September 2013

National Listing of Fish Advisories NEWSLETTER

Recent Advisory News

Revised fish advisory issued for Houston and Galveston area waters

The Texas Department of State Health Services (DSHS) has issued a revised fish consumption advisory, requesting that people avoid consuming all species of fish and blue crab from the Houston Ship Channel, the San Jacinto River below the lake Houston Dam, and all waters north of Highway 146. Testing of fish and blue crab from the San Jacinto River and Houston Ship Channel showed concentrations of dioxins, pesticides, and polychlorinated biphenyls exceeded DSHS health guidelines. Regular or long-term consumption of these species from these waters may increase the likelihood of long-term health risks. Link to original article: http://www.krgv.com/news/revised-fish-advisory-issued-for-houston-and-galveston-area-waters/.

Source: Channel 5 KRGV Houston. 27 June 2013.

Scientists to study mercury contamination in the Arctic – National Science Foundation funds research

A research team from the University of Massachusetts, Lowell; Rutgers University; and the U.S. Geological Survey was awarded a three-year grant totaling nearly $830,000 to study how wetlands influence mercury contamination in the Arctic. This toxic heavy metal can be transported thousands of miles, ultimately polluting even the most remote areas of the world, such as the Arctic. The team will study alternate ways by which wetland bacteria produce methylmercury without the need for sulfate or iron. They will explore the idea that the pathway to methylmercury changes as the composition of plants in wetlands changes in response to climate warming, which is exacerbated in northern latitudes. The team hopes this study will allow them to use plant diversity to map how much methylmercury is being produced in the Arctic and how that will change over the decades to come. Link to original article: http://www.uml.edu/News/stories/2013/Mercury-in-the-Arctic.aspx.

Source: Aguirre, Edwin L. University of Massachusetts Lowell News. 10 July 2013.

New York childbearing-age women, children can eat 4 fish servings per week

The New York Department of Health has issued updated health advisories for the consumption of fish from water bodies in the state. Women ages 50 and younger and children 15 years old and younger can consume up to four meals per month of rock bass, yellow perch, and burbot and up to one meal a month of any other fish besides carp and channel catfish from the Niagara River above Niagara Falls. This same advice is also in effect for Lake Erie. These health advisories are updated annually and are based on fish samples collected from different waters throughout the state. The information is available in both statewide and regional formats and online. An advisory has also been issued to avoid consuming fish or crab from Paerdegat Basin in Jamaica Bay. The complete statewide advisories for fish and game are at the DOH website at: www.health.ny.gov/fish, or by calling 518-402-7800 (toll-free at 800-458-1158). Link to original article: http://www.upi.com/Health_News/2013/07/11/NY-childbearing-age-women-children-can-eat-4-fish-servings-per-week/UPI-50131373601540/.

Source: United Press International. www.upi.com. 11 July 2013.

Fish oil in diet may affect depression symptoms

A recent medical study found that increasing dietary consumption of docosahexanoic acid (DHA) significantly improved symptoms of major depression and that the quantity of DHA in the membranes of red blood cells correlated strongly with reduction in depression symptoms. Past studies have indicated that increasing consumption of specific fish oils, especially DHA, can reduce the symptoms of major depression. Results from a recent medical study at the University of Wollongong, Australia, correlated the concentration of DHA in the cell membranes of red blood cells with reduction in symptoms of depression. In the study, 95 participants with major depression were randomized to receive either DHA or olive oil (placebo). Over the course of 16-weeks, DHA increased within the red blood cell membranes in both groups. However, DHA comprised 16 percent of the fatty acids in the red blood cell membrane in the fish oil group and only 8 percent in the olive oil group. Improvements in depression symptoms were significantly greater in the fish oil group. Link to original article: http://www.dailyherald.com/article/20130715/entlife/707159970/.

Source: Massey, M.D. Ph.D., Patrick. Daily Herald. 15 July 2013.

Investigating fish contamination leads to questions about genetics

When it comes to fish contamination, size matters. Generally the bigger the fish the higher the concentrations of mercury. But shouldn't a fish filled with contamination get sick or die or be sore-covered, tumor-ridden, and obviously inedible? Sometimes they are, but as in the case of a species of killifish found in New Bedford harbor, fish just shrug off the contaminants. Researchers from the Woods Hole Oceanographic Institution use Scorton Creek in Sandwich as a reference for a clean, pristine site to compare polluted sites to, such as New Bedford harbor. The harbor is a Superfund designated clean-up site that is contaminated with PCBs and if you were to expose killifish from Scorton Creek to the PCB levels in the New Bedford harbor, they would develop an array of toxicities, whereas the killifish from the harbor are just fine. The researchers are trying to determine why and how on a molecular level the killifish in New Bedford are capable of surviving and often thriving in such polluted waters. Information learned from studying the genetic differences in fish populations could lead to a basic understanding of how genetic differences in people influence how our own bodies respond to chemicals. Link to original article: http://capeandislands.org/post/investigating-fish-contamination-leads-questions-about-genetics.

Source: Corcoran, Sean. Cape and Islands National Public Radio. 16 July 2013.

United States halts salmon imports from Chile due to contamination

The U.S. Food and Drug Administration banned the importation of salmon from a major producer in Chile on July 17, 2013, following the discovery of the banned carcinogenic chemical known as crystal violet in a shipment of the fish. The Norwegian company who farms the contaminated salmon in Chile, launched an official investigation into the source of the crystal violet. The chemical is used as an antifungal agent in food preparation and animal feed and is banned in both Chile and the United States due to its carcinogenic effects. The company issued a statement that it does not use crystal violet, and their own analysis and that of official Chilean bodies did not detect it in the salmon. Link to original article: http://www.santiagotimes.cl/business/economy-a-trade/26473-us-halts-salmon-imports-from-chile-due-to-contamination.

Source: Stone, Hannah. The Santiago Times. 18 July 2013.

More EPA testing at Donna Reservoir aims to find contamination source

The U.S. Environmental Protection Agency (EPA) is conducting another round of testing near the Donna Reservoir and surrounding canal system in Donna, Texas, where scientists have long deemed waters to be contaminated with polychlorinated biphenyls (PCBs). These chemicals accumulate in the tissue of fish that swim in the water and can cause cancer and other illnesses if consumed. The EPA declared the area a Superfund site in 2008 because it contained uncontrolled hazardous waste. There has been a ban on keeping fish caught in the area since 1994, but those warnings have done little to deter locals from fishing and consuming the fish. This reaction is a familiar story for EPA officials, as they continue to pursue studies on the extent of the contamination and its source. EPA fish removal efforts have taken about 36,000 fish from the canals

Conferences

American Fisheries Society 143rd Annual Meeting
September 8-12, 2013, Little Rock, Arkansas
http://afs2013.com/

Exploring the Exposome: The Future of Exposure Assessment at the 246th American Chemical Society (ACS) National Meeting and Exposition
September 8-12, 2013, Indianapolis, Indiana
http://www.isesweb.org/Meetings/Docs/ACSCallForPapers_Jan2012ENVR02312013_3.pdf

The Society of Environmental Toxicology and Chemistry (SETAC) North America 34th Annual Meeting
November 17-21, 2013, Nashville, Tennessee
http://www.setac.org/events/event_details.asp?id=244644

Monitoring and Management of Red Tides & HABs Conference
November 10-11, 2013, Dubai
http://www.icmevents.in/conference/Monitoring_andstr_Management_of_Red_Tides_andstr_HABs_Conference/overview

Aquaculture America 2014 – The World Aquaculture Society
February 9-12, 2014, Seattle, Washington
http://www.marevent.com/AA14seattle.html

and reservoir since 2009; 3,000 fish were pulled from the lake in October 2012. Most of those fish were destroyed to prevent locals from catching and eating them but scientists tested 16 fish and found PCBs in 12. Link to original article: http://www.themonitor.com/news/local/article_b6315ca8-ef49-11e2-b92b-001a4bcf6878.html.

Source: Findell, Elizabeth. The Monitor. 18 July 2013.

No link between prenatal mercury exposure and autism-like behaviors found

A recent study, which draws upon more than 30 years of research in the Republic of Seychelles, reports that there is no association between prenatal mercury exposure and autism-like behaviors or evidence of a correlation between low level mercury exposure and autism spectrum-like behaviors among children whose mothers ate on average up to 12 meals of fish per week while pregnant. The Seychelles Child Development Study, started in the mid-1980s for the specific purpose of studying the impact of fish consumption and mercury exposure on childhood development, is one of the largest ongoing studies of its kind. The autism study involved 1,784 children, adolescents, young adults, and their mothers. The researchers determined levels of prenatal mercury exposure by analyzing hair samples that had been collected from the mothers around the time of birth, allowing the researchers to estimate mercury levels found in growing fetus. The team then employed two questionnaires to establish whether or not the participants were exhibiting autism spectrum-like behaviors. The mercury levels of the mothers were matched with the test scores of their children and the researchers found no correlation between prenatal exposure and evidence of autism-spectrum-like behaviors. Furthermore, the study found no consistent association in children with mothers with mercury levels that were six to ten times higher than those found in the United States and Europe. Link to original article: http://www.sciencedaily.com/releases/2013/07/130723113753.htm.

Source: Science Daily. 23 July 2013.

Suit threat over how much fish eaten in Washington

On July 23, 2013, multiple environmental groups threatened to sue the U.S. Environmental Protection Agency (EPA) for an alleged lack of enforcement on fish consump-

tion rates. Puget Soundkeeper Alliance, EarthJustice, and several Riverkeeper groups said the EPA must require the State of Washington to revise its fish consumption rate, which is how the state determines the health of Puget Sound and its fish and what emissions standards it needs to require of communities and industry. The groups claim the current consumption rate is based on outdated studies. The current number is 6.5 grams, which means the average Washington state resident eats 6.5 grams of fish, the equivalent of approximately one bite every day. According to these groups, some Washington residents eat much more fish. Other states' rates are much higher, such as Oregon which has a consumption rate of 175 grams per day. During the last legislative session industry groups fought efforts to increase Washington state's consumption rate. Many of the groups have issued press releases stating the number is too low and that not enough is being done to regulate discharges into state waters. Link to original article: http://www.kgw.com/lifestyle/green/Suit-threat-over-how-much-fish-eaten-in-Wash-216766241.html.

Source: Chittim, Gary. King 5 News. 24 July 2013.

Safe Seafood Project is raising expectations

The ECsafeSEAFOOD project held its second coordination meeting in Brussels, Belgium, in June 2013. The goal of this project is to assess food safety issues related to priority contaminants present in seafood as a result of environmental contamination and to determine their impact on public health. The ECsafeSEAFOOD consortium is led by the Portuguese Institute of Sea and Atmosphere and includes 18 partners from ten countries in the European Union. European added-value in the global seafood market lies in offering safe, high-quality seafood to consumers. Accordingly, the ECsafeSEAFOOD project will provide scientifically-based advice to facilitate the development of common food safety, public health, and environmental policies and measures. This is an interdisciplinary project bringing together scientists from a variety of food science disciplines: ecotoxicology; biochemistry; nutrition; risk assessment; seafood quality; and consumer behavior and perceptions. The project is divided into scientific work packages that will address these issues. For more information on ECsafeSEAFOOD, please visit: www.ecsafeseafood.eu. Link to original article: http://www.thefishsite.com/fishnews/20832/safe-seafood-project-is-raising-expectations.

Source: TheFishSite News Desk. 24 July 2013.

Scientific team collects fish to test

A research team from the U.S. Army Public Health Command Water Resources Program (USAPHC) at Aberdeen Proving Ground, Maryland, is collecting fish off the shores of the U.S. Army Kwajelein Atoll (USAKA), located in the Republic of the Marshall Islands, for testing. USAKA is comprised of more than 100 islets, 11 of which currently serve as a testing range for ballistic missiles. The USAPHC has conducted surveys and provided environmental consultation services to USAKA for more than 25 years. The goal of this research is to determine if the consumption of fish from USAKA poses an unacceptable health risk to local fishermen. Several hundred fish were collected during a multi-week field investigation to assess the accumulation of potential contaminants that might affect the local population. Tissue samples were taken from 60 different fish species to determine if they were safe for consumption. Contamination in the harbor area from industrial processes, such as sandblasting ships and the use of pesticides, have raised concerns about the consumption of fish from the local area; however, previous studies indicated that the marine water quality is impaired only within the immediate vicinity of industrial activities near the harbor and local landfill. The final report from this study will make recommendations for future actions, if necessary, to ensure the safety and public health of the Marshallese people and others who live and work in USAKA. Link to

original article: http://www.fortcampbellcourier.com/news/article_384c1e82-f556-11e2-8a7a-0019bb2963f4.html.

Source: Gervasoni, Jane. The Fort Campbell Courier. 25 July 2013.

Fish oil consumption linked to lower breast cancer risk in study

A research team from the U.S. Army Public Health Command Water Resources Program (USAPHC) at Aberdeen Proving Ground, Maryland, is collecting fish off the shores of the U.S. Army Kwajelein Atoll (USAKA), located in the Republic of the Marshall Islands, for testing. USAKA is comprised of more than 100 islets, 11 of which currently serve as a testing range for ballistic missiles. The USAPHC has conducted surveys and provided environmental consultation services to USAKA for more than 25 years. The goal of this research is to determine if the consumption of fish from USAKA poses an unacceptable health risk to local fishermen. Several hundred fish were collected during a multi-week field investigation to assess the accumulation of potential contaminants that might affect the local population. Tissue samples were taken from 60 different fish species to determine if they were safe for consumption. Contamination in the harbor area from industrial processes, such as sandblasting ships and the use of pesticides, have raised concerns about the consumption of fish from the local area; however, previous studies indicated that the marine water quality is impaired only within the immediate vicinity of industrial activities near the harbor and local landfill. The final report from this study will make recommendations for future actions, if necessary, to ensure the safety and public health of the Marshallese people and others who live and work in USAKA. Link to original article: http://www.fortcampbellcourier.com/news/article_384c1e82-f556-11e2-8a7a-0019bb2963f4.html.

Source: von Schaper, Eva. Bloomberg. 27 July 2013.

Tiny plastic beads are latest pollution threat to the Great Lakes

Tiny plastic beads from beauty products, known as microplastic, are showing up in North America's Great Lakes after being found in the world's oceans, and an environmental group is calling upon companies to stop using the plastic particles. A team of researchers collected samples from Lakes Erie, Superior and Huron last summer and found large quantities of round, plastic microbeads that are the tiny plastic balls used in products like facial scrubs, body washes and toothpastes. The plastic particles have been added to an already lengthy list of threats to the fish population, as they can be easily confused with natural food sources in lakes. These beads can remain in fish and eventually be ingested by humans, and researchers are unsure if the threat stops with the fish or extends to the humans that eat the fish. There is no practical way to remove the microplastics already floating in the lakes and the lifespan of microplastics is unknown; it may take several years for it to completely leave these waters, if it ever leaves. Link to original article: http://www.huffingtonpost.com/2013/07/30/tiny-plastic-beads-great-lakes-pollution_n_3680070.html?ir=Green.

Source: Garza, Lisa Maria. The Huffington Post. 30 July 2013.

Women, children urged to avoid bass, carp, and brown trout from California lakes and reservoirs

The first ever state-wide fish consumption advisory for all of California's lakes and reservoirs was issued on August 1, 2013, by the California Environmental Protection Agency, Office of Environmental Health Hazard Assessment. The warning stems primarily from mercury levels found in bass, carp, and large brown trout. Women ages 18 to 45 and children should avoid these fish and instead could consume two servings per week of wild-caught rainbow trout or one serving per week of smaller brown trout which have higher amounts of omega-3 fatty acids and lower mercury concentrations. Women over 45 and men should limit their consumption of bass, carp, and brown trout more than 16 inches in length to one serving per week. Link to original article: http://www.latimes.com/news/science/sciencenow/la-sci-sn-mercury-fish-warning-california-lake-reservoir-20130801,0,2446669.story. The state-issued advisory is available at: http://www.oehha.ca.gov/fish/pdf/CALakeResAdvisory080113.pdf.

Source: Barboza, Tony. Los Angeles Times. 1 August 2013.

Alaska Fish and Game receives NOAA grant for study of Western Stellar Sea Lion mercury contamination

The Alaska Department of Fish and Game recently re-

ceived a grant from the National Marine Fisheries Service totaling $1,385,410 for the purpose of identifying the level and prevalence of mercury and organochlorine contamination in the Western Stellar Sea Lion population. The program will assess the potential links between continued declines and the contamination sources. Of that grant, $527,810 of that will be released to Fish and Game this year with the remainder to follow. Link to original article: http://alaska-native-news.com/alaska-native-news-at-sea/9017-alaska-fish-and-game-receives-noaa-grant-for-study-of-western-stellar-sea-lion-mercury-contamination.html.

Source: Rastopsoff, GW. Alaska Native News. 1 August 2013.

Call to halt imports of Japanese fish due to radiation fears

The first ever state-wide fish consumption advisory for all of California's lakes and reservoirs was issued on August 1, 2013, by the California Environmental Protection Agency, Office of Environmental Health Hazard Assessment. The warning stems primarily from mercury levels found in bass, carp, and large brown trout. Women ages 18 to 45 and children should avoid these fish and instead could consume two servings per week of wild-caught rainbow trout or one serving per week of smaller brown trout which have higher amounts of omega-3 fatty acids and lower mercury concentrations. Women over 45 and men should limit their consumption of bass, carp, and brown trout more than 16 inches in length to one serving per week. Link to original article: http://www.latimes.com/news/science/sciencenow/la-sci-sn-mercury-fish-warning-california-lake-reservoir-20130801,0,2446669.story. The state-issued advisory is available at: http://www.oehha.ca.gov/fish/pdf/CALakeResAdvisory080113.pdf.

Source: TheFishSite News Desk. 2 August 2013.

Recent Publications

Please note: The following abstracts are reprinted verbatim unless otherwise noted. Titles and citations (only) are listed for publications that are copyright protected.

Infant Feeding and Childhood Cognition at Ages 3 and 7 Years: Effects of Breastfeeding Duration and Exclusivity

IMPORTANCE: Breastfeeding may benefit child cognitive development, but few studies have quantified breastfeeding duration or exclusivity, nor has any study to date examined the role of maternal diet during lactation on child cognition. OBJECTIVES: To examine relationships of breastfeeding duration and exclusivity with child cognition at ages 3 and 7 years and to evaluate the extent to which maternal fish intake during lactation modifies associations of infant feeding with later cognition. DESIGN, SETTING, AND PARTICIPANTS: Prospective cohort study (Project Viva), a US prebirth cohort that enrolled mothers from April 22, 1999, to July 31, 2002, and followed up children to age 7 years, including 1312 Project Viva mothers and children. MAIN EXPOSURE: Duration of any breastfeeding to age 12 months. MAIN OUTCOMES AND MEASURES: Child receptive language assessed with the Peabody Picture Vocabulary Test at age 3 years, Wide Range Assessment of Visual Motor Abilities at ages 3 and 7 years, and Kaufman Brief Intelligence Test and Wide Range Assessment of Memory and Learning at age 7 years. RESULTS: Adjusting for sociodemographics, maternal intelligence, and home environment in linear regression, longer breastfeeding duration was associated with higher Peabody Picture Vocabulary Test score at age 3 years (0.21; 95% CI, 0.03-0.38 points per month breastfed) and with higher intelligence on the Kaufman Brief Intelligence Test at age 7 years (0.35; 0.16-0.53 verbal points per month breastfed; and 0.29; 0.05-0.54 nonverbal points per month breastfed). Breastfeeding duration was not associated with Wide Range Assessment of Memory and Learning scores. Beneficial effects of breastfeeding on the Wide Range Assessment of Visual Motor Abilities at age 3 years seemed greater for women who consumed 2 or more servings of fish per week (0.24; 0.00-0.47 points per month breastfed) compared with less than 2 servings of fish per week (-0.01; -0.22 to 0.20 points per month breastfed) (P = .16 for interaction). CONCLUSIONS AND RELEVANCE: Our results support a causal relationship of breastfeeding duration with receptive language and verbal and nonverbal intelligence later in life.

Source: Belfort, M.B., Rifas-Shiman, S.L., Kleinman, K.P., Guthrie, L.B., Bellinger, D.C., Taveras, E.M., Gillman, M.W., Oken, E. (2013). Division of Newborn Medicine, Boston Children's Hospital, Harvard Medical School, Boston, Massachusetts. "Infant Feeding and Childhood Cognition at Ages 3 and 7 Years: Effects of Breastfeeding Duration and Exclusivity." JAMA Pediatrics 10(1001).

Evaluation of radiation doses and associated risk from the Fukushima nuclear accident to marine biota and human consumers of seafood

Radioactive isotopes originating from the damaged Fukushima nuclear reactor in Japan following the earthquake and tsunami in March 2011 were found in resident marine animals and in migratory Pacific bluefin tuna (PBFT). Publication of this information resulted in a worldwide response that caused public anxiety and concern, although PBFT captured off California in August 2011 contained activity concentrations below those from naturally occurring radionuclides. To link the radioactivity to possible health impairments, we calculated doses, attributable to the Fukushima-derived and the naturally occurring radionuclides, to both the marine biota and human fish consumers. We showed that doses in all cases were dominated by the naturally occurring alpha-emitter (210)Po and that Fukushima-derived doses were three to four orders of magnitude below (210)Po-derived doses. Doses to marine biota were about two orders of magnitude below the lowest benchmark protection level proposed for ecosystems (10 μGy·h(-1)). The additional dose from Fukushima radionuclides to humans consuming tainted PBFT in the United States was calculated to be 0.9 and 4.7 μSv for average consumers and subsistence fishermen, respectively. Such doses are comparable to, or less than, the dose all humans concentrations than littoral amphipods. Instead, partitioning of benthic invertebrate resources likely explains the greater MeHg bioaccumulation in brown bullhead, associated with offshore feeding of amphipods. White sucker and brown bullhead had a similar trophic position but white sucker consumed more chironomids, which had one-third the MeHg concentration of amphipods. Our findings suggest that offshore feeding in a lake can affect fish MeHg bioaccumulation via two different processes: (1) the consumption of MeHg-enriched pelagic prey, or (2) resource partitioning of benthic primary consumers with different MeHg concentrations. These observations on the mechanisms of habitat-specific bioaccumulation highlight the complexity of MeHg transfer through lake food webs.

Source: Chételat, J., Cloutier, L., Amyot, M. (2013). "An investigation of enhanced mercury bioaccumulation in fish from offshore feeding." Ecotoxicology 22(6):1020-32.

Risk assessment and toxic effects of metal pollution in two cultured and wild fish species from highly degraded aquatic habitats

Lake Qaroun is an inland lake at the lowest part of El-Fayoum depression, Egypt. It receives agricultural and domestic non-treated drainage waters, which are also used for aquaculture in Qaroun area. The results of the present study aimed to provide comparable data between wild (collected from Lake Qaroun) and cultured (collected from Qaroun fish farms and the reference site) Nile tilapia *Oreochromis niloticus* and mullet *Mugil cephalus*, as indicators of natural and anthropogenic impacts on aquatic ecosystem as well as to evaluate the human hazard index associated with fish consumption. Metal concentrations in fish tissues showed a species-specific bioaccumulation pattern. Statistically significant differences were observed in the mean metal concentrations with lower bioavailability in *M. cephalus* compared with *O. niloticus* in internal vital organs (liver, kidney, and muscle) but much higher in external organs (gill and skin). Histopathological alterations and evident damages were observed in gill, liver, and kidney of both species collected from Lake Qaroun and Qaroun fish farms compared with those from the reference site. The results showed significant increase of plasma aspartate aminotransferase and alanine aminotransferase activity as well as creatinine and uric acid concentration in both fish species from polluted locations. The human health hazard index showed that the cumulative risk greatly increases with increasing fish consumption rate, thus yielding an alarming concern for consumer health.

Source: Omar, W.A., Zaghloul, K.H., Abdel-Khalek, A.A., Abo-Hegab, S. Department of Zoology, Faculty of Science, Cairo University. "Risk Assessment and Toxic Effects of Metal Pollution in Two Cultured and Wild Fish Species from Highly Degraded Aquatic Habitats." Archives

of environmental contamination and toxicology. 2013 Jul 11 [Published online.]

Assessment of dietary fish consumption in pregnancy: comparing one-, four- and thirty -six-item questionnaires

OBJECTIVE: Fish consumption influences a number of health outcomes. Few studies have directly compared dietary assessment methods to determine the best approach to estimating intakes of fish and its component nutrients, including DHA, and toxicants, including methylmercury. Our objective was to compare three methods of assessing fish intake. DESIGN: We assessed 30 d fish intake using three approaches: (i) a single question on total fish consumption; (ii) a brief comprehensive FFQ that included four questions about fish; and (iii) a focused FFQ with thirty-six questions about different finfish and shellfish. SETTING: Obstetrics practices in Boston, MA, USA. SUBJECTS: Fifty-nine pregnant women who consumed ≤2 monthly fish servings. RESULTS: Estimated intakes of fish, DHA and Hg were lowest with the one-question screener and highest with the thirty-six-item fish questionnaire. Estimated intake of DHA with the thirty-six-item questionnaire was 4·4-fold higher (97 v. 22 mg/d), and intake of Hg was 3·8-fold higher (1·6 v. 0·42 μg/d), compared with the one-question screener. Plasma DHA concentration was correlated with fish intake assessed with the one-question screener (Spearman r = 0·27, P = 0·04), but not with the four-item FFQ (r = 0·08, P = 0·54) or the thirty-six-item fish questionnaire (r = 0·01, P = 0·93). In contrast, blood and hair Hg concentrations were similarly correlated with fish and Hg intakes regardless of the assessment method (r = 0·35 to 0·52). CONCLUSIONS: A longer questionnaire provides no advantage over shorter questionnaires in ranking intakes of fish, DHA and Hg compared with biomarkers, but estimates of absolute intakes can vary by as much as fourfold across methods.

Source: Oken E., Guthrie, L.B., Bloomingdale, A., Gillman, M.W., Olsen, S.F., Amarasiriwardena, C.J., Platek, D.N., Bellinger, D.C., Wright, R.O. Department of Population Medicine, Harvard Medical School and the Harvard Pilgrim Health Care Institute. "Assessment of dietary fish consumption in pregnancy: comparing one-, four- and thirty-six-item questionnaires." Public Health Nutrition 2013 Jul 24:1-11.

Fish consumption and advisory awareness among older Wisconsin fishermen

OBJECTIVES: The provision of fish consumption advice issued by the Wisconsin Department of Health Services (DHS) and Department of Natural Resources (DNR) has evolved over the past 40 years. In 2010, DHS received a US Environmental Protection Agency Great Lakes Restoration Initiative (GLRI) grant to evaluate existing advisory approaches, identify gaps, and adapt current communication approaches. METHODS: Previous research conducted by DHS found that older, male anglers eat more sport fish and have higher body burdens of persistent contaminants found in fish than other groups. As part of the GLRI, Wisconsin DHS and DNR aimed to engage this subpopulation and improve communication by using an Internet-based survey to collect information about fishing habits, consumption, and advisory awareness. At the end of the survey, participants were provided with answers to advisory questions and links to relevant online information. From fall 2011 through spring 2012, 827 men aged 50 and older completed this survey. RESULTS: Nearly all fishermen were aware of the existence of consumption advisories. Although awareness was high, penetration of traditional outreach materials was low with fewer than 35% having seen any of the pamphlets featured in the survey. Knowledge of the advisories was significantly higher among residents of counties along Lakes Michigan and Superior and among more frequent sport fish consumers. Men who were aware of these advisories were significantly more likely to have modified their consumption behavior. CONCLUSION: Wisconsin's experience suggests general awareness among older male anglers. Participation in the online survey and responses to sources of advisory information supports the need to expand the current outreach program to reach and inform the fish-consuming public.

Source: Imm, P., Anderson, H.A., Schrank, C., Knobeloch, L. "Fish consumption and advisory awareness among older Wisconsin fishermen." WMJ: The Official Publication of the State Medical Society of Wisconsin 2013 Jun;112(3):111-6.

Fish consumption patterns, knowledge and potential exposure to mercury by race

OBJECTIVE: Compared fish consumption patterns, fish advisory/benefit awareness and risk factors of consuming high-mercury (Hg) fish between Chinese and non-Chinese adults. METHODS: 301 Chinese and 120 non-Chinese participated in this cross-sectional study. Participants self-reported demographics, fish consumption behavior, and awareness of warnings/benefits of fish consumption. RESULTS: non-Chinese (62.5%) ate more high-Hg fish

than Chinese (35.9%) although more Chinese ate fish in the last year. Over 90% of both groups knew general benefits of consuming fish; fewer knew specific benefits. Chinese were less aware of fish warnings (49.8%) than non-Chinese (86.7%); knowledge did not appear to affect their fish consumption. CONCLUSIONS: There were significant differences in fish consumption patterns and fish benefit/warning knowledge between the two groups. A higher proportion of non-Chinese reported consumption of high-Hg fish. Fish knowledge did not affect fish consumption behavior for either group. Public education efforts regarding fish consumption should emphasize details such as species and amounts.

Source: Lin, S., Herdt-Losavio, M.L., Chen, M., Luo, M., Tang, J., Hwang, S.A. "Fish consumption patterns, knowledge and potential exposure to mercury by race." International Journal of Environmental Health Research 2013 Jul 18. [Epub ahead of print]

An investigation of enhanced mercury bioaccumulation in fish from offshore feeding

We investigated the dietary pathways of mercury transfer in the food web of Morency Lake (Canada) to determine the influence of carbon source and habitat use on mercury bioaccumulation in fish. Whole-body concentrations of methylmercury (MeHg) were significantly different in four fish species (white sucker, brown bullhead, pumpkinseed and smallmouth bass) and increased with both trophic position and greater feeding on offshore (versus littoral) carbon. An examination of fish gut contents and the depth distribution of invertebrates in Morency Lake showed that smallmouth bass and brown bullhead were supplementing their littoral diet with the consumption of either opossum shrimp (*Mysis diluviana*) or profundal amphipods in offshore waters. The zooplanktivore Mysis had significantly higher MeHg concentrations than zooplankton and benthic invertebrates, and it was an elevated source of MeHg to smallmouth bass. In contrast, profundal amphipods consumed by brown bullhead did not have higher MeHg concentrations than littoral amphipods. Instead, partitioning of benthic invertebrate resources likely explains the greater MeHg bioaccumulation in brown bullhead, associated with offshore feeding of amphipods. White sucker and brown bullhead had a similar trophic position but white sucker consumed more chironomids, which had one-third the MeHg concentration of amphipods. Our findings suggest that offshore feeding in a lake can affect fish MeHg bioaccumulation via two different processes: (1) the consumption of MeHg-enriched pelagic prey, or (2) resource partitioning of benthic primary consumers with different MeHg concentrations. These observations on the mechanisms of habitat-specific bioaccumulation highlight the complexity of MeHg transfer through lake food webs.

Source: Chételat, J., Cloutier, L., Amyot, M. "An investigation of enhanced mercury bioaccumulation in fish from offshore feeding." Ecotoxicology 22(6):1020-32.

Evaluation of possible health risks of heavy metals by consumption of foodstuffs available in the central market of Rajshahi City, Bangladesh

Considering the human health risk due to the consumption of foodstuffs, the concentrations of heavy metals (lead, manganese, chromium, cadmium, and arsenic) are investigated in vegetables, fruits, and fish species collected from the central market (called Shaheb Bazar) of Rajshahi City, Bangladesh. The foodstuffs examined for metal constituents are the basis of human nutrition in the study area. The highest concentrations of Mn and As in vegetables (onion and pointed gourd, respectively), Cr and Cd in fruits (black berry and mango, respectively), and Pb in fish (catla) are recorded. Health risks associated with these heavy metals are evaluated due to dietary intake. Target hazard quotient (THQ) and hazard index (HI) are calculated to evaluate the non-carcinogenic health risk from individual and combined heavy metals. The THQ values for individual heavy metals are below 1, suggesting that people would not experience significant health risks if they ingest a single heavy metal from one kind of foodstuff (e.g., vegetables). However, consumption of several of the foodstuffs could lead a potential health risk to human population since HI value is higher than 1. The relative contributions of vegetables, fishes, and fruits to HI are 49.44, 39.07, and 11.53 %, respectively. Also, the relative contributions of Pb, Cd, As, Mn, and Cr to HI are 51.81, 35.55, 11.73, 0.85, and 0.02 %, respectively. The estimation shows that the carcinogenic risk of arsenic exceeds the accepted risk level of $1 \times 10(-6)$. Thus, the carcinogenic risk of arsenic for consumers is a matter of concern.

Source: Saha, N., Zaman, M.R. (2013). "Evaluation of possible health risks of heavy metals by consumption of foodstuffs available in the central market of Rajshahi City, Bangladesh." Environmental Monitoring and Assessment 185(5):3867-78.

Influence of dietary carbon on mercury bioaccumulation in streams of the Adirondack Mountains of New York and the Coastal Plain of South Carolina, USA

We studied lower food webs in streams of two mercury-sensitive regions to determine whether variations in consumer foraging strategy and result and dietary carbon signatures accounted for observed within-site and among-site variations in consumer mercury concentration. We collected macroinvertebrates (primary consumers and predators) and selected forage fishes from three sites in the Adirondack Mountains of New York, and three sites in the Coastal Plain of South Carolina, for analysis of mercury (Hg) and stable isotopes of carbon (δ(13)C) and nitrogen (δ(15)N). Among primary consumers, scrapers and filterers had higher MeHg and more depleted δ(13)C than shredders from the same site. Variation in δ(13)C accounted for up to 34 % of within-site variation in MeHg among primary consumers, beyond that explained by δ(15)N, an indicator of trophic position. Consumer δ(13)C accounted for 10% of the variation in Hg among predatory macroinvertebrates and forage fishes across these six sites, after accounting for environmental aqueous methylmercury (MeHg, 5 % of variation) and base-N adjusted consumer trophic position (Δδ(15)N, 22 % of variation). The δ(13)C spatial pattern within consumer taxa groups corresponded to differences in benthic habitat shading among sites. Consumers from relatively more-shaded sites had more enriched δ(13)C that was more similar to typical detrital δ(13)C, while those from the relatively more-open sites had more depleted δ(13)C. Although we could not clearly attribute these differences strictly to differences in assimilation of carbon from terrestrial or in-channel sources, greater potential for benthic primary production at more open sites might play a role. We found significant variation among consumers within and among sites in carbon source; this may be related to within-site differences in diet and foraging habitat, and to among-site differences in environmental conditions that influence primary production. These observations suggest that different foraging strategies and habitats influence MeHg bioaccumulation in streams, even at relatively small spatial scales. Such influence must be considered when selecting lower trophic level consumers as sentinels of MeHg bioaccumulation for comparison within and among sites.

Source: Riva-Murray, K., Bradley, P.M., Chasar, L.C., Button, D.T., Brigham, M.E., Scudder Eikenberry, B.C., Journey, C.A., Lutz, M.A. "Influence of dietary carbon on mercury bioaccumulation in streams of the Adirondack Mountains of New York and the Coastal Plain of South Carolina, USA." Ecotoxicology 22(1):60-71.

In situ analysis of cadmium uptake in four sections of the gastro-intestinal tract of rainbow trout (Oncorhynchusmykiss)

Source: Klinck, J.S., Wood, C.M. "In situ analysis of cadmium uptake in four sections of the gastro-intestinal tract of rainbow trout (Oncorhynchusmykiss)." Ecotoxicology and Environmental Safety 88:95-102.

Mathematical relationships between metrics of chemical bioaccumulation in fish

Source: Mackay, D., Arnot, J.A., Gobas, F.A., Powell, D.E. "Mathematical relationships between metrics of chemical bioaccumulation in fish." Environmental Toxicology and Chemistry/SETAC 32 (7):1459-66.

Risk and toxicity assessments of heavy metals in sediments and fishes from the Yangtze River and Taihu Lake, China

Source: Fu, J., Hu, X., Tao, X., Yu, H., Zhang, X. "Risk and toxicity assessments of heavy metals in sediments and fishes from the Yangtze River and Taihu Lake, China." Chemosphere pii: S0045-6535(13)00918-1.

The emerging farmed fish species meagre (*Argyrosomus regius*): How culinary treatment affects nutrients and contaminants concentration and associated benefit-risk balance

Source: Costa, S., Afonso, C., Bandarra, N.M., Gueifão, S., Castanheira, I., Carvalho, M.L., Cardoso, C., Nunes, M.L. "The emerging farmed fish species meagre (Argyrosomus regius): How culinary treatment affects nutrients and contaminants concentration and associated benefit-risk balance." Food and Chemical Toxicology pii: S0278-6915(13)00505-X.

Maternal exposure to metals-Concentrations and predictors of exposure

Source: Callan, A.C., Hinwood, A.L., Ramalingam, M., Boyce, M., Heyworth, J., McCafferty, P., Odland, J.O. "Maternal exposure to metals – Concentrations and predictors of exposure." Environmental Research pii: S0013-9351(13)00120-5.

A baseline study on levels of polychlorinated dibenzo-p-dioxins, polychlorinated

dibenzofurans, non-ortho and mono-ortho PCBs, non-dioxin-like PCBs and polybrominated diphenyl ethers in Northeast Arctic cod (*Gadus morhua*) from different parts of the Barents Sea

Source: Julshamn, K., Duinker, A., Berntssen, M., Nilsen, B.M., Frantzen, S., Nedreaas, K., Maage, A. "A baseline study on levels of polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans, non-ortho and mono-ortho PCBs, non-dioxin-like PCBs and polybrominated diphenyl ethers in Northeast Arctic cod (*Gadus morhua*) from different parts of the Barents Sea." Marine Pollution Bulletin pii: S0025-326X(13)00386-X.

Associations between socioeconomic status and environmental toxicant concentrations in adults in the USA: NHANES 2001-2010

Source: Tyrrell, J., Melzer, D., Henley, W., Galloway, T.S., Osborne, N.J. "Associations between socioeconomic status and environmental toxicant concentrations in adults in the USA: NHANES 2001-2010." Environment International 59C:328-335.

Comparative study on effects of dietary with diphenyl diselenide on oxidative stress in carp (*Cyprinus carpio*) and silver catfish (*Rhamdia sp.)* exposed to herbicide clomazone

Source: Menezes, C., Leitemperger, J., Toni, C., Santi, A., Lópes, T., Barbosa, N.B., Neto, J.R., Loro, V.L. "Comparative study on effects of dietary with diphenyl diselenide on oxidative stress in carp (Cyprinus carpio) and silver catfish (Rhamdia sp.) exposed to herbicide clomazone." Environmental Toxicology and Pharmacology 36(2):706-714.

Metals and other elements in tissues of wild fish from fish farms and comparison with farmed species in sites with oxic and anoxic sediments

Source: Kalantzi, I., Black, K.D., Pergantis, S.A., Shimmield, T.M., Papageorgiou, N., Sevastou, K., Karakassis, I. "Metals and other elements in tissues of wild fish from fish farms and comparison with farmed species in sites with oxic and anoxic sediments." Food Chemistry 141(2):680-94.

Occurrence of halogenated contaminants in inland and coastal fish from Ghana: Levels, dietary exposure assessment and human health implications

Source: Asante, K.A., Takahashi, S., Itai, T., Isobe, T., Devanathan, G., Muto, M., Agyakwah, S.K., Adu-Kumi, S., Subramanian, A., Tanabe, S. "Occurrence of halogenated contaminants in inland and coastal fish from Ghana: Levels, dietary exposureassessment and human health implications." Ecotoxicology and Environmental Safety 94:123-30.

Neuropsychological assessment at school-age and prenatal low-level exposure to mercury through fish consumption in an Italian birth cohort living near a contaminated site

Source: Deroma, L., Parpinel, M., Tognin, V., Channoufi, L., Tratnik, J., Horvat, M., Valent, F., Barbone, F. "Neuropsychological assessment at school-age and prenatal low-level exposure to mercury through fish consumption in an Italian birth cohort living near a contaminated site." International Journal of Hygiene and Environmental Health 216(4):486-93.

Modelling mercury concentrations in prey fish: derivation of a national-scale common indicator of dietary mercury exposure for piscivorous fish and wildlife

Source: Depew DC, Burgess NM, Campbell LM. Modelling mercury concentrations in prey fish: derivation of a national-scale common indicator of dietary mercuryexposure for piscivorous fish and wildlife. Environmental Pollution 176:234-43.

Accumulation and half lives of 13 pesticides in muscle tissue of freshwater fishes through food exposure

Source: Lazartigues, A., Thomas, M., Banas, D., Brun-Bellut, J., Cren-Olivé, C., Feidt, C. "Accumulation and half lives of 13 pesticides in muscle tissue of freshwater fishes through food exposure." Chemosphere 91(4):530-5.

Additional Information

For more information about specific advisories within a state, contact the appropriate state agency listed on EPA's NLFA website at http://fishadvisoryonline.epa.gov/Contacts.aspx

For more information about the NLFA or EPA's Fish Advisory Program, contact:

The NLFA Newsletter at Fish_Advisory@epa.gov or Jeff Bigler, National Program Manager, Fish Advisory Program

Telephone: 202.566.0389
E-mail: bigler.jeff@epa.gov

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