CANADA'S CHEMICALS MANAGEMENT PLAN

The assessment and management of risks from chemical substances

DEFINING A CHEMICAL SUBSTANCE

What is a "chemical substance"? For some it might evoke thoughts of contaminants in our air, water, and food while others might imagine the vitamins, and minerals in our food that keep us healthy. Chemical substances in fact, are all of these things, and more. They can be naturally occurring, created deliberately, or be a by-product of other processes. Despite a common misconception, natural doesn't always mean good. Arsenic and lead, for, example are two naturally occurring, hazardous chemicals. Whether from nature or a lab, whether alone or part of a larger, complex collection of chemicals, it's important to understand which of these chemical substances have the potential to affect our health and the health of our environment. This is one of the important roles of Canada's Chemicals Management Plan.

"The risk posed by a chemical substance is determined by its hazardous properties and how or where exposure takes place."[22] *This scientific definition of risk differs markedly from public perception of risk. How the public perceives risk is affected by a number factors including whether the hazard arises from something new and unknown, if there is a high level of uncertainty about its effects, and if children or pregnant women are particularly at risk.*

MANAGING THE RISKS OF CHEMICAL SUBSTANCES

The Chemicals Management Plan (CMP) was launched in 2006.[1] A joint initiative of Health Canada and Environment and Climate Change Canada, it was designed to address and manage chemical substances by integrating existing federal chemical programs.[2] Programs within both departments work together to provide comprehensive assessments and risk management strategies.

Two committees support the work of the CMP. The CMP Science Committee contributes expertise on scientific issues such as new approaches and methods for assessing risk. The Stakeholder Advisory Council is made up of representatives from National Indigenous organizations, consumer groups, industry and health and non-government environmental organizations. They provide advice on the CMP, including the implementation and communication of risk management strategies.

The Canadian Environmental Protection Act (CEPA) of 1999 required a review of more than 23,000 chemical substances in use between 1984 and 1986. These "existing substances" form the basis of the Domestic Substances List (DSL) - chemicals known to be manufactured, imported or used in Canada during that time.[3]

[1] http://www.chemicalsubstanceschimiques.gc.ca/plan/index-eng.php
[2] http://healthycanadians.gc.ca/publications/department-mini tere/hc-performance-supplementary-information-2014-2015-rendement-renseignements-supplementaires-sc/index-eng.php?page=4
[3] http://www.chemicalsubstanceschimiques.gc.ca/plan/approach-approche/dsl-lis-eng.php
[4] http://www.chemicalsubstanceschimiques.gc.ca/approach-approche/categor-eng.php

The substances on the DSL were categorized based on whether they were:

- **inherently toxic** to humans or to the environment
- **persistent** (take a very long time to break down), and/or
- **bioaccumulative** (collect in living organisms and end up in the food chain)
- **substances to which the general public might have the greatest potential for exposure**[4] (Exposure in the workplace is not within the scope of assessments under CEPA.)

Given this overwhelming number of chemicals, CMP's regulatory scientists in HC and ECCC developed an innovative categorization process to prioritize those that may present the greatest risk. They identified 4,300 substances that required further investigation. The program also employs an approach to identify risk assessment priorities based on new information. Over the last 15 years, this Canadian-led process has become recognized worldwide.[5]

To date, 2,740 chemical substances have been addressed. The risk assessment of the remaining 1,550 chemicals began in January, 2016 and will be completed by 2020.[6]

As these existing substances are evaluated, new chemicals must also be scrutinized. Each year about 500 new substances are manufactured or imported into Canada. They too, must be assessed for possible risk and any necessary measures regarding their use or release must be in place before they enter the Canadian marketplace.

Sometimes new uses change the risk profile of a substance and therefore its subsequent risk management plan. For example, while plastics have been around for decades, their use as microbeads is new. Microbeads are plastic particles that can be almost as small as the period on this page or as large as the eraser on the end of a pencil. They are added to toiletries such as face scrubs and toothpaste and are also used as abrasives in industrial applications.[7]

Microbeads were brought to the attention of the House of Commons in early 2015. Following scientific review on the potential impacts of microbeads on the environment, a proposal was brought forward to ban certain personal care products containing microbeads in Canada. As of June 2016 plastic microbeads the size of an eraser at the end of a pencil and smaller (5mm or less) are listed as substances requiring risk management Although they have no recognizable impact on human health, their impact on the environment is evident. These microplastics are so small they slip through water treatment filtering systems and wash into the waterways, where they persist for decades and more. There they can be mistaken for food, or caught in the gills of aquatic species.

ASSESSING THE RISK OF A CHEMICAL SUBSTANCE

The risk assessment process starts with gathering scientific and commercial activity information on each substance or substance group. This information is collected from a wide variety of sources, including literature and database searches, industry stakeholders and associations, national or international agencies, government researchers, and other stakeholders.[9]

In addition to research/monitoring, sometimes further information gathering from industry may be conducted to inform the risk assessment and address some of the unknowns. This can be done through mandatory provisions in the Canadian Environmental Protection Act 1999.[10]

Officials review the information collected to determine whether people or the environment are at risk from exposure and the specific ways they might be affected. During the risk assessment a number of factors are considered. Does the chemical have hazardous properties? How is the chemical used in the public or industry sector? How are people exposed to it? Where is the substance found -- in food, in consumer products, in water, soil, or in the air? How likely is it to cause harm at the levels to which people and the environment are exposed? How much is known about the amount of the chemical people have in their bodies? Does the chemical persist in human tissue? Are groups like children, the elderly, or those with compromised health at greater risk to the chemical substance?

In Canada, in order to determine risk, scientists will consider both the hazard of a chemical and the potential for exposure to it.

Photo credit:
http://www.chemicalsubstanceschimiques.gc.ca/fact-fait/overview-vue-eng.php

[5] Letter to the Editor in Response to Forristal et al.: Improving the Quality of Risk Assessments in Canada Using a Principle-Based Approach, Regulatory Toxicology and Pharmacology 50 (2008)336–344 Regulatory Toxicology and Pharmacology 53 (2009) 156–157
[6] http://www.ec.gc.ca/ese-ees/default.asp?lang=En&n=B6D66F41-1
[7] Micro beads are synthetic polymer particles manufactured to be larger than 0.1 micrometer and smaller than or equal to 5 millimeters - http://www.chemicalsubstanceschimiques.gc.ca/fact-fait/microb-eng.php
[8] http://www.chemicalsubstanceschimiques.gc.ca/plan/approach-approche/microb-eng.php
[9] http://www.hc-sc.gc.ca/ahc-asc/pubs/_audit-verif/2013-08/index-eng.php
[10] http://www.chemicalsubstanceschimiques.gc.ca/fact-fait/info-gath-collec-ren-eng.php

RISK MANAGEMENT

Sometimes determining the safe level of a chemical substance can be complex, even with the availability of good quality, relatively complete data. It can be even more challenging when there is no definitive answer about a substance's ability to harm humans or the environment. Also over time an understanding of the toxicity of a chemical substance can change.

Studies can reach different conclusions, requiring scientists to look for weight of evidence to determine if a substance is safe or potentially harmful. Cited laboratory and field studies, epidemiology and chemical modeling results are all carefully assessed for quality, strength, and relevance, defaulting to the safer conclusion, if necessary.

In risk management further considerations include a balance between risk and benefit. For example, the benefits of eating a nutritious food must be weighed against the risk of exposure to a particular contaminant. Fish are an excellent source of protein and omega-3 fatty acids, essential for heart health and brain and eye development. However, some fish may also contribute to harmful levels of mercury when eaten too frequently. Developing fetuses as well as children are particularly vulnerable to mercury's effects.

Where is the balance between the risk and the benefit? When a chemical substance has been identified as a risk to the public and/or the environment, that risk must be managed. Options for management must be identified, and measures chosen. In the case of mercury in fish, consumption guidelines are in place to protect the public illustrating the necessity of education. Regulations can be an effective risk management tool. For example, a regulation can prohibit a substance, removing it from commerce. Non-regulatory options are also possible and can include the development of guidelines, codes of practice and labeling. Financial incentives or penalties like tariffs can be applied to polluters limiting exposure and so limiting risk. Outreach and education of at-risk populations allows them to manage their own exposure to the chemical substance.

When a risk management strategy is selected and implemented, follow-up monitoring and surveillance of the exposure evaluates the effectiveness of the strategy.

RESEARCH, MONITORING AND SURVEILLANCE

In order to gather data to both assess and manage risk, and to judge the effectiveness of risk management measures, the CMP funds research, monitoring, and surveillance of chemical substances. These programs include the following:

The Canadian Health Measures Survey (CHMS) is conducted every two years in conjunction with Statistics Canada and the Public Health Agency of Canada. This survey is designed to provide national baseline data on health and to measure exposure to a variety of chemical substances. Each two-year cycle, chemicals are selected for monitoring, and from one cycle to the next can be rotated in and out of the survey to allow new chemicals to be added. One year arsenic or chromium might be included. Another year, acrylamide (a chemical that can form naturally when certain foods like french fries are heated) might be on the list.[11]

The survey targets approximately 5,000 – 6,000 participants, in randomly chosen locations across Canada. Each participant is interviewed at home and at a mobile clinic. Detailed questionnaires gather information about nutrition, smoking, medical history and lifestyle and physical activities. Blood and urine are collected to provide information on exposure to chemicals. Biomonitoring gives researchers a snapshot of the body's burden of a substance at that moment in time. The samples collected as part of the CHMS also form the basis of a biobank where these and other fluids and tissues are stored for future research.[12]

In some cycles of the CHMS, air samplers are used in some homes to measure concentrations of chemicals, such as the components of cigarette smoke or chemicals released from furniture. In a smaller subset of households, samples of tap water and dust are collected to measure levels of substances like lead.

A new cycle of the CHMS began January 2016,[13]
Maternal-Infant Research on Environmental Chemicals (MIREC) is a biomonitoring program that targets pregnant women and newborns. Tissues collected include the mothers' blood, urine, hair, and milk, as well as the umbilical cord blood. The program gauges the exposure of this unique population to certain chemical substances, and searches for any adverse health effects. The MIREC study has been expanded to include children up to the age of 5, tracking their neurodevelopment and providing a measure of the child's growth, development

[11] http://www.chemicalsubstanceschimiques.gc.ca/challenge-defi/summary-sommaire/batch-lot-5/79-06-1-eng.php
[12] http://www.rdc-cdr.ca/sites/default/files/canadian_health_measures_survey_wsd-20-10-2015.pdf
[13] http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5071
[14] https://www.aadnc-aandc.gc.ca/eng/1323294036202/1323294099541
[15] https://www.aadnc-aandc.gc.ca/DAM/DAM-INTER-YT/STAGING/texte-text/pubs-ncp-brochure-pdf_1323287195200_eng.pdf
[16] http://www.chemicalsubstanceschimiques.gc.ca/fact-fait/overview-vue-eng.php
[17] https://www.ec.gc.ca/international/default.asp?lang=En&n=5CB97CCC-1
[18] https://www.ec.gc.ca/international/default.asp?lang=En&n=F0505BC6-1)

and behaviour, including language and communication skills. Results from this project can provide important guidance not only on the effects of these chemicals on the developing child, but on younger women and their fertility.

The Northern Contaminants Program (NCP) was developed to help reduce and potentially eliminate contaminants in traditionally prepared and harvested foods (traditional food) from local northern ecosystems, also known as country food by Inuit, Dene, and Métis people.[14] Traditional diets based on hunting, fishing and gathering provide well-known nutritional, economic and cultural benefits. However some animals and fish, particularly marine mammals, can accumulate high levels of chemicals - metals like mercury and persistent organic pollutants (POPs) like Polychlorinated Biphenyls (PCBs). The program is designed to protect the health of northerners by reducing the levels of certain chemical substances in traditional food and helping them make informed decisions about what they eat. It includes environmental monitoring of the atmosphere, different plants and animals, and biomonitoring of human populations and human health research.

The NCP has adopted a multi-disciplinary partnership approach that is directed by a Management Committee chaired by Indigenous and Northern Affairs Canada (INAC). The Committee includes representatives from four Northern Aboriginal organizations, five territories and provinces, and four federal departments. Health Canada plays an important role in the management of the NCP for the Human Health subprogram.

Information and data on contaminants such as mercury and POPs in the Canadian Arctic gathered by the NCP are fed into the Arctic Monitoring and Assessment Programme, AMAP, an international working group under the eight-nation circumpolar Arctic Council.

There are other programs outside the CMP including **the Aboriginal Biomonitoring Initiative** which surveys individuals living on reserves.

Risk assessors use available data and published studies as well as original research and monitoring to identify potential exposures. This information helps the government determine how to manage any hazardous chemicals and reduce risks.[16]

Canada is actively involved in a number of international initiatives that help it meet its environmental and human health objectives while also contributing to improved global chemicals management. Some examples include the Organization for Economic Co-Operation and Development Chemicals Programme[17], the Strategic Approach to International Chemicals Management[18] and the Canada-U.S. Regulatory Cooperation Council.[19]

AMAP- Arctic Monitoring and Assessment Programme

As part of its mandate, CMP collaborates internationally on chemicals assessment and management. AMAP is one such international collaboration. In February of 2016 the most recent biomonitoring data from the eight Arctic countries including Canada was released.

The latest results show that, over all, levels of contaminants are mostly declining in monitored populations. In Canada, studies of maternal blood show that levels of almost all POPs and metals have decreased over the past twenty years in the Arctic regions surveyed.

However there are differences across the eight Arctic countries. In some populations contaminant levels are declining quickly, while in others the levels remain constant or are even increasing. Perfluorinated chemicals, (PFCs) for example, used to make a variety of products stain and water-resistant, are ubiquitous and levels are increasing in the Arctic.

When compared with people in other parts of the world, Northerners still have higher levels of some contaminants, particularly in some Arctic Canada and Greenland regions. In parts of Arctic Canada, up to 85% of Inuit women aged 18-39 have blood levels of mercury above Canadian provisional interim blood guidelines. Mercury is a naturally-occurring element that is also released from human activities such as coal-burning power plants and mining. Mercury moves up the food chain, accumulating in increasingly higher levels in fish, marine mammals and finally the people who eat them. In humans it is a potent neurotoxin, and subtle health effects have been seen in children in some regions of the Canadian arctic.[23]

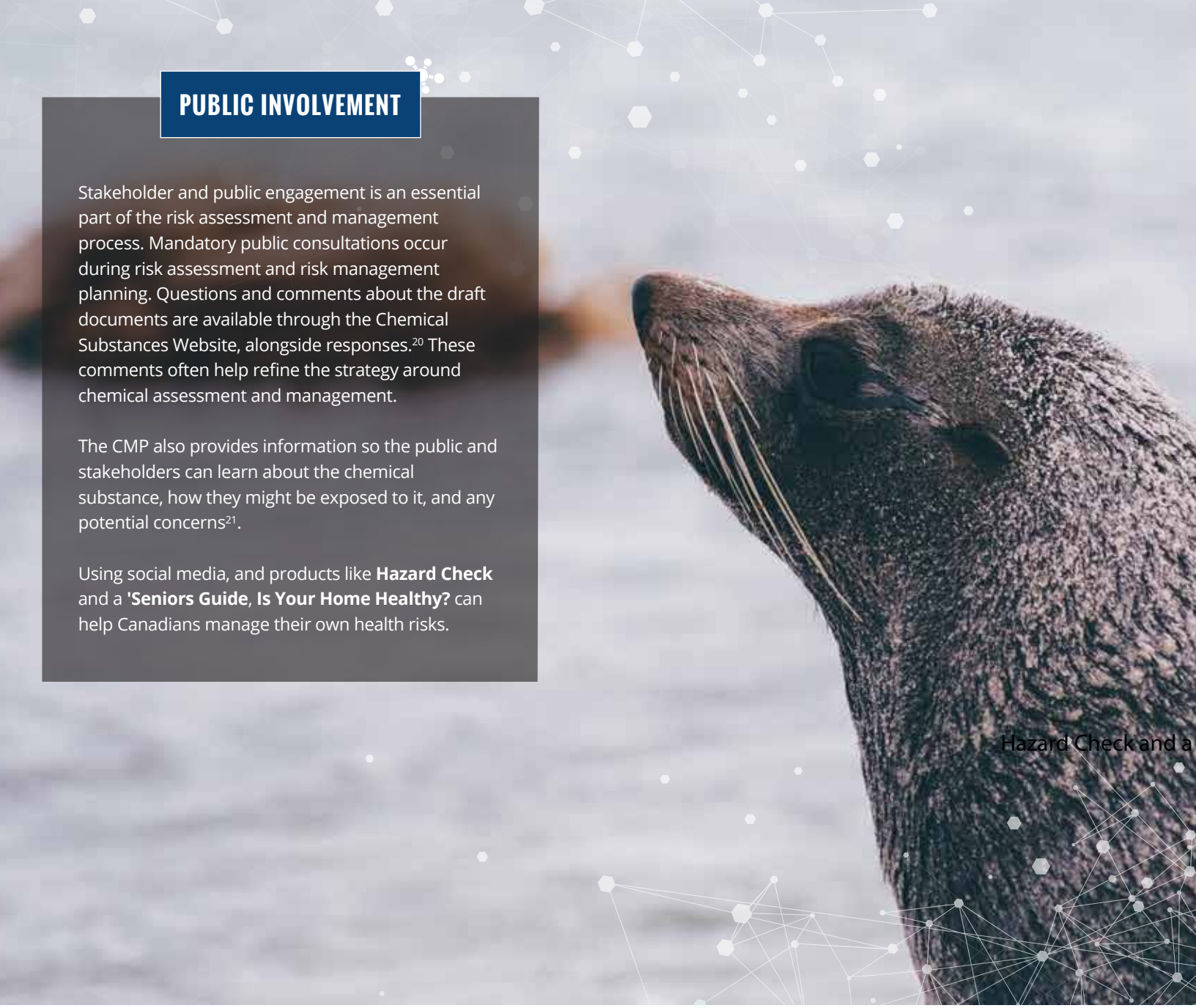
[19] http://www.chemicalsubstanceschimiques.gc.ca/plan/resources/council-conseil-cooperation-eng.php
[20] Example: http://www.ec.gc.ca/ese-ees/default.asp?lang=En&n=D923AE46-1
[21] http://www.hc-sc.gc.ca/ahc-asc/pubs/hpfb-dgpsa/risk-risques_tc-tm-eng.php#ab
[22] http://www.chemicalsubstanceschimiques.gc.ca/approach-approche/assess-eval-eng.php
[23] Health Monitoring and Surveillance Initiatives Under the Government of Canada's Chemicals Management Plan CMP Webinar, December 9, 2014
[24] http://healthycanadians.gc.ca/healthy-living-vie-saine/environment-environnement/home-maison/interactive-interactif-eng.php
[25] CANADA.CA see Health / Healthy Living / Health and the Environment / Home and Garden

PUBLIC INVOLVEMENT

Stakeholder and public engagement is an essential part of the risk assessment and management process. Mandatory public consultations occur during risk assessment and risk management planning. Questions and comments about the draft documents are available through the Chemical Substances Website, alongside responses.[20] These comments often help refine the strategy around chemical assessment and management.

The CMP also provides information so the public and stakeholders can learn about the chemical substance, how they might be exposed to it, and any potential concerns[21].

Using social media, and products like **Hazard Check** and a **'Seniors Guide**, **Is Your Home Healthy?** can help Canadians manage their own health risks.



Hazard Check and a

Managing your risk:

High levels of toxic chemical substances can impact the immune system, cause reproductive problems and birth defects and affect the cognitive and physical development of children. Around the home there are many things you can do to protect yourself from risk. Take the virtual house tour[24] to find out what hazards to look for. When using household chemicals, read and follow all directions. Be sure there's enough ventilation when working with certain household products. Keep all chemical products away and out of sight of children and animals. When working or playing outside consult the Air Quality Health Index. If air quality is poor adjust your activities accordingly, especially if you have heart or breathing problems.[25]

These sites are a good place to start:

- *http://www.healthycanadians.gc.ca/index-eng.php*
- *Fact Sheets and Frequently Asked Questions www.chemicalsubstances-chimiques.gc.ca/fact-fait/index-eng.php*
- *http://healthycanadians.gc.ca/healthy-living-vie-saine/environment-environnement/index-eng.php*
- *http://www.amap.no/documents/doc/summary-for-policy-makers-arctic-pollution-issues-2015/1195*