unusually high consumption, combined with children's small body weights, can result in mercury doses for some children that exceed federal safety guidelines, occasionally by wide margins.



Canned tuna is an inexpensive, nutritious food and is served in many school lunch programs; it is also subsidized through the USDA's Child Nutrition Program. Despite recognized public-health concerns with mercury exposure and awareness of children's developmental vulnerability, no previous research has documented mercury levels in tuna served in schools. The tuna sold to schools comes from a distinctive market sector, with its own products, brand lines and distribution systems. The best way to determine the mercury content of those products was to test them.

The Mercury Policy Project obtained 59 samples of canned tuna from this market sector in 11 states around the country, and sent them to a contract lab for mercury testing. Our samples included 35 large (66.5 oz/1.88 kg) cans and 24 large (43 oz/1.22 kg) foil pouches. The products represented six brands of "light" tuna and two brands of albacore ("white") tuna. We found that the mercury content of these products is similar to what has been reported for supermarket canned tuna by other investigators and by the US Food and Drug Administration (FDA), with several interesting specifics:

- The average mercury level in our 48 samples of light tuna was 0.118 µg/g, slightly lower than the FDA's reported average of 0.128 µg/g. Our 11 samples of albacore tuna averaged 0.560 µg/g, much higher than the FDA's reported average of 0.350 µg/g.
- Mercury levels were highly variable from sample to sample, within types of tuna, within brands and even within some packages. The average mercury content in light tuna samples ranged from 0.020 to 0.640 µg/g; in albacore, from 0.190 to 1.270 µg/g.
- 50 of our 59 samples contained tuna imported from other countries. Our nine samples of US-caught light tuna had the lowest country-of-origin average mercury level, 0.086 µg/g, and light tuna from Ecuador had by far the highest average level, 0.254 µg/g. Light tuna imported from Thailand and the Philippines averaged 0.104 and 0.108 µg/g, respectively.

- One brand of light tuna, *Northeast*, had the lowest average mercury level overall, 0.058 µg/g, and was the only product explicitly labeled as containing skipjack tuna. However, since most light tuna contains skipjack, this result was probably not species-driven, but rather a reflection of the variability of mercury levels in a wild-harvested natural product.
- Two familiar US brands, *StarKist* and *Chicken of the Sea*, accounted for 60 percent of our light tuna samples. The overall average mercury levels in the two brands were 0.131 and 0.126 µg/g, respectively, and one set of samples of each brand had much higher than average levels.

We carried out an exposure modeling exercise, summarized in **Table S-1** on page 3, to assess the risks from children's tuna consumption. Risk for a given child depends on many factors. The table illustrates the interplay of these variables:

- ***Child's weight,*** in kilograms (kg). One kg is 2.2 pounds, so a 20-kg child weighs 44 pounds.
- ***Type of tuna and mercury content.*** Mercury levels are in micrograms per gram (µg/g), also called parts per million. The values here, 0.150 and 0.500 µg/g, fall in the middle of the ranges we found in light tuna and albacore tuna, respectively, in our tests. The type of tuna eaten is not explicitly shown, but the lower value generally represents light tuna, the higher value, albacore. Mercury levels in all types of tuna vary widely, and we could have chosen higher or lower levels for each type (i.e., the table could be greatly expanded; these values are examples.) Using higher or lower mercury levels would raise or lower percents (and color codes) in the final columns.
- ***Tuna consumption,*** in grams. One ounce is 28.3 grams, so the serving sizes in the table, 57 and 170 grams, are 2 ounces (one small serving) and six ounces (three small/two medium servings). Here, too, higher or lower values could have been chosen and these are simply examples.
- ***Dose.*** The first Dose column shows the amount of mercury in micrograms (µg) in each serving, based on serving size and mercury level. The second Dose column shows the amount of mercury per kg of the child's body weight, i.e., the value in the first Dose column divided by the child's weight in the far left column. To assess risks, doses are expressed in µg/kg.
- ***Averaging time.*** The table has three sections, in which the dose is averaged over one month (top), one week (middle), and one day (bottom).
- ***Dose as percent of RfD.*** In 2000, the US government established a "Reference Dose" (RfD) for methylmercury, a definition of acceptable exposure, using evidence available at the time. More recent research, summarized later in this report, has associated adverse effects with prenatal mercury doses around or even below the RfD. In this column of the table, we express the Dose from the previous column as a percent of the RfD.
- ***Relative Risk:*** There is no "bright line" between "safe" and "unsafe" exposures, and risk is generally proportional to dose. To support more effective risk communication, we have defined six relative degrees of risk, shown by color-coding in the table. Given research showing adverse effects at or below the RfD, we defined "safest" exposure as less than 25 percent of the current RfD. Each successively higher dose level (and new color) represents a doubling of exposure.

Table S-1. Relative Risk of Selected Tuna Consumption Scenarios

Child's Weight	Tuna Hg, µg/g	Amount eaten, g	Hg dose, µg	Hg dose, µg/kg	Dose as % of RfD	Risk Level
		Exposure Averaged over 1 Month				
20 kg	0.150	57	8.5	0.43	14	1
		170	25.5	1.28	43	2
	0.500	57	28.4	1.42	47	2
		170	85.1	4.26	142	4
35 kg	0.150	57	8.5	0.24	8	1
		170	25.5	0.73	24	1
	0.500	57	28.4	0.81	27	2
		170	85.1	2.43	81	3
50 kg	0.150	57	8.5	0.17	6	1
		170	25.5	0.51	17	1
	0.500	57	28.4	0.57	19	1
		170	85.1	1.70	57	3
		Exposure Averaged over 1 Week				
20 kg	0.150	57	8.5	0.43	61	3
		170	25.5	1.28	182	4
	0.500	57	28.4	1.42	203	5
		170	85.1	4.26	608	6
35 kg	0.150	57	8.5	0.24	35	2
		170	25.5	0.73	104	4
	0.500	57	28.4	0.81	116	4
		170	85.1	2.43	347	5
50 kg	0.150	57	8.5	0.17	24	1
		170	25.5	0.51	73	3
	0.500	57	28.4	0.57	81	3
		170	85.1	1.70	243	5
		Exposure Averaged over 1 Day				
20 kg	0.150	57	8.5	0.43	425	6
		170	25.5	1.28	1275	6
	0.500	57	28.4	1.42	1420	6
		170	85.1	4.26	4250	6
35 kg	0.150	57	8.5	0.24	243	5
		170	25.5	0.73	729	6
	0.500	57	28.4	0.81	811	6
		170	85.1	2.43	2431	6
50 kg	0.150	57	8.5	0.17	170	4
		170	25.5	0.51	510	6
	0.500	57	28.4	0.57	568	6
		170	85.1	1.70	1702	6

1 **Safest:** Less than 25% of the RfD

2 **Close to Safe:** 25 to 50% of the RfD

3 **Borderline:** 50 to 100% of the RfD

4 **Some Risk:** 100 to 200% (i.e., 1 to 2 times) the RfD

5 **More Risk:** 2 to 4 times the RfD

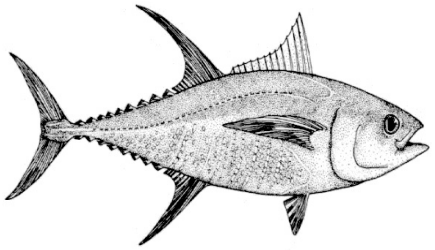
6 **Most Risky:** More than 4 times the RfD (with no upper limit)

Recommendations

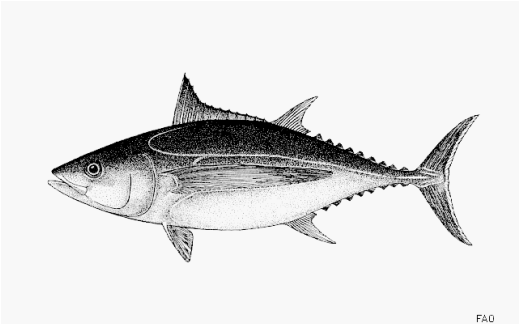
Based on Table S-1 and on our more detailed analysis, we offer these Recommendations:

1. **Children should not eat albacore tuna.** Albacore contains roughly triple the mercury content found in light tuna. Mercury levels typical of albacore are associated with most of the orange, pink and red cells (i.e., the riskier scenarios) in table S-1. There is no particular benefit associated with albacore that can justify tripling a child's mercury exposure.
2. **Smaller children should eat light tuna no more than once a month.** Small children, with body weights less than 25 kg (55 pounds), get higher doses from a given mercury intake. Since the mercury content of all types of tuna varies widely, and some light tuna contains far more than average levels, we believe it is prudent to err on the side of caution here.
3. **Schools and parents should limit most children's light tuna consumption to twice a month.** The blue and green cells in the top part of Table S-1 show that this intake generally poses low risks (and even lower, if the tuna has less than the 0.150 µg/g of mercury we used in the table). The good news is that the majority of US children currently fall well within this consumption level. The bad news is that many children eat more tuna than this relatively safe intake, and those high-end consumers bear the brunt of elevated mercury exposure and its associated risks. (See Recommendations 4 through 9.)
4. **Schools and parents should identify children who "love tuna" and eat it often, and limit them to two tuna meals per month.** Children who eat tuna once a week or more are "tuna lovers;" their mercury exposure is far above average and is likely to pose a significant risk. It is not clear how many such children there are, because of sparse food intake survey data for young consumers, but nationally, millions of kids are "tuna lovers." The many yellow, pink and orange cells in the middle section of Table S-1 show that most children who eat tuna weekly are getting too much mercury.
5. **Children should never be allowed to eat tuna every day.** The many red cells in the bottom section of Table S-1 show how very high the mercury doses are for children who eat tuna daily. Such children are quite rare, but certainly do exist. (See the sidebars on pages 16, 17 & 18 for three cases in which children were diagnosed with methylmercury poisoning caused by their very high tuna consumption.)
6. **Schools, parents and other caregivers should coordinate** their efforts to manage children's mercury exposure from canned tuna, since exposure is the sum of what occurs in and out of school.
7. **Schools and parents should teach children to enjoy other seafood choices.** Salmon, shrimp and other seafood items (see Table 7, page 23) offer similar nutritional benefits but have up to 20 times less mercury than light tuna.
8. **Parents whose children eat tuna once a week or more should have the child's blood tested for mercury.** If the result is over 5 µg/L, the child's tuna consumption should be restricted and low-mercury fish should be substituted in the diet.
9. **The US Department of Agriculture should phase out subsidies for tuna in the school lunch program.** Canned tuna is overwhelmingly the largest source of US children's methylmercury exposure, and some children's overall mercury dose is clearly high enough to raise substantial risk concerns. There is no sound reason why taxpayer dollars should be used to subsidize any part of this risk. Over time, canned tuna can be replaced with low-mercury seafood (e.g., salmon, shrimp) and other protein sources.

10. **The US Environmental Protection Agency (EPA) and Food and Drug Administration (FDA) should expeditiously complete their ongoing effort to revise their joint advisory on seafood consumption and mercury exposure.** The updated advisory will be based on research results available since the current advisory was written in 2003, and it should not list canned light tuna as a "low mercury" choice, since it is nothing of the sort.
11. **The research and policy communities must urgently address the issue of short-term exposure "spikes."** There is clear evidence from animal studies that



brief peaks of toxic exposure during brain development have devastating effects, but it is difficult to apply that knowledge to human exposures, so this issue has largely been ignored in risk assessments. The bottom section of Table S-1 illustrates the short-term (24-hour) mercury doses, or spikes, that every child in every scenario gets on the day when they eat tuna. Most of the doses in this section exceed the RfD by wide margins, ranging up to 42-fold. While it remains uncertain how harmful such brief spikes of exposure are, the table makes clear that ordinary tuna consumption by children routinely produces high short-term spike doses. This suggests a need for additional caution in limiting children's mercury exposure from canned tuna, and cries out for a concerted effort to reduce the uncertainties.



12. **Schools should try to avoid buying tuna from Ecuador and other Latin American countries.** Our tests and a larger earlier study (described later in this report) have shown that tuna from Latin America has consistently above-average mercury levels. When ordering from suppliers, schools should ask specifically for tuna caught by US fleets or imported from Asia.
13. **The FDA should meet with other researchers to determine why its reported mercury levels in albacore tuna are substantially lower than what other analysts have found.** Our testing is the latest of several studies (described later in this report) that have consistently found more mercury in albacore tuna than FDA's tests have found. This disparity is puzzling and must be addressed.