Chemical Sensitivities Manitoba

December 1, 2016

The Honourable Deborah Schulte, M.P.
Chair, Standing Committee on Environment and Sustainable Development
House of Commons
Ottawa, ON K1A 0A6
By Email: ENVI@parl.gc.ca

Re: Canadian Environmental Protection Act (CEPA) Review
Controlling Toxic Substances

Dear Ms Schulte:

On behalf of Prevent Cancer Now, Chemical Sensitivities Manitoba and the National Network on Environments and Women's Health, we are pleased to submit comments to the Standing Committee on Environment and Sustainable Development regarding the *Canadian Environmental Protection Act* (CEPA) – central legislation that is vital to the health and well-being of all Canadians and our environment. Our recommendations are summarized at the beginning of the document.

We begin by providing broad overviews of approaches and considerations to align environmental assessment with current scientific knowledge and practices. Eight brief examples illustrate how Canada's chemicals assessment and management can be more effective and efficient, by focusing on least-toxic and best practice approaches.

Secondly, we address more specifically chemicals management and monitoring, including hazard and risk approaches.

We appreciate this opportunity to comment on CEPA. As representatives of civil society organizations (CSOs) who collectively have worked many decades on issues related to CEPA, the Chemicals Management Plan (CMP), the Pest Control Products Act (PCPA) and other legislation impacting health and the environment, we are deeply concerned about the lack of opportunities for CSOs and concerned citizens to participate in these processes, due to a lack of resources. Whereas other major players in this review – i.e. the industries whose work is affected by CEPA and the CMP, PCPA, CPA, etc. – have ready access to this process and to federal government decision-makers, CSOs and ordinary citizens are not so advantaged. Efforts should be made by the federal government to address this imbalance.

No compensation was received for researching and writing this submission – this is a volunteer effort, building on decades of volunteer work, including federal and international consultations.

We thank you for the opportunity to assist the Environment and Sustainable Development Parliamentary Committee. Dr. Sears would be pleased to appear in person; we would welcome the opportunity to provide clarifications and further information.

Sincerely,

Margaret (Meg) Sears PhD, Prevent Cancer Now
Sandra Madray, Chemical Sensitivities Manitoba
Anne Rochon Ford, National Network on Environments and Women's Health

Summary of Recommendations

PRIMARY GOALS: PROTECTING THE ENVIRONMENT AND CANADIANS BY ACHIEVING BEST PRACTICES AND OPTIONS

- Key questions for CEPA to shift from a largely reactionary framework to a means to ensure least-toxic options that are the most sustainable and effective include:
  1. Does the substance/product/process/proposal work, or provide a net benefit?
  2. Is there a better means to achieve the end?
  3. What precautionary actions are merited, based on information in hand regarding hazard, exposure, possibly risk?
- The primary objective should be to avoid toxicant releases and exposures as identified in a hazard assessment. The most effective, efficient, pragmatic approach is to identify inherently safest, least-toxic, most sustainable means to achieve an end. If a substance or product is truly needed for a necessary function, then verified safer, more sustainable options (when they exist) should be given the market. When a substance is identified as unacceptable for some or all applications, a process for Informed Substitution would mirror this up-front process of defining the objective and determining optimum results-based options for both new and existing substances. As in Europe under REACH, data must be provided before permitting access to the market.

CRITERIA FOR ACTION UNDER CEPA

Issue: Canada's standards for persistence and bioaccumulation are too lax

- Amend persistence and bioaccumulation criteria to be consistent with the strictest criteria in the European Union and the United States. More substances would come under consideration for elimination thereby promoting one of the main purposes of CEPA – pollution prevention.

Issue: Section 64 – persistence, bioaccumulation and inherent toxicity

- Amend CEPA to require risk management processes to be put in place when a substance meets at least one of the toxicity criteria in section 64.

Issue: Virtual elimination not achieved as regulations target only reductions

- Amend CEPA so that toxic substances destined for "virtual elimination" are actually eliminated, with no further releases.

Issue: The dose doesn't necessarily make the poison – endocrine disruption and cellular signalling

- Establish "endocrine disruption" as an explicit aspect of "inherent toxicity."
- Precautionary approaches include informed elimination and substitution.
- Hazard identification, risk management and informed substitution must account for complex dose responses at low doses, and specific hormone targets of similar chemicals.
- Substances grouped for assessment based on similarities in structure and presumed modes of action may exert unmeasured endocrine effects (e.g. a focus on androgen activity may miss oestrogen mimicry by a similar chemical).

- There may be no safe level of exposure to endocrine disruptors for vulnerable populations such as fetuses, newborns, the developing child and adolescent, and those with higher exposures in the home, community or workplace.
- Potential chemical hazards may be flagged with rapid screening approaches, but they are not a basis to conclude absence of endocrine disruption. Rapid screening cannot replace other testing requirements.

Issue: Synergism between non-ionizing radiation and chemical toxicities

- Recognize that electromagnetic radiation has biological effects at low exposure levels, and interacts with biological systems to enhance toxicity of chemicals. This fact necessitates precautionary approaches and best practices to minimize exposures, both to substances and radiation.

SCIENTIFIC PROCESSES

Issue: Hazard, Exposure and hence Risk determinations

- Emphasize hazard as a key metric for decision-making. Hazard is highly relevant, and is associated with clearer mathematical certainty than risk. In the context of epidemiology of everyday or occupational exposures hazard is a form of risk, even if exposures are not quantified to the precision necessary to determine exposure limits.
- Recognize that it may be impractical or intractable to identify “safe” or “threshold” exposure levels for some outcomes, such as cancer and endocrine disruption.
- Report all biological effects in a straightforward manner, with sufficient details and access to data, for transparent judgements of “adversity” of transitory and non-lethal effects versus death. This would result in better informed decision making and permit sensitivity analysis of hazard and risk analyses.
- All significant biological effects should be considered adverse by default. A high bar should be used to justify any other conclusion across all ages and stages, in the context of other ubiquitous toxicants, and across increasingly stressed ecosystems.
- In toxicology testing, require environmentally relevant and lower repeat dose and chronic dose research, in addition to higher doses.
- Be alert to potential non-monotonic and endocrine disruption effects.
- Chemical assessments must include complete environmental and physiological fate data, to elementary chemicals such as carbon dioxide and water.

Issue: Scientific Review

- Systematic scientific review should include primary search of peer-reviewed literature as well as review of assessments from other jurisdictions *to identify data*, as under section 75 of CEPA. *Data* from toxicity studies must be used, not merely conclusions from studies or other reviews. All data should be included, with methodology, assumptions and limitations factored into grading of study quality for the final weighing of evidence.

Issue: Ongoing scientific follow-up – were decisions correct?

- The hypothesis posed in granting an approval or imposing regulations that a product can be used safely, must be validated after the fact. Availability of analytical capacity, data collection and tracking, and *post hoc* analysis, are all part of the responsibility shouldered in granting

permission. The scale, indeed the intractability of this task, highlights the necessity to adopt least-hazardous best practices and optimum solutions.

- Canada should develop an Environmental Health Information Infrastructure to house data and facilitate analyses.

Why Canada needs more direct approaches – seven more examples of CMP shortfalls and advantages of Substitution approaches

- These examples of prolonged unnecessary hazards and risks highlight deficiencies in scientific and regulatory processes under CEPA.
- The following recommendations for CEPA Part 5 would promote pollution prevention and ensure that all Canadians, including the many vulnerable sub-populations and future generations, are fully considered regarding effects and exposures to toxicants – that our environment is safe for all. This requires a paradigm shift.
  - The primary focus should be on substance toxicity (hazard). The pragmatic utility of this approach is evident when considering substances in household and personal care products.
  - Amend CEPA Part 5 to require substitutes for existing regulated substances to be safer for the environment and public health than the substances to be replaced. Assessment decisions should be transparent, rigorous, systematic and science-based, examining the need for a substance to carry out a particular purpose, and choice of substitute (if any). The goals include avoiding unnecessary use of resources and "regrettable substitutions."
  - Increase emphasis on the effects of very low exposures and cumulative exposures to toxicants. It has been sufficiently established that there is no "safe" level for endocrine disrupting substances during critical stages of development (windows of vulnerability) of the fetus and child. There is no "safe" level of exposure to carcinogens.
  - Work with other jurisdictions and organizations to improve methodology for hazard and risk assessment, and the identification and comparative assessment of safer substitutes.

VULNERABLE POPULATIONS

- Amend CEPA, section 64 (not just the preamble) to consider a greater number and range of vulnerable sub-populations in risk assessments, including workers, women of reproductive age, pregnant women and the fetus, babies and children, the elderly, people with chronic illnesses and environmental sensitivities, Indigenous people, those who work in hazardous work environments, and all poor and marginalized populations. In some instances there will be no safe level of exposure. Environmentally relevant levels must be tested because effects may be different with increasing doses.

STRENGTHENING OF REPORTING GUIDELINES

The current opioid crisis highlights hazards of small quantities of potent chemicals. Data reporting requirement thresholds of 10 tonnes/y, or even 1 tonne/y should be decreased. Enable latitude to impose lower data reporting thresholds depending upon potency.

Use a fully updated DSL to include a larger number of chemicals of concern as identified through categorization to compile a more comprehensive list of chemicals that require mandatory NPRI reporting. Chemicals that are persistent and/or bioaccumulative should be

included for mandatory NPRI reporting as well as chemicals that have the potential to harm human health, including (some of these endpoints are listed in section 68 (2) of CEPA 1999):

- Endocrine disruptors;
- Neurodevelopmental and neurological toxicants;
- Chemicals that can have transgenerational health effects;
- Chemicals that cause or have the potential to cause cancer, as they exhibit one or more of the hallmarks of cancer (42)(43); and
- Sensitizers

Issue: Exclusion of fossil fuel resource facilities

Hydrocarbon resource recovery and exploration facilities should not be exempted from NPRI reporting. Reporting thresholds should be chosen so that the majority of these facilities are obliged to report their activities and releases.

Issue: Lack of reporting on substances being phased out

It should be mandatory that substances being phased out (possibly due to excessive toxicity) continue to be reported on the NPRI.

DOMESTIC SUBSTANCES LIST (DSL) - removal of substances & confidential business information

- Amend Section 73 to give explicit permission to the ECCC Minister to remove a substance from the DSL if there is adequate data to prove that it is no longer in Canadian commerce. The process should be transparent, with opportunities for public comment.
- Place explicit time period restrictions on use of a “masked name.” After a maximum of three to five years, Ministers should release the name unless convincing arguments for non-disclosure have been submitted by appropriate parties.
- Amend relevant sections in CEPA, including those related to regulations and guidance documents to indicate clearly that the chemical identity of the substance must be released when a substance with a “masked name” is to be risk managed.

NEW SUBSTANCES - Data requirements, transparency & assessment timeframe

- Introduce assessment of need and least-toxic approaches for all substances new to Canada.
- Require acute toxicity test data at the 100 kg notification level or lower.
- Mutagenicity and endocrine disruption data based on multiple high-throughput methodologies should be provided at the 100 kg level or lower, with more complex carcinogenicity, neurodevelopmental and neurotoxicity data to be included in the requirements at the 1,000 kg level or lower.
- Include repeated-dose mammalian toxicity data at the 1,000 kg notification level or lower. The lowest test dosage should be within a range relevant to human exposures.
- Include environmental fate testing that would be indicative of persistence, starting from the 1,000 kg notification level or lower according to potency.
- Notify new substances and NDSL substances at the same levels, with equal regulatory requirements and consideration of potential potency. Data should be required at lower levels, as 1,000 kg/y or less of a potent chemical at a single site could cause significant harm.
- Increase transparency in the new substances program, with a public listing of all new substances and indications of masked names. Data (toxicity, environmental fate, etc.) should

still be provided under the guise of the masked name. When a substance with a masked name has to be risk managed, relevant sections, including those related to regulations and guidance documents in the Act, should be amended to stipulate that the chemical must be identified.
- Notify new substances and NDSL substances at comparable levels, with equivalent regulatory requirements. Data should be required at lower levels according to potency – 1,000 kg/y of a potent chemical at a single site could cause significant harm.
- The clock should stop counting the allotted time for an assessment when a clarification is required, just as the clock stops when data are requested. The assessment time would continue to be counted once all the information is received.

APPROPRIATE ACT FOR NEW SUBSTANCES ALSO REGULATED UNDER THE *FOOD & DRUG ACT* OR THE *CANADIAN CONSUMER PRODUCTS SAFETY ACT* (CCPSA)

Issue: Appropriate Act for products containing a toxic substance

- *For the management of toxic substances, CEPA should take precedence over FD&A and CCPSA, to ensure the greatest protection of the environment and human health.*

Issue: NSNR is not appropriate for some new substances

- For new substances in F&DA regulated products originating in nature and present in foods, there should be exemption from pre-market notification under CEPA.

Issue: NSNR – inappropriate parameters for environmental assessment of F&DA substances that reach aquatic bodies

- Under CEPA, establish an effective, science-based regulation specifically for new substances in products that are regulated under the F&DA and the CCPSA. The framework should be sensitive to lower usage levels of substances in products that reach aquatic bodies. Appropriate and sufficient testing requirements at lower concentrations would be significantly more robust than the notification requirements under the NSNR.

SUBSTANCES – NEW & EXISTING: strengthening data collection from industry

- Amend sections 70-72 of the Act so that either Minister (Health, ECCC) can request specific information about a substance, with timelines for the receipt of information.

CANADIAN CONSUMER PRODUCTS SAFETY ACT (CCPSA) & CEPA – appropriate Act for products containing a toxic substance

- For the management of toxic substances, CEPA should take precedence over CCPSA.

IN-COMMERCE LIST – addition to the DSL

- The Minister of ECCC should be given explicit authority to add substances from the In-Commerce List to the DSL.
- CEPA should indicate the procedure to deal with dual use substances that would be nominated for the NSNR.

MAIN SUBMISSION

PRIMARY GOALS: PROTECTING THE ENVIRONMENT (AND CANADIANS) BY ACHIEVING BEST PRACTICES AND OPTIONS

The Canadian Environmental Protection Act (1999) (CEPA) is central to protection of health and the environment in Canada. Overlapping with several other Acts, CEPA touches industries, resources, transportation, food, drugs, consumer products, chemicals in commerce, developments in and potentially impacting pristine areas, and much more. CEPA is not currently adequately protecting the Canadian environment, and needs substantial revisions.

Two fundamental shifts or realignments are required to transform CEPA from a reactionary framework that disallows the worst risks, to a framework that encourages – indeed requires – the least-toxic options that are the most sustainable and effective. Only with such positive approaches will Canada make the necessary, nimble advances in the face of a changing climate and rapidly changing commercial world.

The first overarching necessity is to ask a broader set of questions, and the second is to use the most comprehensive, systematic and reliable methods to answer these questions.

Key questions for CEPA to address for success:

Does the substance/product/process/proposal work, or provide a net benefit?

A question that is generally unaddressed under CEPA, although asked under the *Pest Control Products Act (2002)* (PCPA), is whether a product actually works – termed "value" under the PCPA. The proposed triclosan decision announced for consultation on November 26th, 2016 highlights this important gap. The antimicrobial agent triclosan (in cleaning and personal care products) interferes with hormone actions, is poorly captured in sewage treatment, and is accumulating in Canadian waterways and biota. It is proposed to be listed as toxic, risk management is years away. In contrast, the US Food and Drug Administration has banned triclosan for many uses on a basis not considered in Canada – because commercial interests did not submit sufficient evidence that triclosan actually prevents community-acquired infections (its reason for use). Triclosan may contribute to antimicrobial resistance, an issue that the World Health Organization has declared a global emergency. Efficacy and alternatives are key considerations that may alter conclusions for many substances.

Is there a better means to achieve the end?

If and only if the objective is necessary and has merit, then alternatives should be considered. For example, a flame retardant proposal is currently out for comment. Naturally flame-resistant materials that do not require chemical additives are excellent options for durable, less toxic products.

Alternatives assessment may justify restrictions or banning of more-toxic options. If strong actions are taken to "give the market" to the least-toxic, most sustainable options then innovation is driven and the competitive advantage will benefit Canadian products on international markets.

What actions are merited based on information in hand regarding hazard, exposure and possibly risk, versus best practices?

Canadian decision-making is based on determinations of: 1) hazard (whether harm may ensue at some dose); 2) exposure (use data, and environmental and biological monitoring); and 3) risk assessments (meshing of these two highly uncertain information sets). The resulting uncertainties, just as in a court of law, work in favour of the substance/exposure. Business continues as usual due to uncertainties.

The two-stage toxicity determination means that CEPA is to prevent ***excessive*** quantities of toxic substances from entering the environment. Considerable uncertainties in determination of quantities and concentrations may mean that excessive releases continue and harms accrue until events (e.g., disease clusters) make it obvious that the present practice is too permissive.

Uncertainties are of heightened concern for new substances, when most information is provided by industries. Laboratory testing is unlikely to have covered low, environmentally relevant doses, or co-exposures in the context of daily life. It may take an entire generation for important long-term outcomes such as cancers or developmental harms to be proven in human observational studies, if they ever are.

In other jurisdictions such as Scandinavia, when a substance poses a hazard, the immediate response is to do the first step of environmental assessment – to ask if it is necessary to achieve the intended end, and if so, to determine the optimum manner to accomplish this objective. One illustration is the scandal over flame retardants revealed in the Chicago Tribune, including the lack of efficacy and need, and limited considerations of substitutes (1).

Recommendations

The primary objective of chemicals management under CEPA should be to avoid toxicant releases and exposures as identified in a hazard assessment. The most effective, efficient, pragmatic approach would be to identify inherently safest, least-toxic, most sustainable means to achieve an end. If a substance or product is truly needed for a necessary function, then verified safer, more sustainable options (when they exist) should be given the market. When a substance is identified as unacceptable for some or all applications, a process for Informed Substitution would mirror this up-front process of defining the objective and determining optimum results-based options for both new and existing substances. As in Europe under REACH, data is required before permitting access to the market.

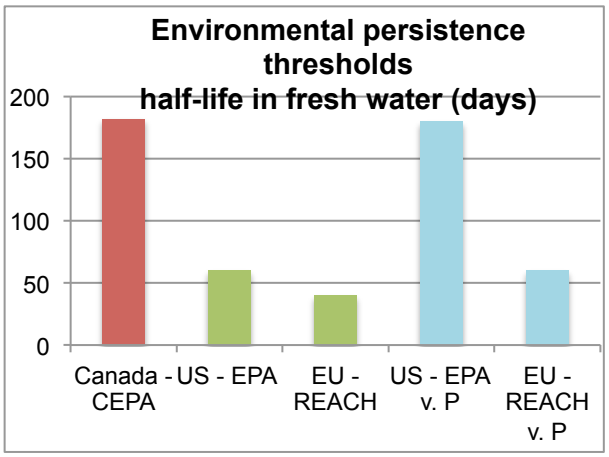
CRITERIA FOR ACTION UNDER CEPA

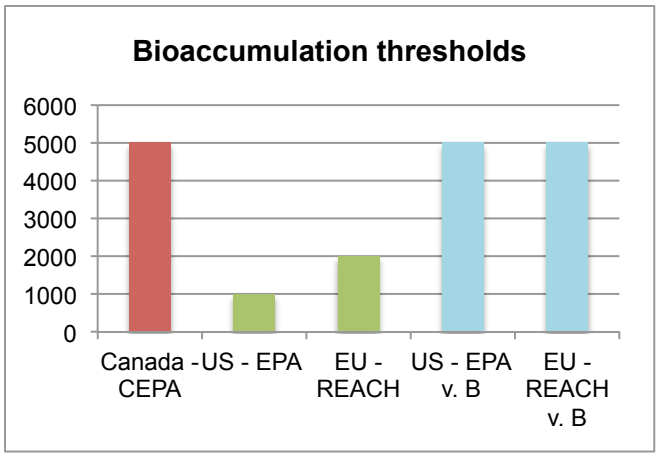
Under CEPA, substances are of concern if they are persistent, bioaccumulative (build up in living tissues, and concentrate up the food chain) *and* are “inherently toxic.” Furthermore, under Section 64, actions are taken only if substances are *also* entering the environment in quantities affecting biological diversity, the environment upon which life depends, or the health of Canadians.

Issue: Canada’s standards for persistence and bioaccumulation are too lax

Standards for persistence and bioaccumulation used by the US Environmental Protection Agency, and by the European Union under its REACH program are more stringent (green values

are lower) than Canada's – foreign agencies capture many more chemicals of concern. Other jurisdictions have a second "very" category (blue) that is comparable to or more restrictive than Canada's criteria.





Recommendation

Amend persistence and bioaccumulation criteria to be consistent with the European Union. A larger number of substances would come under consideration for elimination; and results would be more appropriately aligned with the one of the main purposes of CEPA – pollution prevention.

Issue: Falling through the cracks under CEPA S.64 – Example of Siloxane D5

Criteria for toxicity, persistence, bioaccumulation and excessive quantities and releases

CEPA Part 5, section 64 details numerous conditions to be met for a substance to be declared "toxic," and added to the List of Toxic Substances (Schedule 1).

Siloxane D5 is a recent case (2) illustrating gaps in the current framework. D5 was initially determined to meet all criteria be considered toxic to the Canadian environment. Following the industry's objection, that decision was overturned by a Board of Review, that concluded D5 was not toxic because:

- D5 did *not* exceed the regulatory threshold for bioaccumulation; and
- D5 accumulates in organisms from environmental matrices or food but no evidence was presented to demonstrate that it was toxic to any organisms tested, up to the limit of solubility in any environmental matrix; although
- Evidence indicated that D5 exceeded the regulatory threshold for persistence.

The Board's decision was accepted in 2012, by the then Environment Minister. Since D5 was determined not to be toxic, risk management was considered not necessary. Workplace hazards are covered by a separate system (2).

In contrast, under the European Union REACH Regulation, the same D5 was found to be "very persistent " and "very bioaccumulative" and there is now a proposal from the United Kingdom to restrict the use of the siloxane substances D4 and D5 in "wash-off" personal care products, such as shower gels, shaving foams and shampoos, as these are major sources of these substances

to the aquatic environment in the EU (3). There was concern that the properties of these siloxanes warrant a more precautionary approach in light of the current data gaps since these substances have a potential to accumulate in the environment, and cause effects that are unpredictable in the long-term and would be difficult to reverse (3).

This contrast in classification and risk management measures for the same chemical, D5, raises several issues including the levels at which persistence and bioaccumulation are determined and possible risk management plans if the substance is not deemed to be "toxic" but is either persistent and/or bioaccumulative.

Recommendations:

Amend CEPA to require some form of risk management when a substance does not meet all of the criteria for section 64 but is determined to be persistent or bioaccumulative.

Amend CEPA to require risk management when a substance meets at least one of the toxicity criteria in section 64. Risk management should not be overly restricted to the area of concern; it should encompass a more precautionary approach that considers the long term, if uncertain, implications for the continued usage of such a substance. Further, risk management plans must be viewed through a lens of impact on vulnerable populations and must incorporate a public education component.

Issue: Virtual elimination – under- and mis-applied, as regulation targets reduced release and exposure, not elimination

Clearly, criteria for virtual elimination are overly stringent and/or misapplied. To date, there are only two toxic substances on the Virtual Elimination List (hexachlorobutadiene, and perfluorooctanate sulfonate and its salts).

Furthermore, "Virtual elimination" is not what the term suggests. Under CEPA, a toxic substance may not necessarily be totally eliminated; rather, it will be *reduced* in usage, concentration or release. Some may still be released to the environment, as agreed upon by the Ministers of Health and Environment and Climate Change Canada. The focus, therefore, is not one that emphasizes best practices – total prohibition and pollution prevention, but rather, is aligned with the principles of risk management.

Recommendation

CEPA should be amended so that toxic substances destined for "virtual elimination" are actually eliminated, meaning that there will be no further releases. Eventually this may reduce or eliminate the need for risk management.

Issue: The dose *doesn't* make the poison – endocrine disruption and cellular signalling

Fundamental aspects of our development, health, behaviour, who we are and what we pass on to our offspring are all governed by miniscule quantities of cellular signalling chemicals. Many are hormones, in the "endocrine system." Not surprisingly, look-alike chemicals in the environment can also latch onto hormone receptors, and "flip a cellular switch." Endocrine disrupting chemicals (EDCs) affect how and when cells grow, repair themselves and die. EDCs may contribute to hormonally-induced birth defects, chronic conditions ranging from diabetes

and obesity to infertility and cancers (e.g. breast, ovary, testes, prostate, thyroid), and possibly even gender dysphoria.

At the forefront of early scientists urging actions on EDCs in the 1990s was Theo Colborn (4), author of "Our Stolen Future" (5) and founder of the TEDX website http://endocrinedisruption.org/. The Endocrine Disruptors Action Group is a new, related effort by Canadian scientists (6). In the meantime, large groups of scientists and medical experts and the World Health Organization have repeatedly presented compelling reviews and called for urgent attention to low dose biological effects that are not predicted by high dose observations (7)(8)(9). These are now seen to have profound and expensive impacts on health in North America (10), including male reproduction (11). **The European Union is considering approaches to EDCs, whereas Canada has no systematic approach to identify and respond to EDCs, nor does it have an action plan.**

As the UV filters discussion below describes, structurally similar or related chemicals may exert different endocrine effects (e.g., one chemical may mimic estrogen, another androgen, another multiple hormones). This has important implications for assessment of groups of chemicals using "read across" methods that examine a very limited number of outcomes previously identified for a small number of chemicals within a structurally similar grouping.

Recommendations:

Consider "endocrine disruption" explicitly as a facet of "inherent toxicity." Endocrine disruptors must formally be recognized as having immediate and pervasive adverse effects on public health. Precautionary approaches including informed elimination and substitution when necessary are urgently needed. When substances are grouped for risk assessment because of their similar mode of action (usually based on structural similarities), unmeasured different endocrine effects may be unaccounted for (e.g. a focus on androgen activity may miss estrogen mimicry by a similar but different chemical), so precautionary and risk management measures must account for the possibility that similar chemicals may have different endocrine effects.

There may be no safe level of exposure to endocrine disruptors for some vulnerable populations such as fetuses, newborns, the developing child and adolescent, and those living in areas of high exposure to EDCs. Flagging of chemicals using rapid screening approaches may be of great utility, but rapid screening should not be used to "close the book" on endocrine disruption or reduce other requirements for testing.

Issue: Synergism between non-ionizing radiation and chemical toxicities

Radiofrequency radiation (RFR) as used in wireless communications has biological effects at exposure levels well below those permitted under Health Canada's Safety Code 6, and can act synergistically with chemical toxicants. As such, rapidly escalating exposures to RFR should be considered for incorporation in assessments of chemical toxicity.

"Non-thermal" effects of RFR to increase chemical toxicity is a clinical therapeutic tool as well as being of toxicological interest. A large 2015 review summarized synergistic effects of RFR and toxicants on carcinogenesis, teratogenesis, mutagenesis, inflammation, and other effects; amelioration of RFR effects with agents such as antioxidants (e.g. vitamin C); and use of RFR to enhance therapeutic effectiveness (12).

Recent research indicating synergies includes:

- Lymphocyte infiltration and tumour induction in lymphoma-prone mice was related to altered cellular calcium homeostasis with cell phone irradiation (800 MHz, 1 hour per week for 4 months) (13). This same group studied calcium homeostasis and synergism of radiofrequency radiation with aluminum(14) and with iron (15) to cause cancer.
- Mice prenatally exposed to a chemical carcinogen plus UMTS cell phone signals developed significantly more liver and lung cancers compared with unexposed controls. The lowest powered (0.04 W/kg) UMTS cell phone signal more than doubled cancers in the ENU exposed animals (16).

Compromise of the blood-brain barrier by RFR may decrease protection of the central nervous system from drugs and toxins, as well as contribute to decreases in important antioxidants and hormones such as melatonin (17),(18).

A large study of 2,422 children in 27 schools in 10 Korean cities (19) found synergism between the neurotoxin lead and cell phone radiation. Among children with higher blood lead levels (values greater than 2.35 µg/dL; comparable to levels in Canada), those making more cell phone voice calls exhibited significantly more Attention Deficit Hyperactivity Disorder (ADHD), with no elevation of symptoms in those with lower levels of blood lead and/or voice calls (20).

Recommendation:

Recognize that electromagnetic radiation has biological effects at low exposure levels, and interacts with biological systems to enhance toxicity of chemicals. It is important to incorporate this knowledge within hazard and risk assessments. This fact necessitates precautionary approaches and best practices to minimize toxicant exposures, both to substances and radiation.

SCIENTIFIC PROCESSES

Issue: Hazard, Exposure and hence Risk determinations

CEPA is currently configured to be primarily a risk-based instrument. The same approach is used in pesticide assessment by Health Canada's Pest Management Regulatory Agency (PMRA) and the Radiation Protection Bureau. Risk determinations hinge on both hazard and exposure assessments.

Hazard assessment ascertains various "adverse" effects to human health or the environment. This is a two-step process, with biological effects being identified, and then judged as to "adversity." Judgement of adversity may be subject to abuse.

A similar process is used for pesticides, and test interpretations for the herbicide 2,4-D illustrates this concern (M.Sears examined data in the Health Canada PCPA Reading Room in 2008). A key decision-point is a study of feeding the pesticide to pregnant rodents,that were killed and necropsied near the end of pregnancy. After removal of the uterus, the adults in the lowest dose group were on average half the weight of the control group, but this was not considered to be significant or "adverse." Coincidentally, use of the lowest dose with present uncertainty factors would not have permitted registration. The pesticide was registered on the basis of "adverse" effects at the highest dose, when the animals were moribund and died.

Recommendations

Emphasize hazard as an important metric for decision-making. It is highly relevant, and is associated with clearer mathematical certainty than risk. Hazard in the context of epidemiological everyday or occupational exposures is in fact a form of risk, even if exposures are not quantified to the precision necessary to determine exposure limits.

Recognize that it may be impractical or intractable to identify "safe" or "threshold" exposure levels for some outcomes, such as cancer and endocrine disruption.

Report all biological effects in a straightforward manner before applying judgement regarding "adversity." Sufficient details in assessment documents and access to the source data should be provided to justify and permit verification of interpretations that biological effects are not adverse. This would provide the public with important information, result in better informed decision making and permit sensitivity analysis of hazard and risk analyses, to see how robust conclusions would be to various assumptions.

All significant biological effects should be considered adverse by default. Hazard identification and risk assessment hinge on "adverse" effects. There may be considerable latitude in judgement of "adversity," with transitory and non-lethal effects deemed acceptable, and death considered adverse. A high bar should be used to justify any other conclusion across all ages and stages, in conjunction with other ubiquitous toxicants, and across increasingly stressed ecosystems.

Issue: Hazard characterization / dose response.

It is often assumed that higher doses cause greater effects; what is known as a "monotonic" dose response. This is not true for many chemicals, where different (sometimes even opposite) effects are seen at low doses. The industry testing supplied to regulatory authorities is generally restricted to higher doses, to accommodate "uncertainty factors." Thus, endocrine disrupting effects are missed.

Recommendation

In toxicology testing, require environmentally relevant and lower repeat dose and chronic dose research, in addition to higher doses.

Be alert to potential non-monotonic and endocrine disruption effects.

Issue: Environmental fate

Environmental fate determines persistence in the environment and exposures via many routes. Incomplete degradation data, as the PMRA accepted under the *Pest Control Products Act* (PCPA) for neonicotinoid insecticides, risks important unanticipated adverse effects.

Recommendation

Chemical assessments must include complete environmental and physiological fate data, to elementary chemicals such as carbon dioxide and water.

Issue: Risk assessment

This determines whether the hazard is likely to come to pass under conditions of use or at levels observed in the Canadian environment or population and layers exposure over hazard

assessment. Mathematically, risk assessment combines uncertainties regarding both hazard and exposure, so is inherently less precise or certain than either hazard or exposure data.

Recommendation

In risk determinations, it is important to state explicitly the knowledge (what is both known and unknown) ranges and uncertainties regarding both hazards and exposures, for both transparency and decision-making.

SCIENTIFIC REVIEW

Issue: Systematic methods and related electronic infrastructure

These are essential to handle and to assess rigorously large quantities of complex scientific information. Systematic review facilitates transparency, independence and public confidence. Ultimately, systematic review is the only method by which evidence can be compiled, presented and weighed, to truly carry out what Canadians are promised – "weight of evidence" assessments. This term rings hollow today, when neither the evidence nor the weighing (including "grading" of individual studies) is presented. "Authoritative reviews" from other jurisdictions should only be referenced if they meet rigorous standards for conduct and reporting.

Modern approaches to systematic scientific review that largely mirror established practices for medical interventions have been delineated by the US National Toxicology Program (21) and others. MacKenzie Ross et al. discussed the challenges and advantages of a large systematic review of neurotoxicity from low level, chronic organophosphate (insecticide) exposure (22), concluding that rigorous methodology minimizes bias, improves transparency, yields the most robust conclusions, and that the existing database facilitates rapid updating. Systematic methods have not been evident in Canadian reviews of pesticides, radiofrequency radiation (Safety Code 6), nor chemicals in general commerce. That said, in its current Strategic Plan Health Canada's Pest Management Regulatory Agency lists procurement of the necessary modern electronic infrastructure to support regulatory review (23).

A Parliamentary Standing Committee on Health report made recommendations including that systematic review be instituted and used to compile the first comprehensive assessment of hazards of non-ionizing radiation such as from electricity infrastructure and wireless communications, under Safety Code 6 (24). The Health Canada position stated in Safety Code 6, that the only "established" health effects are shocks from low frequencies and heating from microwave radiation, is founded on very poor and selected scientific review. This was heavily contested by international scientists and physicians during the Parliamentary hearing, indicating genetic, reproductive, developmental, neurological and carcinogenic harms, as well as interactions between environmental toxicants and non-ionizing radiation.

Recommendations

Systematic review should become the mainstay practice to determine hazards, exposures and risks under CEPA, CEAA, PCPA, F&DA, CCPSA, Fisheries Act and whenever else scientific, evidence-based decision-making is required in government operations. Onerous up-front work pays off because once existing research and data are compiled and reviewed, updating the electronic database is quick and easy, facilitating rapid responses to new knowledge.

Environmental data (broadly defined to include emissions and concentrations in environmental compartments, to foods and consumable items) should be systematically assembled within environmental health information infrastructure, to facilitate future research and assessments.

Issue: Sources of data and data quality

These are of concern, with the majority of data for many products, existing substances and particularly newer substances originating from manufacturers or those with related industry interests. As a result, it is necessary to fully employ section 75 of CEPA 1999 to review decisions from other jurisdictions regarding a substance that is under review.

Recommendation

Systematic scientific review for a substance should include review of assessments from other jurisdictions to identify data, as under section 75 of CEPA, to complement scientific literature searches. Data from toxicity studies must be used, not merely conclusions from studies or other reviews. All data should be included, with methodology, assumptions and limitations factored into grading of study quality for the final weighing of evidence.

Issue: Ongoing scientific follow-up – were decisions correct?

When Health Canada and Environment and Climate Change Canada conclude that they are reasonably certain that chemical X does not pose an unreasonable risk to human health or the environment, it is in fact a hypothesis. The responsible, scientifically credible action is to test this hypothesis. This is rarely done. When effects of specific chemicals are examined in the workplace or daily life, it is after prolonged use, build-up in the environment, and potentially ill effects associated with poorly characterized exposures. With limited environmental monitoring and biomonitoring, post-market surveillance covers a minute fraction of substances.

The Canadian Committee of Ministers of the Environment prepare guidelines for water, soil and air quality, and provinces generally adopt these values. Most substances – even drugs and pesticides – that end up in the environment are not subject to guidelines. There are few accredited Canadian labs to undertake the required assessments, and these labs offer analyses of only a limited subset of chemicals of concern. Thus routine analyses of many drugs and pesticides, much less the myriad substances that have been categorized and assessed under CEPA, are not available.

Without commercial labs, or benchmarks to guide sensitivity of laboratory methodologies, Canadians are flying blind, trusting commercial interests that the tens of thousands of chemicals in commerce are not harming or building up in the environment or human population. High costs and resources required to broach post-market monitoring of the environment and population render this approach impractical. This is another reason to use common sense approaches to choose only the least-toxic, most sustainable means to achieve ends, be it sun protection, food packaging or choice of manufacturing materials and processes.

Issue: Late lessons from early warnings

Two European Union publications detail vast, long-term harms from inaction when there were indications of harm related to specific exposures. These include risks from particular substances, as observed in environmental regions such as the Great Lakes, to species such as pollinators, and to novel exposures such as radiofrequency radiation (25)(26).

Recommendation

The hypothesis posed in granting an approval or imposing regulations that a product can be used safely, must be validated after the fact. Availability of analytical capacity, data collection and tracking, and post hoc analysis, are all part of the responsibility shouldered in granting permission. The scale, indeed the intractability of this task, highlights the necessity to adopt least-hazardous best practices and optimum solutions. Canada should develop an Environmental Health Information Infrastructure to house data and facilitate analyses.

WHY CANADA NEEDS MORE DIRECT APPROACHES – seven more examples of CMP shortfalls and advantages of Substitution approaches

As well as the sub-optimal actions regarding D5, current examples of delayed actions and "acceptable harm" rather than least-toxic approaches, putting Canadians and the environment at prolonged, heightened and unnecessary risks include:

1. ***Persistent flame retardants, non-stick and permanent press*** chemicals have been building up in Canadians' blood, fat, breast milk and marine mammals for decades. They can affect endocrine function and early child development, and contribute to the development of cancers. Many have been banned in other jurisdictions, their efficacy is questionable, and less risky, more sustainable alternative options exist. Some flame retardants that have been banned in Scandinavia since the 1990s are now scheduled for eventual phase-out in Canada (27). Needs and efficacy assessments reveal that there are options (e.g. metal instead of plastic casings; materials substitutions) that require no flame retardants, and are indeed preferable, more durable and more easily recycled.
2. ***Microbeads*** and other microplastics directly harm organisms at the base of aquatic and terrestrial food chains, and also accumulate toxic chemicals, kick-starting biomagnification of toxicants and rendering the entire food chain more hazardous. Microbeads in cosmetics (toiletries) will eventually be banned in Canada as of July 1, 2018. This slow action puts us at risk of "dumping" of products illegal for sale in neighbouring states.
3. ***Bisphenol A (BPA)*** is an endocrine disruptor that is ubiquitous in food can linings, drink containers, myriad hard plastic products and thermo-paper such as cash register receipts. The Canadian Health Measures Survey indicates that BPA is found in the blood of virtually every Canadian. A Canadian ban of BPA from products for babies, because the chemical mimics estrogen in the body, led to unfortunate substitution with substitutes from the same chemical family. The substitutes are comparable, if not worse, in terms of endocrine disruption.
4. ***Triclosan*** is an anti-bacterial chemical that exerts many biological effects including endocrine disruption. Triclosan can react in surface water to form toxic dioxins. ***Triclocarban*** is a related phenol with some similar properties and applications.

   These chlorinated chemicals have some medical applications, but are indiscriminately used in cleaning and personal care products, and are added to plastics, clothing and myriad products. Along with metabolites, they contaminate humans including the fetus (28), water, wildlife, sewage sludge and land as these chlorinated chemicals are not adequately removed in sewage treatment plants.

The US Food and Drug Administration (FDA) is banning antibacterial personal care products because the commercial sector failed to produce evidence of efficacy – that use reduces rates of infections in the community as claimed or implied in advertising (29).

Worse, triclosan is not only ubiquitous and does not prevent infections, it may contribute to anti-microbial resistance (30). At a high level World Health Organization meeting on September 21 2016, antimicrobial stewardship was again recognized to be an urgent priority (31).

As with microbeads, the last major jurisdictions to ban this toxic chemical risk "dumping" of discounted products banned elsewhere. On November 26th, 2016, the Canadian government proposed assessment indicated that triclosan was toxic, but excessive levels are not measured in or entering the environment or human population. Astoundingly, under CEPA, little change will be required by the Canadian government in uses of a toxic, ineffective chemical, with broad implications for an issue identified by the WHO as an international emergency.

5. **Ultraviolet Filters – organic chemical UV filters are EDs, and are unnecessary due to safer, effective mineral options.**

UV filters are used in sunscreens to absorb UV light and thus prevent sunburn. A large number of chemicals with multiple ring structures absorb some UV frequencies, and they are generally used in combinations for broad spectrum coverage. These chemicals have a high potential to be endocrine disruptors; for example, the sunscreen ingredient 3-benzylidene camphor was banned in the European Union (32) due to insufficient margin of safety, noting estrogenic, anti-estrogenic and anti-androgenic activities at levels *below* the no-adverse-effect-level that had been used to determine the margin of safety (33). This is typical with non-monotonic dose responses.

Recent screening identified that 13 of 29 UV filters in use mimicked the hormone, progesterone, and impaired sperm function at relevant concentrations (34). Other research found that levels in surface water interfered with endocrine function, stress biomarkers and development of midges (35), and that mixtures of UV filters acted additively (36). With hundreds of possible chemicals that absorb UV light, it is an intractable problem to examine endocrine effects of various chemicals alone and in mixtures.

Fortunately, it is unnecessary to use (and to assess) thousands of possible mixtures of UV absorbing organic chemicals because zinc and titanium oxides, also in sunscreens on the shelf, block UV light across the entire spectrum. Among these mineral sunscreens, larger particles would appear to be safer as they result in lower levels of systemic absorption and, although evidence is mixed, the risk of penetration of nanoparticles through the skin is not encountered with larger particles (37). Potentially harmful photocatalytic reactions are lower with larger particles, with zinc compared with titanium oxides, and recently with particle coatings.

6. **Fabric softeners.** Common raw ingredients used in fabric softeners often smell foul (e.g. when made from rendered animal remains), and the use of strong scents to overpower the "softener" smell is cheaper and more aligned with marketing than the costly refinement of raw ingredients to remove odiferous impurities**.** Manufacturers use phthalates (potential endocrine disruptors) to extend release of fragrances (brews containing dozens of chemicals among thousands of possible ingredients (38), including possible carcinogens, potent sensitizers, endocrine disruptors and other contributors to cancer and other harms). Neither

fragrances nor phthalates reduce static cling or “soften” clothes. Less toxic, more sustainable, preferable alternatives are available to soften clothes.

7. **Single use throw-away products** including packaging and products that go down the drain such as for cleaning and personal care represent an important topic that is ripe for alternatives assessment and substitution, most appropriately under CEPA. Inaction on such issues that rightfully are under federal jurisdiction frustrates and thwarts provincial waste-reduction and pollution-prevention efforts. HC and ECCC could play a strong role in enabling and promoting shifts to more sustainable and healthier options.

Broad considerations in alternatives assessment are essential to make rapid progress improving chemicals management, with new decision-making elements to increase certainty, and reduce or eliminate hazards and risks. The current *post-hoc* approach is not sustainable given generalized lack of data, costs and delays in detecting and possibly eventually acting upon evidence of harm, via a variety of “band-aid” risk management instruments.

A first step in substance or product assessment should answer the question, “Is this a worthwhile, necessary outcome/activity/product, and are there better options to achieve this end?” Identification of objectives and priorities in terms of commercial and societal needs and goals, as well as least-toxic, most sustainable approaches to achieve these objectives, represent challenges that we must meet, to curtail environmental degradation, conserve resources, reduce waste, and meet goals to slow or abate climate change. Each unnecessary or poor quality product represents resources extracted, transported repeatedly, synthesized, manufactured, and eventually disposed of, with each step entailing toxicant footprints.

Identification of least-toxic, most sustainable processes embodies elements of environmental assessment, as objectives are first defined and judged. For every objective, we must consider the null alternative (as with fabric softeners), as well as alternative means to achieve the end. The Swedish have codified these approaches as the “Substitution Principle” – a strategy to put the Precautionary Principle into practice. This approach would require amendment of CEPA for an improved transparent application of the Precautionary Principle, particularly in cases where there are significant data gaps for substances. Subsequent risk assessments would have to rely heavily on alternative methods to fill these gaps.

Recommendations

Under CEPA 1999, Health Canada and Environment and Climate Change Canada have not kept abreast of all scientific advancements, and have not ensured the level of protection that is required for the environment and the health of Canadians. These examples of prolonged significant but unnecessary hazards and risks are indicative of deficiencies within CEPA 1999, as it directs scientific and regulatory processes.

The following are recommendations relevant to Part 5 of the Act to make CEPA an Act that truly embodies pollution prevention and ensures that all Canadians including the many vulnerable sub-populations and future generations, are fully considered regarding effects and exposures to toxicants – that our environment is safe for all. This requires a paradigm shift.

- The primary focus should be on substance toxicity (hazard), with exposure levels of secondary importance. The pragmatic utility of this approach is highlighted for substances in household products and personal care products.

- Amend CEPA Part 5 to require substitutes for existing regulated substances to be safer for the environment and public health than the substances to be replaced. Assessment decisions should be transparent, rigorous, systematic and science-based. Assessments should examine the need for a substance to carry out a particular purpose, and choice of substitute (if any). In effect, the goals are to avoid unnecessary use of resources and "regrettable substitutions."

- Increase emphasis on the effects of very low levels of exposure and cumulative exposures to toxic substances. There is no "safe" level of exposure to endocrine disrupting substances during critical stages of development (windows of vulnerability) of the fetus and child. There is no "safe" level of exposure to carcinogens.

- Work with other jurisdictions and organizations to improve methodology for hazard and risk assessment, and the identification and comparative assessment of safer substitutes.

VULNERABLE POPULATIONS

Chemical assessments must account for the fact that some populations in Canada are more vulnerable than others. Their vulnerability can be the result of geography (e.g., Indigenous communities in close proximity to toxic manufacturing, mining or polluted water systems), of age (e.g., babies and young children, the frail elderly), gender (e.g. pregnant women) or income (e.g., low income people who are more likely to live in more polluted areas and toxic housing, and are less able to afford substitute consumer goods that may contain fewer toxic chemicals; people who work in largely low-income jobs with high chemical exposures), and of medical conditions such as chemical sensitivities.

The health and prosperity of all Canadians is protected when vulnerable members of the population are accounted for in chemical assessments. While CEPA Part 5 mentions consideration of vulnerable populations they are rarely factored into assessments and CEPA lacks specific direction for additional uncertainty factors when determining risk for vulnerable populations. The May 2016 ECCC discussion paper acknowledged the importance of considering vulnerable populations, and suggests that "CEPA could be amended to mention in the preamble, the importance of considering vulnerable populations in risk assessments."[1] As the preamble is an overview with little if any legal status, **protections for vulnerable populations should be incorporated in CEPA itself**.

The present government has a commitment to gender-based analysis of all of its policies and procedures; thus it is worth noting women are disproportionately affected by decisions made under the Chemicals Management Plan (39). Women also disproportionately bear the burden of managing problems that result from toxic exposures (as mothers and as caregivers in formal and informal health care roles).

Employees in hazardous work environments (e.g. laboratories, computer hardware and plastics manufacturing, dry cleaning establishments, foundries, mining, oil and gas facilities, hair and nail

[1] Environment and Climate Change Canada, "Discussion Paper: Canadian Environmental Protection Act, 1999 – Issues and Possible Approaches. May 2016.
Accessed October 6, 2016 - https://www.ec.gc.ca/lcpe-cepa/1817692F-21EF-4FE5-8BD6-525DC6AC755F/DiscussionPaper-CepaIssuesAndSuggestions-eng.pdf

salons, auto body shops, etc.) represent vulnerable groups who are not considered under CEPA, due to jurisdictional technicalities (occupational matters are provincial jurisdiction). This significant oversight in both the assessment and the risk management phases represents an inequality in the process that has important health and social justice consequences.

By way of example, while bisphenol A was designated CEPA-toxic and banned for use in baby bottles (an important first step, although Substitution was not considered), those involved in the manufacturing of baby bottles or other plastics products, including women of reproductive potential, were not considered despite potentially high and on-going levels of exposure.

Recommendation

Amend CEPA, section 64 (not just the preamble) to accommodate a greater number and range of vulnerable sub-populations in risk assessments, including workers, women of reproductive age, pregnant women and the fetus, babies and children, the elderly, people with chronic illnesses and environmental sensitivities, Indigenous people and all poor and marginalized populations. In some instances there will be no safe level of exposure. Effects may not be monotonic with dose, requiring environmentally relevant levels in testing.

NATIONAL POLLUTANT RELEASE INVENTORY (NPRI)

Information gathered as prescribed under Part 3 of *CEPA 1999* for the National Pollutants Release Inventory (NPRI) is publicly accessible in a searchable database of Canadian releases (to air, water, land) for a selected number of pollutants. For the year 2014, 7720 facilities reported on 343 listed substances (40). These chemicals, mainly from larger facilities, are only a portion of the releases that have the potential to harm human health and the environment.

The province of Ontario, the highest pollutant emitter in Canada, now has its own Toxics Reduction Act, which came into force in 2010 (41). It emphasizes the reduction of use and formation of toxic substances in industrial processes. With a lower reporting threshold of 100kg/year for 25 priority substances, industries with lower emissions that would not normally report under the NPRI are now captured.

The CMP came into force in 2006 with a risk-based approach to manage chemicals declared “CEPA-toxic” in Canada (CEPA section 64). This was not as effective as desired from 2006 to 2012. Data from the Commission of Environmental Cooperation (CEC), in conjunction with the Government of Canada, indicated increases in the release of some “CEPA-toxic” substances. While some specific substances were reduced over time, trends in “on-site” and “off-site” emissions for specific categories (42) included:

- Known or suspected carcinogens *increased* by 42% (from approx. 171 million kg/year to approx. 242 million kg/year),
- Known or suspected reproductive/developmental toxicants *increased* by 35% (from approx. 142 million kg/year to approx.192 million kg/year),
- Persistent, bioaccumulative and inherently toxic (PBT) chemicals *increased* by 35% (from 141 million kg/year to 191 kg million/year).

Some of these emission increases included arsenic and/or its compounds, asbestos, cadmium and/or its compounds and lead and/or its compounds – 87%, 98%, 856%, and 127%, respectively (42).

As a performance comparison, the province of Ontario compares poorly to the state of New York, for 2012 (42).

Jurisdiction	Population (millions)	2012 air releases of carcinogens (kg)
Ontario	13.4	1,589,213
New York State	19.6	174,697

Since the reported emissions are mainly from larger facilities, excluding a number of smaller facilities, this data may underestimate the actual emissions, and miss potential application of risk management initiatives.

If CEPA were effective in this regard, one would expect declining emissions - the trends indicated above call into question the appropriateness of the parameters to designate collection of emissions data, as well as the effectiveness of risk management instruments or actions taken by the government. An approach to minimize and eliminate the most hazardous substances would be more precautionary and precise, and would support the identification of safest alternatives for some substances that are currently in Canadian commerce.

With a fully updated Domestic Substances List (DSL), better alignment with the health and environmental impacts derived from categorization data, and inclusion of substances likely to affect the health of vulnerable populations, the number of substances that *should* be tracked is likely considerably higher.

Requirements to report uses and emissions under CEPA, be it under the National Pollutant Release Inventory or for purposes of substances list, are all based upon the mass of the substance. The current opioid crisis, with 1 kg of carfentanil intercepted in Calgary posing a risk of 50 million fatal doses (43) – enough to kill every Canadian – illustrates clearly that potential potency must be factored into reporting requirements, and that reporting thresholds are too high.

The following are issues associated with the NPRI that require consideration and amendment under section (46) of the *Act*:

Issue: Reporting thresholds

At 10 tonnes/year, the reporting threshold for some substances is too high. This level cannot adequately capture medium-small facilities, thereby giving a falsely optimistic indication of actual releases and pollution levels. As well, potency of toxicants must be considered.

Recommendation

For substances with a reporting threshold of 10 tonnes/year, the threshold should be decreased to a threshold of 1 tonne/year or less, depending upon potency.

Issue: Consideration of categorization data and additional data

DSL categorization data, including health endpoints guiding the mandatory reporting of emissions, is not aligned with the inventory of chemicals for the NPRI, possibly resulting in a lower number of substances subject to mandatory reporting.

Recommendation

Use a fully updated DSL to include a larger number of chemicals of concern as identified through categorization to compile a more comprehensive list of chemicals that require mandatory NPRI reporting. Chemicals that are persistent and/or bioaccumulative should be included for mandatory NPRI reporting as well as chemicals that have the potential to harm human health, including (some of these endpoints are listed in section 68 (2) of CEPA 1999):

- *Endocrine disruptors;*
- *Neurodevelopmental and neurological toxicants;*
- *Chemicals that can have transgenerational health effects;*
- *Chemicals that cause or have the potential to cause cancer, as they exhibit one or more of the hallmarks of cancer (44)(45); and*
- *Sensitizers*

Issue: Lack of reporting on substances being phased out

When substances are being phased out there are no obligations to report emissions to the NPRI. Canadians need reassurance that the phase-out of the most concerning substances is in fact occurring.

Recommendation

It should be mandatory that substances being phased out (possibly due to excessive toxicity), continue to be reported on the NPRI.

DOMESTIC SUBSTANCES LIST (DSL) - removal of substances & confidential business information

The Domestic Substances List (DSL) is an inventory of approximately 23,000 substances manufactured in, imported into or used in Canada on a commercial scale, under certain conditions, between January 1, 1984 and December 31, 1986.[2] Substances not listed on the DSL are generally considered new to Canada. One must report to the government any activities regarding a new substance prior to its manufacture, import or use in Canada, as the substance must be assessed for its toxicity to human health and the environment. The DSL is partially updated on a periodic basis but lacks a full update that would be better aligned with the current status of chemical use in Canada.

The following are issues related to the DSL under CEPA Part 5, unless otherwise stated:

Issue: Removal of DSL substances no longer in Canadian commerce

The Minister of Environment and Climate Change Canada (ECCC) is responsible for the DSL, with the authority to add substances to the list. Unless a substance was added in error, however, there is no explicit authorization for the Minister to *remove* substances, when there is sufficient evidence that they are no longer in Canadian commerce.

[2] Environment, Climate Change Canada (ECCC). Domestic Substances List (DSL). http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=5F213FA8-1 Accessed September 2016.

Once removed from the DSL, the substance would be considered a new substance and would be subjected to New Substance Notification Regulations (NSNR) for use, import or manufacture in the Canadian market.

Recommendation

Section 73 should be amended to give explicit permission to the ECCC Minister to remove a substance from the DSL provided that there is adequate data to prove that it is no longer in Canadian commerce. The process should be transparent, with opportunities for public comment.

Issue: Confidential business information

Confidential business information (CBI) is addressed mainly in sections 313 to 321. For the DSL, other substance lists and public documents, a notifier can ask that the name of a substance be confidential, with a "masked name" being used. This lack of full disclosure of the identity and properties of a substance by the manufacturer or supplier means that data gaps are difficult to fill. This could hamper risk assessment efforts, forestall public comment, and is unacceptable if the substance is used in consumer products or has the potential to harm human health or the environment (presents any hazard). A masked name is inappropriate for an unlimited time.

Recommendations

Explicit time period restrictions should be placed on use of a "masked name." After a maximum of five years, Ministers should release the name unless convincing arguments for non-disclosure have been submitted by appropriate parties.

Relevant sections in CEPA, including those related to regulations and guidance documents should be amended to indicate clearly that the chemical identity of the substance must be released when a substance with a "masked name" has to be risk managed.

NEW SUBSTANCES - Data requirements, transparency & assessment timeframe

In Canada, a substance is considered "new" if it is not listed on the DSL as in Canadian commerce between January 1, 1984 and December 31, 1986. To enter commerce in Canada, Part 5 of CEPA requires assessment of a new substance for health and environmental impacts.

A brand new substance is subject to the **New Substance Notification Regulations (NSNR)**, with notification requirements depending on intended usage volumes.

Substances that are in commerce internationally, but not in Canada, are referred to as being on the **Non-DSL (NDSL)**. The NDSL is based mainly on the US Toxic Substances Control Act (TSCA) Chemical Substances Inventory. Information gaps are common for NDSL substances as the majority of new chemicals are information deficient in the US.[3] Reporting requirements are less stringent for the NDSL than for NSNR substances, for importing into Canada. For example, the data requirements at 1,000 kg/year for a NSNR substance are equivalent to the data requirements for 10,000 kg/year of a substance on the NDSL (47). This appears to be perverse, as it would be expected that substances in commerce elsewhere would be more data rich than a brand new substance not used elsewhere.

[3] Under new safety law, 20 toxic substances on which the EPA should act now. July 21, 2016. This indicates that many substances under TSCA have not been assessed.
http://www.ewg.org/research/under-new-safety-law-20-toxic-chemicals-epa-should-act-now

The following is **some** of the information required at the three notification levels of **usage or manufacture** per year, that are relevant to the discussion of issues and recommendations (47):

100 - 1,000 kg No toxicity data required;
Human health and environment hazard information to be provided *if in the possession* of the manufacturer or importer;
NOTE: Usage of products containing the substance by children, pregnant women and other vulnerable individuals is **not specifically considered**.

1,000 – 10, 000 kg: Acute aquatic toxicity data;
Acute mammalian toxicity test selected on the basis of the most significant route of potential human exposure to the substance;
Ready biodegradation data, in respect of the chemical and, *if known*, identification of the products of biodegradation;
Mutagenicity data obtained from one *in vitro* test (with and without metabolic activation, for gene mutation);
Exposure potential to humans and the environment;
Usage by children of products containing the substance is considered;
Usage or exposure of pregnant women and other vulnerable individuals are *not considered*.

> 10,000 kg: Additional acute aquatic toxicity;
Repeated-dose mammalian toxicity data;
Mutagenicity data - *in vitro* and *in vivo;*
Skin irritation & sensitization data.[4]

Numerous data gaps are relevant and essential for assessments. Some examples include:
- Definition of a "significant" exposure of the public;
- Acute toxicity tests are not required below 1,000 kg annual release per site (10,000 kg for the NDSL);
- Acute toxicity tests are only in the aquatic environment;
- Lack of repeated-dose mammalian toxicity data below 10,000 kg
- Lack of specific mention of environmental fate with respect to persistence of the parent compound and/or intermediate breakdown products;
- Lack of specific mention of carcinogenicity (mutagenicity required starting at the intermediate notification level);
- No specific inclusion of endocrine disruption, neurodevelopmental and neurotoxicity adverse effects; and
- No requirements to examine low dose and non-monotonic dose responses.

Notification levels imply that substances are "equal" in their properties with respect to the impacts on human health and the environment, which is clearly absurd. Notification level data requirements do not reflect differences in potencies, and this becomes more critical at the lower notification levels because of the lack of toxicity data. In order to further identify substances of

[4] Canada – New Substances Notification Regulations (Chemicals & Polymers). http://laws-lois.justice.gc.ca/eng/regulations/SOR-2005-247/page-1.html#docCont Accessed September 2016.

concern at any notification level, the onus is then on the government to fill in the data gaps for those substances when there is a suspicion of toxicity.

Data requirements may be qualified by "if available," permitting the exposure of Canadians and the environment to 1000 kg per year of a toxic chemical released from a site, on the basis of a lack of information. For a new substance, there is the possibility that experimental data for hazard assessment will be limited or non-existent, and similarly, exposure data for an environmental assessment could be minimal or absent. These issues, together with other data needs that are not required under the NSNR, could make an assessment challenging.

To summarize, the NSNR lacks requirements for critical data at all notification levels and data collection is discretionary on the part of the proponent. Some rudimentary data that are required are only collected at the high levels of use. As previously indicated, there is the possibility of many data gaps which the government would have to fill using methods normally employed when data is not available from the notifier. If further test data are required, the government has to justify that the required data are essential. This is a Catch-22 situation of requiring data in order to estimate hazards, to establish needs for the data.

The following are issues and recommendations associated with specifics of the NSNR:

Issue: Data requirements

As outlined above, there are many critical deficits in data requirements at all notification levels for new substances, which detract from a robust assessment. As well, should there be serious delayed toxic effects of a new, unknown substance, the 10,000 kg limit is extremely excessive.

Recommendations

Introduce assessment of need and least-toxic approaches for all substances new to Canada.

Require acute toxicity test data at the 100 kg notification level or lower.

Mutagenicity and endocrine disruption data based on multiple high-throughput methodologies should be provided at the 100 kg level or lower, with more complex carcinogenicity, neurodevelopmental and neurotoxicity data to be included in the requirements at the 1,000 kg level.

Include repeated-dose mammalian toxicity data at the 1,000 kg notification level. The lowest test dosage should be within the range that would be relevant to human exposure levels.

Include environmental fate testing that would be indicative of persistence, starting from the 1,000 kg notification level.

Issue: Comparison of data requirements for NDSL & NSNR substances

Not all chemicals are equal in behaviour and the reporting levels may be woefully inadequate for some. In addition, regulatory requirements are less stringent for NDSL substances entering the Canadian market – the data requirements for a NDSL substance at 1,000 kg/year are the same as the data requirements for a brand new substance in Canada at 100 kg/year.[5] In particular, NDSL substances could enter Canada with a lack of appropriate data.

[5] Under new safety law, 20 toxic substances on which the EPA should act now. July 21, 2016. This indicates that many substances under TSCA have not been assessed.
http://www.ewg.org/research/under-new-safety-law-20-toxic-chemicals-epa-should-act-now

Recommendation

New substances and NDSL substances should be notified at the same levels, with equal regulatory requirements and consideration of potential potency. Data should be required at lower levels, as 1,000 kg/y or less of a potent chemical at a single site could cause significant harm.

Issue: Transparency in the new substances program

There is very little transparency in the new substances program as there is no public listing of all new substances. A small percentage have risk assessment documents that are publicly available but these are not subject to public comment unless a substance is proposed for a Significant New Activity (SNAc).

Recommendations

Increase transparency in the new substances program, with a public listing of all new substances and indications of masked names. Data (toxicity, environmental fate, etc.) should still be provided under the guise of the masked name. When a substance with a masked name has to be risk managed, relevant sections, including those related to regulations and guidance documents in the Act, should be amended to stipulate that the chemical must be identified.

New substances and NDSL substances should be notified at the same levels, with equivalent regulatory requirements. Data should be required at lower levels – 1,000 kg/y of a potent chemical at a single site could cause significant harm.

Issue: Timelines for assessment

In the assessment process, when additional information is required, the counting of the allotted time to complete the assessment halts, and then restarts once the information is received. If a clarification is required, however, the allotted time continues to progress. The legal time for the assessment can terminate and there is the potential for the substance to enter the market without the assessment being completed.

Recommendation

*The clock should stop counting the allotted time for an assessment when a clarification is required, just as the clock stops when data are requested. The assessment time would continue to be counted once the information is received, and regulators have **all** of the data necessary to do their work.*

APPROPRIATE ACT FOR NEW SUBSTANCES ALSO REGULATED UNDER THE *FOOD & DRUG ACT* OR THE *CANADIAN CONSUMER PRODUCTS SAFETY ACT* (CCPSA)

Issue: Appropriate Act for products containing a toxic substance

CEPA provides the authority to integrate considerations of both the human health and the environmental impacts of a substance. Meanwhile, FD&A and CCPSA focus on health and safety of a substance in a consumer product. Like CEPA, they have the power to regulate the sale, import and manufacture of the substance in a product; however, CEPA has broader legal authority. CEPA has the mandate to control the use, disposal and complete life cycle considerations for consumer products containing toxic substances.

Recommendation

For the management of toxic substances, CEPA should take precedence over FD&A and CCPSA, to ensure the greatest protection of the environment and human health.

Issue: NSNR is not appropriate for some new substances

Some of the new substances in a product subject to F&DA regulations occur naturally and are used as foods. They pose no threat to the environment but still must go through the pre-market notification and an assessment, as required by CEPA.

Recommendation

For new substances in F&DA regulated products originating in nature and present in foods, there should be exemption from pre-market notification under CEPA.

Issue: NSNR – inappropriate parameters for environmental assessment of substances in products that reach aquatic bodies

Substances in personal care and cleaning products are eventually released to aquatic bodies via the sewer system. If these substances are new, they are assessed under the NSNR. Some of these substances, however, are generally used at low concentration levels and the total annual quantity would not necessarily trigger the requirement for a more in-depth assessment. As described above (see "New Substances – data requirements"), shortcomings in the current NSNR data requirements include acute and repeated–dose mammalian toxicity data at the lowest notification level. Some new substances designated for personal care products could be endocrine disruptors, carcinogens, neurotoxins and neurodevelopmental toxicants that can cause harm at low levels. This would be missed with the current notification levels of the NSNR.

As a result, the current NSNR are inappropriate to assess new substances in personal care and consumer products that are subjected to the *F&DA* and CCPSA for those substances that eventually go down the drain.

Recommendation

Under CEPA, establish an effective regulation specifically for new substances in products that are regulated under the F&DA or the CCPSA. This regulation should be science-based and sensitive to lower levels of usage of new substances that reach aquatic bodies. Appropriate and sufficient testing requirements at lower concentrations would be significantly more robust than the requirements under the NSNR.

SUBSTANCES – NEW & EXISTING: strengthening data collection from industry & requirements for information with more specificity

CEPA sections 70-72 outline the conditions under which commercial interests are to provide the government with specified information for substances proposed for or in Canadian commerce. Continued significant data gaps for substances currently in commerce indicate that this system has been ineffective. The onus or burden of proof is on the government rather than industry to fill data gaps. Under REACH in the EU, the onus is on industry to supply all the relevant information on a substance. Furthermore, the end result under REACH is not a risk assessment.

Through CEPA section 70, industry is obligated to provide any information on a substance that indicates its toxicity or if the substance is capable of becoming toxic. A formal notice in the

Canada Gazette (s. 71) requires industry to provide information, samples or testing data for the substance that is to be assessed.

Issue: Request for toxicological data

The collection of data essential to determine the toxicity of substances is hampered by current constraints in sections 71 and 72, particularly when requests have to go through more formal channels as a Notice in *Canada Gazette*. The ECCC Minister does not have the authority to request toxicological data (s. 71 (1)(c)) for a substance unless both Ministers (HC and ECCC) have reason to suspect that the substance is toxic or capable of becoming toxic (s.72). In the determination of toxicity, both departments are involved in the assessment. Nevertheless, independent requests for information should be permitted.

Issue: Relevant, specific information on specialized substances

Data collection issues can be compounded if substances are engineered to have less predictable behaviour, as in the case of many manufactured nanomaterials. There are often important differences in the physical-chemical and toxicological properties of nanomaterials versus the macroscale counterpart. At present, there are no requirements in sections 70-72 that specifically require the need for information that would be more relevant for substances that exhibit behaviour that is not predictable according to historical standards. The onus is then on the government to fill the data gaps by requesting additional information from industry and/or obtaining the information through searches in the public domain.

Recommendations

Amend sections 70-72 of the Act so that either Minister can request specific information about a substance, to minimize data gaps. This will result in more robust risk assessment and better aligned regulatory actions. Examples include manufactured nanomaterials and endocrine disruptors.

Include timelines for the receipt of information from industry.

IN-COMMERCE LIST

Issue: Addition to the DSL

The In-commerce List is a list of substances in products that entered the Canadian market between January 1, 1987 and September 13, 2001 and are subject to the *Food and Drug Act.* Although they are subject to the authority of CEPA, the Minister of ECCC, does not have authority to add any of these substances to the DSL. Also, there is uncertainty as to the status of some substances in relation to the New Substances Program as they have dual use, that is, they also have uses other than those under the F&DA.

Recommendations

The Minister of ECCC should be given explicit authority to add substances from the In-Commerce List to the DSL, as deemed necessary.

CEPA should clearly indicate the procedure to deal with dual use substances that would be nominated for the NSNR.

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