Fish Consumption Advisory Standard Operating Guidance (SOG)
Oregon Health Authority (OHA) Fish Advisory Program

Goal

The goal of Oregon Health Authority's Fish Advisory Program is to provide information to people who eat fish from local waterbodies. The information enables people to enjoy the health benefits of eating fish in amounts that protect them from harm due to environmental contaminants in the fish. OHA strives to provide this information in ways that are accessible, culturally sensitive and tailored to the communities that need it most.

Purpose

Fish study specialists will use this guidance when evaluating fish tissue contaminant data, making advisory decisions, and communicating health risks associated with consumption of fish contaminated with environmental toxicants. OHA does not collect or analyze fish tissue samples, however, we often receive fish tissue contaminant data from partner agencies that collect and analyze these types of samples.

This guidance protocol outlines the steps to follow when evaluating fish tissue contaminant data to determine potential risks to human health and the need for fish consumption advisories that address safe eating guidelines. Other guidance used in creating fish consumption advisories include the Fish Monitoring SOG (Appendix A) and *Target Analytes for Oregon's Fish Advisory Program* (Appendix B).

The following steps will ensure that the fish study specialist addresses each advisory meal recommendation using the best technical knowledge available along with the combined expertise of the fish advisory team.

1. Sampling and fish Tissue analyses

1.1 Obtain fish tissue data from program partners, published data, and other sources.

1.1.1 Ask partner to put data into OHA fish tissue delivery template so as to minimize errors in interpreting partner data format. Template is available at I:\EPH\Healthy Waters\FISH and SHELLFISH\Tools and Guidance\SOGs

1.1.2 Compare original data to template data to ensure the partner properly translated the data into the OHA format.

1.2 Review data to ensure fish collection and analysis procedures were followed in accordance with the Fish Monitoring SOG (Appendix A) and/or EPA guidelines (https://www.epa.gov/sites/default/files/2018-11/documents/guidance-assess-chemical-contaminant-vol2-third-edition.pdf).

1.3 Prepare dataset for analysis.

1.3.1 The OHA fish tissue delivery template is a workbook that uses tabs or worksheets to separate the fish by species. Each tab, representing a single species, groups results by analyte. These analytical result groupings must be further grouped and analyzed by individual vs. composite samples, then by whole body vs. fillet.

1.3.1.1 For groupings of individual fish to be considered for analysis, the group must have at least 5 individual fish, not including field duplicate samples (sometimes labeled "FD") or samples with "ND" (No data) results. If at least one of the 5 sample results is unqualified, meaning the result was greater than the method quantitation limit and not an estimated result, then that group can be analyzed. Be sure to remove the field duplicate and ND samples from the group.

1.3.1.2 For groupings of composite samples at least one of the sample results must be unqualified, meaning the result was greater than the method quantitation limit and not an estimated result, to be considered for further analysis.

1.3.2 Handling qualified data (e.g., estimates and less-than's).

1.3.2.1 Estimated data can generally be used as-is; however, a large amount of estimated data may indicate systemic QA/QC issues that deserve further investigation.

1.3.2.2 Left-censored data (aka less-than's) are those results for contaminant concentrations that are either below the ability of the analytical method to detect (method detection limit) or are detectable but below the ability of the analytical method to confidently quantify (method or practical quantification limit). Substitution of an arbitrary value (whether the value of the limit, half of the

limit, zero or some other number) is a frequently used but oversimplified solution that will bias group statistics. EPA provides a statistical software (ProUCL) to handle datasets that include censored and uncensored data. This software can be used to impute values for left-censored results.

1.4 Screening and basic statistics.

1.4.1 For each fish species representing a particular location and for each particular analyte, compare the maximum concentration to its screening value in Appendix B. If the maximum concentration is less than the screening value then no further analysis is needed for the particular species/location/analyte.

1.4.2 Individual fish sample datasets (whole or fillet):

1.4.2.1 Calculate the total number of individual fish (N), maximum concentration (max) and minimum concentration (min) of the dataset.

1.4.2.2 Calculate the arithmetic mean.

$$Arithmentic\ mean\ = \frac{\sum measured\ concentrations\ (c)}{number\ of\ fish\ (N)}$$

Compare the mean concentration to its screening value in Appendix B. If the mean concentration is less than the screening value, then no further analysis is needed for the particular species/location/analyte combination.

1.4.2.3 Calculate Standard Deviation.

$$Standard\ Deviation\ = \sqrt{\frac{\sum(c - mean)^2}{N - 1}}$$

Or use STDEV function in Excel or equivalent function in statistical software

1.4.2.4 Chart fish size vs. contaminant concentration

1.4.3 Composite samples (whole body or fillet) or data sets with a mixture of composite samples and results for individual fish samples:

1.4.3.1 Calculate the total number of individual fish (N), maximum concentration (max) and minimum concentration (min) of the dataset.

1.4.3.2 Calculate a grouped mean. Multiply the concentration of each sample (c) by the number of fish in the composite (n). When individual fish samples are included in the dataset, (n) = 1 for those individual samples. Then sum (∑) all multiplied composite (and/or individual) values and divide by the total number of fish in the dataset (N) (not the number of composite samples). *This method gives more weight to composite samples that contain more fish*.

$$Grouped\ mean\ = \frac{\sum cn}{N}$$

Compare the mean concentration to its screening value in Appendix B. If the mean concentration is less than the screening value, then no further analysis is needed for the particular species/location/analyte combination.

1.4.3.3 Calculate standard deviation:

$$Standard\ Deviation\ = \sqrt{\frac{\sum c^2n - (\sum(cn)^2)/N}{(N-1)}}$$

1.4.4 Chemical classes – OHA evaluates health risks for some chemicals as classes. These include polychlorinated biphenyls, dioxins and furans, and some groups of chlorinated pesticides. Individual chemicals within these classes are called "congeners." Usually, the agency that provides fish tissue data will calculate the aggregate concentration for each class of chemicals before providing the data to OHA. In these cases, OHA will use the aggregated concentration for the chemical class that the partner agency provides. In some rare cases, partner agencies may not do this aggregate calculation. If that is the case, OHA may ask the partner agency to do that calculation and provide the updated data. If the partner agency is unable to do these calculations, OHA may have to do it. In these cases, OHA will count congeners that were not detected in

the analysis as zeros when calculating the aggregate concentration for the class for each sample. This is another indirect way that OHA recognizes the health benefits of fish consumption by allowing slightly more fish consumption than would result from other methods of handling undetected congeners when summing an aggregate value, such as imputing half of the detection limit.

2 Risk Assessment

Limit advisories to non-cancer health effects as cancer risk models are more likely to over-estimate risk. Over estimating risk causes consumers to unnecessarily forgo the health benefits of eating fish. When calculating risk and meal consumption limit calculations, use toxicity values from Target Analytes for Oregon's Fish Advisory Program (Appendix B).

2.1 Identify fish species (native and non-native) found in the water body. Differentiate hatchery raised fish (stocked by ODFW) from native fish of the same species, using ODFW identifiers (mainly adipose fin clipping).

2.2 Determine if migratory fish are land locked (i.e., by a dam or other structure). If so, they are considered resident fish.

2.3 Compare mean concentration for each contaminant and fish species with its screening value from the *Target Analytes for Oregon's Fish Advisory Program* document (Appendix B). Consult a toxicologist about contaminants not included in the *Target Analytes* document.

2.4 Identify target populations if known (i.e., who is likely to be catching and eating the fish? Who are the most vulnerable?)

2.5 Use body weights of target populations in calculations if known (if unknown use default values from EPA guidance [70 kg])

2.6 Calculating recommended monthly meal limits for single or multiple contaminants.

2.6.1 Equation for use with a single contaminant:

$$Meals\ per\ month\ = \left(\frac{BW \times 30.44 \frac{days}{month}}{0.227\ \frac{kg\ fish}{meal}} \right) \times \frac{RfD}{C}$$

Where:
RfD = Oral reference dose or other toxicity value from the *Target Analytes for Oregon's Fish Advisory Program* document (Appendix B) (milligrams contaminant per kilogram body weight per day [mg/kg-day])

BW = Body weight (kg); assume 70 kg if site-specific information is not available
C = Mean concentration of contaminant, measured as mg contaminant per kg fish tissue (wet weight) (mg/kg)

2.6.2 Equation for use with multiple contaminants: This equation accounts for additive toxicity of multiple contaminants for each fish species and size class.

$$Meals\ per\ month = \left(\frac{BW \times 30.44\ days/month}{0.227\ kg\ fish/meal}\right) \times \frac{1}{\sum_{m=1}^{x} \frac{C_m}{RfD_m}}$$

Where:
RfD_m = Reference dose or toxicity value for contaminant *m*
C_m = Mean concentration of contaminant *m*
BW = same as above

Note: *Toxicity from multiple contaminants should only be added together if the contaminants target the same organ system or have similar health effect (e.g.: toxicity from PCBs and mercury can be added together because both target fetal brain development. Toxicity from individual PFAS chemicals should also be added).*
If unsure about a specific combination of contaminants, consult a toxicologist or look up the endpoint used in the critical study for a given contaminant in EPA's Integrated Risk Information System (www.epa.gov/IRIS).

2.7 Round to nearest whole meal. When post-decimal digit is 5, round up unless it would change the meal recommendation from zero to 1 meal per month. If the calculated meal recommendation is between 0.6 and 1 consider on a case-by-case basis whether zero or 1 meal per month is most appropriate. Rounding up on 5 allows for more fish consumption which is consistent with the health benefits of eating fish.

2.8 Identify risk-driving contaminant or risk driving combination of contaminants (this is the contaminant associated with most restrictive recommended meal limit)

2.9 Whenever mercury is among the risk-driving contaminants, two sets of meal recommendations should be calculated – one for vulnerable populations and one for everyone else. Use the two RfDs listed for

mercury in the *Target Analytes for Oregon's Fish Advisory Program* document (Appendix B) as the basis for the different meal limits and refer to the guidance document *Technical Memo on the Use of an Alternate Toxicity Value for Methylmercury Applied to Healthy Adults* (Appendix C)

2.10 Lipophilic contaminants like PCBs, dioxins/furans, and organochlorine pesticides primarily accumulate in the fatty portions of the fish. Studies have shown that removal of skin and internal organs can reduce the concentration of lipophilic contaminants measured in the whole body of the fish by 50%. OHA has learned that people from some cultures typically eat the whole body of the fish including internal organs. Often, these are historically marginalized and underserved groups.

Therefore, as part of OHA's commitment to health equity and environmental justice, OHA will calculate and provide to the public separate sets of meal recommendations for lipophilic contaminants for "whole body" and "fillet only" consumption.

If the fish tissue data used were analyzed as whole-body, then prior to calculating recommended meal limits the mean concentrations of lipophilic contaminants should be divided by 2 for the "fillet only" meal recommendation. For the "whole body" meal recommendation, use the whole-body mean concentration of lipophilic contaminants without adjustment. If the fish tissue data used were analyzed as fillet only, consider multiplying the mean concentration of lipophilic contaminants by 2 to calculate a "whole body" meal recommendation. Support for this approach can be found here: (https://www.fish.state.pa.us/images/fisheries/fcs/pcb_fishtech.pdf) and in Appendix C of EPA's Guidance on Chemical Contaminant Data for Use in Fish Advisories Volume 2 (https://www.epa.gov/sites/default/files/2018-11/documents/guidance-assess-chemical-contaminant-vol2-third-edition.pdf).
Hardcopies of these documents can be found by asking a toxicologist. In addition to the support from these two documents, the Washington Department of Health also applies this 50% reduction factor to whole-body data for lipophilic contaminants.

2.11 Make general meal limit recommendations across species of similar trophic levels (e.g., recommended meal limits for smallmouth

bass should be used for all top predator, non-migratory, warm water fish such as largemouth bass, northern pike minnow, yellow perch, etc.).

Note: *Based on data from Phillips Reservoir and information from ODFW biologist Dan Van Dyke, yellow perch likely have mercury concentrations as high as bass if not higher due to this species predatory nature. Therefore, yellow perch should be evaluated on the same trophic level as bass whenever both species are present in the same water body and bass have been sampled.*

Bluegill and crappie are considered "panfish" and are mid-low level predators. They typically have significantly lower mercury levels than bass and other high level predator species.

3 Fish Consumption Advisories

To issue advisories OHA takes the following actions:

- 3.1 Summarize recommendations in a technical report
  - 3.1.1 Date
  - 3.1.2 Title with type of fish, geographic location and risk-driving contaminants identified
  - 3.1.3 Water body background information – include formal and common water body names, location with respect to nearest municipality or commonly recognized landmark, county/counties of locale, fishery information (including native and non-native species present and stocking information from ODFW), information on why the study was conducted and by which agencies
  - 3.1.4 Assessment
    - 3.1.4.1 Sample collection summary – include the number and type of samples (composite vs. individuals), sample matrix (fillet, whole fish, etc.), species of fish, size classes, sample locations and sample collection dates
    - 3.1.4.2 Results of statistical analysis in section 1.3
    - 3.1.4.3 Risk assessment summary from sections 2.1 – 2.11
    - 3.1.4.4 Results- include the proposed allowable daily and monthly meal limits for each affected population associated with each fish species and size class and

for each specified risk-driving contaminant (from section 2.8)

3.1.4.5 Discussion and summary – include meal limit recommendations in a narrative, or in tabular format if there are multiple recommendations. Discuss data limitations and recommendations for improving future studies. Always highlight potential policy implications

3.2 Compile stakeholder list – Name, phone number and email of contacts if possible (separate document from the rest of the technical memo). List should include at a minimum:

- 3.2.1 Media
- 3.2.2 Technical contacts, to include other state or federal agencies with an interest in the advisory
- 3.2.3 County health department(s) responsible for the area(s) covered by the advisory
- 3.2.4 Tribes with fishing rights in the area
- 3.2.5 Any local fishing organizations known to fish in the area

3.3 Technical report feedback and action

- 3.3.1 Solicit feedback from internal and external program partners.
- 3.3.2 Incorporate feedback, as applicable and document actions to be taken in the Technical Report.
- 3.3.3 Submit report to section manager for approval and to others as necessary.

3.4 Risk and Tribal Communications

- 3.4.1 Follow the steps outlined in the Fish Advisory Procedures Checklist to ensure necessary risk and Tribal communications are performed. The checklist will guarantee that key internal and external stakeholders, the nine federally recognized Tribes in Oregon, and the Tribes and Tribal Nations in Washington and Idaho have an opportunity to review documents and participate in the process. The checklist also outlines the steps OHA takes to inform the public of important information on fish consumption that can help to reduce exposure to contaminants in fish and shellfish, when data is available.
- 3.4.2 Discuss with local water body managers recommendations for sign posting. Work with the manager to develop and create signage that would alert fishers to an applicable

advisory and where to go to get additional information about species and meal consumption recommendations.

4 Lifting an Advisory

If new data indicate that an advisory can be lifted, reclassify the advisory as a safe eating guideline. Follow the steps described in section 3 including the Risk Communication section described in section 3.4.

Note: *More than 23 meals/month is considered "unlimited" and no number is associated with this amount.*

Revision summary:

December 2014 revisions are most apparent in Sections 1.3, 2.3, and 2.6. Revisions included addition of equations for calculation of means, variance, and standard deviation for different types of data sets including those that contain composite samples. December revisions also included addition of guidance for accounting for additive toxicity among mixtures of contaminants in fish tissue when calculating recommended meal limits.

2021 revisions included:

- A rewrite of section 3.4 that directs staff to the Fish Advisory Procedures Checklist where a complete list of steps involved in risk and Tribal communications are outlined.
- Appendix B revision to include congener specific analysis of per- and polyfluoroalkyl (PFAS) substances to the list of target analytes with reference doses and screening levels.

2022 revisions included:

- Addition of section 1.3.3 describing OHA's approach to calculating aggregate concentrations of chemicals whose risk is evaluated as a class.
- Simplification of guidance on rounding to nearest whole meal.
- Formalized guidance on calculating separate meal recommendations for "whole body" and "fillet only" consumption in section 2.10.
- Eliminated distinction between "fish advisories" and "Safe eating guidelines." The concept of safe eating guidelines was intended to reduce OHA workload in terms of community engagement and outreach in cases where meal recommendations were less restrictive. Subsequent

experience has shown that the volume of fish consumption advisories is too low to justify separate designations that may potentially confuse the public; in other words, for purposes of communicating risk to the public, it is better to offer a single "advisory."
- Modification of screening levels in Appendix B to match the fish consumption rate that the Oregon Department of Environmental Quality recommended in 2011[1] and became effective in rule as of 2014[2] for developing human health water quality criteria. This consumption rate is 175 grams per day or 23 eight-ounce meals per month and is informed by Tribal Nations in the Pacific Northwest.[3]

2023 revisions included:

- Updated links to EPA National Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 2.
- Added instructions to section 1 to compare original dataset to those same data provided in the OHA template to ensure transcription of data was accurate.
- Section 1 guidance on grouping and separating data used in analysis from excluded data.
- Section 1 guidance on handling qualified data (e.g., estimates and less-than's).
- Section 1 guidance on screening contaminant data versus Appendix B.
- Corrected equation for use with multiple contaminants in 2.6.2.
- Added values for antimony and benzo(a)pyrene in Appendix B.

2024 revisions included:

- Added values for Perfluorohexanoic Acid (PFHxA) in Appendix B.

Appendix A

FISH MONITORING STANDARD OPERATING GUIDANCE (SOG)
Guidance for the Oregon Health Authority (OHA) and its partners.

[1] "Human Health Criteria Issue Paper" Oregon Department of Environmental Quality 2011 (https://www.oregon.gov/deq/FilterDocs/shhToxicCritIssue.pdf)
[2] Oregon Administrative Rule 340-041-8033 Table 40 Human Health Criteria Summary (https://secure.sos.state.or.us/oard/viewSingleRule.action?ruleVrsnRsn=256054)
[3] "A FISH CONSUMPTION SURVEY OF THE UMATILLA, NEZ PERCE, YAKAMA, AND WARM SPRINGS TRIBES OF THE COLUMBIA RIVER BASIN" Columbia River Intertribal Fish Commission 1994 (https://www.critfc.org/wp-content/uploads/2015/06/94-3report.pdf)

October 11, 2010

This document will guide the OHA fish advisory program and its partners in designing and implementing fish tissue studies that generate data appropriate for use in developing human health fish consumption advisories. We encourage our partners to consult with us before and during the study design processes. However, this SOG may also be used by monitoring crews on site to alter or add to the fish study design based on the lack of/or availability of various fish species.

1. Select **waterbody sites** for fish sampling based on the following factors.

    1.1. *Contaminant(s) of concern* known or suspected in the waterbody.

    1.2. Prior sampling found fish tissue with *contaminant(s) of concern* at, or above screening values (SVs) as established according to the *Fish Consumption Advisory SOG.*

    1.3. Waterbody is heavily fished.

    1.4. Possible changes in fish contaminant levels in a waterbody through time may change advisory status.

    1.5. Need additional data for waterbodies where no contaminant concentrations exceeded the SVs to establish areas of unrestricted fish consumption or "green areas."

2. Maintain continuity and uniformity in the fish **sample species** collected for fish consumption studies.

    2.1. The EPA recommends that studies collect one bottom-feeding fish species and one predator fish species at each site.

        2.1.1. Examples of bottom-feeding fish include carp, catfish, and sucker.

        2.1.2. Predator fish preferring warm water habitats include large/smallmouth bass, crappie, walleye and sunfish.

    2.2. Salmonids prefer relatively cold-water environs and are used infrequently in Oregon fish studies. Anadromous fish such as salmon, steelhead, lamprey, smelt and shad do not reflect local contamination as they spend very little time in local streams and only during spawning.

2.3. Consult ODFW and/or the reservoir manager for known species of fish caught and consumed from each waterbody.

3. The **size of fish** collected for analyses should reflect the size of fish caught and subsequently eaten from each waterbody.

4. **Analyses of fish** should reflect the type of tissue considered to be most healthful for human consumption.

   4.1. Prepare composite fillet samples (skin on, belly flap included) for each target fish species. For scaleless species, use skin-off fillets.

   4.2. A composite sample of five fish in each of three size ranges is desirable. ODFW and/or other fishery management may be able to provide the size range of fish found in the waterbody. The smallest fish in each composite should not be more than 25% shorter than the largest in the composite and must meet ODFW's minimum size requirement for the waterbody. If possible, collect at least one replicate sample for each target species.

5. Request a **Quality Assurance Project Plan** (QAPP) for the fish collection and analyses from the partner(s) providing this work. It should cover the following standard field work.

   5.1. Sample collection procedures,

   5.2. Recordkeeping and chain of custody, and

   5.3. Sample processing, preservation, and shipping

   5.4. The QAPP should also identify technically sound analytical methods and QA and QC procedures including

      5.4.1. Detection limits capable of measuring tissue concentrations at or below SVs (OHA will make these numbers available to the participating laboratory.

      5.4.2. Procedures for data analysis and reporting of fish contamination data (i.e., wet weight for mercury concentrations).

Appendix B

Target Analytes for Oregon's Fish Advisory Program

Chemical	Form	Oral Reference Dose[4] (mg/kg-day)	Screening Value (mg/kg fish tissue)[5]
Metals			
Antimony		0.0004	0.2
Arsenic	Inorganic	0.0003	0.1
Cadmium		0.001	0.4
Mercury (Vulnerable Populations)[6]	Methylmercury	0.0001	0.03
Mercury (General population)[7]	Methylmercury	0.0003[8]	0.1
Selenium		0.005	2
Tributyltin		0.0003	0.1
Organochlorine Pesticides			
Aldrin		0.00003	0.01
Chlordane	total (cis- and trans-chlordane, cis- and trans-nonachlor, oxychlordane)	0.0005	0.2
DDT	total (2,4'-DDD, 4,4'-DDD, 2,4'-DDE, 4,4'-DDE, 2,4'-DDT, 4,4'-DDT)	0.0005	0.2
Dicofol		0.0004	0.2
Dieldrin		0.00005	0.02
Endosulfan	I and II	0.006	2
Endrin		0.0003	0.1
Heptachlor Epoxide		0.00001	0.004
Hexachlorobenzene		0.0008	0.3
Lindane	γ-hexachlorocyclohexane; γ-HCH	0.0003	0.1

[4] Unless otherwise noted, all oral reference doses are from EPA's IRIS program (http://www.epa.gov/IRIS/)
[5] Values are rounded to one significant digit. Calculations to generate these numbers used inputs with all significant digits.
[6] Vulnerable populations are children and women of childbearing age
[7] General public excluding vulnerable populations (defined above)
[8] This value is based on an older IRIS value for methylmercury, which was based on studies in otherwise healthy adults. This value is used in this way by state fish advisory programs in California, Washington, and Idaho. See Technical Memo on the Use of an Alternate Toxicity Value for Methylmercury Applied to Healthy Adults.

Chemical	Form	Oral Reference Dose[4] (mg/kg-day)	Screening Value (mg/kg fish tissue)[5]
Methoxychlor		0.005	2
Mirex		0.0002	0.08
Toxaphene[9]		0.002	0.8
Organophosphate Pesticides			
Chlorpyrifos		0.0003	0.1
Diazinon		0.0007	0.3
Disulfoton		0.00004	0.02
Ethion		0.0005	0.2
Terbufos		0.00002	0.008
Chlorophenoxy herbicides			
Oxyfluorofen		0.003	1
Polychlorinated biphenyls (PCBs)	Total (sum of congeners)	0.00002	0.008
Polycyclic Aromatic Hydrocarbons (PAHs)			
Benzo(a)pyrene		0.0003	0.1
Dioxins/furans	TEQ	0.0000000007	0.0000003
Brominated flame retardants	Congener-specific analysis		
BDE-47		0.0001	0.04
BDE-99		0.0001	0.04
BDE-153		0.0002	0.08
BDE-209		0.007	3
Per- and polyfluoroalkyl substances (PFAS)	Congener-specific analysis		
Perfluorooctane sulfonic acid (PFOS)[10]		0.0000041	0.002
Perfluorooctanoic Acid (PFOA)[6]		0.000017	0.007
Perfluorononanoic Acid (PFNA)[6]		0.0000034	0.001
Perfluorohexanoic Acid (PFHxA)		0.0005	0.2
Perfluorohexane sulfonic acid (PFHxS)[6]		0.0000057	0.002

[9] ATSDR's Intermediate Oral Minimal Risk Level (http://www.atsdr.cdc.gov/toxprofiles/tp94-a.pdf); no IRIS value

[10] Oregon Health Authority Provisional Reference Dose, September 2021

Chemical	Form	Oral Reference Dose[4] (mg/kg-day)	Screening Value (mg/kg fish tissue)[5]
Perfluorobutanoic acid (PFBA)		0.001	0.4
Perfluorobutane sulfonic acid (PFBS)		0.0003	0.1
GenX – hexafluoropropylene oxide (HFPO)		0.000003	0.001

Screening values were developed from the listed RfD assuming 23 eight-ounce fish meals per month using the equation below:

$$SV = \frac{RfD \times BW}{IR \times CF}$$

Where:
SV = Screening value (mg/kg)
RfD = Oral reference dose (mg/kg-day)
BW = Bodyweight (70 kg for all but mercury which used 60 kg for pregnant women)
IR = Intake rate of fish (175 grams per day)
CF = Unitless conversion factor (0.001) to convert grams of fish to kilograms of fish

Appendix C

Technical Memo on the Use of an Alternate Toxicity Value for Methylmercury Applied to Healthy Adults

December 30, 2013
Approved 1.10.14 by Curtis Cude

Background

Different states use different toxicity values to calculate fish advisories where methylmercury is the risk driving contaminant. The Environmental Protection Agency's (EPA) Integrated Risk Information System (IRIS) provides an oral reference dose (RfD) for methylmercury (0.0001 mg/kg-day) that is based on studies in humans who were exposed to methylmercury by eating contaminated fish. These studies identified the most sensitive human health endpoint as observed impairments in fetal neurodevelopment leading to lifelong cognitive deficits in affected children. However, fish consumption itself confers many health benefits. To allow as much fish consumption as possible, states neighboring Oregon (e.g. Washington, California, and Idaho) use a less restrictive RfD for healthy adults where fetal neurodevelopment is not at risk.

Proposed Change to Toxicity Value Used for Methylmercury in Oregon Fish Advisories

Because the current RfD is based on toxicity studies that are so relevant to fish advisories for children and women of childbearing age, the current RfD of 0.0001 mg/kg-day should be used to calculate fish advisories for these vulnerable populations.

Prior to 1995, EPA's RfD for methylmercury was 0.0003 mg/kg-day (three times higher than it is today). This older value was based on toxicity endpoints relevant to otherwise healthy adults instead of fetal developmental endpoints [as reviewed in (CalEPA, 2008)]. This makes the older RfD more relevant for healthy adults not carrying developing fetuses and the current RfD more relevant for children and women of childbearing age where neurodevelopment may still be ongoing (CalEPA, 2008). California, Washington, and Idaho state fish advisory programs all use this old RfD for adult men and women beyond childbearing years.

In practice, this will mean that all fish advisories that include methylmercury will have two fish consumption recommendations. One recommendation will be for children and women of childbearing years and will be calculated using the current RfD that is based on fetal neurodevelopment as the toxic endpoint. The

second recommendation will be for adult men and women older than childbearing age, and this recommendation will be calculated using the older (pre-1995) RfD of 0.0003 mg/kg-day which is based on toxicity in adults. This change in practice acknowledges that adults have higher tolerance for methylmercury than children and developing fetuses and allows more adults to continue to enjoy the health benefits of fish consumption.

Summary

Toxicity value for vulnerable populations (children and women of childbearing age): 0.0001 mg/kg-day [current RfD]
Toxicity value for adult men and women beyond childbearing years: 0.0003 mg/kg-day [pre-1995 RfD]

Reference

CalEPA (2008). Development of Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish. Available at http://oehha.ca.gov/fish/gtlsv/pdf/FCGsATLs27June2008.pdf