Chemical Sensitivities Manitoba
CSM

www.PreventCancerNow.ca February 9, 2017

The Honourable Jane Philpott
Minister of Health

Transmission by email: *Hon.Jane.Philpott@Canada.ca*

Submission in response to the "Science Approach Document "Biomonitoring-based Approach 2 for Barium-containing Substances, Molybdenum-containing Substances, Silver-containing Substances, Thallium-containing Substances, Inorganic Tin-containing Substances," Canada Gazette, Part I: Vol. 150, No. 50. December 10, 2016.

Dear Minister Philpott,

Human Biomonitoring (HBM) is of central importance in public health, to assess and track both beneficial and adverse exposures in Canadians, and the proposed Science-Based Approach for chemical screening is one potential use for this data. The civil society organizations Prevent Cancer Now (PCN) and Chemical Sensitivities Manitoba (CSM) offer the following observations, cautions and recommendations regarding the proposed application of HBM in chemicals screening.

The HBM approach is proposed to "identify" chemicals of low concern for human health that have previously been identified as priorities for assessment because they met categorization criteria under the *Canadian Environmental Protection Act* (CEPA) subsection 73(1) and/or were considered a priority based on other human health concerns. Identifying that chemicals are of low concern should only be done with the strongest evidence; biomonitoring data could only be considered a strong basis for selected chemicals that have well-understood toxicokinetics. The government should stipulate explicitly the toxicokinetics data necessary before the application of this approach. For example, it would not be appropriate for chemicals with:

- effects on the endocrine system;
- tendency to accumulate in particular tissues;
- potential developmental effects;

- chemicals with metabolites of concern if HBM does not include the metabolite of concern;
- chemicals with rapid metabolism (before testing can be done).

It is also proposed to use the total metal values in place of a lower analysis of the particular moiety of interest. This is necessarily a [protective] over-estimate of the concentration in the blood or urine only if supported by the toxicokinetics, Health Canada apparently relied upon other jurisdictions' findings and practices in this regard, without further substantiation.

Scientific rigour calls for toxicokinetic details, and explicit justification of the use of HBM data for each application. For instance, HBM data of older children (as available in Canada), is not indicative of earlier exposures when metals such as lead or cadmium are sequestered in growing bone and organs.

Section 2.3 discusses the distinction between "exposure" in food, dust, water, air, etc., and internal concentrations, but this should be clear not only in the minds of assessors but also in minds of readers. Semantics are important. The subsequent use of "exposure" to characterize concentration in a bodily fluid is admittedly common, but it is scientifically "loose" and will frequently be inaccurate due to bioaccumulation in various compartments (e.g. organs, bone, adipose tissue, etc.) and ongoing, slow re-equilibration with blood and hence urine.

> *We encourage Health Canada to be scrupulous in the use of terminology for external dose or exposure (via particular routes), absorbed dose, toxicokinetics, and concentrations in bodily fluids and compartments.*

While there are many advantages to incorporating HBM data in an assessment, it is not without its limitations. This endeavor would, nevertheless, be an opportunity to initiate the possible linking of biomonitoring data to adverse health outcomes, in populations within certain locales, or occupations.

The government should consider the use of accurate HBM in environmental health impact assessments (EHIAs) targeting low-level, chronic chemical exposures of individuals, rather than the single chemical/health impact scenario. This can be a positive step towards an improved understanding of the combined contaminant levels in the human body. Other determinants of health could also be included such as socio-economic data. Assembly of environmental parameters, exposures, internal doses, health outcomes, etc. on an Environmental Health Information Infrastructure platform, would be a strong step forward.

The following are some limitations and advantages of HBM and areas for consideration for HBM as they relate to the consultation document.

A) General comments on HBM

Limitations:

- With multiple sources of exposures, source identification could be difficult in some cases.
- It is not always possible to reach accurate conclusions on the health effects that may be associated with individual HBM data, if other exposures and environmental data are not also simultaneously available. Reaching conclusions on health outcomes based on exposure, without further studies, is unlikely to be feasible
- Any HBM measurement is only valid for that specific time and array of circumstances; it cannot detect trends in chemical exposure.
- For a comparison of exposure data, knowledge of background and potentially elevated environmental levels is essential.
- Metabolites for some chemicals can be of equal or greater concern than the original chemical; when excluded, HBM data is inaccurate and only gives part of the picture.
- Sufficient pharmacokinetic and toxicokinetic data for a chemical are not always known.
- There are often communication issues related to the expression of hazard and risk associated with HBM data as it can be difficult to balance both issues at a public level and yet accurately convey the message. When this information is communicated in a manner that is not sensitive to those affected and at a level of communication that is not easily understood, the end result may be fear, or unfounded complacency.

Advantages:

- The use of HBM data provides a level of quantification of exposure thereby resulting in less dependence on modelled exposure data.
- If the measured exposure level for a chemical is determined to be harmful to human health, the cost of biomonitoring to conclude on this would be a small fraction of the socio-economic costs.
- HBM data can be useful to determine the efficacy of elimination, or risk management instruments, for a chemical.
- Data from HBM can help to identify populations with higher chemical exposures, vulnerable populations, changes in human exposure, highlight new chemical exposures, and determine how exposures are distributed across the general population.
- The biomarkers from HBM data can be beneficial in refining human multi-chemical exposures.

- When initiating an environmental health impact assessment (EHIA), the use of HBM data adds to the robustness of the assessment.
- The use of HBM data in an EHIA may result in a more integrated approach to human environmental exposure when other factors are included such as co-exposures, cultural differences, socio-economic influences, vulnerable population and susceptibility, differences in individual exposures and exposures across a population.

Areas for consideration:

a) Lack of HBM for children under 6 years of age

- Biomonitoring data for children 6 years of age is essential, as the very young are both more vulnerable, and less well “equipped” to metabolize and excrete toxicants. The wider age span results in a more representative HBM dataset. For example, the consultation document indicates that the hazard dataset for barium is robust but for children under 6 years of age, yet there was no biomonitoring data from the Canadian Health Measures Survey and this age group has the highest dietary intake. Attempts should be made to include biomonitoring data for children less than 6 years of age even though intraspecies and dietary uptake differences have been taken into account in the reference dose.

b) Manufactured nanomaterials

- Manufactured nanomaterials chemicals (silver) were not included in the Science Approach document. Consumer products, for children and adults, as well as food packaging containing nanosilver as an anti-microbial/anti-bacterial agent, have seen an exponential increase in the market. There are concerns about the widespread use of nanosilver in consumer products; because of its size, there is the possibility that it can enter cells or cross the blood-brain barrier. Also, there is concern that the current wide-spread use of nanosilver can contribute to silver resistance in bacteria similar to antibiotics such as penicillin and tetracycline.

  Consideration should be given to the inclusion of some nanomaterials in human monitoring with emphasis on those nanomaterials that have toxic properties in the macroform. This would require specific and accepted methodology for detection.

c) Tin – inclusion or mention of organotin compounds

- The document is inaccurate regarding organotins. It suggests that they were not of concern, but in fact, organotins were previously assessed in 2009, with important Risk Management actions including Virtual Elimination of some organotins.[1] A progress update would be appropriate. Organotins are well documented as toxic pollutants in the environment and are used mainly as polyvinyl chloride heat stabilizers and aquatic anti-fouling chemicals; they are persistent and bioaccumulative. Organotin compounds show endocrine disrupting properties.[2]

  Studies of the impacts of organotins on human health are few but this does not minimize the concerns that organotins can enter the human food chain via food from the aquatic environment and possibly other sources. For communities with significant dependence of food from lakes or other aquatic bodies, consideration should be given to initiate HBM for organotin compounds and their metabolites.

d) Targeting areas with chronic low-level pollution or areas of high pollution

- Vulnerable and targeted populations were mentioned in the consultation document. This is different from regions that are subjected to chronic low-level pollution or periodic high levels of pollution because of their proximity to industrial plants or being downwind from industrial plants. Chronic and acute health issues can be a battle for the populations in these areas – with the government and industry. There are alternative ways to execute HBM for some organic substances that may provide preliminary indications for further urgent consideration. Examples include silicone wristbands that can be used as passive sampling devices to measure personal environmental exposure to organic compounds.[3] This approach is non-invasive and can be used as an indicator for further testing.

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[1] Proposed Risk Management Approach for Non-Pesticidal Organotin Compounds (Organotins) (Non-Pesticidal Organotins). August 2009 Environment Canada. Health Canada. https://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=98F99990-1#9

[2] Nakanishi T. 2008. Endocrine disruption induced by organotin compounds; organotins function as a powerful agonist for nuclear receptors rather than an aromatase inhibitor. J. of Toxicol Sci. Aug., 33(3): 269-76

[3] Kline Molly, et al. 2016. Using silicone wristbands to evaluate preschool children's exposure to flame retardants. Environmental Research 147: 365-372.

e) Other areas for consideration
For subsequent HBM Approach documents, the following topics could be considered for inclusion:

- Details of toxicokinetics that lend credence to the HBM approach;
- An expansion on the gaps in HBM studies – some of the current and future challenges;
- Sample collection, storage/preservation when the half-life of the environmental pollutant is short;
- Low concentrations of environmental pollutants of concern – detection and quantification; and
- Future considerations for additional or new biomarkers for environmental pollutants.

In conclusion, the use of HBM data in chemical assessments is worthwhile, but its application must be carefully circumscribed and justified. Before HBM is further incorporated in chemical assessments, guidelines should be proposed, with public comment before final publication.

Sandra Madray
Chemical Sensitivities Manitoba (CSM)
Email: madray@mts.net

Meg Sears, PhD.
Prevent Cancer Now (PCN)
E-mail: meg@preventcancer.ca