

# 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**

**Oakdale, Minnesota  
March 2008**



**James Kelly, M.S.  
Minnesota Department of Health  
Environmental Health Division**

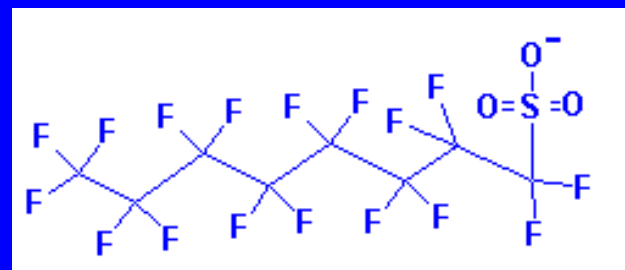
# Perfluorochemicals (PFCs)

- 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

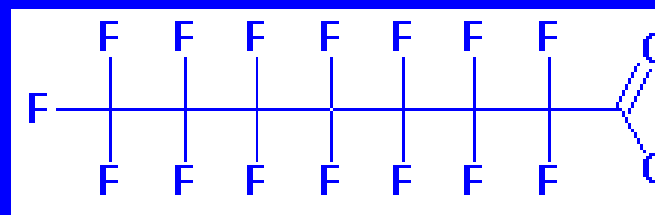


# Primary PFCs of Interest in MN

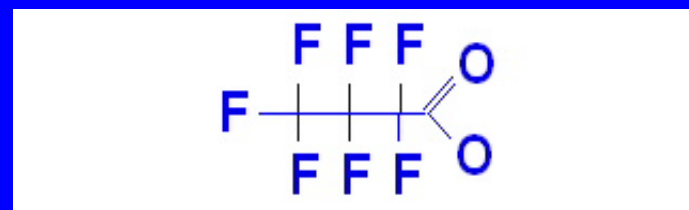
- PFOS:  $C_8F_{17}SO_3^-$   
Perfluorooctane sulfonate



- 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

# 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

# What about other PFCs?

- In 2005-2006, testing focused on PFOS and PFOA
- 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

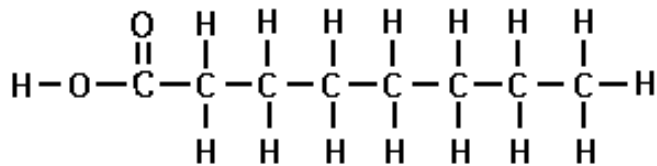
- Half-lives in humans:
  - PFOA 3.8 years;
  - PFOS 5.4 years

## PFBA

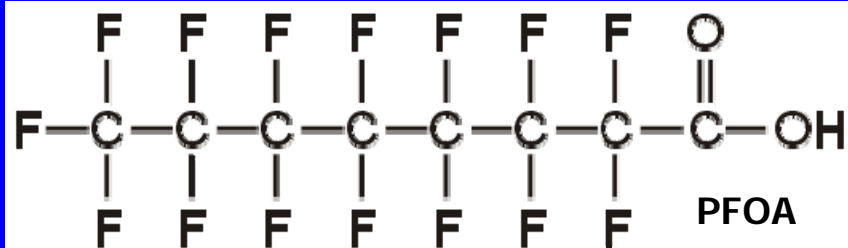
- Half-life in humans: 3 days (range 1.9 – 6.3 days)

# 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



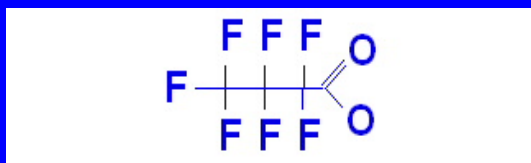
PFOA

# MDH 2006 Guideline for PFBA

- As a cautious public health approach, in 2006 MDH applied a drinking water guideline of 1 ppb for PFBA based on 2006 information for PFOA
  - 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
- 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

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

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

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

# Oakdale Well Water Data

Well #	1	2	3	5	7	8	9	T.P.
% of Water Supplied in 2007	4.9	6.8	10.4	23.4	3.1	0.4	51	74.4
PFBA HBV=7	0.27	0.35	0.12	1.69	0.88	1.31	1.89	0.93
PFOA HRL=0.5	nd	0.10	nd	0.73	0.29	0.55	0.68	nd
PFOS HRL=0.3	nd	nd	nd	1.09	0.30	0.81	0.62	nd

**T.P.** = Treatment Plant

**nd** = not detected

# Oakdale GAC Treatment Plant

- Constructed by 3M and City of Oakdale
- Treats water from wells 5 & 9
- Went into operation 10/30/06
- Samples collected bi-weekly by MDH



# 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.
- PFC levels in the Oakdale water supply are well below MDH guidelines.
- While some uncertainties remain, the public health risks appear to be low.