

# PFAS and Modern Life: Part 1

NERC Presentation

Terri Goldberg, NEWMOA

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# Overview

- ▶ What is PFAS?
- ▶ PFAS in the Environment? Health Impacts?
- ▶ PFAS Uses
- ▶ Examples of recent studies
- ▶ Examples of state / city actions
- ▶ Upcoming conference

Disclaimer - personal views; not necessarily the views of NEWMOA or its members

# What is PFAS?

- ▶ Per- & polyfluoroalkyl substances (PFAS) class of more 4,500 - 5,000 fluorinated chemicals
- ▶ May have heard of PFAS, PFOS, PFNA, PFHxS, & others
- ▶ Long chain (C8) & short chain (C4) compounds
- ▶ Highly persistent (i.e., take a long time to break down in the environment); sometimes called the “forever chemicals”
- ▶ PFOA & PFOS phased out & replaced with other members of PFAS class

# Why PFAS Are Used?

- ▶ Widely used because of their ability to repel heat, water, & oil
- ▶ Commonly used to manufacture non-stick, grease & stain-resistant coatings on many industrial & consumer products, including food packaging & service ware
- ▶ Used in Aqueous Film Forming Foams (AFFF), which are used to put out oil/gas fires
- ▶ PFOA & PFOS phased out & replaced with other members of PFAS class, including GenX

# Commercial & Consumer Products Containing PFAS

- ▶ Paper & packaging
- ▶ Clothing & carpets
- ▶ Outdoor textiles & sporting equipment
- ▶ Ski & snowboard waxes
- ▶ Non-stick cookware
- ▶ Cleaning agents & fabric softeners
- ▶ Polishes, waxes, & latex paints
- ▶ Pesticides & herbicides
- ▶ Hydraulic fluids
- ▶ Windshield wipers
- ▶ Paints, varnishes, dyes, & inks
- ▶ Adhesives
- ▶ Medical products
- ▶ Personal care products  
(i.e., shampoo, hair conditioners, sunscreen, cosmetics, toothpaste, dental floss)

Note: slide courtesy of Debra Darby

# Food Packaging & Service Ware that Can Contain PFAS?

PFAS compounds can be added to paper & fiber products:

- ▶ Bowls
- ▶ Take-out & soup containers
- ▶ Plates
- ▶ Clamshells
- ▶ Food trays, boats, & scoops
- ▶ Deli & portion cups
- ▶ Boxes
- ▶ Bags, wrappers, bakery liners, such as muffin papers & sandwich bags



Note: pictures courtesy of Debra Darby

# Fluoropolymers for Repeat-Use Applications - Food Contact & Pharmaceuticals

## Examples

- ▶ Tubing & hoses used in soda & ice cream dispensers
- ▶ Food processing equipment components (i.e., gaskets, sealants & filters)
- ▶ Blister packaging for sensitive pharmaceuticals - high barrier against humidity to extend shelf-life for dry formulations, pills & powders
- ▶ Manufacture of plastics, rubber, compression mold release coatings



Note: Slide courtesy of Debra Darby

Source: [Fluorocouncil.com/applications/food-packaging](https://fluorocouncil.com/applications/food-packaging)

Source: [https://pfas-1.itrcweb.org/wp-content/uploads/2017/11/pfas\\_fact\\_sheet\\_history\\_and\\_use\\_\\_11\\_13\\_17.pdf](https://pfas-1.itrcweb.org/wp-content/uploads/2017/11/pfas_fact_sheet_history_and_use__11_13_17.pdf) & Interstate Technology Regulatory Council - ITRC.org

Photo source: Shutterstock

# Health Impacts

- ▶ Perfluorooctanoic acid (PFOA) & perfluorooctane sulfonic acid (PFOS), two of the most well studied PFAS have been associated with cancer, developmental toxicity, immunotoxicity, growth & learning delays in children, & other health effects
- ▶ Many PFAS compounds have little to no data demonstrating their safety
- ▶ In humans, the longer chain (PFOA & PFOS) tend to bind to proteins & are found in blood serum



# States' Drinking Water (DW) / Groundwater (GW) Standards

- ▶ VT: DW Health advisory level for the sum of 5 PFAS should not exceed 20 ppt (parts per trillion): PFOA, PFOS, PFHxS (perfluorohexane sulfonic acid), PFHpA (perfluoroheptanoic acid), PFNA (perfluorononanoic acid)
- ▶ NH Maximum Contaminant Levels or MCLs (also GW standards): PFOA-12 ppt; PFOS-15 ppt; PFHxS-18 ppt; PFNA-11 ppt
- ▶ NJ MCL & GW standards: PFOA-14 ppt (GW: 10 ppt); PFOS-13 ppt (GW: 10 ppt); PFNA-13 ppt
- ▶ NYS proposed MCLs: PFOA-10ppt; PFOS-10 ppt
- ▶ MI proposed MCLs: PFOA-8 ppt; PFOS-16 ppt; PFNA-6 ppt; PFHxA-400,000 ppt; PFHxS-51 ppt; perfluorobutane sulfonic acid (PFBS)-420 ppt; GenX-370 ppt
- ▶ MA proposed GW: PFAS-20 ppt (includes PFDA [perfluorodecanoic acid], PFHpA, PFHxS, PFOS, PFOA)

# PFAS in the Environment

- ▶ Sampling in the northeast has found PFAS compounds in landfill leachate, biosolids, sludge, soil, drinking water, wastewater, groundwater, & surface water
- ▶ Tight C-F bond stops the compound from degrading, can accumulate to unsafe levels in the environment
- ▶ Most clean-ups occur at commercial real estate properties - factories, military bases, airports, & firefighting training facilities; PFAS has been directly released to the air &/or entered the soil & ground &/or surface water from the sites
- ▶ Long chain less likely to leach & move through soil but are more likely to bio-accumulate in the food chain (i.e., fish & animals); long chain are less likely to be taken up in plants through soil
- ▶ Short chain PFAS are found in leachate; have shorter-half lives in the human body & in animals; are also persistent in the environment

# PFAS in Food Service Ware (FSW)

- ▶ May be present; may not be
- ▶ Can migrate into food from packaging & food service ware & can contaminate compost & crops
- ▶ PFAS compounds do not break down during the composting process & may concentrate
- ▶ Brands may not know if PFAS are added to their products, because the chemicals may be added by raw material providers
- ▶ Some brands sell products under the same name with & without PFAS
- ▶ All molded fiber products contain PFAS
- ▶ Ask the supplier for test results or get products tested
- ▶ Center for Environmental Health (CEH) has conducted [independent testing](#)

# CEH Findings

- ▶ Tested plates, bowls, clamshells, & multi-compartment food trays for their total fluorine content
- ▶ In total, >130 products representing 39 manufacturers/brands were tested & classified as “non-fluorinated” or “fluorinated”
- ▶ 57% percent of these products were fluorinated

# Results

- ▶ Products made of the following materials tested as no or low-fluorine:
  - Bamboo
  - Clay-coated paper or paperboard
  - Clear PLA (polylactic acid) & paper-lined with PLA
  - Palm leaf
  - Paper with unknown coatings & uncoated paper

# Results

- ▶ Products made of the following materials consistently tested as fluorinated:
  - All molded fiber products, such as wheat fiber
  - “Blend of plant fibers”
  - Silver grass (miscanthus)
  - Sugarcane waste, including molded recycled paper & polylactic acid (PLA)-lined molded sugarcane

# Harvard Study

- ▶ Tested a variety of common consumer products, including compostable plates & bowls from Harvard dining hall & restaurants
- ▶ Found that paper-based compostable food containers had among the highest PFAS concentrations of all the products evaluated
- ▶ [www.seas.harvard.edu/content/reducing-chemical-exposure-on-campus-one-compostable-plate-at-time](http://www.seas.harvard.edu/content/reducing-chemical-exposure-on-campus-one-compostable-plate-at-time)

# Washington State's Action

- ▶ March 2018 - law regulated PFAS in food contact materials & articles
- ▶ Dept. of Ecology (DoE) must conduct an alternatives assessment (AA) & publish its findings January 2020
- ▶ Prohibition on PFAS chemicals in food packaging will become effective January 1, 2022 if AA finds safer alternatives are available; if not, DoE is required to conduct further AAs starting in 2021 & annually thereafter
- ▶ Prohibition of PFAS chemicals will become effective 2 years after DoE's AA findings that there are available safer alternatives
- ▶ Food packaging manufacturers must certify compliance after the date the prohibition takes effect



# SF's Ban on PFAS in FSW

- ▶ August 2018 - 1<sup>st</sup> city in the U.S. to prohibit PFAS chemicals in FSW
- ▶ Effective on January 1, 2020
- ▶ Covers FSW, including food contact products that are designed for single use for prepared foods - bowls, containers, forks, knives, lids, napkins, plates, spoons, straws, trays, & similar items
- ▶ Also food service ware accessories provided along with single use plates or cups - condiment packets, chopsticks, cup lids, cup sleeves, food or beverage trays & napkins, toothpicks, sticks & stirrers, & more
- ▶ Also prohibits cocktail sticks, splash sticks, stirrers, straws, or toothpicks made with plastic, including compostable, bio- or plant based plastic

# Examples of Other Regulations

- ▶ CA has listed PFOA & PFOS under its Prop 65 list of chemicals since Nov. 2017; warnings required by Nov. 2018
- ▶ European Union regulated PFOA & PFOA-related substances under the Registration, Evaluation, Authorization, & Restriction of Chemicals (REACH) - [https://ec.europa.eu/growth/sectors/chemicals/reach\\_en](https://ec.europa.eu/growth/sectors/chemicals/reach_en)

# NORTHEAST CONFERENCE THE SCIENCE OF PFAS: Public Health & The Environment

March 31-April 1, 2020 @ the Sheraton Framingham Hotel & Conference Center, in Framingham, MA

[www.newmoa.org/pfascienceconference](http://www.newmoa.org/pfascienceconference)

NEWMOA with NERC, NEIWPC, & NESCAUM

- ▶ Ensure that government actions to address PFAS contamination is informed by current & reliable science
- ▶ Facilitate networking & information-sharing among key stakeholders on PFAS topics
- ▶ Identify important gaps in the science & policy to help inform future research

Sessions will cover:

- ▶ Health impacts & environmental behavior
- ▶ Treatment, remediation, & disposal
- ▶ PFAS uses & alternatives
- ▶ Environmental sampling & analysis



# Terri Goldberg NEWMOA Executive Director

(617) 367-8558 x302

[tgoldberg@newmoa.org](mailto:tgoldberg@newmoa.org)

[www.newmoa.org](http://www.newmoa.org)

[www.newmoa.org](http://www.newmoa.org)