



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OFFICE OF
WATER

TECHNICAL MEMORANDUM

DATE: March 11, 2004
RE: Origin of 1 Meal/Week Noncommercial Fish Consumption Rate in National Advisory for Mercury

Background

The national advisory states that, for noncommercial fish, consumers should first consult any local advisories that may pertain to their catch. In case of no local advisory, consumers are advised to restrict consumption to 1 meal/week. Because states and tribes have not monitored nor posted advisories on all waters in the U.S., the noncommercial fish consumption advice is provided as a baseline of protection. This technical memorandum provides the methodology from which the default safe consumption rate is derived.

Introduction

Statistics on mercury concentrations in noncommercial fish were calculated from a national database. Mean fish tissue concentrations were compared against default fish consumption limits for mercury, as presented in EPA guidance. Noncommercial fish can be consumed at a rate of one 6-oz. meal of fish per week for the vast majority of species.

Fish Tissue Database

Database: National Listing of Fish and Wildlife Advisories (NLFWA), US EPA, 2003.
Date range: All dates covering a range of years from 1987 to 2003.
Species selected: All species with data from at least 100 sampling stations in the database.
Sample type: Fillet only. Whole fish samples not included, as these are relevant for ecological risk.
Additional Notes: The NLFWA fish tissue database is data voluntarily provided to EPA, representing sampling and analysis performed by States and Tribes for the purpose of fish consumption advisory assessments. Thus the data collection is targeted to those areas of concern for increased fish contaminant levels. All fish data are from adult fish. Juveniles and fish organs are not included in the database as such data are relevant for ecological risk assessments, rather than human health risk assessments.

Fish Tissue Statistics

Statistics for each species are provided in Table 1. All of the statistics calculated for Table 1 are based on sampling station averages (means). That is, the mean value was calculated at each sampling station for each species. The statistics shown in Table 1 (count, mean, median, minimum, and maximum), then are calculated based on the station level averages. While some stations had as few as a single sample per species, others might have hundreds of samples. Thus, using station-level averages eliminates biasing toward stations with a large number of samples, and produces statistics that are more representative of the entire population of sampling stations. From Table 1, one can see that species means range from 0.06 ppm to 0.96 ppm, but that the bulk of the species (27 out of 34) have average mercury concentrations between 0.13 ppm and 0.43 ppm.

Risk Based Fish Consumption Limits

US EPA, 2000, Table 4-3 (see attachment) presents risk-based fish consumption limits which relate the number of fish meals that can be eaten per month to fish tissue concentrations of methylmercury. The inputs used in the development of Table 4-3, are described in Section 3.3 of the same document (US EPA, 2000). These include:

Reference Dose (RfD): 1×10^{-4} mg/kg-d.
Meal Size: 8 oz., uncooked corresponding with 6 oz. cooked as used in the national advisory.
Body Weight: 70 kg, average body weight of adult males and females combined, in the U.S. population.



Derivation of Safe Fish Consumption Rate

US EPA, 2000, Table 4-3 (see attachment) presents safe fish consumption rates corresponding to various ranges of mercury contaminant concentrations. While Table 4-3 is quite detailed, most states have issued fish consumption advisories according to a more coarse consumption rate categorization, i.e.: no consumption, 1 meal/month, 1 meal/week, and 2 meals/week. At this categorization, states typically collapse the 2-4 meals/month consumption rates to a single 1 meal/week category. That is, by Table 4-3 (US EPA, 2000), one can safely consume 2 meals/week at concentrations ranging from >0.078 ppm to 0.12 ppm, and should consume no more than 1 meal/month at concentrations ranging from >0.47 ppm to 0.94 ppm. As can be seen from Table 1, below, the vast majority of fish species with contamination data (27 out of 34 species) have concentrations within the coarse 1 meal/week range (i.e. 2-4 meals/month range or > 0.12 ppm - 0.47 ppm). Thus, the general consumer should be advised to eat no more than 1 meal/week of noncommercial fish in the U.S.

Note: Collapsing the 2-4 meal/month consumption rate to a 1 meal/week consumption rate strikes a balance between a too detailed advisory that would overwhelm or confuse most consumers, and simplified advice that balances risks from mercury with the benefits of fish. Consumers are encouraged to use more detailed information where available for the waterbodies on which they fish, and the fish species they choose to consume. Also, as can be seen from the minimum and maximum values in Table 1, mercury concentrations in fish vary considerably from waterbody to waterbody and region to region. Consumers should, first and foremost, consider any local advisories.

Table 1. Mercury Contamination Statistics by Species*

Species	# Stations	Concentration Statistics (ppm)			
		Mean	Median	Minimum	Maximum
Bowfin	358	0.96	0.82	0.02	4.80
Chain pickerel	250	0.61	0.54	0.05	2.25
Largemouth bass	2,425	0.43	0.34	0.00	4.47
Walleye	1,520	0.40	0.34	0.02	3.30
Warmouth sunfish	147	0.39	0.34	0.02	1.36
Flathead catfish	158	0.37	0.21	0.02	2.31
Spotted bass	163	0.36	0.28	0.02	1.72
Northern pike	1,322	0.35	0.30	0.01	1.78
Lake trout	160	0.30	0.25	0.05	1.70
Sauger	109	0.28	0.18	0.03	1.40
Smallmouth bass	738	0.27	0.22	0.01	2.50
Yellow bullhead	185	0.27	0.18	0.00	1.38
Striped bass	146	0.27	0.25	0.01	1.05
Redear sunfish	215	0.26	0.21	0.01	1.58
Yellow perch	604	0.22	0.17	0.01	1.55
White perch	133	0.22	0.15	0.01	1.05
Freshwater drum	226	0.22	0.16	0.01	1.91
White bass	212	0.21	0.14	0.01	1.30
White crappie	352	0.19	0.11	0.01	1.70
Black crappie	652	0.19	0.14	0.00	1.50
Rock bass	376	0.19	0.17	0.01	0.69
Channel catfish	1,213	0.18	0.12	0.00	7.00
Rainbow smelt	116	0.18	0.14	0.02	0.67
Brown trout	131	0.16	0.12	0.01	1.25
Bluegill sunfish	1,062	0.15	0.10	0.01	4.49
Carp	426	0.14	0.10	0.01	1.84
Common carp	737	0.14	0.12	0.00	1.80
Pumpkinseed sunfish	107	0.13	0.09	0.01	1.02
Brown bullhead	214	0.13	0.08	0.01	2.46
White sucker	714	0.11	0.09	0.01	0.68
Rainbow trout	119	0.11	0.10	0.01	0.51
Black bullhead	130	0.10	0.07	0.01	0.68
Gizzard shad	151	0.09	0.10	0.01	0.40
English sole	241	0.06	0.06	0.02	0.13

* Data source: U.S. EPA NLFWA fish tissue database. October 2003.

Concentration statistics based on sampling station averages.

Shading indicates safe consumption rate associated with mean conc.:

1 meal/mo.	2 meal/mo.	3 meal/mo.	4 meal/mo.	8 meal/mo.	12 meal/mo.
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References

US EPA, 2000. *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 2: Risk Assessment and Fish Consumption Limits, Third Edition*, Office of Water, November 2000, EPA-823-B-00-008.

US EPA, 2003. National Listing of Fish and Wildlife Advisories (NLFWA): Fish Tissue Database. Data export October 2003. Available at: <http://www.epa.gov/ost/fish/>.

Attachment

*Table 4-3 from US EPA, 2000.
Consumption rates presented in meals/month.
Divide by four to obtain consumption rates in meals/week.*

Table 4-3. Monthly Fish Consumption Limits for Noncarcinogenic Health Endpoint - Methylmercury

Risk Based Consumption Limit ^a	Noncancer Health Endpoints ^b
Fish Meals/Month	Fish Tissue Concentrations (ppm, wet weight)
Unrestricted (>16)	0 - 0.029
16	>0.029 - 0.059
12	>0.059 - 0.078
8	>0.078 - 0.12
4	>0.12 - 0.23
3	>0.23 - 0.31
2	>0.31 - 0.47
1	>0.47 - 0.94
0.5	>0.94 - 1.9
None (<0.5)	>1.9

^a The assumed meal size is 8 oz (0.227 kg). The ranges of chemical concentrations presented are conservative, e.g., the 12-meal-per-month levels represent the concentrations associated with 12 to 15.9 meals.

^b Chronic, systemic effects.

Notes:

1. Consumption limits are based on an adult body weight of 70 kg and an interim RfD of 1×10^{-4} mg/kg-d.
2. None = No consumption recommended.
3. In cases where >16 meals per month are consumed, refer to Equations 3-1 and 3-2, Section 3.2.1.2, for methods to determine safe consumption limits.
4. The detection limit for methylmercury is 1×10^{-3} mg/kg.
5. Instructions for modifying the variables in this table are found in Section 3.3.
6. Monthly limits are based on the total dose allowable over a 1-month period (based on the RfD). When the monthly limit is consumed in less than 1 month (e.g., in a few large meals), the daily dose may exceed the RfD (see Section 2.3).