July 2014

# National Listing of Fish Advisories NEWSLETTER



## Recent Advisory News

### Study questions benefit of taking fish oil supplements during pregnancy

A new study questions the benefits of consuming fish oil supplements during pregnancy. Doctors often recommend that pregnant women take an Omega-3 acid, particularly DHA supplement or fish oil, to optimize fetal brain and eye development. Although there are 20 different edible fatty acids, the human body cannot produce Omega-3 and Omega-6 fatty acids, and most pregnant women are not likely to get enough of these nutrients through their diets. A 2008 study published in Obstetrics and Gynecology concluded that, along with vegetable oils and two servings of seafood per week, women should get these important Omega-3's from supplements. Now, a research letter published Saturday in JAMA disputes that recommendation. Researchers studied pregnant women who were given an 800 mg DHA supplement or a placebo and their children's brain development at age 4. The study found prenatal DHA supplementation did not result in improved cognitive, problem-solving, or language abilities for children at age 4 (the children had been previously assessed at 18 months). They also observed that girls in the DHA group had poorer language scores than girls in the control group. The data collected from this study do not support recommendations of prenatal DHA supplementation to enhance early childhood development. Link to original article: http://thechart.blogs.cnn.com/2014/05/06/new-research-recommendations-for-parents/.

Source: Falco, Miriam. CNN Health. 5/6/2014.

### Fish intake found to combat depression but only in women

A new study suggests that eating fish at least twice a week reduces the risk of depression by 25 percent in women. This study was developed by the Menzies Research Institute in Tasmania, Australia and was published in the American Journal of Epidemiology. The research concluded that the observed protective association for women and not for men may have been due to men consuming more omega-3 fatty acids from other (non-fish) dietary sources, primarily from meat. The study tracked more than 1,400 men and women ages 26 to 36 for a period of five years. The study speculates that high levels of omega-3 fatty acids may combine with the female sex hormones oestrogen and progesterone to keep the brain functioning properly. Participants kept diaries of their diet, including various types of seafood including fish, prawns, and mussels consumed, while details about their mental health were also collated. Dietitian Dr. Sarah Schenker remarked that, "The fatty acids in fish are long chain so [they] can be readily used by the body whereas they are short chain in meat so have to be adapted. If men consume more food but are more reliant on meat for their fatty acids than women, it would perhaps explain why the positive effects of fish on depression are seen only in women in this study." Link to original article: http://www.fis.com/fis/worldnews/worldnews.asp?monthyear=&day=6&id=68331&l=e&special=&ndb=1%20target.

Source: Fish Info & Services Co. 5/6/2014.

### Coal ash spill - fish sampling to continue in Dan River

The long-term effects of a February 2014 coal ash spill on fish in the Dan River are still unknown, according to Virginia and North Carolina regulatory officials. This is primarily because the incident at Duke Energy's old Dan River Steam Station in Eden, NC, occurred in the winter during a period when there was little biological activity by fish

in the Dan River. The lack of fish activity hindered the ability to monitor immediately following the spill to pick up trace-element effects in the river's fish. The Virginia Department of Environmental Quality (VDEQ) plans to conduct long-term monitoring of fish tissue at eight locations along the Dan River from June through August over the next three to five years. The VDEQ collected water and sediment samples on February 11 at four sites along the river nine days after the incident that caused 39,000 tons of coal ash to enter the Dan River. The VDEQ tested the water samples for 23 metals and those concentrations did not exceed Virginia water quality standards. A preliminary review of other Virginia water quality sample data collected by the U.S. Environmental Protection Agency showed no exceedances of standards. Tissue from 25 fish collected on February 20 upstream of the Schoolfield Dam were tested for 23 metals; arsenic concentrations were not elevated and mercury concentrations were found to be below Virginia Department of Health's level of concern. Despite metal concentrations in fish tissue being within acceptable ranges, it is still too early to determine to what extent the fish have taken up the metals. The metals must first be liberated from the ash and then enter the ecosystem to be taken up by the fish. The VDEQ will provide information from long-term monitoring to the Virginia Department of Health to determine whether to issue a fish consumption advisory. The Dan River, from Danville to Kerr Reservoir, already has an advisory for polychlorinated biphenyls and mercury that advises against consuming catfish more than 32 inches long and other fish more than twice a month. Link to original article: http://www.godanriver.com/news/coal-ash/fish-sampling-to-continue-in-dan-river/article_7f664d16-c9a3-11e3-8f2e-001a4bcf6878.html.

Source: Crane, John R. www.godanriver.com. 4/21/2014.

## Fish consumption advisories for pregnant women ineffective in reducing infant exposure to persistent organic pollutants

A new modeling study indicates that fish consumption advisories for expecting mothers are ineffective in reducing infant exposure to long-lived contaminants like persistent organic pollutants (POPs). The study focused on how various levels of environmental contamination, a mother's compliance with advisories, and the behavior of chemicals in the body influenced exposure in her children. The results estimate that women who stop eating fish shortly before or during their pregnancy may only lower their child's exposure to POPs by 10 to 15 percent. One of the researchers believes that consumption advisories for POPs are ineffective because they can remain in the body for years or even decades due to properties that make it difficult for the human body to eliminate them. The same does not apply for mercury-based advisories, as the residence time of mercury in the body is shorter. Fish consumption advisories are more effective for reducing exposure to quickly eliminated contaminants like mercury. Link to original article: http://www.news-medical.net/news/20140418/Fish-consumption-advisories-for-pregnant-women-ineffective-in-reducing-infant-exposure-to-POPs.aspx.

Source: News-Medical.Net. 4/18/2014.

## Fish in National Parks from Alaska to Colorado have unhealthy mercury levels

A recent study has revealed high mercury levels in fish within a number of national parks, from Alaska to Colorado. In some cases, the concentrations exceed limits acceptable for human consumption. One fish sample from Yosemite National Park contained mercury at a concentration of 950 parts per billion (ppb), "at which no human consumption is advised," according to the report produced by the U.S. Geological Survey (USGS) and the National Park Service (NPS). All 21 parks included in the four-year survey contain fish with varying levels of mercury, ranging in concentration from 9.9 ppb to 1,109 ppb, with an average concentration of 77.8 ppb. Fourteen of the 21 parks surveyed did not contain any fish samples that exceeded the 300 parts per billion EPA fish tissue criterion. While only 5 percent of the nearly 1,500 fish sampled had mercury concentrations exceeding a benchmark of 200 parts per billion that elicits toxic responses in fish, 35 percent of the samples had mercury concentrations above 90 parts per billion, high enough to impact some birds. In addition, mercury levels in 68 percent of the fish "were above exposure levels recommended by the Great Lakes Advisory Group for unlimited consumption by humans," the study said. The report notes that Zion, Capital Reef, Wrangell-St. Elias, and Lake Clark national parks all contained sites in which most fish exceeded benchmarks for the protection of human and wildlife health and that some fish samples taken within a single park varied widely in mercury concentrations. A joint press release from the USGS and

# Conferences

**11th International Congress on the Biology of Fish**
**August 3-7, 2014, Edinburgh, Scotland**
**http://www.icbf2014.sls.hw.ac.uk/**

**Annual Meeting of the American Fisheries Society**
**August 17-21, 2014, Quebec City, QE, Canada**
**http://afs2014.org/**

**7th World Recreational Fishing Conference**
**September 1-4, 2014, Campinas, Brazil**
**http://www.7wrfc.com/**

**National Forum on Contaminants in Fish**
**September 22-24, 2014, Alexandria, Virginia**
**http://water.epa.gov/scitech/swguidance/fishshellfish/fishadvisories/index.cfm**

NPS pointed out that the NPS is coordinating with state officials in the 10 study states regarding potential fish consumption advisories. The study, "Mercury in fishes from 21 national parks in the Western United States – Inter and intra-park variation in concentrations and ecological risk," is available at: http://pubs.usgs.gov/of/2014/1051/pdf/ofr2014-1051.pdf. Link to original article: http://www.nationalparkstraveler.com/2014/04/fish-national-parks-alaska-colorado-have-unhealthy-mercury-levels24948

Source: Repanshek, Kurt. www.nationalparkstraveler.com. 4/17/2014.

## Research into Noxon walleye fish beginning

Montana Fish, Wildlife and Parks (FWP) says that biologists began to collect data starting in early April to determine population demographics, reproductive potential, dietary habits, and polychlorinated biphenyl (PCB) concentrations within edible portions of walleye in the Noxon Reservoir. State officials say the information will be used in a revised draft Environmental Assessment and to determine if additional consumption advisories are necessary for Noxon's sport fish. The goal of this short-term feasibility study is to determine if the Noxon walleye population can be effectively controlled, as a substantial amount of scientific data indicates that walleye pose a threat to reservoirs' fisheries, including perch and bass. Studies show that walleye are efficient predators that feed on any species of fish available and can quickly overpopulate, giving walleye the ability to significantly reduce populations of other fish species. Link to original article: http://www.kpax.com/news/research-into-noxon-walleye-fish-beginning/.

Source: KPAX News Staff. www.kpax.com. 4/17/2014.

## State issues new fish consumption advisories

The 2014 West Virginia Sport Fish Consumption Advisory has updated its advisories for eating fish caught in lakes and rivers. This advisory revision removes limits on consumption of Greenbrier River smallmouth bass and walleye from Summersville Lake. The West Virginia Department of Health and Human Resources explained that newer information indicates lower mercury levels in both fish species at these locations. However, a limit on consumption of smallmouth bass from the Shenandoah River was expanded to include all fish sizes, while the previous limit only applied to fish greater than 12 inches in length. New

information reveals higher concentrations of mercury in smaller smallmouth bass. Limits on consumption of Ohio River striped bass hybrids have been revised from one meal per month to no more than six meals per year due to increased levels of polychlorinated biphenyls. Link to original article: http://www.register-herald.com/latestnews/x749157588/State-issues-new-fish-consumption-advisories.

Source: Associated Press. The Register-Herald. 4/14/2014.

## State warns certain Monterey Bay seafoods may be temporarily unsafe to eat

The California Department of Public Health (CDPH) warned the public of a naturally occurring toxin that is showing up in seafood recently caught in Monterey Bay. According to a recent press release, unsafe levels of domoic acid, produced by algae blooms, have been detected in anchovy, sardines, and the internal organs of crab caught off the shores of Monterey and Santa Cruz counties. Anchovy and sardines are of concern because the toxin resides in their digestive tracks and these fish are not usually gutted before they are eaten. CDPH is coordinating with commercial fishermen in the area to ensure that recently caught sardines, anchovies, and crab were not distributed into the human food supply. CDPH has also warned consumers to avoid bivalves including mussels, clams, and whole scallops harvested by recreational fishermen in Monterey Bay. However, commercially sold bivalves from approved sources are exempt from the advisory because they are tested for toxins. While no related illnesses have been reported, the state continues to monitor domoic acid levels in the area's seafood. For more information and updates, call (800) 553-4133 or visit CDPH's Natural Marine Toxins website. Link to original article: http://www.montereycountyweekly.com/blogs/news_blog/state-warns-certain-monterey-bay-seafoods-may-be-temporarily-unsafe/article_a9a2105a-c0e9-11e3-8f62-0017a43b2370.html.

Source: Abraham, Kera. Monterrey County Weekly. 4/10/2014.

## Mercury level concerns prompt Flathead Lake fish guidelines

Trout in Flathead Lake contain trace amounts of mercury, therefore the Confederated Salish and Kootenai Tribes (CSKT) and Montana Fish, Wildlife and Parks (FWP) have partnered to issue guidelines for safe consumption of the fish. Lake trout are predators in Flathead Lake, and are more likely to accumulate mercury. CSKT Information and Education Specialist, Germaine White, says that the size of the fish is what really matters. CKST created a guideline for safe consumption, advising children and women of childbearing age to eat no more than six servings a month of lake trout 6 to 10 inches long. Adult males can eat up to 12 servings a month of the smaller fish. While eating Flathead Lake trout is safe, the guidelines recommend against eating lake trout longer than 30". For a complete guide on safe lake trout consumption: http://fwp.mt.gov/news/newsReleases/fishing/nr_0824.html. Link to original article: http://www.kpax.com/news/mercury-level-concerns-prompt-flathead-fish-guidelines/.

Source: Cole, Anna. KAJ News. 4/9/2014.

# 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.

## Occurrence of di-(2-ethylhexyl) adipate and phthalate plasticizers in samples of meat, fish, and cheese and their packaging films

Di-(2-ethylhexyl) adipate (DEHA) and phthalates are commonly used as plasticizers to soften polyvinyl chloride products. Because both DEHA and certain phthalates have been identified as priority chemicals for assessment of human health risk under the Government of Canada's Chemicals Management Plan, a comprehensive targeted survey was conducted to investigate the occurrence of

DEHA and eight phthalates (di-methyl phthalate, di-ethyl phthalate, di-n-butyl phthalate, di-iso-butyl phthalate, butyl benzyl phthalate, di-n-hexyl phthalate, d-(2-ethylhexyl) phthalate, and di-n-octyl phthalate) in a total of 118 samples of meat (beef, pork, and chicken), fish, and cheese packaged mostly in cling films. The eight phthalates were not detected in any of the food packaging, but DEHA was detected in most of the cling films, indicating that although DEHA-plasticized films (e.g., polyvinyl chloride film) are currently being used by most grocery stores, nonplasticized cling films such as polyethylene film, are also being used by some stores. DEHA was not detected in any of the 10 cheese samples packaged in nonplasticized rigid plastics but was detected in all 30 cheese samples packaged in DEHA-plasticized cling films at levels from 0.71 to 879 μg/g, with an average of 203 μg/g. Only DEHA was detected in the beef, pork, chicken, and fish samples packaged in DEHA-plasticized cling films but at considerably lower levels than those found in cheese, with averages of 6.3, 9.1, 2.5, and 5.9 μg/g, respectively. Among the eight phthalates, only di -(2-ethylhexyl) phthalate (DEHP) was detected in a few cheese samples at levels from 0.29 to 15 μg/g, with an average of 2.8 μg/g; these levels were very likely due to environmental contamination. Levels of DEHA found in most of the cheese samples from this study are above the European specific migration limit of 18 mg/kg for DEHA in food or food simulants, and levels of phthalates (i.e., DEHP) were low.

Source: Cao, X.L., Zhao W., Churchill, R., Hilts, C. Bureau of Chemical Safety, Food Directorate, Health Canada, Ontario, Canada. "Occurrence of di-(2-ethylhexyl) adipate and phthalate plasticizers in samples of meat, fish, and cheese and their packaging films." Journal of Food Protection. 2014 Apr;77(4):610-20.

## Heavy metals levels in fish from aquaculture farms and risk assessment in Lhasa, Tibetan Autonomous Region of China

Fish is consumed as a common food by humans due to its nutritional and therapeutic benefits. However, they can accumulate toxic chemicals (such as heavy metals, persistent organic pollutants) from water and food chain. Very few studies have been investigated on heavy metal contents in fish from Tibetan Autonomous Region of China. In order to study heavy metals levels in fish from aquaculture farms and evaluate the risk that humans consume fish in this area, we collected four types of aquaculture fish species (6 big-head carps, 5 grass carps, 5 carps and 5 tilapias) from fisheries around Lhasa city in this study. 9 heavy metals (Cr, As, Cd, Pb, Cu, Ba, Co, Mn and V) in different tissues of fish were determined by an inductively coupled plasma mass spectrometer. Cr, Ba, Co, Mn and V could easily accumulate in the gill, and Cu was detected in the hearts of all the fishes. Toxic metal (As, Cd and Pb) contents were higher in the liver than those in other tissues, heavy metal levels were the lowest in the muscle among all tissues. Most of heavy metal concentrations in the tilapia tissues were higher than those in other fish tissues, especially arsenic. Arsenic content in the tilapia samples was ~2-4 times higher than the maximum levels (MLs) of contaminants in the national standard, and other metals were all lower than the MLs. Compared the estimated daily intake of heavy metals through fish consumption with tolerable daily intakes recommended by FAO, the metals daily intake of As, Cd and Pb from fish consumption might not pose serious health risk to the local inhabitants. It is therefore necessary to determine the dose level for human, which is considered to be taken daily over a lifetime without adverse effects.

Source: Jiang, D., Hu, Z., Liu, F., Zhang, R., Duo, B., Fu, J., Cui, Y., Li, M. State Key Laboratory of Pollution Control & Resource Reuse, School of the Environment, Nanjing University, Xianlin Campus, Nanjing, People's Republic of China. "Heavy metals levels in fish from aquaculture farms and risk assessment in Lhasa, Tibetan Autonomous Region of China." Ecotoxicology. 2014 Mar 27. [Epub ahead of print].

## Human health risks of geothermally derived metals and other contaminants in wild-caught food

Arsenic (As) and mercury (Hg) associated with geothermally influenced lakes and rivers represent a potential health risk to communities where wild-caught food is consumed. The Rotorua Lakes region of New Zealand has extensive natural geothermal activity and a large proportion (35%) of indigenous Māori population, for whom wild food gathering is an important cultural activity. The aim of this study was to measure selected heavy metal and organochlorine (OC) concentrations in important local fish and shellfish species and assess the potential health risk to the local population of consuming these species. Following U.S. Environmental Protection Agency (EPA) protocols, consumption limits were calculated based on both excess lifetime cancer risk and noncancer risk. These were compared with local consumption rates, which were determined by questionnaire (n = 19). Median and 95th percentile contaminant concentrations were calculated to approximate ran-

dom and most extreme contaminant consumption scenarios. Only Hg concentrations exceeded established Food Standards Australia New Zealand (FSANZ) guideline values of 0.5 mg/kg, namely, for rainbow trout (*Oncorhynchus mykiss*; 62% of the study sites) and koura (freshwater crayfish; *Paranephrops planifrons*; 25% of sites). The major risk was from consumption of trout, where the local consumption rate (1.5 meals/mo) exceeded the consumption limit of 0.9 meals/mo (median data) and 0.4 meals/mo (95th percentile data). Shellfish--pipi (*Paphies australis*) and mussel (*Perna canaliculus*)--collected from the only estuarine site also had local consumption rates (3.5 meals/mo) above calculated consumption limits (2.6 and 2.9 meals/mo, respectively). Our results, while based on a limited sample size and therefore exploratory in nature, nevertheless provide the basis for developing consumption guidelines. This study makes a significant contribution to broadening our understanding of the complexities of managing customary fisheries.

Source: Phillips, N.R., Stewart, M., Olsen, G., Hickey, C.W. National Institute of Water & Atmospheric Research , Hamilton , New Zealand. "Human health risks of geothermally derived metals and other contaminants in wild-caught food." Journal of Toxicology and Environmental Health. Part A. 2014;77(6):346-65.

## Exposure assessment of pregnant Portuguese women to methylmercury through the ingestion of fish: cross-sectional survey and biomarker validation

Methylmercury (MeHg) contamination is a critical public health problem in Portugal, where fish is an important component of the daily diet. The Portuguese are the third largest consumers in the world (after Japan and Iceland) but first in Europe. Prenatal exposure to MeHg is believed to be linked to fetal/child neurodevelopment and behavioral impairments due to the neurotoxicity of the compound. The objective of this study was to assess the exposure of pregnant Portuguese women to mercury (Hg) due to fish consumption, calculating the indices of risk and confirming exposure through analyses of a biomarker of exposure. The study consisted of a cross-sectional evaluation of 343 pregnant women recruited at their visit to two antenatal care units in Lisbon, Portugal. A food frequency questionnaire was used to estimate prenatal exposure. Total Hg levels in hair were analyzed by atomic absorption, in samples from 186 women. The average fish consumption was 3.1 meals per week. Median Hg level in the hair was 1.26 μg/g (range: 0.07-5.3 μg/g). The mean calculated risk index was 0.81; however, 28% of the pregnant women ingested levels above the provisional tolerable weekly intake (PTWI) level recommended by the World Health Organization (WHO; 1.6 mg/kg per body weight), indicating the possibility of risk due to MeHg exposure. Multiple linear regression analysis showed the risk index was reliably predicted from predatory fish species and number of fish meals consumed per week. Ingestion of black and silver scabbard fish as well as mixed predatory fish cooked in traditional dishes enhanced the toxicity risk. In conclusion, some exposure levels exceeded the reference value; therefore, nutritional counseling needs to be provided to populations at risk.

Source: Nunes, E., Cavaco, A., Carvalho, C. Instituto de Investigação do Medicamento, Faculdade de Farmácia , Universidade de Lisboa, Lisboa, Portugal. "Exposure assessment of pregnant Portuguese women to methylmercury through the ingestion of fish: cross-sectional survey and biomarker validation." Journal of Toxicology and Environmental Health. Part A. 2014;77(1-3):133-42.

## Children's health risk and benefits of fish consumption: risk indices based on a diet diary follow-up of two weeks

Several epidemiological studies indicate that fish intake is associated with neurocognitive development and visual outcomes in children attributed to long-chain polyunsaturated fatty acids (PUFA). However, methylmercury (MeHg) represents the most toxic and abundant form of environmental mercury (Hg) exposure to humans and exposure occurs primarily through fish consumption. The objective of the study was to describe fish consumption during childhood in Portugal, estimating the intake of Hg from fish and calculating the indices of risk. The group consisted of 233 infants and students aged 7-11 yr and attending 5 primary schools in Lisbon, Amadora, and Sesimbra. Information regarding food consumption habits was collected through a food diary during 2 weeks, completed under the supervision of teachers and parents, where participants registered what was ingested for lunch and dinner during that period. The exposure assessment and indices of risk were calculated for each participant. Individuals were classified according to weekly intake and indices of risk determined per group. In addition, the methods used to collect information on fish intake habits, a food frequency questionnaire and diet diary, are described in relation to quality of information provided. The mean val-

ue of fish meals per week was approximately 5. The calculated indices of risk reached values above 1 in more than 50% of the studied population, demonstrating the presence of risk in subsets of the population. While Portuguese children represent an important group of fish consumers, this does not manifest as appreciable benefit with respect to omega-3 ingestion, as children ingest half or less of the recommended value (200 mg/d of omega-3), which is equivalent to being exposed to risk for Hg intoxication. The choice of fish species shows lack of knowledge of fish characteristics. Therefore, risk communication and population education need to be established to prevent consumption of predatory fish species that contribute to the increase in risk toxicity and to encourage ingestion of prey fish, which represent significant levels of high-value nutrients such as PUFA.

Source: Nunes, E., Cavaco, A., Carvalho, C. Instituto de Investigação do Medicamento (iMed.ULisboa), Faculdade de Farmácia , Universidade de Lisboa, Lisboa, Portugal. "Children's health risk and benefits of fish consumption: risk indices based on a diet diary follow-up of two weeks." Journal of Toxicology and Environmental Health. Part A. 2014;77(1-3):103-14.

## Hazard assessment of metals in invasive fish species of the Yamuna River, India in relation to bioaccumulation factor and exposure concentration for human health implications

Monitoring of heavy metals was conducted in the Yamuna River considering bioaccumulation factor, exposure concentration, and human health implications which showed contamination levels of copper (Cu), lead (Pb), nickel (Ni), and chromium (Cr) and their dispersion patterns along the river. Largest concentration of Pb in river water was 392 μg L(-1); Cu was 392 μg L(-1) at the extreme downstream,

Allahabad and Ni was 146 μg L(-1) at midstream, Agra. Largest concentration of Cu was 617 μg kg(-1), Ni 1,621 μg kg(-1) at midstream while Pb was 1,214 μg kg(-1) at Allahabad in surface sediment. The bioconcentration of Cu, Pb, Ni, and Cr was observed where the largest accumulation of Pb was 2.29 μg kg(-1) in *Oreochromis niloticus* and 1.55 μg kg (-1) in *Cyprinus carpio* invaded at Allahabad while largest concentration of Ni was 174 μg kg(-1) in *O. niloticus* and 124 μg kg(-1) in *C. carpio* in the midstream of the river. The calculated values of hazard index (HI) for Pb was found more than one which indicated human health concern. Carcinogenic risk value for Ni was again high i.e., 17.02 × 10(-4) which was larger than all other metals studied. The results of this study indicated bioconcentration in fish due to their exposures to heavy metals from different routes which had human health risk implications. Thus, regular environmental monitoring of heavy metal contamination in fish is advocated for assessing food safety since health risk may be associated with the consumption of fish contaminated through exposure to a degraded environment.

Source: Singh, A.K., Srivastava, S.C., Verma, P., Ansari, A., Verma, A. Exotic Fish Germplasm Section of Fish Health Management, National Bureau of fish Genetic Resources, Uttar Pradesh, India. "Hazard assessment of metals in invasive fish species of the Yamuna River, India in relation to bioaccumulation factor and exposure concentration for human health implications." Environmental Monitoring and Assessment. 2014 Jun;186(6):3823-36.

## Fish intake during pregnancy, fetal growth, and gestational length in 19 European birth cohort studies

BACKGROUND: Fish is a rich source of essential nutrients for fetal development, but in contrast, it is also a well-known route of exposure to environmental pollutants. OBJECTIVE: We assessed whether fish intake during pregnancy is associated with fetal growth and the length of gestation in a panel of European birth cohort studies. DESIGN: The study sample of 151,880 mother-child pairs was derived from 19 population-based European birth cohort studies. Individual data from cohorts were pooled and harmonized. Adjusted cohort-specific effect estimates were combined by using a random- and fixed-effects meta-analysis. RESULTS: Women who ate fish >1 time/wk during pregnancy had lower risk of preterm birth than did women who rarely ate fish (≤ 1 time/wk); the adjusted RR of fish intake >1 but <3 times/wk was 0.87 (95% CI: 0.82,

0.92), and for intake ≥ 3 times/wk, the adjusted RR was 0.89 (95% CI: 0.84, 0.96). Women with a higher intake of fish during pregnancy gave birth to neonates with a higher birth weight by 8.9 g (95% CI: 3.3, 14.6 g) for >1 but <3 times/wk and 15.2 g (95% CI: 8.9, 21.5 g) for ≥ 3 times/wk independent of gestational age. The association was greater in smokers and in overweight or obese women. Findings were consistent across cohorts. CONCLUSION: This large, international study indicates that moderate fish intake during pregnancy is associated with lower risk of preterm birth and a small but significant increase in birth weight.

Source: Leventakou, V., Roumeliotaki, T., Martinez, D., Barros, H., Brantsaeter, A.L., Casas, M., Charles, M.A., Cordier, S., Eggesbø, M., van Eijsden, M., Forastiere, F., Gehring, U.,Govarts, E., Halldórsson, T.I., Hanke, W., Haugen, M., Heppe, D.H., Heude, B., Inskip, H.M., Jaddoe, V.W., Jansen, M., Kelleher, C., Meltzer, H.M., Merletti, F., Moltó-Puigmartí, C., Mommers, M., Murcia, M., Oliveira, A., Olsen, S.F., Pele, F., Polanska, K., Porta, D., Richiardi, L., Robinson, S.M., Stigum, H., Strøm, M., Sunyer, J., Thijs, C., Viljoen, K., Vrijkotte, T.G., Wijga, A.H., Kogevinas, M., Vrijheid, M., Chatzi, L. "Fish intake during pregnancy, fetal growth, and gestational length in 19 European birth cohort studies." The American Journal of Clinical Nutrition. 2014 Mar;99 (3):506-16.

## Temporal and spatial trends in freshwater fish tissue mercury concentrations associated with mercury emissions reductions

Mercury (Hg) concentrations were monitored from 1999 to 2011 in largemouth bass (LMB) and yellow perch (YP) in 23 lakes in Massachusetts USA during a period of significant local and regional Hg emissions reductions. Average LMB tissue Hg concentration decreases of 44% were seen in 13 of 16 lakes in a regional Hg "hotspot" area. YP in all lakes sampled in this area decreased 43% after the major emissions reductions. Comparative decreases throughout the remainder of the state were 13% and 19% for LMB and YP respectively. Annual tissue mercury concentration rate decreases were 0.029 (LMB) and 0.016 mg Hg/kg/yr (YP) in the hotspot. In lakes around the rest of the state, LMB showed no trend and YP Hg decreased 0.0068 mg Hg/kg/yr. Mercury emissions from major point sources in the hotspot area decreased 98%, and 93% in the rest of the state from the early 1990s to 2008. The significant declines in fish Hg concentrations in many lakes occurred over the second half of a two decade decrease in Hg emissions primarily from municipal solid waste combustors and, secondarily, from other combustion point sources. In addition to the substantial Hg emissions reductions achieved in Massachusetts, further regional, national and global emissions reductions are needed for fish Hg levels to decrease below fish consumption advisory levels.

Source: Hutcheson, M.S., Smith, C.M., Rose, J., Batdorf, C., Pancorbo, O., West, C.R., Strube, J., Francis, C. Office of Research and Standards, Massachusetts Department of Environmental Protection, Boston, Massachusetts. "Temporal and spatial trends in freshwater fish tissue mercury concentrations associated with mercury emissions reductions." Environmental Science and Technology. 2014 Feb 18;48 (4):2193-202.

## Milestone achievement and neurodevelopment of rural Amazonian toddlers (12 to 24 months) with different methylmercury and ethylmercury exposure

Neurological outcomes (Gesell development schedules [GDS]), age of walking, and age of talking were studied in 299 toddlers (12 to 24 mo) in relation to environmental (fish consumption and tin mining) exposure. Exposure to fish methylmercury (MeHg) consumption and iatrogenic ethylmercury (EtHg) in Thimerosal-containing vaccines (TCV) was quantified in toddlers from two rural villages (n = 91, Itapuã; n = 218, Bom Futuro) respectively populated by fishers and cassiterite miners. Median total hair Hg (HHg) concentrations of infants from Itapuã (3.5 μg/g) were significantly higher than those of infants from Bom Futuro (2.2 μg/g). Median EtHg exposure from TCV was also significantly higher in toddlers from Itapuã (137.5 μg) than in those from Bom Futuro (112.5 μg). There were no significant differences between groups for any of the Gesell schedules; however, there were proportionally more compromised toddlers (GDS < 70) in Itapuã than Bom Futuro. Median age of talking was not statistically different but median age of walking was significantly higher in Bom Futuro. In toddlers from both villages, of fishers and miners, HHg concentrations were significantly correlated with family fish consumption. A logistic regression model was applied to all infants after classification into two groups: above or below the median Gesell schedules. Overall, there was no distinctive pattern of neurodevelopment associated with either HHg or EtHg exposure; however, nutritional status was significantly associated with GDS. In conclusion, milestone achievement was delayed in toddlers from tin-ore mining communities. Despite significantly higher exposure to both forms of organic Hg (MeHg from maternal fish consumption, and EtHg from TCV) in toddlers from the fishing village, significant differences were seen only

among the proportions of most severely affected toddlers (GDS < 70).

Source: Dórea, J.G., Marques, R.C., Abreu, L. Department of Nutrition, Universidade de Brasília, Brasília, Brazil. "Milestone achievement and neurodevelopment of rural Amazonian toddlers (12 to 24 months) with different methylmercury and ethylmercury exposure." Journal of Toxicology and Environmental Health. Part A. 2014;77(1-3):1-13.

## Pre-anthropocene mercury residues in North American freshwater fish

Mercury (Hg) has been entering the environment from both natural and anthropogenic sources for millennia, and humans have been influencing its environmental transport and fate from well before the Industrial Revolution. Exposure to Hg (as neurotoxic monomethylmercury [MeHg]) occurs primarily through consumption of finfish, shellfish, and marine mammals, and regulatory limits for MeHg concentrations in fish tissue have steadily decreased as information on its health impacts has become available. These facts prompted us to consider 2 questions: 1) What might the MeHg levels in fish tissue have been in the pre-Anthropocene, before significant human impacts on the environment? and 2) How would these pre-Anthropocene levels have compared with current regulatory criteria for MeHg residues in fish tissue? We addressed the first question by estimating pre-Anthropocene concentrations of MeHg in the tissues of prey and predatory fish with an integrated Hg speciation, transport, fate, and food web model (SERAFM), using estimated Hg concentrations in soil, sediment, and atmospheric deposition before the onset of significant human activity (i.e., ≤2000 BCE). Model results show MeHg residues in fish varying depending on the characteristics of the modeled water body, which suggests that Hg in fish tissue is best considered at the scale of individual watersheds or water bodies. We addressed the second question by comparing these model estimates with current regulatory criteria and found that MeHg residues in predatory (but not prey) fish could have approached or exceeded these criteria in some water bodies during the pre-Anthropocene. This suggests that the possibility of naturally occurring levels of Hg in fish below which it is not possible to descend, regardless of where those levels stand with respect to current regulatory limits. Risk management decisions made under these circumstances have the potential to be ineffectual, frustrating, and costly for decision makers and stakeholders alike, suggesting the need for regulatory flexibility when addressing the issue of Hg in fish.

Source: Hope, B.K., Louch, J. CH2M HILL, Portland, Oregon, USA. "Pre-anthropocene mercury residues in North American freshwater fish." Integrated Environmental Assessment and Management. 2014 Apr;10(2):299-308.

## Mercury exposure in pregnancy: a review

Mercury exposure in pregnancy has been associated with both pregnancy complications and developmental problems in infants. Apart from industrial accidents and contaminated food, mercury exposure is likely to arise from predatory fish consumption, environmental contamination and dental amalgam restorations placed before or during pregnancy. It would be prudent to recommend that pregnant women avoid these potential problems and minimize any risk. The available literature indicates a linear relationship with mercury levels and IQ deficit, and therefore a safe limit of mercury cannot be calculated.

Source: Solan, T.D., Lindow, S.W. "Mercury exposure in pregnancy: a review." Journal of Perinatal Medicine. 2014 Apr 3. [Epub ahead of print].

## Gestational weight gain and exposure of newborns to persistent organic pollutants

BACKGROUND: Exposure to persistent organic pollutants (POPs) during fetal development can increase the risk of adverse health effects during childhood. Maternal characteristics and physiological changes during gestation such as gestational weight gain (GWG) may have an influence in the overall burden of POPs in neonates. However, the associations between GWG and POP concentrations are still not well established. OBJECTIVE: We examined the association of GWG with cord serum POPs concentrations after adjusting for pre-pregnancy maternal body mass index

(BMI) and other potential determinants of the transfer of POPs into newborns. The GWG values were evaluated after grouping by the reference guidelines of the Institute of Medicine (IOM). METHODS: We measured levels of 14 organochlorine pesticides, 7 polychlorobiphenyls (PCBs) and 14 polybromodiphenyl ethers (PBDEs) in 325 cord serum samples from a Spanish birth cohort. Multivariable models were used to estimate associations of GWG, pre-pregnancy BMI, and other maternal determinants on cord serum concentrations of POPs. RESULTS: Neonatal concentrations of POPs were inversely associated with GWG after adjustment for age, pre-pregnancy BMI, educational level, and fish consumption. On average, neonates of women with IOM recommended GWG have lower POP concentrations than neonates of mothers with inadequate GWG. CONCLUSIONS: The present findings suggest an association between neonatal exposure to POPs and inadequate GWG during pregnancy. Encouraging pregnant women to meet the recommended IOM guidelines for GWG may reduce the accumulation of POPs in newborns.

Source: Vizcaino, E., Grimalt, J.O., Glomstad, B., Fernández-Somoano, A., Tardón, A. Department of Preventive Medicine and Public Health, University of Oviedo, Asturias; Department of Environmental Chemistry, Institute of Environmental Assessment and Water Research (IDÆA-CSIC), Barcelona, Catalonia; and Spanish Consortium for Research on Epidemiology and Public Health (CIBERESP), Instituto de Salud Carlos III, Madrid, Spain. "Gestational Weight Gain and Exposure of Newborns to Persistent Organic Pollutants." Environmental Health Perspectives. 2014 May 2. [Epub ahead of print].

## Comparison of seafood consumption in a group of Italian mother-child pairs

Seafood is an important component of healthful human diets. Intake of seafood is recommended both for young women and children. In fact, it is a good source of high-quality protein, low in saturated fats, and rich in essential nutrients (e.g. iodine, iron, choline, and selenium) and long-chain polyunsaturated fatty acids (LCPUFAs), especially omega-3. However, the relationship between maternal diet and the children's dietary habits is controversial. This study investigated the possible association between the seafood consumption by mothers and that by their 8-11 years old children and compared maternal seafood intakes during pregnancy and about 10 years later. The seafood consumption by 37 pregnant women was assessed in 1999-2001. In 2009, mothers were asked to report their weekly intake and

their children's. Mother-child pairs showed a similar consumption pattern: the overall intake was 1.28 +/- 0.77 versus 1.19 +/- 0.64 ($p = 0.49$) while the sum of specific items was 3.71 +/- 3.01 versus 3.18 +/- 2.90 ($p = 0.049$). However, it cannot be discerned whether maternal diet affected the children's nutritional habits or vice-versa. In fact, mothers showed to have a higher seafood intake about 10 years after pregnancy (3.71 versus 1.83; $p < 0.001$), suggesting that a progressive modification of dietary habits occurred after delivery, possibly due to the influence of maternal diet on the nutritional habits of offspring or due to the presence of children in the family unit, that could have influenced maternal dietary habits. This dietary improvement could be brought forward through educational interventions addressed to young women, that could also allow a more informed choice of the healthier species of fish both for them and their children.

Source: Deroma, L., Valent, F., Parpinel, M., Barbone, F. Centre for Rare Diseases, University Hospital "Santa Maria della Misericordia," Udine, Italy; Regional Health Directorate, Friuli Venezia Giulia Region, Udine, Italy; Department of Medical and Biological Sciences, University of Udine, Italy; Institute of Hygiene and Clinical Epidemiology, University Hospital "Santa Maria della Misericordia", Udine, Italy. "Comparison of seafood consumption in a group of Italian mother-child pairs." Journal of Health, Population, and Nutrition. 2013 Dec;31(4):455-61.

## Food sources of arsenic in pregnant Mediterranean women with high urine concentrations of this metalloid

Seafood consumption provides a significant amount of arsenic, although in its organic, nontoxic forms. Mediterranean populations may incorporate high levels of this metalloid as a consequence of seafood consumption. In the present study, the significance of this input among pregnant women from a Mediterranean city (Sabadell, Catalonia, Spain) is assessed. Total urinary arsenic was analyzed in 489 pairs of urine samples, corresponding to the 12th and 32th weeks of pregnancy. Association of arsenic content with seafood and other dietary items were studied. Geometric mean concentrations were 34 and 37 μg/g creatinine during the first and third trimesters, respectively. The observed concentrations were similar to those reported in studies from other Mediterranean countries. The differences between both periods were not statistically significant. The only dietary factor significantly and positively associated with total urinary arsenic in both series of samples was seafood, particularly lean fish. Moreover, lean fish consumption during both periods was found to be the main determinant for differences in levels of arsenic between the first and third trimesters, which confirms the association between high levels of total urinary arsenic and seafood consumption.

Source: Fort, M., Grimalt, J.O., Casas, M., Sunyer, J. Department of Environmental Chemistry, Institute of Environmental Assessment and Water Research, Barcelona, Catalonia, Spain. "Food sources of arsenic in pregnant Mediterranean women with high urine concentrations of this metalloid." Environmental Science and Pollution Research International. 2014 February 22. [Epub ahead of print].

## Dietary effects of introducing school meals based on the New Nordic Diet - a randomised controlled trial in Danish children. The OPUS School Meal Study.

The OPUS (Optimal well-being, development and health for Danish children through a healthy New Nordic Diet (NND)) School Meal Study investigated the effects on the intake of foods and nutrients of introducing school meals based on the principles of the NND covering lunch and all snacks during the school day in a cluster-randomised cross-over design. For two 3-month periods, 834 Danish children aged 8-11 years from forty-six school classes at nine schools received NND school meals or their usual packed lunches brought from home (control) in random order. The whole diet of the children was recorded over seven consecutive days using a validated Web-based Dietary Assessment Software for Children. The NND resulted in higher intakes of potatoes (130 %, 95 % CI 2·07, 2·58), fish (48 %, 95 % CI 1·33, 1·65), cheese (25 %, 95 % CI 1·15, 1·36), vegetables (16 %, 95 % CI 1·10, 1·21), eggs (10 %, 95 % CI 1·01, 1·19) and beverages (6 %, 95 % CI 1·02, 1·09), and lower intakes of bread (13 %, 95 % CI 0·84, 0·89) and fats (6 %, 95 % CI 0·90, 0·98) were found among the children during the NND period than in the control period (all, $P < 0·05$). No difference was found in mean energy intake ($P = 0·4$), but on average children reported 0·9 % less energy intake from fat and 0·9 % higher energy intake from protein during the NND period than in the control period. For micronutrient intakes, the largest differences were found for vitamin D (42 %, 95 % CI 1·32, 1·53) and iodine (11 %, 95 % CI 1·08, 1·15) due to the higher fish intake. In conclusion, the present study showed that the overall dietary intake at the food and nutrient levels was improved among children aged 8-11 years when their habitual packed lunches were replaced by school meals following the principles of the NND.

Source: Andersen, R., Biltoft-Jensen, A., Christensen, T., Andersen, E.W., Ege, M., Thorsen, A.V., Dalskov, S.M., Damsgaard, C.T., Astrup, A., Michaelsen, K.F., Tetens, I. Division of Nutrition, National Food Institute, Technical University of Denmark, Denmark; Department of Applied Mathematics and Computer Science, Technical University of Denmark, Lyngby, Denmark; Department of Nutrition, Exercise and Sports, Faculty of Science, University of Copenhagen, Frederiksberg, Denmark. "Dietary effects of introducing school meals based on the New Nordic Diet - a randomised controlled trial in Danish children. The OPUS School Meal Study." The British Journal of Nutrition. 2014 April 8:1-10. [Epub ahead of print].

## Fish consumption and lung cancer risk: systematic review and meta-analysis

There is evidence pointing to a possible role of diet on cancer etiology. Prior studies evaluating the relationship between fish consumption and lung cancer risk reported inconclusive results. The aim of this study was to achieve a comprehensive assessment of the relationship between fish consumption and lung cancer risk through systematic review and meta-analysis. Case control and cohort studies up to September 1, 2012 about fish consumption and lung cancer risk were confirmed by an online search. Separate relative risk (RR) or odds ratio (OR) estimates with 95% confidence interval (CI) of the relationship between lung cancer risk and fish consumption level from the included articles were combined by Stata11.0 software. Publication bias was evaluated by Egger's linear regression test and funnel plot. Twenty articles (17 case-control and 3 cohort studies) comprising 8799 cases of lung cancer and 17,072 noncases were included in the final analysis. The pooled results from all studies indicated that high fish consumption was significantly associated with a decreased risk of lung cancer (pooled RR: 0.79; 95% CI: 0.69-0.92). There was heterogeneity among the studies ($I(2) = 73\%$, $P < 0.05$). Pooled RR in case control and cohort studies were 0.76 (95% CI: 0.63-0.91) and 0.95 (95% CI: 0.73-1.24), respectively. Omission of any single study had little effect on the combined risk estimates. This article had no publication bias. This study identifies a significant association between fish consumption and lung cancer, confirming a protective role of fish in lung cancer. More well-designed prospective studies are required to further verify the effect of fish consumption on lung cancer.

Source: Song, J., Su, H., Wang, B.L., Zhou, Y.Y., Guo, L.L. Department of Epidemiology and Biostatistics, School of Public Health Anhui Medical University , Hefei, Anhui Province, China. "Fish consumption and lung cancer risk: systematic review and meta-analysis." Nutrition and Cancer. 2014 66(4):539-49.

## Influence of feeding graded levels of canned sardines on the inflammatory markers and tissue fatty acid composition of Wistar rats

Canned sardines are a ready-to-use fish product with excellent nutritional properties owing to its high n-3 long-chain PUFA content, mainly EPA (20 : 5n-3) and DHA (22 : 6n-3). The present study aimed to assess the effect of two dosages of canned sardines, recommended for the primary and secondary prevention of human CVD, on the inflammatory marker concentrations and fatty acid composition of erythrocytes and key metabolic tissues (liver, muscle, adipose tissue and brain) in the rat model. Wistar rats were fed a diet containing 11 % (w/w) of canned sardines (low-sardine (LS) diet) and a diet containing 22 % (w/w) of canned sardines (high-sardine (HS) diet) for 10 weeks. Daily food intake, weight gain, and organ and final body weights were not affected by the dietary treatments. The concentrations of total cholesterol, HDL-cholesterol and LDL-cholesterol decreased in both the LS and HS groups, while those of alanine aminotransferase and adiponectin increased. The concentrations of IL-1β increased only with the highest dosage of sardine. The dose-dependent influence of the graded levels of EPA+DHA was tissue specific. Compared with that of other tissues and erythrocytes, the fatty acid composition of the brain was less affected by the canned sardine-supplemented diets. In contrast, the retroperitoneal adipose tissue was highly responsive. The deposition ratios of EPA and DHA indicated that the LS diet was optimal for DHA deposition across the tissues, except in the retroperitoneal adipose tissue. Taken together, our findings indicate that a LS diet positively affects plasma lipid profiles and inflammatory mediators, whereas a HS diet has contradictory effects on IL-1β, which, in turn, is not associated with variations in the concentrations of other pro-inflammatory cytokines. This finding requires further investigation and pathophysiological understanding.

Source: Rodrigues, P.O., Martins, S.V., Lopes, P.A., Ramos, C., Miguéis, S., Alfaia, C.M., Pinto, R.M., Rolo, E.A., Bispo, P., Batista, I., Bandarra, N.M., Prates, J.A. CEDOC, Faculdade de Ciências Médicas, Universidade Nova de Lisboa, Lisbon, Portugal; CIISA, Faculdade de Medicina Veterinária, Universidade de Lisboa, Lisbon, Portugal; DIVAV, Instituto Português do Mar e da Atmosfera, Lisbon, Portugal; iMed.UL, Faculdade de Farmácia, Universidade de Lisboa, Lisbon, Portugal. "Influence of feeding graded levels of canned sardines on the inflammatory markers and tissue fatty acid composition of Wistar rats." The British Journal of Nutrition. 2014 Apr 28:1-11. [Epub ahead of print]

## Impact of Omega-3 and Omega-9 fatty acids enriched total parenteral nutrition on blood chemistry and inflammatory markers in septic patients

Objective: Lipid emulsions containing omega-3 are known to have positive effects on patient's prognosis due to anti-inflammatory properties. The aim of this study was to investigate the effects of omega-3 enriched total parenteral nutrition (TPN) emulsion containing omega-9 on biochemical parameters, inflammatory mediators in septic patients. Methods: Thirty-two participants who were not fed orally for over five days and needing TPN support were included in this prospective, randomized and double-blind clinical study. Patients were randomly divided into control (n=16), treatment (n=16) groups. The treatment group received TPN containing 80% olive oil+20% soy oil additionally 10 g fish oil enriched TPN. Control group received only olive oil containing standard lipid emulsion (1.3±0.1 g/kg/day). Blood samples were collected for biochemical analysis on the 1(st) and 6(th) days of study. Results: The serum albumin levels significantly increased ($p<0.05$) in both groups whereas total protein and prealbumin levels did not show any significant changes. In treatment group, significant decreases were determined in LTB4 and CRP levels ($p<0.05$) while decreases in IL-6, TNF-α and leukocyte levels were not significant. No statistically significant changes were found in LTB4, CRP, IL-6, TNF-α and leukocyte levels of controls. Conclusion: Results of the study have shown that omega-3 enriched TPN solution containing omega-9 contributes to decrease in the levels of inflammatory mediators and to improvement in the biochemical parameters in septic patients.

Source: Gultekin, G., Sahin, H., Inanc, N., Uyanik, F., Ok, E. MSc, Formortaca Diet Clinic, Mugla, Turkey; Department of Nutrition and Dietetics; Department of Nutrition and Dietetics; Nuh Naci Yazgan University, Faculty of Health Sciences, Kayseri, Turkey; Canakkale Onsekiz Mart University. "Impact of Omega-3 and Omega-9 fatty acids enriched total parenteral nutrition on blood chemistry and inflammatory markers in septic patients." Pakistan Journal of Medical Sciences. 2014 March. 30(2):299-304.

## Longitudinal associations between fish consumption and depression in young adults

Few studies have examined longitudinal associations between fish consumption and depression; none have defined depression using a diagnostic tool. We investigated whether fish consumption was associated with fewer new depression episodes in a national study of Australian adults. In 2004-2006, 1,386 adults aged 26-36 years (38% males) completed a 127-item (9 fish items) food frequency questionnaire. Fish intake was examined continuously (times/week) and dichotomously (reference group: <2 times/week). During 2009-2011, the lifetime version of the Composite International Diagnostic Interview was administered by telephone. New episodes of major depression/dysthymic disorder (since baseline) were defined using the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. During follow-up, 160 (18.8%) women and 70 (13.1%) men experienced depression. For women, each additional weekly serving of fish consumed at baseline decreased the risk of having a new depressive episode by 6% (adjusted relative risk = 0.94, 95% confidence interval: 0.87, 1.01). Women who ate fish ≥2 times/week at baseline had a 25% lower risk of depression during follow-up than those who ate fish <2 times/week (adjusted relative risk = 0.75, 95% confidence interval: 0.57, 0.99). Reverse causation was also suggested but appeared to be restricted to persons with recent depression. Fish consumption was not associated with depression in men. These findings provide further evidence that fish consumption may be beneficial for women's mental health.

Source: Smith, K.J., Sanderson, K., McNaughton, S.A., Gall, S.L., Dwyer, T., Venn, A.J. "Longitudinal Associations Between Fish Consumption and Depression in Young Adults." American Journal of Epidemiology. 2014 April 15. [Epub ahead of print].

## Omega-3 fatty acids and depression: scientific evidence and biological mechanisms

The changing of omega-6/omega-3 polyunsaturated fatty acids (PUFA) in the food supply of Western societies occurred over the last 150 years is thought to promote the pathogenesis of many inflammatory-related diseases, including depressive disorders. Several epidemiological studies reported a significant inverse correlation between intake of oily fish and depression or bipolar disorders. Studies conducted specifically on the association between omega-3 intake and depression reported contrasting results, suggesting that the preventive role of omega-3 PUFA may depend also on other factors, such as overall diet quality and the social environment. Accordingly, tertiary prevention with omega-3 PUFA supplement in depressed patients has reached greater effectiveness during the last recent years, although definitive statements on their use in depression therapy cannot be yet freely asserted. Among the biological properties of omega-3 PUFA, their anti-inflammatory effects and their important role on the structural changing of the brain should be taken into account to better understand the possible pathway through which they can be effective both in preventing or treating depression. However, the problem of how to correct the inadequate supply of omega -3 PUFA in the Westernized countries' diet is a priority in order to set food and health policies and also dietary recommendations for individuals and population groups.

Source: Grosso, G., Galvano, F., Marventano, S., Malaguarnera, M., Bucolo, C., Drago, F., Caraci, F. University of Catania, Catania, Italy. "Omega-3 fatty acids and depression: scientific evidence and biological mechanisms." Oxidative Medicine and Cellular Longevity. 2014. 2014:313570.

## Global methylmercury exposure from seafood consumption and risk of developmental neurotoxicity: a systematic review

OBJECTIVE: To examine biomarkers of methylmercury (MeHg) intake in women and infants from seafood-consuming populations globally and characterize the comparative risk of fetal developmental neurotoxicity. METHODS: A search was conducted of the published literature reporting total mercury (Hg) in hair and blood in women and infants. These biomarkers are validated proxy measures of MeHg, a neurotoxin found primarily in seafood. Average and high-end biomarkers were extracted, stratified by seafood consumption context, and pooled by category. Medians for average and high-end pooled distributions were compared with the reference level established by a joint expert committee of the Food and Agriculture Organization (FAO) and the World Health Organization (WHO). FINDINGS: Selection criteria were met by 164 studies of women and infants from 43 countries. Pooled average biomarkers suggest an intake of MeHg several times over the FAO/WHO reference in fish-consuming riparians living near small-scale gold mining and well over the reference in consumers of marine mammals in Arctic regions. In coastal regions of south-eastern Asia, the western Pacific and the Mediterranean, average biomarkers approach the reference. Although the two former groups have a higher risk of neurotoxicity than the latter, coastal regions are home to the largest number at risk. High-end biomarkers across all categories indicate MeHg intake is in excess of the reference value. CONCLUSION: There is a need for policies to reduce Hg exposure among women and infants and for surveillance in high-risk populations, the majority of which live in low-and middle-income countries.

Source: Sheehan, M.C., Burke, T.A., Navas-Acien, A., Breysse, P.N., McGready, J., Fox, M.A. Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland. "Global methylmercury exposure from seafood consumption and risk of developmental neurotoxicity: a systematic review." Bulletin of the World Health Organization. 2014 April 1. 92(4):254-269F.

## Fatty acids and cardiac disease: Fuel carrying a message

Source: van Bilsen, M., Planavila, A. Department of Physiology, Cardiovascular Research Institute Maastricht, Maastricht University, Maastricht, the Netherlands. "Fatty acids and cardiac disease: Fuel carrying a message." Acta Physiologica (Oxford, England). 2014 April 28. [Epub ahead of print].

## The effect of docosahexaenoic acid on bone microstructure in young mice and bone fracture in neonates

Source: Fallon, E.M., Nazarian, A., Nehra, D., Pan, A.H., O'Loughlin, A.A., Nose, V., Puder, M. Harvard Medical School, Boston, Massachusetts; Department of Surgery and the Vascular Biology Program, Boston Children's Hospital, Boston, Massachusetts; Harvard Medical School, Boston, Massachusetts; Center for Advanced Orthopaedic Studies, Beth Israel Deaconess Medical Center, Boston, Massachusetts; Department of Pathology, Massachusetts General Hospital, Boston, Massachusetts; Department of Surgery and the Vascular Biology Program, Boston Children's Hospital, Boston, Massachusetts; "The effect of docosahexaenoic acid on bone microstructure in young mice and bone fracture in neonates." The Journal of Surgical Research. 2014 April 12. pii: S0022-4804(14)00359-X.

## Diet and psoriasis, part III: Role of nutritional supplements

Source: Millsop, J.W., Bhatia, B.K., Debbaneh, M., Koo, J., Liao, W. University of California, San Francisco, California. "Diet and psoriasis, part III: Role of nutritional supplements." Journal of the American Academy of Dermatology. 2014 April 25. pii: S0190-9622(14)01243-2.

## Distribution of polycyclic aromatic hydrocarbon (PAH) residues in several tissues of edible fishes from the largest freshwater lake in China, Poyang Lake, and associated human health risk assessment

Source: Zhao Z1, Zhang L2, Cai Y1, Chen Y1. State Key Laboratory of Lake Science and Environment Research, Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences, Nanjing, China. "Distribution of polycyclic aromatic hydrocarbon (PAH) residues in several tissues of edible fishes from the largest freshwater lake in China, Poyang Lake, and associated human health risk assessment." Ecotoxicology and Environmental Safety. 2014 April 11. 104C:323-331.

## Evaluation of human health risks posed by carcinogenic and non-carcinogenic multiple contaminants associated with consumption of fish from Taihu Lake, China

Source: Yu, Y., Wang, X., Yang, D., Lei, B., Zhang, X., Zhang, X. Institute of Environmental Pollution and Health, School of Environmental and Chemical Engineering, Shanghai University, Shanghai, PR China. "Evaluation of human health risks posed by carcinogenic and non-carcinogenic multiple contaminants associated with consumption of fish from Taihu Lake, China." Food and Chemical Toxicology. 2014 April 12;69C:86-93.

## The arsenic content in marketed seafood and associated health risks for the residents of Shandong, China

Source: Wu, X., Gao, M., Wang, L., Luo, Y., Bi, R., Li, L., Xie, L. Key Laboratory of Pollution Ecology and Environmental Engineering, Institute of Applied Ecology, Chinese Academy of Sciences, China; Central Laboratory, Shandong Academy of Agriculture Science (Shandong Key Laboratory of Test Technique on Food Quality and Safety), China; Guangxi Fisheries Research Institute, China. "The arsenic content in marketed seafood and associated health risks for the residents of Shandong, China." Ecotoxicology and Environmental Safety. 2014 April. 102:168-73.

## Elevated blood Hg at recommended seafood consumption rates in adult seafood consumers

Source: Karimi, R., Silbernagel, S., Fisher, N.S., Meliker, J.R. Stony Brook University, Stony Brook, New York. "Elevated blood Hg at recommended seafood consumption rates in adult seafood consumers." International Journal of Hygiene and Environmental Health. 2014 April 6. pii: S1438-4639(14)00034-0.

## High levels of perfluoroalkyl acids in sport fish species downstream of a firefighting training facility at Hamilton International Airport, Ontario, Canada

Source: Gewurtz, S.B., Bhavsar, S.P., Petro, S., Mahon, C.G., Zhao, X., Morse, D., Reiner, E.J., Tittlemier, S.A., Braekevelt, E., Drouillard, K. Great Lakes Institute for Environmental Research, University of Windsor, Windsor, Ontario, Canada; Ontario Ministry of the Environment, Toronto, Canada; School of the Environment, University of Toronto, Toronto, ON M5S 3E8, Canada. "High levels of perfluoroalkyl acids in sport fish species downstream of a firefighting training facility at Hamilton International Airport, Ontario, Canada." Environment International. 2014 June. 67:1-11.

## Metal concentration in water, sediment and four fish species from Lake Titicaca reveals a large-scale environmental concern

Source: Monroy, M., Maceda-Veiga, A., de Sostoa, A. University of Barcelona, Barcelona, Spain; Cardiff University, Cardiff, United Kingdom. "Metal concentration in water, sediment and four fish species from Lake Titicaca reveals a large-scale environmental concern." The Science of the Total Environment. 2014 April 28;487C:233-244.

## Heavy metals in fish from the Aleutians: Interspecific and locational differences

Source: Burger, J., Gochfeld, M., Jeitner, C., Pittfield, T., Donio, M. Rutgers University, Piscataway, New Jersey. "Heavy metals in fish from the Aleutians: Interspecific and locational differences." Environmental Research. 2014 April 8; 131C:119-130.

## Concentrations of selected heavy metals in maternal blood and associated factors in rural areas in Shanxi Province, China

Source: Jin, L., Liu, J., Ye, B., Ren, A. School of Public Health, Peking University, PR China; Institute for Environment Hygiene and Health Related Product Safety, Chinese Center for Disease Control and Prevention, PR China; Institute of Reproductive and Child Health/Ministry of Health Key Laboratory of Reproductive Health, Peking University, PR China. "Concentrations of selected heavy metals in maternal blood and associated factors in rural areas in Shanxi Province, China." Environment International. 2014 May;66:157-64.

## Perinatal multiple exposure to neurotoxic (lead, methylmercury, ethylmercury, and aluminum) substances and neurodevelopment at six and 24 months of age

Source: Marques, R.C., Bernardi, J.V., Dórea, J.G., de Fatima, R., Moreira, M., Malm, O. Federal University of Rio de Janeiro, Campus Macaé, Brazil; [2]University of Brasília, Brasil; Escola Nacional de Saúde Pública, Fundação Oswaldo Cruz, RJ, Brazil. "Perinatal multiple exposure to neurotoxic (lead, methylmercury, ethylmercury, and aluminum) substances and neurodevelopment at six and 24 months of age." Environmental Pollution (Barking, Essex: 1987). 2014 April;187:130-5.

## Fish consumption and blood mercury levels: Golding et al. respond

Source: Golding, J., Steer, C.D., Lowery, T., Jones, R., Hibbeln, J.R. Centre for Child and Adolescent Health, University of Bristol, Bristol, United Kingdom. "Fish consumption and blood mercury levels: golding et Al. Respond." Environmental Health Perspectives. 2014 May 1;122 (5):A120-1.

## Exposure to mercury among Spanish preschool children: Trend from birth to age four

Source: Llop, S., Murcia, M., Aguinagalde, X., Vioque, J., Rebagliato, M., Cases, A., Iñiguez, C., Lopez-Espinosa, M.J., Amurrio, A., María Navarrete-Muñoz, E., Ballester, F. Spanish Consortium for Research on Epidemiology and Public Health (CIBERESP), Madrid, Spain; Foundation for the Promotion of Health and Biomedical Research in the Valencian Region, FISABIO-Public Health, Valencia, Spain; Laboratorio de Salud Pública de Alava, Vitoria Gasteiz, Spain; Universidad Miguel Hernandez, Sant Joan d´Alacant, Spain. "Exposure to mercury among Spanish preschool children: Trend from birth to age four." Environmental Research. 2014 April 15;132C:83-92.

## 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

U.S. Environmental Protection Agency
Office of Science and Technology (4305T)
1200 Pennsylvania Avenue, NW, Washington, DC 20460