Health Canada Santé Canada

Canada

Proposed Objective for Per- and Polyfluoroalkyl Substances in Drinking Water

Webinar, March 1, 2023

YOUR HEALTH AND SAFETY... OUR PRIORITY.

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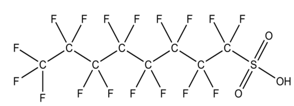
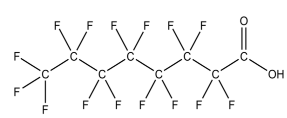
PFAS

- > 5,000 synthetic substances
- Extremely stable and persistent "Forever chemicals"
- Detected in humans, wildlife, and environmental media worldwide
- Mainly enter the Canadian environment through products and manufactured items
- Most common point source of aquatic contamination is associated with AFFF (firefighting foam) use



PFOS



PFOA

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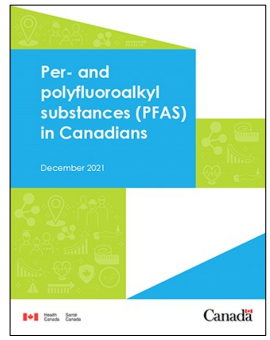
Exposure to PFAS

- Certain PFAS are frequently detected in the plasma of Canadians
- Canadians are exposed to multiple PFAS simultaneously; hazards are unknown
- Northern Indigenous populations can be exposed to higher concentrations (long range environmental transport, consumption of country foods)
- PFAS can be transferred to infants/children through the placenta and human milk



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Health Considerations

- Toxicity information available for a limited number of PFAS
- Effects commonly reported in animals: liver, immune system, kidney, reproduction, development, endocrine system (thyroid), the nervous system, and metabolism (lipids, glucose homeostasis, body weight).
- Outcomes in human studies involve similar endpoints
- New science: rapidly developing, effects at progressively lower levels, no consensus on key endpoint

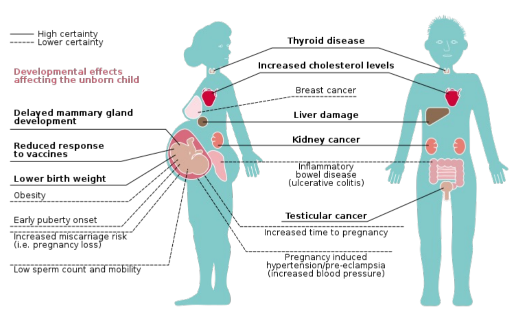

Image credit: European Environment Agency

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Levels in Canadian Waters

Study	Number of PFAS monitored	Number of sites sampled	PFAS compounds with high detection frequencies	Max. concentrations of all PFAS tested (ng/L)
Lalonde and Garron (2022)	13	29 sites across Canada (freshwater samples)	PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFOS	138 (PFBS) 137 (PFHxA) 73 (PFBA) 47.8 (PFPeA)
MELCC (2022)	18	41 drinking water treatment systems in QC	PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFOS	48 (PFPeA) 30 (PFHxA) 6 (PFOA) 3 (PFOS)
WSA (2022)	2	7 drinking water treatment systems in SK	N/A	3 (PFOA)
Kleywegt et al. (2020)	14	25 drinking water treatment systems in ON	PFBA, PFPeA, PFHxA, PFOA, PFNA, PFHxS, PFOS	13 (PFBA) 5.1 (PFOA) 5 (PFPeA) 4.7 (PFHxA)
Kaboré et al. (2018)	29	19 Canadian sites (tap water samples)	PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFHxS, PFOS	4.9 (PFOA) 4.1 (PFOS) 3.6 (PFBA) 3.5 (PFHxA)

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Analytical Methods

- Two validated, standardized U.S. EPA methods quantify a combined total of 29 PFAS
- Method 533 is an isotope-dilution/anion-exchange SPE LC-MS/MS method (25 PFAS)
- Method 537.1 is an SPE LC-MS/MS method (18 PFAS)
- Minimum reporting levels range from 2–20 ng/L
- The methods are approved by other jurisdictions
- Total Oxidizable Precursor (TOP) assay and Total Organofluorine (TOF) analysis are screening methods to assess the number of PFAS beyond the 29 listed

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Treatment Technologies-Municipal

- Removal efficacies depend on source water characteristics, concentration and type of PFAS
- Common drinking water treatment technologies (e.g., coagulation, flocculation, oxidation, and aeration) are not effective
- The most effective treatment technologies (>90% removal efficacy for certain PFAS): granular activated carbon (GAC), reverse osmosis (RO), nanofiltration (NF) and anion exchange (AIX)
- Achieving the objective may lead to challenging operational conditions (e.g., frequent media regeneration)

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Treatment Technologies-Municipal (2)

- GAC technology has the most field-relevant data
- GAC and AIX have higher removal efficacy for longer chain PFAS and PFSA compared to shorter chain PFAS (<C6) and PFCA
- AIX resins have greater capacity than GAC, but are not effective for neutral PFAS
- Regeneration and disposal issues with spent carbon and resins

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Treatment Technologies-Municipal (3)

- RO and NF are both highly effective for removal of PFAS
- RO and NF effectively remove PFAS of all chain lengths
- NF removal may be substantially lower for charge-neutral PFAS (e.g., FOSA)
- Both membrane technologies are subject to fouling and scaling problems
- Research gap in management of reject stream (up to 20% of feed volume)

Treatment Technologies-Residential

- For residential-scale, treatment devices can be certified to NSF Standard 53 (GAC) and NSF Standard 58 (RO) for reduction of total PFAS in drinking water
- NSF International total PFAS criteria is for 7 PFAS: PFHpA, PFOA, PFNA, PFDA, PFBS, PFHxS and PFOS
- Versions of NSF Standard 53 and 58 with these new requirements were published in late February, 2023

What is the difference between an Objective and a Guideline?

	Objective	Guideline
Used where new information raises concerns that need to be addressed more quickly	X	
Rapid review of data, shorter time to develop	X	
Developed in collaboration with FPT partners	X	X
Defines a maximum acceptable level	X	X
Considers health information, treatment technology, analytical methods	X	X
Peer-reviewed	X	X

Reduces exposure while a guideline is revised/developed

Proposed Objective for PFAS in Drinking Water

- Sum of total PFAS detected in drinking water using EPA Method 533 or EPA 537.1 or both, or another method validated by a jurisdiction **should not exceed 30 ng/L**
- Strive to maintain PFAS concentrations as low as reasonably achievable (ALARA)
- Precautionary approach due to numerous uncertainties
- Practical approach to reduce **exposure**

The lower the level of PFAS, the lower the risk to public health

Basis for the Objective

- Levels of PFAS found in Canadian waters
- Availability of validated methods to detect PFAS
- Ability of technology to remove PFAS
- Lowest concentrations that are technically achievable for a larger number of quantifiable PFAS
- Although health effects information was considered, a quantitative health-based risk assessment was not conducted

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Why is the Objective lower than previous Guidelines and Screening Values?

- Research is occurring at a very rapid pace
- The objective is based on the best available information at this time
  - ➡ Value may change again as the science is updated

To reduce exposure to multiple PFAS through drinking water and lower the risk to health

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International Considerations

- Other jurisdictions (e.g., the European Commission, Sweden, Denmark, and some US states) have a single guideline for a combination of PFAS.
- European Union:
  - 100 ng/L for the sum of 20 PFAS
  - 500 ng/L for the sum of all PFAS
- US States:
  - MA, ME: 20 ng/L for 6 PFAS
  - OR: 30 ng/L for 4 PFAS
- US Health Advisories (non-regulatory):
  - PFOA (interim) = 0.004 ng/L
  - PFOS (interim) = 0.02 ng/L

Questions?

Consultation document:

https://www.canada.ca/en/health-canada/programs/consultation-draft-objective-per-polyfluoroalkyl-substances-canadian-drinking-water/overview.html

Reminder:

Webinar in French on Tuesday March 7, 2023

https://healthcanada.webcoastevents.com/french/

Contact information:

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