

*State of Alaska
Epidemiology*



Bulletin

**Recommendations
and
Reports**

Department of Health and Social Services
Joel Gilbertson, Commissioner

Division of Public Health
Richard Mandsager, MD, Director

Section of Epidemiology
Beth Funk, MD, MPH, Editor

3601 C Street, Suite 540, PO Box 240249, Anchorage, Alaska 99524-0249 (907) 269-8000
24-Hour Emergency Number 1-800-478-0084

<http://www.epi.Alaska.gov>

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Use of Traditional Foods in a Healthy Diet in Alaska: Risks in Perspective

Second Edition:

Volume 2. Mercury

EXECUTIVE SUMMARY

Risks in Perspective - Second Edition: Volume 2.

Mercury

Executive Summary

Mercury occurs naturally in the earth's crust, is ubiquitous in the environment, and is a component of freshwater and marine fish and mammals. Human industrial activities such as coal burning contribute to the global distribution of mercury in the environment. Global mercury emissions have increased since the 1700s. Currently, known man-made emissions of mercury roughly equal known natural emissions. Mercury has many chemical forms that occur naturally in the environment. From a public health standpoint, methylmercury is the most important.

Alaskans are exposed to methylmercury primarily from ingestion of fish and marine mammals. Methylmercury concentrations in the most frequently consumed fish (e.g., salmon, cod, halibut, pollock, sole, and herring) are very low, consistently below 0.2 µg/g [parts per million, ppm, wet weight (all tissue concentrations are wet weight unless noted otherwise)]. This is one-fifth of the Food and Drug Administration (FDA) action level for commercial sale of seafood of 1 ppm. Alaska salmon average 0.05 ppm of methylmercury. Similarly for marine mammals, except for some beluga whale tissues, average methylmercury concentrations are below 0.2 ppm. Bowhead whale tissues (e.g., muscle, blubber, epidermis, liver and kidney) contain very low methylmercury concentrations (<0.02 ppm). Older fish and marine mammals that are higher on the food chain have higher concentrations of methylmercury.

Currently, there is scientific and public health agreement regarding safe levels of dietary methylmercury intake for adults. The World Health Organization (WHO) developed guidelines based upon the Minimata and Niigata, Japan poisoning outbreaks associated with heavily industrial methylmercury-polluted fish, and on an Iraqi mercury-poisoning outbreak, where grain treated with a mercury-containing fungicide intended for crops was instead used to bake bread. The WHO relied heavily upon data from these tragedies to develop a provisional tolerable weekly intake (PTWI) for methylmercury of 230 µg, and for total mercury of 300 µg. This weekly intake corresponds to a daily dose of 0.5 µg/kg/day.

Scientists, medical, and public health professionals do not agree on safe levels of dietary intake of methylmercury to protect the developing fetus. Two large-scale, rigorous, epidemiologic studies were designed to determine if subtle neurodevelopmental effects could be associated with chronic low-level *in utero* exposures. One study was conducted in the Faroe Islands; the other was conducted in the Seychelles Islands. These studies produced different results.

In the Faroe Islands study, no clinical or neurophysiological methylmercury-related abnormalities were noted in 917 children evaluated at 7 years of age. However, subtle decreases in some neurodevelopmental test results were found to be associated with low-level mercury exposure, although most test scores of highly exposed children were normal. The median maternal hair mercury concentration was 4.5 ppm. Methylmercury exposure in this cohort occurred primarily through the consumption of pilot whale meat (1-2 meals a week; average methylmercury concentration detected in pilot whale meat was 1.6 ppm) which also contained polychlorinated biphenyls (PCBs). PCBs are suspected to cause similar subtle neurodevelopmental effects. Therefore, in this cohort, it is not possible to separate the contributions of PCBs and methylmercury, or their potential interaction, to the subtle decreases noted in the neurodevelopmental tests. Nevertheless, the U.S. Environmental Protection Agency (USEPA) chose to base its recommendations for dietary exposure primarily upon the data from the Faroe Islands study.

In the Seychelles Islands study no neurodevelopmental effects were detected in 643 children. The median maternal hair mercury concentration was 6.6 ppm, an exposure higher than the Faroe Islands. Over 75% of the mothers reported eating 10-14 fish meals per week. Average fish concentrations of methylmercury were approximately 0.3 ppm. In contrast to the Faroe Islands study, exposure to PCBs or other potential neurotoxins were extremely low in the Seychelles Islands.

In 2001, the USEPA developed a new reference dose (RfD) (the safe dose that can be consumed every day

over a lifetime of 70 years without any ill effects), relying on the Faroe Islands study, for methylmercury that is 0.1 µg/kg/day. In developing their new RfD, the USEPA made a decision to dismiss the results of the Seychelles Islands study. The EPA also made a decision not to take into account the well-known health benefits of fish consumption or to assess the risks associated with loss of nutrients from the diet.

In 2001, the USEPA and FDA issued generic national fish consumption advisories recommending pregnant women, those who could become pregnant, nursing mothers, and young children to restrict consumption of recreationally caught fish to 6 ounces per week (USEPA) and commercially caught fish to 12 ounces per week (FDA). Because extensive data existed to document that many species of fish have methylmercury concentrations far below 0.2 µg/g (ppm), the average level upon which these severe dietary restrictions were based, the FDA amended the 2001 fish advisory to include the following:

“Some kinds of fish that are known to have much lower than average levels of methylmercury can be safely eaten more frequently and in larger amounts. Contact your federal, state, or local health or food safety authority for specific consumption recommendations about fish caught or sold in your local area.”

In 2001, the Alaska Division of Public Health (ADPH) convened an advisory group of public health officials, research scientists, and Native health leaders to review all available information concerning mercury exposure in Alaska. Based upon consensus, the Alaska Division of Public Health strongly recommended that all Alaskans, including pregnant women, women who are breast-feeding, women of childbearing age, and young children continue unrestricted consumption of fish and marine mammals from Alaskan waters as part of a balanced diet.

Because of the heavy consumption of fish and marine mammals in Alaska, several initiatives were begun to increase fish and human biomonitoring.

The Alaska Department of Environmental Conservation implemented a statewide fish-monitoring program. The average concentration of methylmercury in the most frequently consumed fish in Alaska (five species of Pacific salmon) is very low (<0.05 ppm). Recent human biomonitoring studies in Alaska have documented that levels of methylmercury exposure are

well below levels associated with known adverse health effects. Results from the Alaska Division of Public Health's Statewide Maternal Hair Mercury Biomonitoring Program are well below the World Health Organization's No Observed Effect Level of 14 ppm in hair. The median and mean hair mercury concentrations for pregnant women (n = 176) were 0.47 ppm and 0.71 ppm (range 0.02 – 6.35 ppm). The median and mean hair mercury concentrations for women of childbearing age (n = 60) were 0.63 ppm and 1.2 ppm (range 0.15 – 8.36 ppm). In addition, results from the Alaska Native Tribal Health Consortium's infant-maternal cord-blood study were also well below the WHO No Observed Effect Level of 56 ppb in blood. The average total mercury concentration for the Barrow area (n = 29) was 1.5 ppb (range = not detected - 4.5 ppb) and 6.5 ppb (range = 0.6 ppb – 21 ppb) for the Bethel area (n = 52).

Public health officials from the international Arctic Monitoring and Assessment Programme have monitored the impacts of arctic contaminants on human health since 1991. They concluded that the nutritional and physiological benefits of traditional arctic diets outweigh potential risks from exposure to contaminants in most areas of the Arctic, and advised local public health policy makers to encourage continued traditional food use when indicated by risk-benefit analyses.

National fish advisories are based solely upon risk assessment -- they do not consider the well-established public health benefits of fish consumption. Evaluation of food safety and the development of food consumption advice should occur within a multi-disciplinary public health framework. Fish is a healthy and readily available food item that is high in protein, low in saturated fat, and a rich source of omega-3 fatty acids and antioxidants such as selenium and vitamin E. Limiting the consumption of fish or marine mammals will reduce significant health benefits, causing unintended negative health consequences.

The Alaska Division of Public Health continues to recommend that all Alaskans, including pregnant women, women who are breast feeding, women of childbearing age, and young children continue unrestricted consumption of fish and marine mammals from Alaskan waters as part of a balanced diet. The ADPH is continuing efforts to expand human biomonitoring for methylmercury and persistent organic pollutants to monitor trends and provide evidence to support dietary recommendations.

“Use of Traditional Foods in a Healthy Diet in Alaska: Risks in Perspective” was originally published as an Epidemiology Bulletin, Recommendations and Reports on January 15, 1998. We issued a second printing in May 1999. At that time, we did not have the capacity to make the entire document available in an electronic form on our website.

We are pleased to now publish an updated, second edition. Due to the length of the document, we are publishing the second edition in three separate volumes.

**Use of Traditional Foods in a Healthy Diet in Alaska: Risks in Perspective –
Second Edition**

Volume 1. Polychlorinated Biphenyls (PCBs) and Related Compounds

Volume 2. Mercury

Volume 3. Benefits from Traditional Foods

We will be publishing an electronic version on the State of Alaska, Department of Health and Social Services, Division of Public Health, Section of Epidemiology website www.epi.Alaska.gov. Readers may request a hard copy of each volume by contacting the Section of Epidemiology at 907-269-8000 or e-mail your request to envhealth@health.state.ak.us.

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State of Alaska, Section of Epidemiology
PO Box 240249
Anchorage, AK 99524-0249

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