

IEAC INDEPENDENT EXPERT COMMITTEE

RECOMMENDATIONS: MANAGEMENT (Human Health)

Submitted to the IEAC Oversight Committee

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1. Background

The terms of reference for the Independent Expert Advisory Committee (IEAC) refers to the protection of health of the indigenous and local populations who harvest and consume country foods in the Churchill River near Muskrat Falls and downstream, all along the river and including Lake Melville. This document provides a summary of the activities carried out by the Independent Expert Committee (IEC) with regard to human health and recommendations based on their deliberations.

2. Activities

The IEC contracted an expert review of existing documents on dietary surveys, biomonitoring and human health risk assessment and consulted with experts on the toxicology of methylmercury. In addition, a review of the literature was conducted to provide background information on the health effects of methylmercury, the benefits of country food and risk communication around food advisories in the arctic/subarctic from a public health perspective.

2.1 Review of the dietary surveys, biomonitoring and the human health risk assessment

IEAC contracted Ollson Environmental Health Management (OEHM) to review the methylmercury biomonitoring and dietary surveys conducted for the Muskrat Falls project on behalf of Nalcor (Golder, 2015) and the Nunatsiavut Government (Calder, 2016). He was asked to compare the biomonitoring results to other populations, identify data gaps and indicate if the results permit comments on the safety of country foods being consumed currently. The work was done by Dr. Chris Ollson (Environmental Health Scientist) who presented to the IEC and prepared a report on his findings. The biomonitoring studies show that methylmercury exposures are typically below the Health Canada Guidelines and lower than values reported for northern high consumers of country food. (Note that the country food to which other northern populations are consuming has elevated levels of methylmercury from global pollution or from reservoir impoundment.) He concluded that current practices of country food consumption are safe. He recommended ensuring that existing datasets are archived in such a way as to be available for future use.

2.2 Experts on Methylmercury toxicology

Dr. Laurie Chan, (PhD, University of Ottawa Professor and Contaminants Researcher) provided a broad overview of methylmercury in the environment as well as the health effects. He described the seafood dilemma which is balancing the health benefits of seafood consumption against the risks related to contaminants. Contaminants and polyunsaturated fatty acids (PUFA) concentrations differ in different fish species so the choice of fish species

to consume is important in determining the optimal benefits. In most cases of one to two servings per week of fish, the benefits will outweigh the risks. He described the Inuit Health Survey results for Nunatsiavut and as well as the Golder (2015) and Calder (2016) biomonitoring results. While there is no cause for concern with the current levels of exposure he agrees with the Calder prediction of increased methylmercury post inundation which will have a particular effect on the individuals in Rigolet who are in the top 5% of fish consumption. He stressed the benefits of country food over market food.

Dr. Pal Weihe is an Occupational Health Physician in the Faroe Islands and researcher on the health effects of methylmercury. Dr. Weihe presented the research his team has done in the Faroe Islands over more than 20 years on the health effects of methylmercury exposure of the fetus related to pilot whale consumption by the mother. This exposure resulted in neurological deficits that persisted as the children got older. This work resulted in a health advisory to avoid consumption of pilot whale meat and blubber. He noted that health effects are being found at lower and lower levels of exposure as more research is being done.

2.3 The public health perspective

Dr. Maureen Baikie, Public Health Physician and Committee member, presented to the IEC and prepared a background paper on the public health perspective of methylmercury and Muskrat Falls. This included a review of the health effects of methylmercury, the benefits of country food and the need to balance the two taking food security into account. This balance is particularly important for pregnant women and the fetus in order to provide a healthy start to life. Communicating this balance is difficult. Some individuals in communities affected by Muskrat Falls perceive the risk of methylmercury to their health and way of life to be significant both now and after inundation.

2.4 Discussion around exposure limits for methylmercury

The Calder et al peer reviewed publication (Calder et al, 2016), the report from OEHM and the presentations by Drs. Chan and Weihe all refer to regulatory guidelines for methylmercury exposure through the diet. The United States Environmental Protection Agency's (U.S. EPA) reference dose (RfD) for methylmercury is 0.1 ug per kg body weight per day while Health Canada's (HC) provisional tolerable daily intake (pTDI) is 0.20 to 0.47 ug per kg body weight per day. These two guidelines are based on the same studies but have different safety factors built in. Dr. Weihe showed that over the years the regulatory guideline has decreased as more research shows health effects at lower and lower levels of exposure begging the question if the current guidelines are sensitive enough. Dr. Ollson (OEHM 2018) received confirmation in writing from Dr. H. Schwartz, Manager, Chemical Safety of Traditional Foods, Dept of Indigenous Service Canada that the biomonitoring guidance values that are the basis of the pTDI and referred to by Ollson, Chan and Calder remain in place and were reviewed for inclusion in the report entitled Canadian Mercury Science Assessment (Environment and Climate Change Canada 2016). Dr. Ollson also communicated via email with the U.S. EPA Integrated Risk Information System (IRIS). Methylmercury is on their priority list for review but no timeline was given for the completion of the updated assessment which may take several years. Dr. Weihe noted that

there are 70,000 ongoing pregnancies in the U.S. over the RfD. If this is lowered there would be more people over the exposure limit which would have to be managed in a public health context. This may be taken into account in revising the exposure limits.

The other discussion point regarding health effects and exposure limits is around whether or not there is a lower threshold of exposure for methylmercury or if any level of exposure results in health effects. While the IEC notes this point, it is not something that we have the expertise to weigh in on. It is also important to remember that country food has nutrients with positive health benefits. It would be very difficult to prevent all exposure to methylmercury in country foods and market foods.

2.5 Potential impacts of the Muskrat Falls Project on the health of the affected population

Based on hair methylmercury values at current consumption levels of country food, over 90% of baseline exposures are below regulatory guidelines for methylmercury in both Canada and the U.S. When put in terms of daily intake, Rigolet had the highest exposures with 3% above pTDI and 24% of individuals were above the U.S. RfD (Calder et al, 2016).

After flooding of the Muskrat Falls reservoir methylmercury levels are expected to increase downstream. The only work done to date to assess the impact on the downstream environment was carried out by Calder et al who modelled increases in biota and changes in exposure of consumers of country food (Calder et al, 2016). At the peak of the increase, median methylmercury exposures are expected to at least double (1.9 x) for the majority of the downstream Inuit population. The median exposure for residents of Rigolet is predicted to almost triple compared to exposure before inundation. The average methylmercury exposure levels for women of childbearing age and young children in Rigolet will exceed the U.S. EPA's RfD and be within 15% of Health Canada's pTDI. Note that an increase in methylmercury exposure is not accompanied by an increase in health benefits for the same level of consumption.

The model was rerun by Calder at the request of the IEC to look at slightly altered parameters (alternative model) and the effect on exposure of the mitigation scenarios described in the document "IEC Recommendations – Mitigation".

Summary

There is considerable evidence that exposure to methylmercury results in adverse neurodevelopmental outcomes in children exposed prenatally to methylmercury. The evidence for infants and children is less clear but blood guidance values place this group along with women of child bearing age in the same category since the nervous system continues to develop after birth. The effects on adults are less clear. However, it is a complex epidemiological picture with many confounders and interactions with other contaminants as well as with nutrients in country food.

Methylmercury exposure occurs through food including country food which has health and socio-cultural benefits and contributes to food security. Some nutrients in fish such as polyunsaturated fatty acids (PUFA) are thought to be protective against the adverse effects of methylmercury and are an important source of nutrients for pregnant women and the developing fetus. However, the balance between the nutritional benefits and the risks of methylmercury exposure remains unclear and is complex and hard to communicate. This has been described as the fish or seafood dilemma. Poor risk communication around country food may result in unintended consequences such as fear, confusion and undesirable changes in dietary behaviour and traditional lifestyles. Replacing country foods with store bought foods could result in nutritional deficiencies, diabetes and obesity depending on the acceptability, availability and affordability of food choices.

The dilemma of fish consumption can be addressed by an approach that balances the benefits of nutrients in fish with the risk of methylmercury and advises to continue fish consumption with attention to the choice of species consumed to achieve the neurological benefits of PUFA intake while reducing methylmercury exposure. This approach should be tailored to the community, take the broad public health context into account and follow optimal communication practices including involving community members in designing the approach, using a variety of media appropriate to the community, communicating over a period of time and evaluating communication efforts.

A review of biomonitoring work to date indicates that current practices of country food harvesting and consumption are safe. However, levels of methylmercury are predicted to increase post inundation thereby increasing exposure to methylmercury in country food.

Whether or not this increase is mitigated, a management plan should include monitoring methylmercury levels in country food and working with the community to develop benchmarks that would trigger a communication plan to ensure appropriate dietary advice tailored to the situation.

Recommendations

The Independent Expert Committee makes the following recommendations with regards to Management:

1. *Current exposure to methylmercury:*

Given the current level of concern in the community around methylmercury, communicate that current practices related to country food are safe. Provide standard advice to pregnant women and the community at large that it is important to eat fish but choose those that are high in important nutrients and low in methylmercury such as salmon, brook trout and smelt. Weave this message into public health programming around maternal child health, healthy eating, school health etc. Note that this is a universal message and not just related to Muskrat Falls.

2. *Post inundation scenarios and changes in exposure to methylmercury:*

In the longer term, work with the community to develop benchmarks for action and a communication plan to ensure appropriate ongoing dietary advice should methylmercury increases be detected through monitoring.

The above recommendations were made by full consensus of the IEC.

List of Relevant Documents

(All documents are provided in attached zip file.)

Baikie, M. February 8, 2018. Muskrat Falls and Methylmercury – The Public Health Perspective. Presentation to the Independent Expert Advisory Committee.

Baikie, M. February 28, 2018. Methylmercury and Muskrat Falls: A Public Health Perspective. Report to the Independent Expert Advisory Committee. 15 pages

Calder, R. et al, 2016. Future Impacts of Hydroelectric Power Development on Methylmercury Exposures of Canadian Indigenous Communities. Environmental Science and Technology. 8 pages.

Chan, Laurie H.M., February 15, 2018. Risk Assessment on Mercury Exposure: Meeting with the Independent Expert Advisory Committee. Presentation.

Ollson, C., January 23, 2018. Review of MeHg Biomonitoring and Prospective Risk Assessments for Muskrat Falls. Presentation to the Independent Expert Advisory Committee.

Ollson, C. March 1, 2018. Review of Methylmercury Biomonitoring Programs for the Muskrat Falls Project. Prepared for the Independent Expert Advisory Committee, Muskrat Falls Project. 31 Pages

Weihe, P., February 19, 2018. Mercury – Health- Food. Presentation to the Independent Expert Advisory Committee.