UPDATE ON ENVIRONMENT CANADA'S ECOLOGICAL RISK ASSESSMENT ACTIVITIES FOR CERTAIN PERFLUOROALKYL COMPOUNDS

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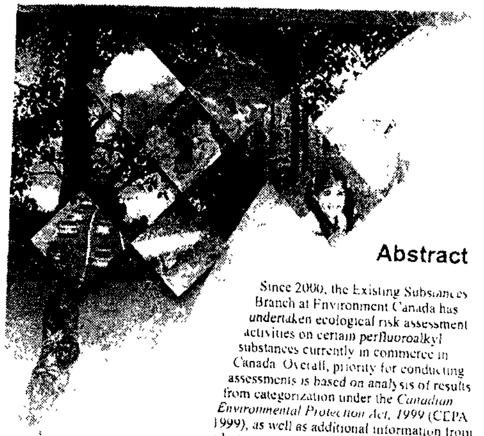


Abstract

Since 2000, the Existing Substances Branch at Environment Canada has undertaken ecological risk assessment activities on certain perfluoroalkyl substances currently in commerce in Canada. Overall, priority for conducting assessments is based on analysis of results from categorization under the *Canadian Environmental Protection Act, 1999* (CEPA 1999), as well as additional information from industry, emerging science, international assessment activities, new substances notifications, public nominations, and provincial or international decisions. Categorization identifies those substances that are persistent, bioaccumulative, and inherently toxic to human or non-human biota, as well as substances that may present the greatest potential for exposure to humans in Canada.

Perfluorooctane sulfonate (PFOS), its salts and precursors were identified as the first assessment priority. Therefore, Environment Canada, in conjunction with Health Canada, initiated and completed a screening assessment on PFOS, its salts and precursors. The draft assessment report was subject to a 60-day public comment period from October to December 2004.

As perfluorooctanoic acid (PFOA) and its salts were identified as the next assessment priority, an ecological review of PFOA in the Canadian environment has been initiated. Environment Canada is also identifying priorities for other perfluoroalkyl substances including long chain perfluorocarboxylic acids (PFCAs) which are emerging contaminants of concern due to their persistence, high bioaccumulation potential and presence in the Arctic. In partnership with researchers, data gathering activities are underway for PFCAs and related substances.

In January 2005, as part of broader data collection work to determine import and manufacturing activities for perfluorinated substances in Canada, Environment Canada published a *Notice with Respect to Certain Perfluoroalkyl and Fluoroalkyl Substances* in the *Canada Gazette*. This Notice requires companies who manufactured or imported greater than 100 kilograms of specific perfluoroalkyl and fluoroalkyl (PFA/FA) substances in 2004 to provide information on activities. The information required by this PFA/FA Notice will be used, along with other data sources, to inform current and future risk assessment and risk management activities conducted under CEPA 1999. A separate Notice specific to PFOS, its salts and precursors, was also issued in January 2005, to support the development of potential risk management activities for PFOS.

Screening Assessments

- The *Canadian Environmental Protection Act, 1999* (CEPA 1999) is the legal framework for assessing and managing the risks associated with substances in the environment
- The Existing Substances Branch (ESB) of Environment Canada shares with Health Canada (HC) the responsibility to identify existing substances requiring assessment, and to assess the risks from exposure to such substances in the environment
- The assessment objective is to determine if a substance is "toxic" as defined under Section 64 of CEPA 1999 (see Fig. 1)
- Draft assessments are published for a 60-day public comment period during which stakeholders can submit comments or new information for consideration

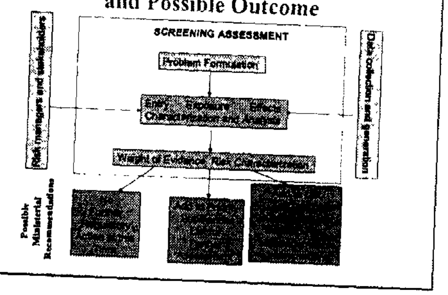
7 Feeders Can Identify Candidate Substances for Assessment

- **Section 73** CEPA 1999: Domestic Substances List (DSL) categorization of substances: approximately 23,000 substances on the Domestic Substances List (DSL) to be categorized for persistence, bioaccumulation, inherent toxicity, and human exposure
- **Section 70** CEPA 1999: Industry information, obligation for industry to provide data
- **Section 75** CEPA 1999: Provincial or international decisions
- **Section 76** CEPA 1999: Public nominations
- **Sections 81-82** CEPA 1999: New Substances Notifications
- **Emerging science and monitoring**
- **International assessment or data collection**

Perfluorinated Chemicals

- Global production of perfluoroalkyl substances (PFAs) began in the 1950's with small-scale specialty applications
- PFAs are widely used (e.g. in stain and water repellents for carpets, textiles and paper packaging; firefighting foams) and increasingly incorporated into everyday consumer products (e.g. bathroom cleaners, windshield washer fluids, dental floss, clothing etc.)
- "Complex" PFAs can degrade to "less complex" PFAs, some of which may be persistent, potentially highly bioaccumulative (e.g. long chain perfluorocarboxylic acids) and toxic in the environment (see Fig. 2)
- A PFAs survey of Canadian industry for the period 1997-2000 found PFAs are not manufactured in Canada. (Fifteen Canadian companies imported 159 different PFAs into Canada, totalling approximately 600,000 kg. Imports were from the USA, France, Germany and Japan.)

Fig. 1 Assessment Approach and Possible Outcome

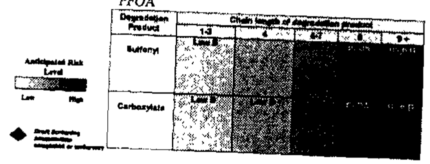


Ecological Risk Assessment Activities for PFAs

- In 2000, perfluorooctane sulfonate (PFOS) was identified in Canada as a priority for assessment. Since this time PFOS has also been subject to many international activities (e.g. US, Australia, UK, Sweden, OECD) and the main manufacturer has phased out PFOS.
- Perfluorooctanoic acid (PFOA) is also of interest internationally and is the next priority for assessment in Canada
- Environment Canada is also collecting data on other perfluorocarboxylic acids (PFCAs) and developing a path forward for remaining PFAs of interest.

Fig. 2 PFAs can degrade, releasing PFAs belonging to 1 of 2 major categories

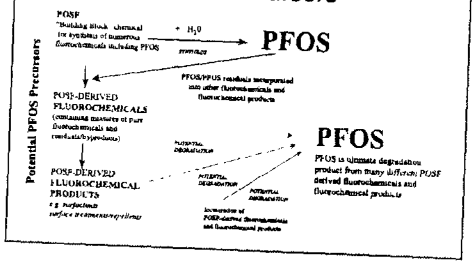
- Perfluorinated sulfonyl compounds (~62% of PFAs) e.g. PFOS
- Perfluorinated carboxylic acids (~32% of PFAs) e.g. PFOA



Perfluorooctane Sulfonate (PFOS) Assessment

- PFOS is an 8-carbon perfluorinated sulfonyl compound widely detected in the environment
- The assessment considered PFOS, its salts and its precursors (Fig. 3) and included over 50 substances
- The assessment found that PFOS is persistent, bioaccumulative and poses potential ecological risk to marine mammals, birds and fish
- PFOS is associated with a range of effects including growth inhibition in birds and fish, atrophied thymus, liver toxicity, decline in aquatic species diversity and impacts on fish survival and growth
- The draft screening assessment concluded PFOS, its salts and its precursors are "toxic" under CEPA 1999
- The draft screening assessment was subject to a formal 60-day public comment period from October - December 2004. Comments received from stakeholders (NGOs, industry, and academics) are currently undergoing review

Fig. 3 Assessment Included PFOS Precursors



PFOS Next Steps

- A summary of Environment Canada's response to all comments received will be published, along with the revised assessment, prior to the Government of Canada's final decision
- In particular, comments were received regarding the bioaccumulation and biomagnification of PFOS. Environment Canada will be convening experts to further understand the science
- It is anticipated that a final PFOS screening assessment report will be prepared in early 2006
- The development of risk management strategy options for PFOS will occur in consultation with industry and other affected stakeholders. The proposed risk management approach would focus on preventing the re-entry of these substances into Canada and on addressing the remaining stocks in use
- Responses to the PFOS S. 71 Notice January 2005 indicated less than 3000 kg of PFOS were imported from the US and Germany
- The following sectors may be using PFOS in Canada: photofinishing, photolithography, chromium plating and fire fighting (quantities in stock). However, quantities of PFOS imported for use in these sectors may be below 100 kg. It is unknown whether there are other remaining uses of PFOS in Canada requiring imports totalling less than 100 kg

Perfluorooctanoic Acid (PFOA) and its Salts Assessment

- PFOA is an 8-carbon perfluorocarboxylic acid used as an intermediate in the manufacture of Teflon and other articles
- A preliminary ecological review of PFOA and its salts in the Canadian environment has been initiated
- Available information indicates that PFOA presents a lower risk to the environment compared to PFOS as it does not bioaccumulate to the same extent
- PFOA is persistent in water
- Available studies indicate PFOA does not bioaccumulate in fish. However, the bioaccumulation potential of PFOA in other species is unclear
- PFOA has been detected in higher trophic levels (e.g. polar bear) but there are conflicting studies regarding the biomagnification potential at higher trophic levels (e.g. Arctic food web[1] vs. Lake Ontario food web[2])
- PFOA exhibits low to moderate toxicity to pelagic organisms (lethality, immobilization, growth, reproduction), including fish, and low toxicity (respiration inhibition, survival & growth) to benthic organisms.
- Emerging data suggest increases in indicators of inflammation and immunity in bottlenose dolphins[3] and loggerhead sea turtles[4] in relation to PFOA concentrations, suggesting possible autoimmune processes. Current study results suggest that PFOA may alter biomarkers of health in marine mammals

[1]Tomy, G.T., Budakowski, W., Halldorson, T., Helm, P.A., Stern, G.A., Friesen, K., Pepper, K., Tittlemier, S.A., Fisk, A.T. 2004. Fluorinated Organic Compounds in an Eastern Arctic Marine Food Web. Environmental Science & Technology 38:6475-6481
[2]Martin, J.W., Whittle, M., Muir, D.C.G. and Mabury, S.A. 2004b. Perfluoroalkyl Contaminants in a Food Web from Lake Ontario. Environmental Science & Technology 38:5379-5385
[3]Fedem-Adams, M.M., Romano, T., Rice, C.D., Hesselman, L., LoDay, J., Muir, D., Houde, M., Bossart, G., and Fair, P. 2004. Immune Function and Clinical Blood Parameters Correlate with Perfluorinated Alkyl Acid Concentrations in Bottlenose Dolphins. SETAC Poster presentation.
[4]Houde, M., Bujas, T.A.D., Balmer, B.C., Bossart, G., Fair, P.A., Wells, R.S., Solomon, K.R. and Muir, D.C.G. 2004. Perfluorinated Compounds in Three Free-Ranging Bottlenose Dolphin Populations from Southeastern U.S. Waters. Poster Presentation at North America SETAC 2004

Further Data Collection and Path Forward for other PFAs

- Regulatory and research scientists are discussing, among other topics, the data gaps concerning the potential bioaccumulation and environmental sources of PFCAs.
- ESB is engaging with departmental scientists to fill some of the identified data gaps for PFCAs and fluorotelomer alcohols. Work includes monitoring of precipitation and glacial snow cores, water sampling, and persistence and bioaccumulation trends in herring gulls and lake trout
- Future work may consider broader temporal and spatial studies for select species in southern latitudes of Canada.
- A path forward to address PFAs beyond PFOS and PFOA will be developed based on review of on-going research and the updated industry survey on PFAs.

For Further Information

- For further information on PFAs assessment activities: Anita.Miettunen@ec.gc.ca or Jessy.Kurias@ec.gc.ca
- Existing Substances Branch website: www.ec.gc.ca/substances/ese/
- Environment Canada's Homepage (The Green Lane): www.ec.gc.ca/envhome.html