

## **NGO Submission – Batch 2**

**Anna Tilman, STORM Coalition**

March 27, 2009

Existing Substances Program  
Gatineau QC K1A 0H3

E-mail: [DSL.surveyco@ec.gc.ca](mailto:DSL.surveyco@ec.gc.ca)

Re: Submission on final screening assessments and risk management strategies for four substances in Batch 2:

1. Oxirane (chloromethyl)-(Epichlorohydrin) CAS No. 106-89-8;
2. Three siloxane compounds:
  - i. Octamethylcyclotetrasiloxane (D4) CAS No. 556-67-2;
  - ii. Decamethylcyclopentasiloxane (D5) CAS No. 541-02-6; and
  - iii. Dodecamethylcyclohexasiloxane (D6) CAS No. 540-97-6

Canada Gazette Notice Part 1 Vol. 143, No. 5, January 31, 2009

From: Anna Tilman, STORM Coalition  
7 Whitfield Court  
Aurora, On L4G 5L8  
905-841-0095  
[annatilman@sympatico.ca](mailto:annatilman@sympatico.ca)

### **General Comments and Considerations**

This submission focuses on four Batch 2 substances, three of which are high-volume substances, namely, D4, D5 and D6. While epichlorohydrin is not a high-volume, it is imported as a residual substance. These substances were identified as high priority during categorization due to their potential for human exposure and their persistence, bioaccumulative, inherently toxic or carcinogenic properties.

None of these substances are naturally-occurring. Their presence in the environment is exclusively a result of anthropogenic sources. They are used in a broad range of applications, from industrial to numerous common consumer products including personal care products, food additives, pesticides, automotive products, paints, adhesives, dyes, and deodorizers, to name a few. They can also be transported thousands of kilometres from their source through the atmosphere.

Because of their extensive use, not only would there be releases of these substances to all media, the disposal of these products would result in their presence in waste streams, and depending on waste treatment (e.g., incineration), can be re-released to the environment.

These substances represent only a few of the numerous toxic substances in commonly used

products. But because assessments are done on a substance-by-substance basis, the cumulative impact of exposure to these substances is not taken into account. Furthermore, the effects of chronic exposure, susceptibility of vulnerable populations, or the impacts of long-range transport do not weigh in to these assessments.

The shortcomings in these screening assessments and the acknowledged considerable gaps in both the toxicity and use patterns of each of these substances warrant a precautionary approach in order to minimize and phase out their use to avoid any releases to the environment.

## **Overview of Assessment Findings**

The screening assessments on these four substances found that three meet one or more criteria to be declared toxic under section 64, *Canadian Environmental Protection Act (CEPA) 1999*. The exception is the siloxane compound referred to D6. As a result, no risk management approach has been prepared for D6. Considering the vast range of products that contain siloxane compounds, many of which are personal use products, the impact of dermal exposure as well as exposure via air, this disturbing conclusion must be contested. It makes no sense to treat D6 differently from D4 or D5. It sets a dangerous precedent for handling substances with such similar chemical, biological and toxicological properties in an isolated manner and could result in the increase in the use of one over the others.

While the government is seeking comments on those substances that have been found toxic under CEPA, it is most important that comments be accepted for those substances in Batch 2 for which the final assessment concluded that the toxicity criteria were not met as is the case for D6.

On another note, only one of the Batch 2 substances (phenol, 2, 4, 6-tris (1,1-dimethylethyl) has been proposed to be added to the Virtual Elimination(VE) under section 77(4) CEPA (1999). None of the others are slated for virtual elimination, presumably because the assessors found that these substances may not have satisfied all criteria for VE, in particular the criteria for persistence and bioaccumulation. These findings are questionable as they are based on very limited data and are subject to interpretation as to what levels are appropriate to deem a substance bioaccumulative and/or persistent.

The following sections highlight specific features and issues pertaining to epichlorohydrin and the three siloxanes compounds (D4, D5 and D6).

### **1. Oxirane (chloromethyl) - (Epichlorohydrin) CAS No. 106-89-8**

Epichlorohydrin was flagged as a high priority substance during categorization due to its high potential for human exposure and its listing as a probable carcinogen. It is known to induce genetic damage but it is not known whether there is a threshold to its carcinogenicity.

The final screening assessment concluded that on the basis of the carcinogenicity of epichlorohydrin, for which there may be a probability of harm at any level of exposure, epichlorohydrin may be entering the environment in a quantity or concentration or under

conditions that constitute or may constitute a danger in Canada to human life or health and therefore meets the criteria for toxicity under section 64(c) of CEPA 1999.

Additionally, the assessors concluded that while epichlorohydrin meets the criterion for persistence in air, it does not meet the persistence criteria for water, soil or sediment, nor does it meet the criteria for bioaccumulation potential as set out in the *Persistence and Bioaccumulation Regulations*. Furthermore, based on the available information, the assessment report concluded that epichlorohydrin is unlikely to be causing ecological harm in Canada.<sup>1</sup>

The following section highlights some of the critical aspects of the assessment along with comments on these findings.

#### **a. Manufacture and Use Information**

According to data submitted in response to the Section 71 notice under CEPA 1999, there were no reports of epichlorohydrin manufactured or imported by any company in Canada above the 100 kg reporting threshold. Epichlorohydrin is likely being imported as residual monomer in products containing epoxy resin or other resins made using epichlorohydrin. However, these residuals would not meet the survey reporting criteria.<sup>2</sup>

The list of uses of this substance is so extensive that it would be extremely difficult, if not impossible to not encounter or use many of the products containing epichlorohydrin. For example,

- Epichlorohydrin is mainly used in epoxy resins including those used to line food and beverage containers. It is also used in circuit boards, semiconductors, tooling, molding and casting, flooring, adhesives and paints, the manufacture of thermoplastic polymers, and synthetic glycerol as well as in cosmetics (hair products and dyes, makeup and nail lacquers), detergents, drugs, food products and beverages.
- Polymers made with epichlorohydrin are used as additives in papermaking to preserve the strength of the paper in the presence of water. This includes paper products such as tissues, towelling, beverage filters and other cellulose products.
- It is also used as a reactive ingredient in treating drinking water and wastewater. Though approved as a food additive in Canada, it is no longer thought to be in use in this way.

#### **b. Long-Range Transport**

Based on modeling predictions, the travel distance of epichlorohydrin from its point of release to air is in the order of 4000 km, which is considered to represent a high long-range transport potential (LRTP) and likely to travel to remote regions such as the Arctic.<sup>3</sup>

However, there was no further information on the impact of long-range transport.

---

<sup>1</sup> Final Screening Assessment Report on Epichlorohydrin CAS 106-89-8, November 2008 p.12

<sup>2</sup> In 1986, 2,200 tonnes were manufactured, imported or in commerce.

<sup>3</sup> Final Screening Assessment Report on Epichlorohydrin November 2008 p.12

### **c. Releases**

No releases of epichlorohydrin have been reported to the National Pollutant Release Inventory (NPRI) since 2003, when a total of 2 kg were released on-site by one company. No releases were reported in the recent industry survey.

The assessor noted that since epichlorohydrin is present only as a residual in Canada, environmental and consumer product exposures are expected to be low to negligible. At the same time, no empirical data were identified regarding measured concentrations of epichlorohydrin in environmental media (i.e., air, water, soil and food) in Canada.

### **d. Health Effects**

Despite limited human studies, animal studies have shown tumours in exposed rats and tumour initiation in exposed mice. Epichlorohydrin was genotoxic in a wide range of experiments and in occupationally exposed workers. Several international or national agencies anticipate it to be a human carcinogen.<sup>4</sup>

Potential cancer effects include nasal tumours from inhalation and upper digestive track cancers from drinking contaminated water. Non-cancer effects include respiratory damage, increase in airway abnormalities, and increased rate of heart disease as primarily shown in occupationally exposed workers, as well as stomach cellular changes in a variety of studies. It is classified as a dermal sensitizer by the European Union (EU), and can be easily absorbed through the skin.

### **e. Exposure**

Exposure may occur through drinking water (through the use of flocculating agents or through epoxy resin coatings on pipes, food, and consumer product use). Although there was no exposure information pertaining to all uses and all exposure routes, the assessors considered that population exposure was low. They also indicated that while alternatives to epichlorohydrin use in water treatment may exist, the toxicity of the alternatives is of concern.

There is no basis for assuming that that population exposure was low. Nor are there any details as to why the toxicity of alternatives is of concern.

### **f. Existing Controls/Regulations**

Internationally, there are a number of measures restricting the use of epichlorohydrin, including its prohibition by the European Union (EU) in cosmetics and some hair dyes, as well jurisdictional limits on its concentration in drinking water. For example, Northern Irish regulations limit the amount of epichlorohydrin in plastic food packaging to 1 mg/kg. For use in water treatment, the World Health Organization (WHO) has a provisional guideline value of 0.4 parts per billion (ppb), the United Kingdom 0.10 ppb and the U.S. guideline is 2 ppb.

---

<sup>4</sup> Agencies include - International Agency for Research on Cancer, U.S.; Environmental Protection Agency, U.S.; National Toxicology Program, European Commission.

While it is likely that polymers manufactured using epichlorohydrin are used for drinking water treatment in Canada, the assessment notes that there were no measured values of residual levels of epichlorohydrin identified in water therefore intake estimates from this source could not be quantified. Canada has *voluntary standards* (a.k.a. guidelines) of 2 ppb for use of this substance in drinking water treatment.<sup>5</sup>

Of course, there is no data on how such “standards” are being monitored and as they are voluntary, enforcement is not even an issue.

### **g. Uncertainties**

The assessment report notes the following: “There are significant uncertainties with respect to the extent of the exposure of the general population to epichlorohydrin. There are no measured concentrations of epichlorohydrin available for any media in Canada, and these measurements are infrequent elsewhere. There is little known about the actual use of epichlorohydrin for water treatment in Canada, and as the standards in place are voluntary, it is possible that these levels may be exceeded, depending upon the treatment technique in place. There has not been any testing for migration of epichlorohydrin from can linings in Canada. Also, there is little known about the actual residual levels of epichlorohydrin in consumer products, as levels are not commonly reported on Material Safety Data Sheets. However, it is believed that the estimates of exposure to consumer products presented here are conservative, and so there is confidence that actual exposure levels do not exceed these estimates.”<sup>6</sup>

These statements clearly indicate how little is actually known about this substance, and call to question the rationale by which the assessors formulated their conclusions as to persistence, bioaccumulation potential, and ecological considerations. They also point out the futility of voluntary measures (such as for water treatment).

## **Proposed Risk Management Strategy**

Given that epichlorohydrin is a known genotoxin, it is appropriate to list it as CEPA-toxic, as the assessors have concluded. However, rather than dealing with this substance in an appropriately rigorous manner, the risk management approach proposed follows in the footsteps of the ineffective “risk management scope” document, by requiring that the federal government be notified regarding any proposed future uses<sup>7</sup>. It does go a little bit further by proposing that;

- Future submissions for use in food linings to be scrutinized.
- Health Canada is to investigate delisting epichlorohydrin from the food additives table of the *Food and Drug Regulations*, and
- Epichlorohydrin and the two hair dyes that use epichlorohydrin in their manufacture are to be added to the Cosmetic Ingredient Hotlist.

---

<sup>5</sup> Final Screening Assessment Report on Epichlorohydrin CAS 106-89-8, November 2008 p. 14 The U.S. has a similar guideline to that in Canada.

<sup>6</sup> Ibid p.18

<sup>7</sup> The Scope document suggests that any action on the chemical would be to ensure that its exposure to Canadians does not increase.

While the strategy document notes that voluntary standards for drinking water have been adopted by almost all provinces and territories, it offers no recommendation as to mandatory standards or whether such standards would be implemented federally or provincially. “Scrutiny” as to its use in food linings, or “voluntary” measures, as in the case for drinking water, is not appropriate for a toxic substance so prevalent in many products and uses.

The risk management strategy needs to focus on reducing the overall burden of human exposure to epichlorohydrin, not only by addressing the gaps in information, but also by implementing measures to minimize the use and release of this substance to the environment, and seek safer alternatives.

As it stands, the approach described is superficial and inadequate in how it addresses this substance. The deficiencies in the approach need to be addressed.

## **Comments and Recommendations -**

### **Final Assessment and Risk Management Strategy**

- There is no data on emissions to waste streams or effluent.
- The threshold for reporting releases of epichlorohydrin to the NPRI should be revised to require reporting any releases, that is, no threshold.
- More information is needed on the actual levels in drinking water, and mandatory measures at the federal level should be implemented to minimize these amounts.
- Occupational exposure is not adequately dealt with. Risk management should include protecting workers from epichlorohydrin inhalation thought to cause lung damage.
- The matter of disposal of the many products containing epichlorohydrin has not been dealt with and needs to be addressed.
- Food contact applications should be a particular focus of the strategy, minimizing any exposure to the chemical.
- The conclusion formulated as to bioaccumulation must be re-examined, particularly as it has been arrived at despite lack of supported, peer-reviewed information.
- There is no mention of long-term, cumulative or synergistic effects, or consideration of sensitive populations, or the impact of long-range transport. These areas require further work.
- Consideration must be given to phasing out the pervasive use of this substance and substitution by safer alternatives.

## **2. Octamethylcyclotetrasiloxane (D4), Decamethylcyclopentasiloxane (D5), Dodecamethylcyclohexasiloxane (D6) CAS Nos. 556-67-2, 641-02-6, 540-97-6**

### **Overview**

D4, D5, and D6 were prioritized during categorization due to their inherent toxicity, their persistence and ability to bioaccumulate.

For D4 and D5, the final screening assessments conclude that they meet the criteria for being defined as toxic under section 64 (a) of CEPA 1999 (that is, they have an immediate or long-term harmful effect on the environment or its biological diversity). The assessments also conclude that D4 and D5 are not entering the environment in a quantity or concentration or under conditions that constitute or may constitute a danger in Canada to human life or health, and thus are not toxic under Section 64 (c) CEPA 1999.

Further, the assessments conclude that while D4 and D5 meet the criteria for persistence as set out in the *Persistence and Bioaccumulation Regulations*, due to “conflicting evidence,” it is not possible to conclude at this time that they meet the criterion for bioaccumulation under that regulation.

As to D6, the assessment concludes that it does not meet any of the criteria for toxicity under section 64, CEPA 1999. The assessors state that “D6 was recommended that a human health assessment be conducted due to its structure and use pattern similarity to D4, a high priority for assessment for both human health and ecological risks under CEPA 1999, and due to the increased use of D6 as an alternative to D4.”<sup>8</sup>

These findings on D4, D5 and D6 are most disturbing on a number of counts; above all,

- These substances were found to not constitute a danger to human health;
- They were considered to not be bioaccumulative despite indications that they are; and
- D6 was not found to be toxic at all, despite its similarity to D4 and likelihood of increased use to substitute for D4.

These screening assessments are acknowledged to not represent an exhaustive or critical review of all data. So it begs the question as to what and how the assessors have chosen what they consider to be the most critical studies to formulate their conclusions and what forces may have influenced these findings. It is precisely in face of uncertainty, and lack of appropriate unbiased studies, that the government must act in a precautionary manner. To do otherwise is an abrogation of its responsibility under CEPA to protect the health and environment of Canadians.

---

<sup>8</sup> Final Screening Assessment report November 2008 540-97-6, p.1

## Highlights and Issues - Screening Assessments

### a. Manufacture and Use Information

None of these siloxanes were reported to be currently manufactured by any company in Canada above the 100 kg reporting threshold. Between 1,000 and 10,000 tonnes of D5 were imported in 2006 as a pure substance, in mixtures with other cyclic siloxanes, as a residual in silicone polymers, and in finished consumer products. For D4 and D6, the amounts imported are between 100 tonnes and 1000 tonnes. The quantities of D6 imported into Canada have increased significantly since being placed on the Domestic Substance List in the 1980s.<sup>9</sup>

2,220 tonnes of cyclomethicone (polydimethylcyclosiloxane (PDMS)) which contains various amounts of these siloxanes were reported in commerce in Canada in 1986.

D4, D5 and D6 are volatile organic chemicals primarily used to make silicone polymers that form ingredients for personal care products, e.g. deodorants and hair care products, sunscreen, and antiperspirants.<sup>10</sup> Additional uses include plastic products, silicone rubber consumer products such as pacifiers, pharmaceuticals, lubricants, polishes and coatings for textiles, carpeting and paper, sealants and adhesives, architectural coatings, mechanical, heat transfer, and dielectric fluids, surfactants and defoamers.<sup>11</sup>

D4 is found in nearly 100 cosmetic products in Canada, D5 in nearly 3,000 and D6 in about 530. In addition, about 6,000 cyclomethicone-containing cosmetics contain these siloxanes.<sup>12</sup>

### b. Releases

Siloxanes are released to the environment during their use in industrial processes and through consumer product use and disposal. More than 90% of the D4, D5 and D6 used in personal care products are estimated to enter the atmosphere. D5 and D6 are thought to be most likely released to the environment mainly during product use, while more of the D4 is released from the industrial manufacturing processes such as blending, formulation and packaging and from its use as an industrial defoamer and degreaser. The application of D4-containing pesticides on crops and as an ingredient in pesticides will result in the release of D4 to environmental media.

Some of the siloxanes end up in wastewater sludge that may then be sent to landfills, incinerated or applied to agricultural soils as fertilizer. They have been detected at sewage treatment plants, landfills and near industrial plants as well as in indoor and ambient air away from industrial activity. The most significant route of Canadian intake is via indoor air.

---

<sup>9</sup> Screening Assessment November 2008 CAS 540-97-6 p.8

<sup>10</sup> Shady sun protection – environmental toxins in sun creams:

<http://www.naturskyddsforeningen.se/upload/report-shady-sun-protection.pdf>

<sup>11</sup> Defoamers are used in the processing of pulp and paper, food, petrochemical, petroleum, water treatment, household products (cleaners and detergents), pesticides, silicone fluid/gel implants and other biomedical applications.

<sup>12</sup> Cyclomethicone is a mixture of siloxanes bearing CAS RN 69430-24-6.

### **c. Persistence and Bioaccumulation – D4, D5 and D6**

The assessment for both D4 and D5 note that while they have the potential to accumulate in biota, it is not possible to conclude at this time that they meet the criterion for bioaccumulation as set out in the *Persistence and Bioaccumulation Regulations* based on consideration of the conflicting evidence from laboratory studies and predictive models.<sup>13</sup>

Empirical and modelled data show D5 to meet persistence criteria as set out in the *Persistence and Bioaccumulation Regulations* in air, water, and sediment and D4 to meet these criteria in air and sediment. Both may be transported over long distances, but they lack potential to be deposited in water or soil in remote regions.

Data shows D4 to be hazardous to particular aquatic and soil-dwelling organisms. Similar D5 toxicity is possible. Long-term environmental exposure is of particular concern as the chemicals have the potential for bioconcentration at higher trophic levels.

Models suggest that D5 and D4 have the potential to bioaccumulate. Thus, the statement that it is not possible to conclude that they meet the bioaccumulation criteria is perplexing and not credible.

Similarly, D6 meets the persistent criteria in air, water and sediment, but not soil. It has the potential to be transported over long-distances in the atmosphere but a low potential to be deposited in water or soil in remote regions.

As is the case for D4 and D5, the assessment considered that the predicted bioaccumulation factor alone to not provide sufficient weight to conclude that D6 has a high bioaccumulation potential due to a high degree of uncertainty in this prediction. Thus, while D6 may have some bioaccumulation potential in biota, based on empirical bioconcentration factor data and read-across evidence, the assessment concluded that it does not meet the bioaccumulation criterion as set out in the *Persistence and Bioaccumulation Regulations*.

Once again, it would seem that the conclusion for D6 has been formulated but the rationale for it is ambiguous.

### **d. Health Effects**

Though D5 and D6 have not been studied to the same extent as D4, the chemicals are similar in structure and similar effects may be expected. D4 has been classified by the European Commission as a Category 3 reproductive toxicant, meaning there is possible risk of impaired fertility. The Danish Environmental Protection Agency has also identified impaired fertility as an effect of D4 exposure and in addition, found a potential link to repeat-dose toxicity with increased liver weights and effects on other organs (adrenals, thymus, and lungs) in animal experiments.

The Danish EPA has identified the lung as a target organ for D5 exposures and the important health effects of D5 to be carcinogenicity.

---

<sup>13</sup> Screening Assessment reports for CAS 541-02-06 and CAS 556-67-2, p.ii

A recent report by the Swedish Society for Nature Conservation has stated that D5 is persistent, bioaccumulative and very toxic to aquatic organisms. It is also suspected of having carcinogenic properties. The substance has been found in fish and in the liver of glaucous gulls in a study on dead and dying birds, suggesting that the substance can be spread on a large scale.<sup>14</sup>

The assessments for D4 and D5 consider that margins of exposure were sufficiently protective of human health and have concluded that they are not entering the environment in a quantity or concentration or under conditions that constitute or may constitute a danger in Canada to human life or health.

The screening assessment for D5 indicates that “The scope of this screening assessment of D5 does not take into consideration a full analysis of the mechanism of action of D5 and it does not take into account possible differences between humans and experimental species in sensitivity to effects induced by this substance. There is uncertainty surrounding the mechanism of carcinogenicity following exposure via the inhalation route. There is also uncertainty as to the mechanism of action resulting in liver effects following exposure via the inhalation or oral routes. Potential adverse effects of D5 via the oral route were based on using D4 and D6 as analogues and there is uncertainty on the boundaries/limits for using D4 and D6 to extrapolate effects for D5”.<sup>15</sup>

These statements simply illustrate that, in the face of such a degree of uncertainty and the adverse effects from exposure to this substance such as cancer, reproductive and developmental disorders and other diseases influenced by the presence of these toxins, the government has favoured to take a path of least resistance over a rational, precautionary and protective approach for these substances.

#### **e. Long-range Transport**

All three chemicals are thought to be transported long distances in the atmosphere and are likely to be deposited further north. The assessments estimate that D4 likely has the longest range of travel and is the most likely to contaminate the Arctic. Though there is no Canadian monitoring data, Norwegian studies show that the chemicals bioaccumulate in fish livers and other marine life. The tendency of siloxanes to travel north and their ability to bioaccumulate in wildlife make them of particular concern for First Nations, Inuit and Métis populations and the environment that they depend upon.

#### **f. Existing Controls/Regulations**

The use of silicone formulants containing D4 and D5 in certain pesticide products is regulated in Canada under the *Pest Control Products Act*. They are not permitted for use under the *Food and Drug Regulations* under the *Food and Drugs Act* and are considered to be dangerous goods under the *Transportation of Dangerous Goods Regulations*. The assessors did not find any regulation of these siloxanes in other countries.

---

<sup>14</sup> <http://www.naturskyddsforeningen.se/upload/report-shady-sun-protection.pdf>

<sup>15</sup> Final Screening Assessment CAS 541-02-6 p.50

## Comments and Recommendations - Screening Assessments

It is abundantly clear that some of the contentious conclusions of the screening assessments must be revisited, especially the issues of CEPA-toxic for D6, the bioaccumulation finding for all three substances and the criteria for D4, D5 and D6 under CEPA 1999 regarding toxicity for their impacts on ecosystems and health.

The following items are additional examples of deficiencies in the screening assessments:

- The assessments do not consider the impact of release and cumulative exposures of the cyclosiloxanes in polydimethylsiloxanes (PDMS) to the environmental load of D4, D5 and D6.
- The evaluation of D4, D5 and D6 has not considered long-term effects, or vulnerable populations (children, pregnant women) or occupational exposure.
- There is no firm monitoring data to track releases of these substances to the environment, nor is there information available to the public on releases of these substances to the environment.
- There is only a minor reference to substitution, but no suggestions of further work in this area.
- Disposal of products containing these siloxanes is not addressed.
- While these substances are subject to, there is no consideration as to the potential impacts on the health and environment of these distant communities from the long-range transport of these substances.

## Proposed Risk Management – D4 and D5

The government has proposed the following actions:

- **Products:** Limit the quantity or concentration of D4 and D5 that may be contained in certain personal care products through regulation and, where appropriate, in other consumer products that are manufactured in and imported into Canada, with a focus on those products that have the potential to result in releases to the aquatic environment. Certain critical use products (such as in medical devices) will be permitted.
- **Industrial use:** A regulation is proposed to prevent or minimize industrial releases to the aquatic environment by establishing allowable maximum D4 and D5 concentrations in effluents. A requirement to implement a management system to ensure that best management practices are adopted at facilities where D4 and D5 are used is also being considered.
- **Pesticides:** The PMRA (pesticide formulant reassessment program) will utilize information from the screening assessments and additional information to determine whether reduction of concentrations of D4 and D5 in pest control products beyond current levels is required.
- **Monitoring:** The government proposes to conduct monitoring for D4 and D5 in the environment under a more comprehensive monitoring and surveillance strategy for all substances that come under the Chemicals Management Plan.

Based on the findings of the assessments, the weakness and limitations of the risk management strategy comes as no surprise. For example,

- There is no mention of seeking substitution by safer alternatives and phasing out and eliminating the use and release of these siloxanes. Each of these substances requires a study as to feasibility of alternatives.
- There is no indication that there will be a public education campaign about these substances, or that these products will be labeled.
- There is nothing mentioned about occupational exposure or vulnerable populations.
- The disposal of products containing siloxanes and the use of siloxane-contaminated effluent as soil enrichment are not addressed.
- The potential impact to communities distant from the sources or information to the public on releases of these substances to the environment.
- There are no attempts to ban cosmetic products containing these siloxanes.
- Cumulative exposure is not addressed.

The ultimate goal of a risk management strategy should be to limit human exposure and phase out the use and release of these chemicals over time. In this respect, that means that the strategy should work toward prohibiting the use of these chemicals in industrial processes and food additives, personal care products, deodorizers, and other products where direct skin application, ingestion or inhalation will occur. Such action calls for research into safer substitution plans.

## **Summary Comments**

Consumer uses of products containing these siloxanes chemicals directly expose the public in many ways. Chemicals added to food are ingested. Those in cosmetics and other personal care products are put directly on the skin and therefore absorbed. Chemicals in deodorizers and fragrances are inhaled thus providing a direct route to the brain. Workers are exposed to these chemicals in many industrial settings.

Humans during neonatal and prenatal development and children are more vulnerable to toxic chemicals than adults. In the womb, humans have immature immune systems and higher sensitivity to endocrine disruptors, developmental toxins, mutagens and carcinogens. Substances that are persistent, bioaccumulative, and inherently toxic (PBiT) have great potential to cause human health and ecological damage both near and oftentimes far from the emission source.

A precautionary approach is essential to address the hazards and risks posed by exposure to these substances, especially where information and data are not-existent, insufficient and outdated. As well, these substances should be considered for addition to the Virtual Elimination List, pending clarification of the determination of bioaccumulation.

The government should take these concerns into account and re-examine these assessments. The risk management strategies should be strengthened and include regulations and substitution instruments that would benefit all concerned. Above all, I stress the need for public transparency and accountability in how these substances are being dealt with.

Anna Tilman, STORM Coalition