PFAS

A Toolkit for Oral Health Providers

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NC ORAL HEALTH COLLABORATIVE

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What are PFAS?

PFAS, also referred to as **"forever chemicals"**, gained widespread public attention in 2016 after media outlets published findings of high levels in the **North Carolina** Cape Fear River Basin, downstream of the Chemours plant. This chemical class, found in numerous everyday products and ubiquitously in the environment across the U.S., presents long-term concerns due to characteristic persistence for hundreds and maybe thousands of years.

The term **PFAS** collectively represents a large class of over 5,000 man-made chemicals known as **per- and polyfluoroalkyl substances**

In the human body, some PFAS are rapidly removed while others can remain for years. While the health effects of all PFAS are not yet known, research findings on certain PFAS, like perfluorooctanoic acid (PFOA), have already confirmed a suite of **adverse health outcomes**. To compound the lack of evidence on the majority of PFAS, there are no existing regulatory guidelines for these chemicals in **drinking water**. The U.S. Environmental Protection Agency (EPA) has issued a lifetime drinking water health advisory of 70 parts per trillion (ppt) for two “legacy” types of PFAS, with states retaining authority to follow or lower this advisory.

The NC Department of Health and Human Services (NC DHHS) has additionally implemented a provisional health goal of **140 ppt** for **GenX** in drinking water

What's Being Done?

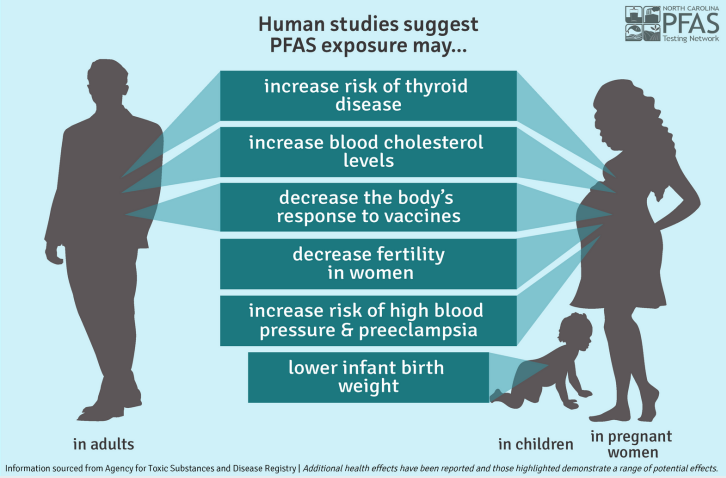
The **North Carolina PFAS Testing Network** (PFAST) is a state-wide research collaborative, established by the NC General Assembly and funded by the North Carolina Policy Collaboratory. This group, which harnesses expertise from **7 university systems**, is championing the effort to answer questions about the extent of PFAS contamination across the state and the potential health implications of exposure.

NORTH CAROLINA PFAS Testing Network

Baseline sampling conducted by PFAST in 2019 revealed **GenX** contamination in **80% of wells tested**. Elevated levels of PFAS have also been identified in drinking water from public water systems (PWS) across the state.

A study out of **Duke University** estimated that 1 million people may be drinking PFAS-contaminated water from the Haw River and downstream Cape Fear River. The researchers also noted PFAS blood levels to be **two to four times higher** in Pittsboro residents than in the general U.S. population. Town leaders in some hard-hit areas, like Pittsboro, are advocating to fast-track the implementation of new filtration methods to screen out PFAS from community water systems (CWS), but such projects have big price tags. Additionally, with over **27% of North Carolinians** not currently connected to CWS, or **unincorporated**, the benefits of such technologies will not reach all consumers under status quo infrastructure conditions.

What are the Potential Health Effects?



While much is still unknown, emerging research suggests that PFAS exposure may be associated with a range of **adverse health outcomes**, including increased risk of thyroid disease, increased risk of various forms of cancer, decreased fertility in women, lower infant birthweight, and decreased immunologic response to vaccines. In fact, researchers have recently reported elevated blood levels of PFAS to be associated with increased susceptibility to contracting COVID-19 and decreased responsiveness to COVID **vaccines**.

With water quality concerns emerging, the NC DHHS has encouraged the public to consider the cost of potential health effects from PFAS balanced against the **known benefits of municipal, treated water**.

With 99% of the U.S. population estimated to have one or more PFAS in their bodies, the presence of these chemicals in drinking water may be **"one of the most seminal public health challenges for the next decades"** (Patrick Breysse, CDC)

PFAS and Dental Floss

The momentum behind **PFAS** research has led to investigation of these chemicals in numerous commercial products, including certain types of **dental floss**.

A recent study suggested that flossing with some **"easy glide"** products, like Oral-B Glide, reportedly contributed to elevated blood levels of PFAS in participants.

In response to medial coverage surrounding these findings, the **American Dental Association** (ADA) released a public statement noting that the study "may raise unwarranted concern about the safety of certain types of dental floss" and that there is **"no cause for concern** based on current evidence". The ADA's statement also identified significant shortcomings in the study methods and reinforced that **daily flossing should continue to be encouraged by dental providers**.

Additionally, the **U.S. Food and Drug Administration** (FDA) maintains that there are **no restrictions** on any dental floss. Additionally, Duke researchers contend that non-consumption behaviors, like brushing teeth, do not pose significant exposure risk.

Tip for Providers

Reassure concerned patients that flossing continues to be a safe and effective hygiene strategy. While glide products may contain PFAS, traditional, non-glide products are unlikely to and may be a satisfactory alternative

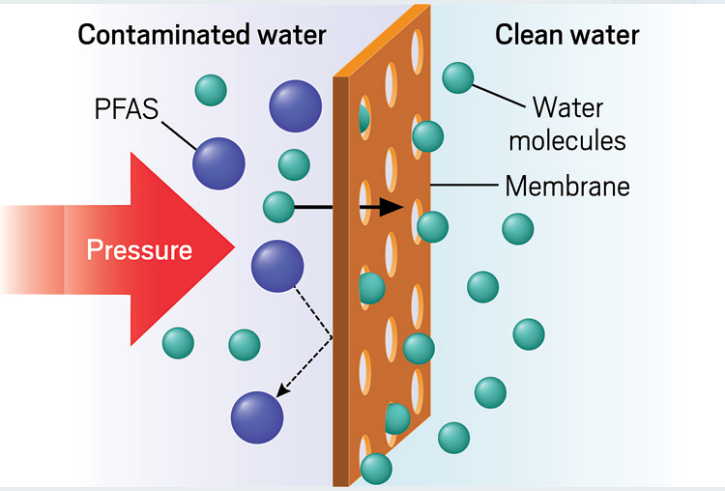
Home Filtration Devices

Filter recommendations have been published by various research groups to guide concerned consumers in selecting household devices that remove a percentage of PFAS from drinking water. For instance, Duke researchers developed a fact sheet, explaining the limitations, costs, and maintenance requirements of various **point-of-use** (POU) filter types. The Environmental Protection Agency (EPA) Drinking Water Treatability Database (TDB) also publishes data on the efficacy of tested treatment processes, although no commercial filtration products are specifically recommended.

NC PFAST testing has shown that common, POU-activated carbon filters do not completely remove PFAS, while **reverse osmosis and two-stage filters** remove around **99% of PFAS**. While very helpful to consumers in regards to PFAS, what the available recommendations fail to explain is that **certain filtration methods**, like reverse osmosis, **also remove** the majority of **fluoride** from drinking water.

In response to a community **survey** of over 1,800 North Carolina households near the Chemours plant and contamination-based recommendations, **62%** of respondents reported having transitioned to **bottled water** and **16%** began using **water filters**. The presumption that households may be heeding recommendations to employ certain filters warrants discussion in the dental community.

While over 70 years of research overwhelmingly confirms the positive impact of **community water fluoridation** (CWF) on caries prevention, consumer mistrust of public water paired with filtration systems that may remove fluoride has the potential to **impact** the reach of this successful public health service.



In compliance with the 2019 NC Department of Environmental Quality (NCDEQ) Consent Order, **eligible North Carolinians** within a certain perimeter of Chemours plant have been offered one of two **filtration options** at no-cost:

1) Whole-house Granulated Activated Carbon (GAC) or,
2) Under-sink Reverse Osmosis (RO)

While GAC will not remove fluoride from drinking water, the preferred method, RO, will remove a significant portion of this beneficial additive.

Bottled water, a common alternative to tap water, has also been found in some cases to contain PFAS and is not guaranteed to contain optimal fluoride levels for caries prevention.

Community Water Systems

Innovative groups, like the UNC researchers of NC PFAST, are leading the race to develop new **technologies** for screening out all PFAS in CWS. Incorporating these technologies, like ion exchange resins, into municipal water treatment plants and eventually home systems will be critical in protecting those who are already connected to CWS as well as the **15%** of Americans who rely on **domestic** (private) **wells** for drinking water.

Currently, **87.5%** of North Carolinians who are connected to CWS, or **incorporated**, were reported to be receiving community-fluoridated water. The remaining **12.5%** who do not receive community-fluoridated water, as reported by the NC DHHS, only accounts for incorporated residents, however. Given the current NC population of roughly **10.4 million people**, an additional 27% of residents who are unincorporated contribute to a total of nearly **40% of North Carolinians who are not receiving community-fluoridated drinking water**. This means that over 4 million residents are not receiving the proven caries-prevention benefits of fluoridated drinking water. Furthermore, unincorporated residents would not benefit from PFAS treatment plant technologies under status quo conditions.

The Role of the Dental Community

1. Consider updating your Dental Health Questionnaire (DHQ) to prompt discussion of filtration devices in addition to questions on water source

2. Maintain broad knowledge on the fluoride-removal capabilities of in-home filtration in order to advise on fluoride supplementation, particularly in households with young children

3. Advocate for notification of local or state-endorsed home filtration devices that are dispensed within the community or otherwise recommended

4. Be aware of the potential adverse health outcomes associated with PFAS as research progresses and seek guidance from reputable sources for potential implications of PFAS in dental products

5. Continue to advocate for inclusion of all NC residents in community-water fluoridation services in support of the Health People 2030 fluoridation goal and the 2020-2025 NC Oral Health Improvement Plan

6. Consider bolstering supplemental fluoridation programs in communities that are heavily impacted by PFAS-contamination and may experience suboptimal fluoride exposure