

Bibliography



Detroit River Fish Consumption Advisories: PCBs

Table of Contents

PCBs in Humans	p. 2
PCBs in Fish	p. 16
Acknowledgements	p. 20

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This bibliography is part of an integrated assessment (IA) supported by a grant to D. Kashian from Michigan Sea Grant. The goal of the IA is to review the causes, consequences, and correctives for contamination on the Detroit River. More specifically, it looks at the reasons why fish contamination advisories are issued when they are. The project seeks to bring policy-makers, interested stakeholders, scientists, and governmental agencies together on both the Canadian and United States sides of the shore to talk about new information concerning PCB contamination and integrate historical elements to create new approaches to management of the River. We aim to help in protecting the health and safety of the people who fish on the Detroit River, the ecosystems that house them, and the economy that depends on fishing.

Fish Consumption Advisories for Polychlorinated Biphenyls (PCBs): Human Health

Abdelouahab, N., D. Mergler, L. Takser, C. Vanier, M. St-Jean, M. Baldwin, P. A. Spear, and H. M. Chan. 2008. Gender differences in the effects of organochlorines, mercury, and lead on thyroid hormone levels in lakeside communities of Quebec (Canada). *Environmental Research* 107 (3):380-392.

Agudo, A., F. Goni, A. Etxeandia, A. Vives, E. Millan, R. Lopez, P. Amiano, E. Ardanaz, A. Barricarte, M. D. Chirlaque, M. Dorronsoro, P. Jakszyn, N. Larranaga, C. Martinez, C. Navarro, L. Rodriguez, M. J. Sanchez, M. J. Tormo, and C. A. Gonzalez. 2009. Polychlorinated biphenyls in Spanish adults: Determinants of serum concentrations. *Environmental Research* 109 (5):620-628.

Anderson, H. A., Falk, C., Hanrahan, L., Olson, J., Burse, V.W., Needham, L., Paschal, D., Patterson, D. Jr., and Hill, R. Jr. 1998. Profiles of Great Lakes critical pollutants: A sentinel analysis of human blood and urine. *Environmental Health Perspectives*. 106(5): 279-28.

Angulo, R., Martinez P. and Jodral, M.L. 1999. PCB congeners transferred by human milk, with an estimate of their daily intake. *Food and Toxicology*. 37:1081-1088

Arulmozhiraja, S; Shiraishi, F; Okumura, T; Iida, M; Takigami, H; Edmonds, JS; Morita, M. 2005. Structural requirements for the interaction of 91 hydroxylated polychlorinated biphenyls with estrogen and thyroid hormone receptors. *Toxicological Sciences* 84 (1): 49-62.

Axmon, A., Rylander, L., Strömberg, U., Dyremark, E. and Hagmar, L. 2001. Polychlorinated biphenyls in blood plasma among Swedish female fish consumers in relation to time pregnancy. *Journal of Toxicology and Environmental Health A*. 64:6, 485-498.

Axmon, A., 2006. Menarche in women with high exposure to persistent organochlorine pollutants in utero and during childhoods. *Environmental Research*. 102:77-82.

Behrooz, R. D., A. E. Sari, N. Bahramifar, and S. M. Ghasempouri. 2009. Organochlorine pesticide and polychlorinated biphenyl residues in human milk from the Southern Coast of Caspian Sea, Iran. *Chemosphere* 74 (7):931-937.

Bilau, M., C. Matthys, W. Baeyens, L. Bruckers, G. De Backer, E. Den Hond, H. Keune, G. Koppen, V. Nelen, G. Schoeters, N. Van Larebeke, J. L. Willems, S. De Henauw, and Environm Flemish Ctr Expertise. 2008. Dietary exposure to dioxin-like compounds in three age groups: Results from the Flemish environment and health study. *Chemosphere* 70 (4):584-592.

Bloom, M.S., Weiner, J.M., Vena, J.E. and Beehler, G.P. 2003. Exploring associations between serum levels of select organochlorines and thyroxine in a sample of New York state sportsmen: the New York State Cohort Study. *Environmental Research*. 93:52-66.

- Bloom, M. S., Vena, J. E., Swanson, M. K., Moysich, K. B. and Olson, J. R. 2005. Profile of ortho-polychlorinated biphenyl congeners, dichlorodiphenyldichloroethylene, hexachlorobenzene, and mirex among male Lake Ontario sportfish consumers: the New York state angler cohort study. *Environmental Research*. 97:178-194.
- Breffle, W. S., and K. K. Maroney. 2009. The restoration of fishing services and the conveyance of risk information in the Southern California Bight. *Marine Policy* 33 (4):561-570.
- Brustad, M., T. M. Sandanger, E. Nieboer, and E. Lund. 2008. 10th Anniversary Review: when healthy food becomes polluted - implications for public health and dietary advice. *Journal of Environmental Monitoring* 10 (4):422-427.
- Buck Louis, G. M., J. Dmochowski, C. Lynch, P. Kostyniak, B. M. McGuinness, and J. E. Vena. 2009. Polychlorinated biphenyl serum concentrations, lifestyle and time-to-pregnancy. *Hum Reprod* 24 (2):451-8.
- Buck, G. M., P. Mendola, J. E. Vena, L. E. Sever, P. Kostyniak, H. Greizerstein, J. Olson, and F. D. Stephen. 1999. Paternal Lake Ontario fish consumption and risk of conception delay, New York state angler cohort. *Environmental Research* 80 (2):S13-S18.
- Buck, G. M., J. E. Vena, H. B. Greizerstein, J. M. Weiner, B. McGuinness, P. Mendola, P. J. Kostyniak, M. Swanson, M. S. Bloom, and J. R. Olson. 2002. PCB congeners and pesticides and female fecundity, New York State Angler Prospective Pregnancy Study. *Environmental Toxicology and Pharmacology* 12 (2):83-92.
- Buck, G. M., J. E. Vena, E. F. Schisterman, J. Dmochowski, P. Mendola, L. E. Sever, E. Fitzgerald, P. Kostyniak, H. Greizerstein, and J. Olson. 2000. Parental consumption of contaminated sport fish from Lake Ontario and predicted fecundability. *Epidemiology* 11 (4):388-393.
- Burger J. 2005. Fishing, fish consumption, and knowledge about advisories in college students and others in central New Jersey. *Environmental Research* 98(2):268-275.
- Burger J. 2008. Fishing, fish consumption, and awareness about warnings in a university community in central New Jersey in 2007, and comparisons with 2004. *Environmental Research* 108(1):107-116.
- Burger, Joanna. 2008. Perceptions as Indicators of Potential Risk from Fish Consumption and Health of Fish Populations. *Environmental Bioindicators* 3 (2):90-105.
- Burger, J., and K. R. Campbell. 2008. Fishing and consumption patterns of anglers adjacent to the Oak Ridge Reservation, Tennessee: higher income anglers ate more fish and are more at risk. *Journal of Risk Research* 11 (3):335-350.
- Burger J, Gochfeld M. 2006. A framework and information needs for the management of the risks from consumption of self-caught fish. *Environmental Research* 101(2):275-285.

Burger, J., and M. Gochfeld. 2008. Knowledge about fish consumption advisories: A risk communication failure within a university population. *Science of the Total Environment* 390 (2-3):346-354.

Burger, Joanna, and Michael Gochfeld. 2009. Perceptions of the risks and benefits of fish consumption: Individual choices to reduce risk and increase health benefits. *Environmental Research* 109 (3):343-349.

Burger J, Gochfeld M, Burke S, Jeitner CW, Jewett S, Snigaroff D, Snigaroff R, Stamm T, Harper S, Hoberg M and others. 2006. Do scientists and fishermen collect the same size fish? Possible implications for exposure assessment. *Environmental Research* 101(1):34-41.

Burger J, Harris S, Gochfeld M. Identifying High-End & Highly Impacted Fish Consumers: Methods for Assessing Exposure Risk for Populations with High Fish Consumption Rates; 2008 Oct 12-16; Pasadena, CA. p S18-S18.

Burger, J., S. Shukla, M. Fitzgerald, S. Flores, and C. Chess. 2008. Fish consumption: efficacy among fishermen of a brochure developed for pregnant women. *Journal of Risk Research* 11 (7):891-904.

Chess C, Burger J, McDermott MH. 2005. Speaking like a state: Environmental justice and fish consumption advisories. *Society & Natural Resources* 18(3):267-278.

Cooper, G. S., Klebanoff, M.A., Promislow J., Brock, J.W. and Longnecker, M. P. 2005. Polychlorinated biphenyls and menstrual cycle characteristics. *Epidemiology*. 16(2):191-200.

Costabeber, I., Emanuell, I., 2003. Influence of alimentary habits, age and occupation on polychlorinated biphenyl levels in adipose tissue. *Food and Chemical Toxicology*. 41:73-80

Craan, A.G., Haines, D.A. 1998. Twenty-five years of surveillance for contaminants in human breast milk. *Arch. Environ. Contam. Toxicol.* 35:702-710.

Dallaire, F., Dewailly, É., Muckle, G., Vézina, C., Jacobson, S.W., Jacobson, J. L. and Ayotte, P. 2004. Acute infections and environmental exposure to organochlorines in inuit infants from Nunavik. *Environmental Health Perspectives*. 112(14):1359-1364.

Darvill, T., Lonky, E., Reihman, J., Stewart P. and Pagano, J. 2000. Prenatal exposure to PCBs and infant performance on the Fagan test of infant intelligence. *Neurotoxicology*. 21(6)1029-38.

Dawson J, Sheeshka J, Cole DC, Kraft D, Waugh A. 2008. Fishers weigh in: benefits and risks of eating Great Lakes fish from the consumer's perspective. *Agriculture and Human Values* 25:349-364.

Dellinger, J.A. 2004. Exposure assessment and initial intervention regarding fish consumption of tribal members of the Upper Great Lakes Region in the United States. *Environmental Research*. 95(3):325-340.

- De Mul, A., M. I. Bakker, M. J. Zeilmaker, W. A. Traag, S. P. J. van Leeuwen, Rlap Hoogenboom, P. E. Boon, and J. D. van Klaveren. 2008. Dietary exposure to dioxins and dioxin-like PCBs in The Netherlands anno 2004. *Regulatory Toxicology and Pharmacology* 51 (3):278-287.
- DeWeese, A. D., N. E. Kmiecik, E. D. Chiriboga, and J. A. Foran. 2009. Efficacy of Risk-Based, Culturally Sensitive Oгаа (Walleye) Consumption Advice for Anishinaabe Tribal Members in the Great Lakes Region. *Risk Analysis* 29 (5):729-742.
- Domingo JL, Bocio A, Falco G, Llobet JM. 2007. Benefits and risks of fish consumption Part I. A quantitative analysis of the intake of omega-3 fatty acids and chemical contaminants. *Toxicology* 230(2-3):219-226.
- Domingo JL, Bocio A, Marti-Cid R, Llobet JM. 2007. Benefits and risks of fish consumption Part II. RIBEPEIX, a computer program to optimize the balance between the intake of omega-3 fatty acids and chemical contaminants. *Toxicology* 230(2-3):227-233.
- Falk, C., Hanrahan, L, Anderson, H. A., Kanarek, M. S. and Draheim, L. 1999. Body burden levels of dioxin, furans, and PCBs among frequent consumers of Great Lakes Sport Fish. *Environmental Research A*. 80:19-25
- Fangstrom, B., Athanasiaduo, M., Grandjean, P. Weihe, P. and Bergman, A. 2002. Hydrolated PCB metabolites and PCBs in serum from pregnant Faroese women. *Environmental Health Perspectives*. 110(9):895-899.
- Fangstrom, B., Hovander, L., Bignert, A., Athanassiadis, I., Linderholm, L., Grandjean, P., Weihe, P. and, Bergman, A. 2005. Concentrations of polybrominated diphenyl ethers, polychlorinated biphenyls, and polychlorobiphenylols in serum from pregnant Faroese women and their children 7 years later. *Environ. Sci. Technol.* 39: 9457-9463
- Feeley, M.M., Jordan, S.A. and Gilman, A.P. 1998. The health Canada Great Lakes multigeneration study-summary and regulatory considerations. *Regulatory Toxicology and Pharmacology*. 27:90-98.
- Fitzgerald, E. F., E. E. Belanger, M. I. Gomez, M. Cayo, R. J. McCaffrey, R. F. Seegal, R. L. Jansing, S. A. Hwang, and H. E. Hicks. 2008. Polychlorinated biphenyl exposure and neuropsychological status among older residents of upper Hudson river communities. *Environmental Health Perspectives* 116 (2):209-215.
- Fitzgerald, E.F., Brix, K.A., Deres, D.A., Hwang, S.A., Bush, B., Lambert, G. and Tarbell, A. 1996. Polychlorinated biphenyl (PCB) and dichlorodiphenyl dichloroethylene (DDE) exposure among Native American men from contaminated Great Lakes fish and wilflife. *Toxicol. Ind. Health*. 12(3-4):361-8.
- Fitzgerald, E.F., Deres, D.A., Hwang, S., Bush, B., Yang, B. 1999. Local fish consumption and serum PCB concentrations among Mohawk men at Akwesasne. *Environmental Research A*. 80:97-103

Fitzgerald, E. F., Hwang S., Bush B., Cook K., and Worswick, P., 1998. Fish consumption and breast milk PCB concentrations among Mohawk woman at Akwesasne. *American Journal of Epidemiology*. 148(2)

Fitzgerald, E.F., Hwang, S., Lambert, G., Gomez, M., Tarbell, A., 2005. PCB exposure and in vivo CYP1A2 Activity among Native Americans. *Environmental Health Perspectives*. 113(3):272-277.

Fitzgerald, E.F.; Hwang, SA; Gomez, M; Bush, B; Yang, BZ; Tarbell, A. 2007. Environmental and occupational exposures and serum PCB concentrations and patterns among Mohawk men at Akwesasne. *Journal of Exposure Science and Environmental Epidemiology* 17 (3): 269-278.

Foran JA, Good DH, Carpenter DO, Hamilton MC, Knuth BA, Schwager SJ. 2005. Quantitative analysis of the benefits and risks of consuming farmed and wild salmon. *Journal of Nutrition* 135(11):2639-2643.

Frithsen, I., and W. Goodnight. 2009. Awareness and Implications of Fish Consumption Advisories in a Women's Health Setting. *Journal of Reproductive Medicine* 54 (5):267-272.

Garabrant, D. H., A. Franzblau, J. Lepkowski, B. W. Gillespie, P. Adriaens, A. Demond, E. Hedgeman, K. Knutson, L. Zwica, K. Olson, T. Towey, Q. X. Chen, B. L. Hong, C. W. Chang, S. Y. Lee, B. Ward, K. LaDronka, W. Luksemburg, and M. Maier. 2009. The University of Michigan Dioxin Exposure Study: Predictors of Human Serum Dioxin Concentrations in Midland and Saginaw, Michigan. *Environmental Health Perspectives* 117 (5):818-824.

Gerstenberger, S.L. and Dellinger, J.A. 2002. PCBs, mercury, and organochlorines concentrations in lake trout, walleye, and whitefish from selected tribal fisheries in the Upper Great Lakes region. *Environmental Toxicology*. 17(6):513-519.

Glynn, A.W., Granath, F., Aune, M., Atuma, S., Bjerselius, R., Darnerud, P.O., Vainio, H., Weiderpass, E. 2003. Organochlorines in Swedish women: Determinants of serum concentrations. *Environmental Health Perspectives*. 111(3): 349-355.

Gochfeld M, Burger J. Good fish/bad fish: A composite benefit-risk by dose curve; 2004 Feb 10-14; Honolulu, HI. p 511-520.

Goncharov, A., Haase, R.F., Santiago-Rivera, A., Morse, G., Akwesasne Task Force on the Environment, McCaffrey, R.J., Rej, R. and Carpenter, D.O. 2008. High serum PCBs are associated with elevation of serum lipids and cardiovascular disease in a Native American population. *Environmental Research*. 106:226-239.

Gonzales, G.J. and Fresquez, P.R. 2005. Polychlorinated biphenyls (PCBs) in predator and bottom-feeding fish from Abiquiu and Cochiti reservoirs in North-Central New Mexico. Edited by Hector Hinojosa. Group IM-1. Los Alamos National Laboratory. U.S., Dept. of Energy. LA-14289. pages: 1-16.

Haase, R. F., R. J. McCaffrey, A. L. Santiago-Rivera, G. S. Morse, and A. Tarbell. 2009. Evidence of an age-related threshold effect of polychlorinated biphenyls (PCBs) on neuropsychological functioning in a Native American population. *Environmental Research* 109 (1):73-85.

Habron, G., M. Barbier, and R. Kinnunen. 2008. Local understanding of fish consumption advisory risks in Michigan's Upper Peninsula: The role of structure, culture, and agency. *Rural Sociology* 73 (2):275-299.

Hagmar, L., Wallin, E., Vessby, B., Jonsson, B. AG, Bergman A. and, Rylander L. 2006. Intra-individual variations and time trends 1991-2001 in human serum levels of PCB, DDE and hexachlorobenzene. *Chemosphere*. 64:1507-1513.

Halldorsson, T. I., I. Thorsdottir, H. M. Meltzer, F. Nielsen, and S. F. Olsen. 2008. Linking Exposure to Polychlorinated Biphenyls With Fatty Fish Consumption and Reduced Fetal Growth Among Danish Pregnant Women: A Cause for Concern? *American Journal of Epidemiology* 168 (8):958-965.

Hanrahan, L.P., Falk, C., Anderson, H.A., Draheim, L., Kanarek, M.S., Olson, J. and The Great Lakes Consortium. 1999. Serum PCB and DDE levels of frequent Great Lakes sport fish consumers – a first look. *Environmental Research Section A*. 80:26-37.

Harris, S. A., and J. L. Jones. 2008. Fish consumption and PCB-associated health risks in recreational fishermen on the James River, Virginia. *Environmental Research* 107 (2):254-263.

He, J-P, Stein, A.D., Humphrey, H.E.B., Paneth, N. and Courval, J.M. 2001. Time trends in sport-caught Great Lakes fish consumption and serum polychlorinated biphenyl levels among Michigan Anglers, 1973-1993. *Environmental Science and Technology*. 35(3):435-439.

Hedgeman, Elizabeth, Qixuan Chen, Biling Hong, Chiung-Wen Chang, Kristen Olson, Kathleen LaDronka, Barbara Ward, Peter Adriaens, Avery Demond, Brenda W. Gillespie, James Lepkowski, Alfred Franzblau, and David H. Garabrant. 2009. The University of Michigan Dioxin Exposure Study: Population Survey Results and Serum Concentrations for Polychlorinated Dioxins, Furans, and Biphenyls. *Environmental Health Perspectives* 117 (5):811-817.

Hertz-Picciotto, I., Charles, M.J., James, R.A., Keller, J.A., Willman, E. and Teplin, S. 2005. In utero polychlorinated biphenyl exposures in relation to fetal and early childhood growth. *Epidemiology*. 16(5):648-656.

Hotchkiss, A. K., C. V. Rider, C. R. Blystone, V. S. Wilson, P. C. Hartig, G. T. Ankley, P. M. Foster, C. L. Gray, and L. E. Gray. 2008. Fifteen years after "Wingspread" - Environmental endocrine disrupters and human and wildlife health: Where we are today and where we need to go. *Toxicological Sciences* 105 (2):235-259.

Huang, X., Hites, R.A., Foran, J.A., Hamilton, C., Knuthe, B.A., Schwager, S.J. and Carpenter, D.O. 2006. Consumption advisories for salmon based on risk of cancer and noncancer health effects. *Environmental Research*. 101:263-274.

Humphrey, H.E.B., Gardiner, J.C., Pandya, J.R., Sweeney, A.M., Gasior, D.M., McCaffrey, R.J. and Schantz, S.L. 2000. PCB congener profile in the serum of humans consuming Great Lakes fish. *Environmental Health Perspectives*. 108(2):167-172.

Jacobson, J.L., and Jacobson, S.W. 1996. Intellectual impairment in children exposed to polychlorinated biphenyls in utero. *The New England Journal of Medicine*. 335(11):783-789.

Jacobson, J.L. and Jacobson, S.W. 2002. Breast-feeding and gender as moderators of teratogenic effects on cognitive development. *Neurotoxicology and Teratology*. 24:349-358.

Jacobson, J.L. and Jacobson, S.W. 2003. Prenatal exposure to polychlorinated biphenyls and attention at school age. *The Journal of Pediatrics*. 780-788.

Jan, J., and K. Reinert. 2008. Dental caries in Faroese children exposed to polychlorinated biphenyls. *Environmental Toxicology and Pharmacology* 25 (2):188-191.

Johansen HR, Alexander J, Rossland OJ, Planting S, Lovik M, Gaarder PI, Gdynia W, Bjerve KS, Becher G. 1996. PCDDs, PCDFs, and PCBs in human blood in relation to consumption of crabs from a contaminated Fjord area in Norway. *Environmental Health Perspectives* 104(7):756-764.

Johansen, P., Muin, D., Asmund, G. and Riget, F. 2004. Human exposure to contaminants in the traditional Greenland diet. *Science of the Total Environment*. 331:189-206.

Judd, N.L., Griffith, W.C., Kalman, D.A. and Faustman, E.M. 2003. Assessment of PCB congener analytical methods: do they meet risk assessment needs? *Arch. Environ. Contam. Toxicology*. 44:132-130.

Judd, N., Griffith, W.C. and Faustman, E.M. 2004. Contribution of PCB exposure from fish consumption to total dioxin-like dietary exposure. *Regulatory Toxicology and Pharmacology*. 40:125-135.

Kamrin, M.A. and Fishcer, L.J. 1999. Current status of sport fish consumption advisories for PCBs in the Great Lakes. *Regulatory Toxicology and Pharmacology*. 29:175-181.

Kearney, J.P., Cole, D.C., Ferron, L.A. and Weber, J-P. 1999. Blood PCB, p,p'-DDE, and mirex levels in the Great Lakes fish and waterfowl consumers in two Ontario communities. *Environmental Research A*. 80:138-149.

Kelly BC, Ikonomou MG, Higgs DA, Oakes J, Dubetz C. 2008. Mercury and other trace elements in farmed and wild salmon from British Columbia, Canada. *Environmental Toxicology and Chemistry* 27:1361-1370.

Khanjani, N. and Sim, M.S. 2007. Maternal contamination with PCBs and reproductive outcomes in an Australian population. *Journal of Exposure Science and Environmental Epidemiology*. 17:191-195.

- Kiviranta H, Vartiainen T, Tuomisto J. 2002. Polychlorinated dibenzo-p-dioxins, dibenzofurans, and biphenyls in fishermen in Finland. *Environmental Health Perspectives* 110(4):355-361.
- Kiviranta, H., Ovaskainen, M-L. and Vartiainen, T. 2004. Market basket study on dietary intake of PCDD/Fs, PCBs, and PBDEs in Finland. *Environmental International*. 30:923-932.
- Kiviranta, H., Tuomisto, J.T., Tuomisto J., Tukiainen E. and Vartiainen, T. 2005. Polychlorinated dibenzo-p-dioxins, dibenzofurans, and biphenyls in the general population in Finland. *Chemosphere*. 60:854-869.
- Knobeloch, L., M. Turyk, P. Imm, C. Schrank, and H. Anderson. 2009. Temporal changes in PCB and DDE levels among a cohort of frequent and infrequent consumers of Great Lakes sportfish. *Environmental Research* 109 (1):66-72.
- Knuth, B. A., C. McOliver, E. K. Silbergeld, N. A. Connelly, and A. Faulds. 2008. Contaminant and Pathogen Considerations in Urban Fisheries: Balancing the Fishing Experience with the Need to Protect Human Health. *Urban and Community Fisheries Programms: Development, Management, and Evaluation* 67:143-164.
- Kosatsky, T., Przybysz, R., Shatenstein, B, Weber, J-P and Armstrong, B. 1999. Fish consumption and contaminant exposure among Montreal-area sportfishers: pilot study. *Environmental Research Section A*. 80:150-158.
- Lee, K.T., Lee, J.H., Lee., J.S., Park, K.H., Kim, S.K., Shim, W.J., Hong, S.H., Im, U.H., Giesy, J.P., Oh, J.R. 2007. Human exposure to dioxin-like compounds in fish and shellfish consumed in South Korea. *Human and Ecological Risk Assessment*. 13(1):223-235.
- Leng, Jun-Hong, Fujio Kayama, Pei-Yu Wang, Masafumi Nakamura, Toshiyoshi Nakata, and Yan Wang. 2009. Levels of persistent organic pollutants in human milk in two Chinese coastal cities, Tianjin and Yantai: Influence of fish consumption. *Chemosphere* 75 (5):634-639.
- Llobet, J. M., R. Marti-Cid, V. Castell, and J. L. Domingo. 2008. Significant decreasing trend in human dietary exposure to PCDD/PCDFs and PCBs in Catalonia, Spain. *Toxicology Letters* 178 (2):117-126.
- Longnecker, M.O., Wolff, M.S., Gladen, B.C., Brock, J.W., Grandjean, P., Jacobson, J.L., Korrick, S.A., Rogan, W.J., Weisglas-Kuperus, N., Hertz-Picciotto, I., Ayotte, P., Stewart, P., Winneke, G., Charles, M.J., Jacobson, S.W., Dewailly, E., Boersma, E.R., Altshul, L.M., Heinzow, B., Pagano, J.J. and Jensen, A.A., 2003. Comparison of polychlorinated biphenyl levels across studies of human neurodevelopment. *Environmental Health Perspectives*. 111(1)65-70.
- Louis, G. M. B., J. Dmochowski, C. Lynch, P. Kostyniak, B. M. McGuinness, and J. E. Vena. 2009. Polychlorinated biphenyl serum concentrations, lifestyle and time-to-pregnancy. *Human Reproduction* 24 (2):451-458.

- Lurig, L., and K. K. Pflugh. 2008. Development and Evolution of the New Jersey Department of Environmental Protection's Urban Fishing Program. *Urban and Community Fisheries Programms: Development, Management, and Evaluation* 67:271-279.
- Madeddu, A., and S. Sciacca. 2008. Biological tracking on the presence of Hg, PCB and HCG in milk and hair of women resident in a region with high incidence of children born with malformation (Augusta). *Ann Ig* 20 (3 Suppl 1):59-64.
- Mahaffey KR, Clickner RP, Jeffries RA. 2008. Methylmercury and omega-3 fatty acids: Co-occurrence of dietary sources with emphasis on fish and shellfish. *Environmental Research* 107:20-29.
- McGraw, J. E., and D. P. Waller. 2009. Fish ingestion and congener specific polychlorinated biphenyl and p,p'-dichlorodiphenyldichloroethylene serum concentrations in a great lakes cohort of pregnant African American women. *Environment International* 35 (3):557-565.
- Mikoczy, Z., and L. Rylander. 2009. Mortality and cancer incidence in cohorts of Swedish fishermen and fishermen's wives: Updated findings. *Chemosphere* 74 (7):938-943.
- Moon, H. B., and H. G. Choi. 2009. Human exposure to PCDDs, PCDFs and dioxin-like PCBs associated with seafood consumption in Korea from 2005 to 2007. *Environment International* 35 (2):279-284.
- Moon, H. B., H. S. Kim, M. Choi, J. Yu, and H. G. Choi. 2009. Human health risk of polychlorinated biphenyls and organochlorine pesticides resulting from seafood consumption in South Korea, 2005-2007. *Food and Chemical Toxicology* 47 (8):1819-1825.
- Morland, K., M. Wolff, R. Bopp, J. Godbold, and P. Landrigan. 2008. Fish consumption and body burden of organochlorines among lower Hudson urban anglers. *American Journal of Industrial Medicine* 51 (8):587-594.
- Moya, J., C. Itkin, S. G. Selevan, J. W. Rogers, and R. P. Clickner. 2008. Estimates of fish consumption rates for consumers of bought and self-caught fish in Connecticut, Florida, Minnesota, and North Dakota. *Science of the Total Environment* 403 (1-3):89-98.
- Nadon, S., Kosatsky, T. and Przybysz, R. 2002. Contaminant exposure among women of childbearing age who eat St. Lawrence River sport fish. *Archives Environmental Health*. 57(5):473-481.
- Naert, C., Piette, M., Bruneel, N. and Van Petegham, C. 2006. Occurrence of polychlorinated biphenyls and polybrominated diphenyl ethers in Belgian human adipose tissue samples. *Archives Environmental. Contam. Toxicology*. 50:290-296.
- Newsome, W.H., Davies, D. and Doucet, J. 1995. PCB and organochlorine pesticides in Canadian human milk-1992. *Chemosphere*. 30(11):2143-2153.

- Ney, J. J., and J. P. Ney. 2008. Risky Business: Evaluation of US Consumption Advisories for Freshwater Sport Fish. *Balancing Fisheries Management and Water Uses for Impounded River Systems* 62:559-569.
- Paris-Pombo, A., Aronson, K.J., Woolcott, C.G. and King, W.D. 2003. Dietary predictors of concentrations of polychlorinated biphenyls in breast adipose tissue of women living in Ontario, Canada. *Archives of Environmental Health*. 58(1):48-54.
- Phillips, L.J. and Birchard, G.F. 1991. Regional variations in human toxics exposure in the USA: An analysis based on the National Human Adipose Tissue Survey. *Arch. Environ. Contain. Toxicol.* 21:159-168.
- Pompa, G., Caloni, F. and Fracchiolla, M.L. 2003. Dioxin and PCB contamination of fish and shellfish: assessment of human exposure. Review of the international situation. *Veterinary Research Communications*. 27(Suppl. 1):159-167.
- Ravoori, S., P. Ayotte, C. Srinivasan, D. Pereg, L. W. Robertson, G. K. Russell, J. Jeyabalan, and R. C. Gupta. 2008. DNA damage associated with PCBs in the whole blood cells of Inuit. *Environmental Toxicology and Pharmacology* 25 (2):273-276.
- Ritchie, J.M., Vial, S.L., Fuortes, L.J., Robertson, L.W., Guo, H., Reedy, V.E. and Smith, E.M. 2005. Comparison of proposed frameworks for grouping polychlorinated biphenyl congener data applied to a case-control pilot study of prostate cancer. *Environmental Research*. 98:104-113.
- Rozati, R. 2002. Role of environmental estrogens in the deterioration of male factor fertility. *Fertility and Sterility*. 78(6):1187-1194.
- Rylander, C., T. M. Sandanger, and M. Brustad. 2009. Associations between marine food consumption and plasma concentrations of POPs in a Norwegian coastal population. *Journal of Environmental Monitoring* 11 (2):370-376.
- Saint-Amour, D., Roy, M-S., Bastian, C., Ayotte, P., Dewailly, E., Despres, C., Gingras, S. and Muckle, G. 2006. Alterations of visual evoked potentials in preschool Inuit children exposed to methylmercury and polychlorinated biphenyls from a marine diet. *NeuroToxicology*. 27:567-578.
- Sandanger, T.M., Brustad, M., Lund, E. and Burkow, I.C. 2003. Change in levels of persistent organic pollutants in human plasma after consumption of a traditional northern Norwegian fish dish-Molje (cod, cod liver, cod liver oil and hard roe). *J. Environ. Monit.* 5:160-165.
- Sandanger, T.M., Brustad, M., Odland, J.O., Doudarev, A.A., Miretsky, G.I., Chaschin, V., Burkow, I.C. and Lund, E. 2003. Human plasma levels of POPs, and diet among native people from Uelen, Chukotka. *The Royal Society of Chemistry*. 5:689-696
- Schaeffer, D.J., Dellinger, J.A., Needham, L.L. and Hansen, L.G. 2006. Serum PCB profiles in Native Americans from Wisconsin based on region, diet, age, and gender: implications for epidemiology studies. *Science of Total Environment*. 357:74-87.

- Schechter, A., Pavuk, M., Malisch, R. and Ryan, J.J. 2003. Dioxin, dibenzofuran, and polychlorinated biphenyl (PCB) levels in food from agent. *Journal of Toxicology and Environmental Health A*. 66:2165-2186.
- Schell, L. M., M. V. Gallo, J. Ravenscroft, and A. P. DeCaprio. 2009. Persistent organic pollutants and anti-thyroid peroxidase levels in Akwesasne Mohawk young adults. *Environmental Research* 109 (1):86-92.
- Scherer, A. C., A. Tsuchiya, L. R. Younglove, T. M. Burbacher, and E. M. Faustman. 2008. Comparative Analysis of State Fish Consumption Advisories Targeting Sensitive Populations. *Environmental Health Perspectives* 116 (12):1598-1606.
- Senn, K. M., B. M. McGuinness, G. M. Buck, J. E. Vena, S. Anderson, and B. T. Rogers. 2005. Longitudinal study of babies born to mothers enrolled in a preconception prospective pregnancy study: study design and methodology, New York State Angler Cohort Study. *Environmental Research* 97 (2):163-169.
- Stewart, P., Darvill, T., Lonky, E., Reihman, J., Pagano, J. and Bush, B. 1999. Assessment of prenatal exposure to PCBs from maternal consumption of Great Lakes fish: An analysis of PCB pattern and concentration. *Environmental Research A*. 80:87-96.
- Stewart, P., Reihman, J., Lonky, E., Darvill, T. and Pagano, J. 2004. Prenatal PCB exposure and neurobehavioral development in infants and children: Can the Oswego study inform the current debate? *Psychology in the Schools*. 41(6)639-653.
- Stewart, P.W., Sargent, D.M., Reihamn, J., Gump, B.B., Lonky, E., Darvill, T., Hicks, H. and Pagano, J. 2006. Response inhibition during differential reinforcement of low rates (DRL). Schedules may be sensitive to low-level polychlorinated biphenyl, methylmercury, and lead exposure in children. *Environmental Health Perspectives*. 114(12):1923-1929.
- Stewart, P.W., Lonky, E., Reihamn, J., Pagano, J., Gump, B.B. and Darvill, T. 2008. The relationship between prenatal PCB exposure and intelligence (IQ) in 9-year-old children. *Environmental Health Perspectives*. Doi: 10.1289/ehp.11058 (<http://dx.doi.org/>)
- Storelli, M. M. 2008. Potential human health risks from metals (Hg, Cd, and Pb) and polychlorinated biphenyls (PCBs) via seafood consumption: Estimation of target hazard quotients (THQs) and toxic equivalents (TEQs). *Food and Chemical Toxicology* 46 (8):2782-2788.
- Sun, S-J., Zhao, J-H., Liu, H-J., Liu, D-W., Ma, Y-X., Li, L., Horiguchi, H., Uno, H., Lida, T., Koga, M., Kiyonari, Y., Nakamura, M., Sasako, S., Fukatu, H., Clark, G.C. and Kayama, F. 2006. Dioxin concentration in human milk in Hebei province in China and Tokyo, Japan: potential dietary risk factors and determination of possible sources. *Chemosphere*. 62:1879-1888.
- Surgan, M. H., J. Davis, T. Congdon, and L. Kellerman. 2008. Fish consumption advisories: One agency's focus on families. *Society & Natural Resources* 21 (3):266-270.

Tan, J., Q. Q. Li, A. Loganath, Y. S. Chong, M. Xiao, and J. P. Obbard. 2008. Multivariate data analyses of persistent organic pollutants in maternal adipose tissue in Singapore. *Environmental Science & Technology* 42 (7):2681-2687.

Taylor, K.C., Jackson, L.W., Lynch, C.D., Kostyniak, P.J. and Louis, G.M.B. 2007. Preconception maternal polychlorinated biphenyl concentrations and the secondary sex ratio. *Environmental Research*. 103:99-105.

Tee, P.G., Sweeney, A.M., Symanski, E., Gardiner, J.C., Gasior, D.M. and Schantz, S.L. 2003. A longitudinal examination of factors related to changes in serum polychlorinated biphenyl levels. *Environmental Health Perspectives*. 111(5):702-707.

Tiido, T., Rignell-Hydbom, A., Jonsseon, B.A.G., Giwercman, Y.L., Pedersen, H.S., Wojtyniak, B., Ludwicki, J.K., Lesovoy, V., Zvyeyday, V., Spano, M., Manicardi, G-C., Bizzaro, D., Bonefeld-Jorgensen, E.C., Toft, G., Bonde, J.P., Rylander, L., Hagmar, L. and Giwercman, A. 2006. Impact of PCB and p,p'-DDE contaminants on human sperm Y:X chromosome ratio: studies in three European populations and the Inuit population in Greenland. *Environmental Health Perspectives*. 114(5):718-724.

Tsuchiya, A., J. Hardy, T. M. Burbacher, E. M. Faustman, and K. Marien. 2008. Fish intake guidelines: incorporating n-3 fatty acid intake and contaminant exposure in the Korean and Japanese communities. *American Journal of Clinical Nutrition* 87 (6):1867-1875.

Turyk, M.E., Anderson, H.A., Freels, S., Chatterton, R. Jr., Needham, L.L., Patterson, D.G. Jr., Steenport, D.N., Knobeloch, L., Imm, P., Persky, V.W. and the Great Lakes Consortium., 2006. Associations of organochlorines with endogenous hormones in male Great Lakes fish consumers and nonconsumers. *Environmental Research*. 102:299-307.

Turyk, M., Anderson, H.A., Hanrahan, L.P., Falk, C., Steenport, D.N., Needham, L.L., Patterson, D.G. Jr., Freels, S., Persky, V. and the Great Lakes Consortium., 2006. Relationship of serum levels of individual PCB, dioxin and furan congeners and DDE with Great Lakes sport-caught fish consumptions. *Environmental Research*. 100:173-183.

Turyk, Mary, Henry Anderson, Lynda Knobeloch, Pamela Imm, and Victoria Persky. 2009. Organochlorine Exposure and Incidence of Diabetes in a Cohort of Great Lakes Sport Fish Consumers. *Environmental Health Perspectives* 117 (7):1076-1082.

Turyk, Mary, Henry A. Anderson, Lynda Knobeloch, Pamela Imm, and Victoria W. Persky. 2009. Prevalence of diabetes and body burdens of polychlorinated biphenyls, polybrominated diphenyl ethers, and p,p'-diphenyldichloroethene in Great Lakes sport fish consumers. *Chemosphere* 75 (5):674-679.

Turyk ME, Persky VW, Imm P, Knobeloch L, Chatterton R, Anderson HA. 2008. Hormone Disruption by PBDEs in Adult Male Sport Fish Consumers. *Environmental Health Perspectives* 116:1635-1641.

- Uemura, H., K. Arisawa, M. Hiyoshi, H. Satoh, Y. Sumiyoshi, K. Morinaga, K. Kodama, T. Suzuki, and M. Nagai. 2008. PCDDs/PCDFs and dioxin-like PCBs: Recent body burden levels and their determinants among general inhabitants in Japan. *Chemosphere* 73 (1):30-37.
- Urban, J. D., J. A. Tachovsky, L. C. Haws, D. Wikoff Staskal, and M. A. Harris. 2009. Assessment of human health risks posed by consumption of fish from the Lower Passaic River, New Jersey. *Science of the Total Environment* 408 (2):209-224
- Usydus, Z., J. Szlinder-Richert, L. Polak-Juszczak, K. Komar, M. Adamczyk, M. Malesa-Cieciewicz, and W. Ruczynska. 2009. Fish products available in Polish market - Assessment of the nutritive value and human exposure to dioxins and other contaminants. *Chemosphere* 74 (11):1420-1428.
- Vaclavik, E., Tjonneland, A., Stripp, C., Overvad, K., Weber, J.P. and Rasschou-Nielsen, O. 2006. Organochlorines in Danish women: Predictors of adipose tissue concentrations. *Environmental Research*. 100:362-379
- van der Voet H, de Mul A, van Klaveren JD. 2007. A probabilistic model for simultaneous exposure to multiple compounds from food and its use for risk-benefit assessment. *Food and Chemical Toxicology* 45(8):1496-1506.
- Vardeman, J. E., and L. Aldoory. 2008. A qualitative study of how women make meaning of contradictory media messages about the risks of eating fish. *Health Communication* 23 (3):282-291.
- Vasiliu, O., Muttineni, J. and Karmaus, W. 2004. In utero exposure to organochlorines and age at menarche. *Human Reproduction*. 19(7):1506-1512.
- Vena, J. E., G. M. Buck, P. Kostyniak, P. Mendola, E. Fitzgerald, L. Sever, J. Freudenheim, H. Greizerstein, M. Zielezny, J. McReynolds, and J. Olson. 1996. The New York Angler Cohort Study: Exposure characterization and reproductive and developmental health. *Toxicology and Industrial Health* 12 (3-4):327-334.
- Verger, P., N. Khalfi, C. Roy, S. Blanchemanche, S. Marette, and J. Roosen. 2008. Balancing the risk of dioxins and polychlorinated biphenyls (PCBs) and the benefit of long-chain polyunsaturated fatty acids of the n-3 variety for French fish consumers in western coastal areas. *Food Additives and Contaminants* 25 (6):765-771.
- Weintraub M, Birnbaum LS. 2008. Catfish consumption as a contributor to elevated PCB levels in a non-Hispanic black subpopulation. *Environmental Research* 107(3):412-417.
- Weis, P. and Ashley, J.T.F. 2007. Contaminants in fish of the Hackensack Meadowlands, New Jersey: size, sex, and seasonal relationships as related to health risks. *Arch. Environ. Contam. Toxicol.* 52:80-89.
- Westphal, L. M., M. Longoni, C. L. LeBlanc, and A. Wali. 2008. Anglers' appraisals of the risks of eating sport-caught fish from industrial areas: Lessons from Chicago's Calumet region. *Human Ecology Review* 15 (1):46-62.

Williams, L.L., Glesy, J.P., DeGalan, N., Verbrugge, D.A., Tillit, D.E., Ankley, G.T. and Welch, R.L. 1992. Prediction of concentrations of 2,3,4,8-Tetrachlorodibenzo-p-dioxin equivalents from total concentrations of polychlorinated biphenyls in fish fillets. *Environ. Sci. Technol.* 26:1151-1159.

Wolff, M.S., Britton, J.A., Teitelbaum, S.L., Eng, S., Deych, E., Ireland, K., Liu, Z., Neugut, A.I., Santella, R.M. and Gammon, M.D. 2005. Improving organochlorine biomarker models for cancer research. *Cancer Epidemiol Biomarkers Prev.* 14(9):2224-2236.

Wolff, M.S., Deych, E., Ojo, F. and Berkowitz, G.S. 2005. Predictors of organochlorines in New York City pregnant women, 1998-2001. *Environmental Research.* 97:170-177.

Wong, C.K.C., Leung, K.M., Poon, B.H.T., Lan, C.Y., and Wong, M.H. 2002. Organochlorines hydrocarbons in human breast milk collected in Hong Kong and Guangzhou. *Arch. Environ. Contam. Toxicol.* 43:364-372.

Yang, C. Y., Y. J. Wang, P. C. Chen, S. J. Tsai, and Y. L. Guo. 2008. Exposure to a mixture of polychlorinated biphenyls and polychlorinated dibenzofurans resulted in a prolonged time to pregnancy in women. *Environmental Health Perspectives* 116 (5):599-604.

Yim, U.H., Hong, S.H., Shim, J. and Oh, J.R. 2005. Levels of persistent organochlorine contaminants in fish from Korea and their potential health risk. *Arch. Environ. Contam. Toxicol.* 48:358-366.

Zhang, J. Q., Y. S. Jiang, R. Zhou, D. K. Fang, J. Jiang, G. H. Liu, H. Y. Zhang, J. B. Xie, W. Huang, J. Z. Zhang, H. Li, Z. Wang, and L. Pan. 2008. Concentrations of PCDD/PCDFs and PCBs in retail foods and an assessment of dietary intake for local population of Shenzhen in China. *Environment International* 34 (6):799-803.

Fish Consumption Advisories for Polychlorinated Biphenyls (PCBs): PCBs in Fish

Ackerman, L. K., A. R. Schwindt, S. L. M. Simonich, D. C. Koch, T. F. Blett, C. B. Schreck, M. L. Kent, and D. H. Landers. 2008. Atmospherically deposited PBDEs, pesticides, PCBs, and PAHs in Western US National Park fish: Concentrations and consumption guidelines. *Environmental Science & Technology* 42 (7):2334-2341.

Antunes P, Amado J, Vale C, Gil O. 2007. Influence of the chemical structure on mobility of PCB congeners in female and male sardine (*Sardina pilchardus*) from Portuguese coast. *Chemosphere* 69(3):395-402.

Baeyens, W., Leermakers, M., Elskens, M., Van Larebeke, N., De Bont, R., Vanderperren, H., Fontaine, A., Degroodt, J.-M., Goeyens, L., Hanot, V. and Windal, I. 2007. PCBs and PCDD/FS in fish and fish products and their impact on the human body burden in Belgium. *Archives of Environmental Contamination and Toxicology*. 52(4):563-571.

Bayarri, S., Baldassarri, L.T., Iacovella, N., Ferrara, F. and Domenico, A. 2001. PCDDs, PCDFs, PCBs and DDE in edible marine species from the Adriatic Sea. *Chemosphere*. 43(4-7):601-610.

Binelli, A. and Provini, A. 2004. Risk for human health of some POPs due to fish from Lake Iseo. *Ecotoxicology and Environmental Safety*. 58(1):139-145.

Brown, F.R., Winkler, J., Visita, P., Dhaliwal, J. and Petreas, M. 2006. Levels of PBDEs, PCDDs, PCDFs, and coplanar PCBs in edible fish from California coastal waters. *Chemosphere*. 64(2):276-286.

Buckman, AH; Brown, SB; Hoekstra, PF; Solomon, KR; Fisk, AT. 2004. Toxicokinetics of three polychlorinated biphenyl technical mixtures in rainbow trout (*Oncorhynchus mykiss*). *Environmental Toxicology and Chemistry* 23 (7): 1725-1736.

Buckman, AH; Wong, CS; Chow, EA; Brown, SB; Solomon, KR; Fisk, AT. 2006. Biotransformation of polychlorinated biphenyls (PCBs) and bioformation of hydroxylated PCBs in fish. *Aquatic Toxicology* 78 (2): 176-185.

Buckman, AH; Brown, SB; Small, J; Muir, DCG; Parrott, J; Solomon, KR; Fisk, AT. 2007. Role of temperature and enzyme induction in the biotransformation of polychlorinated biphenyls and bioformation of hydroxylated polychlorinated biphenyls by rainbow trout (*Oncorhynchus mykiss*). *Environmental Science and Technology* 41 (11): 3856-3863.

Burkhard, LP; Cook, PM; Lukasewycz, MT. 2004. Biota-sediment accumulation factors for polychlorinated biphenyls, dibenzo-p-dioxins, and dibenzofurans in southern Lake Michigan lake trout (*Salvelinus namaycush*). *Environmental Science and Technology* 38 (20): 5297-5305.

Campbell, LM; Muir, DCG; Whittle, DM; Backus, S; Norstrom, RJ; Fisk, AT. 2003. Hydroxylated PCBs and other chlorinated phenolic compounds in lake trout (*Salvelinus namaycush*) blood plasma from the Great Lakes Region. *Environmental Science and Technology* 37 (9): 1720-1725.

Connor, K.T., Eversen, M., Su, S.H. and Finley, B.L. 2005. Quantitation of polychlorinated biphenyls in fish for human cancer risk assessment: a comparative case study. *Environmental Toxicology and Chemistry*. 24(1):17-24.

Corsolini, S., Ademollo, N., Romeo, T., Greco, S. and Focardi, S. 2005. Persistent organic pollutants in edible fish: a human and environmental health problem. *Microchemical Journal*. 79(1-2):115-123.

Domingo, JL; Bocio, A. 2007. Levels of PCDD/PCDFs and PCBs in edible marine species and human intake: A literature review. *Environment International* 33 (3): 397-405.

Dorea, J. G. 2008. Persistent, bioaccumulative and toxic substances in fish: Human health considerations. *Science of the Total Environment* 400 (1-3):93-114.

Elia, AC; Dorr, AJM; Galarini, R. 2007. Comparison of organochlorine pesticides, PCBs, and heavy metal contamination and of detoxifying response in tissues of *Ameiurus melas* from corbara, alviano, and trasimeno lakes, italy. *Bulletin of Environmental Contamination and Toxicology* 78 (6): 463-468.

Fairey, R., Taberski, K., Lamerdin, S., Johnson, E., Clark, R.P., Downing, J.W., Newman, J. and Petreas M. 1997. Organochlorines and other environmental contaminants in muscle tissues of sportfish collected from San Francisco Bay. *Marine Pollution Bulletin*. 34(12):1058-1071.

Fernandes, A., P. Dicks, D. Mortimer, M. Gem, F. Smith, M. D. Ield, S. White, and M. Rose. 2008. Brominated and chlorinated dioxins, PCBs and brominated flame retardants in Scottish shellfish: Methodology, occurrence and human dietary exposure. *Molecular Nutrition & Food Research* 52 (2):238-249.

Ferrante, MC; Cirillo, T; Naso, B; Clausi, MT; Lucisano, A; Cocchieri, RA. 2007. Polychlorinated biphenyls and organochlorine pesticides in seafood from the Gulf of Naples (Italy). *Journal of Food Protection* 70 (3): 706-715.

Gomara, B; Bordajandi, LR; Fernandez, MA; Herrero, L; Abad, E; Abalos, M; Rivera, J; Gonzalez, MJ. 2005. Levels and trends of polychlorinated dibenzo-p-dioxins/furans (PCDD/Fs) and dioxin-like polychlorinated biphenyls (PCBs) in Spanish commercial fish and shellfish products, 1995-2003. *Journal of Agricultural and Food Chemistry* 53 (21): 8406-8413.

Greenfield, B.K., Davis, J.A., Fairey, R., Roberts, C., Crane, D. and Ichikawa, G. 2005. Seasonal, interannual, and long-term variation in sport fish contamination, San Francisco Bay. *Science of Total Environment*. 336(1-3):25-43.

- Leondiadis, L., D. Costopoulou, I. Vassiliadou, and A. Papadopoulos. 2008. Monitoring of dioxins and dioxin-like PCBs in food, feed, and biological samples in Greece. *Fate of Persistent Organic Pollutants in the Environment*: 83-98.
- Li, H., Drouillard, K.G., Bennet, E., Haffner, G.D. and Letcher, R.J. 2003. Plasma-associated halogenated phenolic contaminants in benthic and pelagic fish species from the Detroit River. *Environ. Sci. Technol.* 37(5):832-839.
- Li, XM; Gan, YP; Yang, XP; Zhou, J; Dai, JY; Xu, MQ. 2008. Human health risk of organochlorine pesticides (OCPs) and polychlorinated biphenyls (PCBs) in edible fish from Huairou Reservoir and Gaobeidian Lake in Beijing, China. *Food Chemistry* 109 (2): 348-354.
- Mazet, A; Keck, G; Berny, P. 2005. Concentrations of PCBs, organochlorine pesticides and heavy metals (lead, cadmium, and copper) in fish from the Drome river: Potential effects on otters (*Lutra lutra*). *Chemosphere* 61 (6): 810-816.
- Parnell, PE; Groce, AK; Stebbins, TD; Dayton, PK. 2008. Discriminating sources of PCB contamination in fish on the coastal shelf off San Diego, California (USA). *Marine Pollution Bulletin* 56 (12): 1992-2002.
- Perugini, M., Cavalier, M., Giammarino, A., Mazzone, P., Olivieri, V. and Amorena, M. 2004. Levels of polychlorinated biphenyls and organochlorine pesticides in some edible marine organisms from the Central Adriatic Sea. *Chemosphere.* 57(5):391-400.
- Perugini, M; Giammarino, A; Olivieri, V; Di Nardo, W; Amorena, M. 2006. Assessment of edible marine species in the Adriatic Sea for contamination from polychlorinated biphenyls and organochlorine insecticides. *Journal of Food Protection* 69 (5): 1144-1149.
- Pinto, B., S. L. Garritano, R. Cristofani, G. Ortaggi, A. Giuliano, R. Amodio-Cocchieri, T. Cirillo, M. De Giusti, A. Boccia, and D. Reali. 2008. Monitoring of polychlorinated biphenyl contamination and estrogenic activity in water, commercial feed and farmed seafood. *Environmental Monitoring and Assessment* 144 (1-3):445-453.
- Rawn, D. F. K., K. Breakell, V. Verigin, H. Nicolidakis, D. Sit, and M. Feeley. 2009. Persistent Organic Pollutants in Fish Oil Supplements on the Canadian Market: Polychlorinated Biphenyls and Organochlorine Insecticides. *Journal of Food Science* 74 (1):T14-T19.
- Roosens, L., A. C. Dirtu, G. Goemans, C. Belpaire, A. Gheorghe, H. Neels, R. Blust, and A. Covaci. 2008. Brominated flame retardants and polychlorinated biphenyls in fish from the river Scheldt, Belgium. *Environment International* 34 (7):976-983.
- Sagrati, G; Buccioni, M; Ciccarelli, C; Conti, P; Cristalli, G; Giardina, D; Lambertucci, C; Marucci, G; Volpini, R; Vittori, S. 2008. Levels of polychlorinated biphenyls in fish and shellfish from the Adriatic Sea. *Food Additives and Contaminants Part B-Surveillance* 1 (1): 69-77.

- Salama, A.A., Mohamed, M.A.M., Duval, B., Potter, T.L. and Levin, R.E. 1998. Polychlorinated biphenyl concentration in raw and cooked North Atlantic Bluefish (*Pomatomus saltatrix*) fillets. *J. Agric. Food Chem.* 46(4):1359-1362.
- Simmonds, M.P., Johnston, P.A., French, M.C., Reeve, R. and Hutchinson, J.D. 1994. Organochlorines and mercury in pilot whale blubber consumed by Faroe islanders. *The Science of the Total Environment.* 149:97-111.
- Stahl, L. L., B. D. Snyder, A. R. Olsen, and J. L. Pitt. 2009. Contaminants in fish tissue from US lakes and reservoirs: a national probabilistic study. *Environmental Monitoring and Assessment* 150 (1-4):3-19.
- Storelli, M.M. and Marcotrigiano, G.O. 2003. Levels and congener pattern of polychlorinated biphenyls in the blubber of the Mediterranean bottlenose dolphins *Tursiops truncatus*. *Environmental International.* 28(7):559-565.
- Storelli, M.M, Perrone, V.G. and Marcotrigiano, G.O. 2007. Organochlorine contamination (PCBs and DDTs) in deep-sea fish from the Mediterranean Sea. *Marine Pollution Bulletin.* 54(12):1968-1971.
- Storelli MM, Barone G, Giacomini-Stuffler R, Marcotrigiano GO. 2008. Levels and profiles of DDTs and PCBs in a gadiform fish (*Phycis blennoides*) from Mediterranean Sea. *Marine Pollution Bulletin* 56(7):1367-1370.
- Storelli, M.M., Casalino, E., Barone, G. and Marcotrigiano, G.O. 2008. Persistent organic pollutants (PCBs and DDTs) in small size specimens of bluefin tuna (*Thunnus thynnus*) from the Mediterranean Sea (Ionian Sea). *Environmental International.* 34(4):509-513.
- Valters, K; Li, HX; Alae, M; D'Sa, I; Marsh, G; Bergman, A; Letcher, RJ. 2005. Polybrominated diphenyl ethers and hydroxylated and methoxylated brominated and chlorinated analogues in the plasma of fish from the Detroit River. *Environmental Science and Technology* 39 (15): 5612-5619.
- van Leeuwen, S. P. J., M. J. M. van Velzen, C. P. Swart, I. van der Veen, W. A. Traag, and J. de Boer. 2009. Halogenated Contaminants in Farmed Salmon, Trout, Tilapia, Pangasius, and Shrimp. *Environmental Science & Technology* 43 (11):4009-4015.
- Wang, W., S. Batterman, S. Chernyak, and J. Nriagu. 2008. Concentrations and risks of organic and metal contaminants in Eurasian caviar. *Ecotoxicology and Environmental Safety* 71 (1):138-148.
- Yang, FX; Xu, Y. 2005. Hydroxylated metabolites of polychlorinated biphenyls and their endocrine disrupting mechanism. *Progress in Chemistry* 17 (4): 740-748.
- Zuccato, E., P. Grassi, E. Davoli, L. Valdicelli, D. Wood, G. Reitano, and R. Fanelli. 2008. PCB concentrations in some foods from four European countries. *Food and Chemical Toxicology* 46 (3):1062-1067.

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