

PFCs and Health Update

6:00 p.m. to 7:00 p.m.: Public information session

7:00 p.m.: Presentation

Presentation

Welcome and Introductions

Background and Context

Health Based Exposure Limits for PFCs

Summary of Sampling

Point of Use Water Treatment Study

Q & A / Conclusion

8:00 p.m. to 9:00 p.m.: Public information session

Health-Based Exposure Limits for Perfluorochemicals

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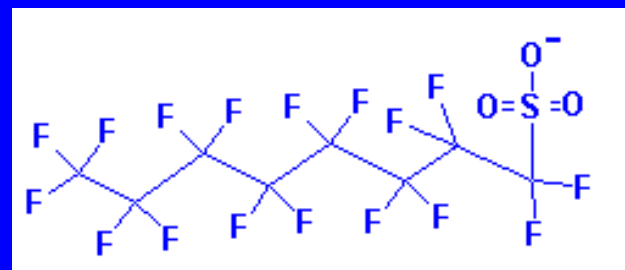
Perfluorochemicals (PFCs)

- Used for many years in products that resist heat, stains, water, oil and grease
- Many other specialized industrial and commercial uses
- Surfactants with unique chemical properties

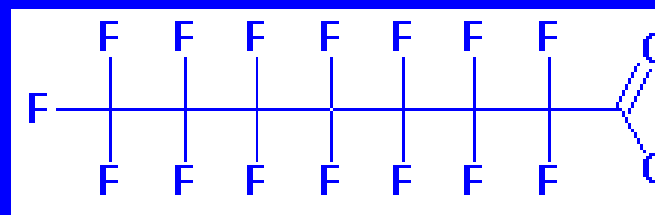


Primary PFCs of Interest in MN

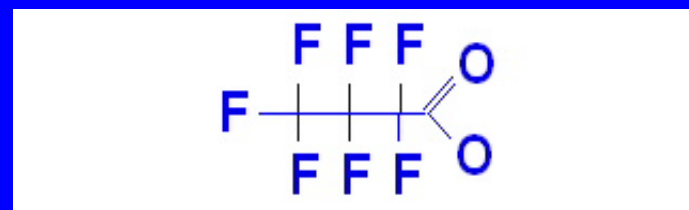
- PFOS: $C_8F_{17}SO_3^-$
Perfluorooctane sulfonate



- PFOA: $C_8F_{15}O_2^-$
Perfluorooctanoic acid



- PFBA: $C_4F_7O_2^-$
Perfluorobutanoic acid



PFCs Behave in Unique Ways in the Environment

- PFCs:
 - Do not break down in the environment.
 - Do not stick readily to organic materials:
 - Water soluble
 - Infiltrate rapidly to the groundwater
 - Move nearly as fast as the groundwater
 - Travel long distances
 - Living things may be where some PFCs build up most.



MDH's Mission



*To protect, maintain and improve
the health of all Minnesotans*

- As a part of our mission, MDH establishes standards for contaminants in drinking water:
 - Health Based Values (HBV) – preliminary or site specific guidelines
 - Health Risk Limits (HRL) – statewide limit established by formal rule-making process
- In 2002, MDH was requested by the MPCA to develop drinking water criteria for PFOS and PFOA, because they were detected in groundwater samples at the 3M Cottage Grove plant

Toxicity – PFOA & PFOS

- Low concentrations cause undesirable changes in the liver and thyroid
- Slightly higher concentrations cause developmental delays in growth and maturation in the offspring of rats and mice
- High concentrations over a long period of time causes tumors in rats - mechanism(s) believed to have a threshold (a dose below which there is no risk of developing tumors)



Human Epidemiology

- PFC Workers
 - Exposure are difficult to estimate and workers may not be properly categorized
 - Possible effects: hormone levels, liver, CVS, cancer (?)
- General Public (recent)
 - Two studies evaluated relationship between the health of newborn babies and PFC levels in the mother's blood - small decrease in birth weight or other measures of growth associated with increasing PFC levels
 - New health study of 70,000 people exposed to PFOA in drinking water in Ohio and West Virginia - no health results available at this time

What about other PFCs?

- In 2006, the MDH Public Health Laboratory expanded their method to include 5 additional PFCs:
 - Perfluorohexane sulfonate (PFHxS)
 - Perfluorobutane sulfonate (PFBS)
 - Perfluorohexanoic acid (PFHxA)
 - Perfluoropentanoic acid (PFPeA)
 - Perfluorobutanoic acid (PFBA)
- Of the five, PFBA is by far the most commonly detected in drinking water and became a prime focus of both MDH and MPCA

Half-life in the Body

Half-life: The length of time it takes to eliminate half of a single dose from the human body

PFOA & PFOS

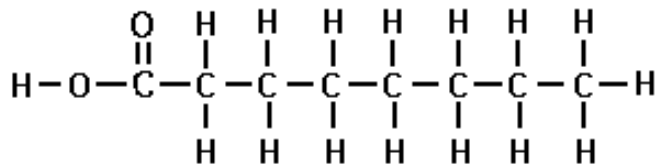
- Half-lives in humans:
 - PFOA 3.8 years;
 - PFOS 5.4 years

PFBA

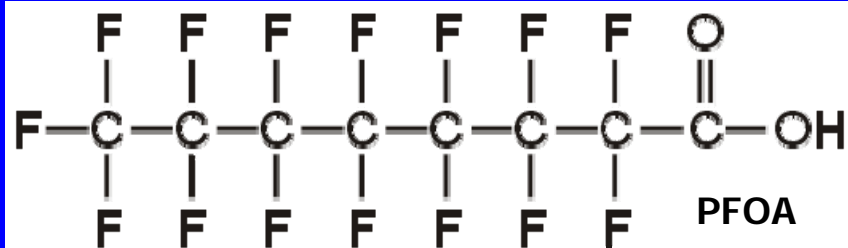
- Half-life in humans: 3 days (range 1.9 – 6.3 days)

Why do Some PFCs Have a Long Half-life?

- Some PFCs have a very similar structure to fatty acids – natural compounds (in oils and fats) that are easily retained by the body and bind with proteins in blood.



Caprylic Acid



PFOA

PFOA & PFOS

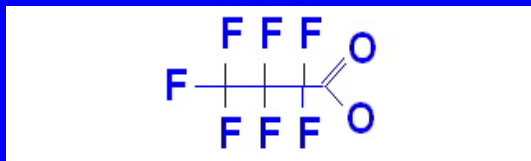
- Found in drinking water only in Lake Elmo, Oakdale, and small areas of Cottage Grove
- 2007: HBVs promulgated as HRLs (August)
 - 0.5 ppb PFOA
 - 0.3 ppb PFOS
- 2008: Draft HRLs proposed
 - 0.3 ppb PFOA
 - 0.3 ppb PFOS

MDH 2006 Guideline for PFBA

- As a cautious public health approach, in 2006 MDH applied a drinking water guideline of 1 ppb for PFBA
 - Exposure at or below that level considered unlikely to be of health concern
 - Risk from exposure above that level is small, but could not be quantified
 - Information provided on reducing exposure
- Based on 2006 information for PFOA
- Value was protective until more information was available – we have reached that point for PFBA

Animal Toxicity – PFBA

- Based on studies completed in 2007 & 2008 by EPA, 3M, and consultation with experts
- Low concentrations cause undesirable changes in the liver and thyroid
- Similar concentrations cause developmental delays in growth and maturation in the offspring of rats and mice
- Toxicity is lower than PFOA



2008 PFBA HBV

$$= \frac{(\text{Reference Dose, mg/kg-d}) \times (\text{RSC}) \times (\text{Conversion Factor})}{(\text{Intake rate, L/kg-d})}$$

$$= \frac{(0.0038 \text{ mg/kg-d}) \times (0.5) \times (1000 \text{ ug/mg})}{(0.289 \text{ L/kg-d})}$$

$$= 7 \text{ ug/L (ppb)}$$

2007 Community Well PFBA Data

| City | # wells PFBA / # wells | Range (ppb) | Avg. of all Samples |
|------------------|---------------------------|--------------|------------------------|
| Cottage Grove | 11 / 11 | 0.41 – 1.78 | 1.04 |
| Hastings | 5 / 5 | 0.14 – 0.46 | 0.26 |
| Newport | 2 / 2 | 0.14 – 0.71 | 0.44 |
| Oakdale | 7 / 7 | <0.05 – 2.15 | 0.93 |
| St. Paul Park | 3 / 3 | 1.12 – 2.30 | 1.46 |
| S. St. Paul | 3 / 5 | 0.08 – 0.37 | 0.19 |
| Woodbury | 16 / 16 | 0.07 – 0.55 | 0.25 |

Other Environmental Exposure Pathways

- While many uses of PFCs have been eliminated, they are still used in some consumer products.
- They have also been detected in house dust, rainwater, and occasionally in food products.
- CDC data shows that PFOS / PFOA levels in the blood of the general population are declining. We expect them to continue to decline as more and more PFC containing products are eliminated.

Fish are Good!

- MDH provides site-specific and statewide fish consumption advice (based on data from over 1,000 tested lakes) for kids and moms:
 - Panfish: 1 meal per week
 - Other fish: 1 meal per month
 - Large walleye/northern: do not eat
- MPCA study of PFCs in fish from 30 lakes in Metro Area:
 - Results suggest fish in perhaps half of the lakes are impacted
 - The advice for those lakes ranges from unrestricted to 1 meal per month for everyone
 - For example, advice for bluegill from Lake Elmo, Lake Calhoun, and Mississippi River Pool 2 is 1 meal per month
- Concern is for long-term exposure, and for most people the benefits of eating fish outweigh any risks

Conclusions

- PFCs are ubiquitous in the environment, likely as a result of their widespread use in consumer products.
- Disposal of PFC manufacturing wastes in Minnesota have resulted in localized impacts to groundwater used as drinking water.
- PFBA levels in the affected communities are well below the MDH HBV of 7 ppb.
- While some uncertainties remain, the public health risks appear to be low.