Methylmercury Exposure and Health Effects in Humans: A Worldwide Concern

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Dr. Laurie Hing Man Chan is a holder of the Dr. Donald Rix BC Leadership Chair in Aboriginal Environmental Health at the University of Northern British Columbia. His work involves both basic and applied research on neurotoxic effects of mercury on wildlife and human populations. He has conducted extensive studies on the risk and benefits of the consumption of traditional food among Indigenous Peoples. His address: University of Northern British Columbia, 3333 University Way, Prince George, BC Canada V2N 4Z9. lchan@unbc.ca

Dr. Kathryn Mahaffey is a toxicologist, who specialized in research on nutrient-toxicant interactions and risk assessment for toxic elements, including methylmercury. She has published the distributional
data on blood and hair mercury concentrations indicating mercury exposures for the US population as part of the National Health and Nutrition Examination Survey. Dr. Mahaffey and two other scientists from the US Environmental Protection Agency established the reference dose for methylmercury, which is the most health protective risk assessment available to date. Her address: 5025 Hawthorne Place NW, Washington, DC 20016, USA. krmahaffey@starpower.net

Dr. Michael Murray is an environmental chemist and has been Staff Scientist in the Great Lakes office of the National Wildlife Federation since 1997. His scientific and science policy research has been in diverse areas, ranging from contaminant sources, environmental cycling, and environmental toxicology to human health aspects of methylmercury, including exposure, effects, and fish advisory protocols and communication. His address: Great Lakes Natural Resource Center, National Wildlife Federation, 213 West Liberty St, Suite 200,
Dr. Mineshi Sakamoto, Director of the Department of Epidemiology, National Institute for Minamata Disease, Minamata City, Kumamoto Prefecture, Japan. He is a toxicologist and conducts both epidemiological and experimental studies focused on the health effects of methylmercury, especially in the early stage of development, when the brain is most vulnerable. His address: National Institute for Minamata Disease, 058–18 Hama, Minamata City, Kumamoto 867-0008, Japan. sakamoto@nimd.go.jp

Dr. Alan Stern is the Section Chief for Risk Assessment and Toxicology in the Division of Science and Research of the New Jersey Department of Environmental Protection and adjunct associate professor in the School of Public Health, and the Department of Environmental and Occupational Medicine of the University of Medicine and Dentistry of New Jersey. He served as a member of the National Research Council/National Academy of
Abstract
The paper builds on existing literature, highlighting current understanding and identifying unresolved issues about MeHg exposure, health effects, and risk assessment, and concludes with a consensus statement. Methylmercury is a potent toxin, bioaccumulated and concentrated through the aquatic food chain, placing at risk people, throughout the globe and across the socioeconomic spectrum, who consume predatory fish or for whom fish is a dietary mainstay. Methylmercury developmental neurotoxicity has constituted the basis for risk assessments and public health policies. Despite gaps in our knowledge on new bioindicators of exposure, factors that influence MeHg uptake and toxicity, toxicokinetics, neurologic and cardiovascular effects in adult populations, and the nutritional benefits and risks from the large number of marine and freshwater fish and fish-eating species, the panel concluded that to preserve human health, all efforts need to be made to reduce and eliminate sources of exposure.

References and Notes


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<tr>
<td>Studies</td>
<td>Considered Faroes, New Zealand, Seychelles. Final value based on Faroes</td>
<td>Faroes and Seychelles</td>
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<tr>
<td>Biomarker used as index</td>
<td>Cord blood, µg L⁻¹</td>
<td>Maternal hair [Hg], µg g⁻¹ or ppm.</td>
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<tr>
<td></td>
<td>58 µg L⁻¹ cord blood</td>
<td>14 µg g⁻¹ maternal hair</td>
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<tr>
<td>BMDL selected</td>
<td></td>
<td>3.2 (100.5) (individual variation) × 2 for overall average interindividual variation = 6.4</td>
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<tr>
<td>Uncertainty factor</td>
<td>Uncertainty factor = 10. 3.2 for toxicokinetics. 3.2 for toxicodynamics</td>
<td>No toxicodynamic factor.</td>
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<td>Exposure limit</td>
<td>Reference dose of 0.1 µg kgbw⁻¹ d⁻¹ (equal to 0.7 µg kgbw⁻¹ wk⁻¹)</td>
<td>1.6 µg kgbw⁻¹ wk⁻¹ (equal to 0.23 µg kgbw⁻¹ d⁻¹)</td>
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