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Exposure to PFAS and Your Risk for Thyroid Disease

Analysis by Dr. Joseph Mercola | November 07, 2023

STORY AT-A-GLANCE

- Researchers looked into associations between PFAS levels and thyroid cancer diagnosis
- Per- and polyfluoroalkyl chemicals (PFAS) are known as "forever chemicals" because they don't break down easily in the environment and bioaccumulate in people and wildlife
- Exposure to PFAS was significantly associated with thyroid cancer; a 56% increased rate of diagnosis occurred per doubling of linear PFOS intensity
- PFAS may lead to cancer by causing changes in epigenetics, immunosuppression, oxidative stress, inflammation or via hormone and metabolomic pathways
- Due to their ability to repel oil, dirt and water, PFAS chemicals are widely used in consumer products including nonstick cookware, stain-resistant fabric and firefighting foams

Thyroid cancer is on the rise, and endocrine-disrupting chemicals (EDCs) in the environment may be a key reason why. From 1974 to 2013, incidence of thyroid cancer in the U.S. rose by 3.6% per year. While it's been suggested that the increase is due to overdiagnosis — or detecting cases that may not cause symptoms or affect mortality — researchers believe this alone does not explain the uptick in cases.

"Evidence is growing to support a true rise in thyroid cancer incidence," scientists with the Icahn School of Medicine at Mount Sinai and colleagues explained. Aside from risk factors such as obesity and exposure to ionizing radiation, "exposure to endocrine

disrupting chemicals (EDCs) has been identified as a potential risk factor warranting investigation."[1]

Exposure to 'Forever Chemicals' Increases Thyroid Cancer Risk 56%

Per- and polyfluoroalkyl chemicals (PFAS) are known as "forever chemicals" because they don't break down easily in the environment and bioaccumulate in people and wildlife. In the human body, PFAS have half-lives of two to five years.[2]

Due to their ability to repel oil, dirt and water, they're widely used in consumer products including nonstick cookware, stain-resistant fabric and firefighting foams. They're also known to contaminate food, soil, water and air, leading to "almost universal exposure of the general population" — upward of 95% of humans have been exposed.[3]

One PFAS, perfluorooctanoic acid (PFOA), is categorized as possibly carcinogenic to humans by the International Agency for Research on Cancer, while exposure to both PFOA and PFOS (perfluorooctane sulfonate) is linked to thyroid hormone disruption, including hypothyroidism.[4]

For the study, researchers looked into associations between plasma PFAS levels and thyroid cancer diagnosis. Using data from 88 patients with thyroid cancer and 88 matched controls without thyroid cancer, the team measured levels of eight PFAS, finding a significant association.

"There was a 56% increased rate of thyroid cancer diagnosis per doubling of linear perfluorooctanesulfonic acid (n-PFOS) intensity," according to the study.[5] Another analysis was conducted on a subgroup of 31 patients who were diagnosed with thyroid cancer a year or more after enrolling in the study.

This analysis also found an association between exposure to PFOS and thyroid cancer risk, as well as exposure to several other PFAS, including branched perfluorooctanesulfonic acid, perfluorononanoic acid, perfluorooctylphosphonic acid

and linear perfluorohexanesulfonic acid.[6] Study author Lauren Petrick, Ph.D., associate professor of environmental medicine and public health at Icahn Mount Sinai, said in a news release:[7]

> *"The results of this study provide further confirmation for the PFAS health crisis and underline the need to reduce, and hopefully one day eliminate, PFAS exposure. Today, it's nearly impossible to avoid PFAS in our daily activities. We hope these findings bring awareness of the severity of these forever chemicals.*
>
> *Everyone should discuss their PFAS exposure with their treating physician to determine their risk and get screened if appropriate. In addition, we need continued industry changes to eliminate PFAS altogether."*

How Do PFAS Contribute to Thyroid Cancer?

PFAS may lead to cancer by causing changes in epigenetics, immunosuppression, oxidative stress, inflammation or via hormone and metabolomic pathways. An accumulation of epigenetic events induced by PFAS exposure can "synergistically amplify tumorigenicity and cancer progression," the team explained, adding that immune system suppression and chronic inflammation also likely play a role:[8]

> *"PFOS and PFOA have been found to be immunotoxic in epidemiological and animal studies. Suppression of the immune system can affect the body's response to foreign antigens, including those on tumor cells.*
>
> *PFOS exposures are inversely associated with decreased anti-mumps and anti-rubella antibodies and reduced antibody response to tetanus and diphtheria among children, demonstrating the ability of PFOS to cause systemic immunosuppression.*
>
> *Chronic inflammation, which can drive cancer development, has been linked with PFOS exposures … Finally, PFOS activates peroxisome proliferator-activated receptors, which contributed to development and regulation of thyroid cancers."*

In addition to interfering with hormone systems, PFAS may mimic fatty acids in the body, leading to additional health effects. According to the Endocrine Society, PFAS exposure may contribute to:[9]

Thyroid disease	Ulcerative colitis	Testicular cancer
Kidney cancer	Pregnancy-induced high blood pressure	Altered cholesterol levels
Liver and kidney damage	Altered immune response	Reproductive damage
Birth defects	Low birth weights	Tumors and cancer

Where Are You Exposed to PFAS?

While production of PFOA ended in 2015, DuPont and other companies have substituted similar chemicals in the production of nonstick cookware and other products. But even exposure to new generation PFAS is linked to thyroid disruption.[10] Part of what makes PFAS so dangerous is its persistence in the environment — and how widespread it is.

EWG compiled a map that shows the location of 41,828 industrial and municipal sites in the U.S. known to, or suspected of, using or releasing PFAS.[11] Among them are landfills and wastewater treatment plants, airports, paper mills, car washes and areas where firefighting foam has been used.

Food and water are major sources of exposure. In one study, leafy greens grown within 10 miles of a PFAS plant contained very high amounts, but even chocolate cake was contaminated.[12] In addition to nonstick cookware, you'll find PFAS in food packaging, carpets, dental floss and outdoor wear.

PFAS on farmland is another major issue, one that's been called a "slow-motion disaster."[13] The source of the contamination on many agricultural lands is biosolids — toxic human waste sludge — that's marketed as an affordable fertilizer. Fred Stone, a

farmer in Maine, applied biosolids to his hayfields intended to feed his dairy cattle for decades, not knowing it could be contaminated with PFAS.

Milk from Stone's cows later tested positive for PFAS, forcing him to dump hundreds of gallons of milk a day.[14] In 2022, Maine became the first U.S. state to ban the use of PFAS-contaminated sewage sludge as fertilizer,[15] but it's still allowed elsewhere. An estimated 20 million acres of U.S. farmland may be contaminated with PFAS as a result.[16]

Water is also heavily tainted, which is why even eating one freshwater fish a year could be dangerous. Research conducted by EWG scientists revealed that consuming a single serving of freshwater fish annually equates to a month of drinking water contaminated with PFOS at a concentration of 48 parts per trillion (ppt).[17]

Given that people in many vulnerable U.S. communities still depend on freshwater fish as a key part of their diets, public health could be at risk. Meanwhile, more than 200 million Americans may be drinking water containing PFAS at a concentration of 1 ppt or higher.[18,19] EWG has endorsed making 1 ppt the standard upper safe level for PFAS in drinking water.

Even contact lenses may be exposing you to these thyroid-damaging chemicals. Mamavation, in partnership with Environmental Health News, has been investigating PFAS in everyday products such as clothes, food and makeup.[20] They sent 18 different contact lens brands to a laboratory certified by the U.S. Environmental Protection Agency to test for organic fluorine, a marker for PFAS.

All the contact lenses tested positive for fluorine, at levels ranging from 105 to 20,700 parts per million (ppm). While 44% of the contact lenses tested contained fluorine at a level over 4,000 ppm, 22% contained more than 18,000 ppm.[21] Pete Myers, chief scientist for Environmental Health Sciences, explained what this could mean for your health:[22]

> *"The presumption that these organic fluorine levels measured in contact lenses are safe is laughable … the EPA issued health advisories … for four common*

PFAS, ranging from 0.004 parts per trillion (ppt) to 2000 ppt. EPA considers exposure beneath these thresholds to be safe for drinking water.

While comparing drinking levels in water to concentrations in contact lenses is like comparing apples to oranges, it's worth noting that all of the contact lenses tested exceeded 100 ppm, which is equivalent to 100,000,000 ppt, or 50,000 times higher than the highest level deemed safe in drinking water by the EPA."

Other EDCs Also Linked to Thyroid Cancer

Your thyroid is at risk not only from PFAS but also from multiple other EDCs circulating in the environment. Among them are flame retardant chemicals, which are widely used in upholstered furniture, foam baby products, foam carpet padding and more. What's more, the chemicals collect in household dust.

Exposure to flame retardants in the home is associated with the most common type of thyroid cancer, papillary thyroid cancer (PTC). Researchers analyzed house dust to determine levels of exposure to the chemicals, as personal exposure correlates with levels of flame retardants in house dust.

Two types of flame retardants — decabromodiphenyl ether (BDE-209), belonging to the polybrominated diphenyl ethers (PBDEs) class, and tris(2-chloroethyl) phosphate (TCEP), an organophosphate flame retardant — were linked to papillary thyroid cancer diagnosis and severity.[23]

For BDE-209, those living in homes with elevated levels in their household dust were more than twice as likely to have been diagnosed with PTC. Further, a press release by the Endocrine Society explained:[24]

"Participants with high levels of TCEP in their house dust were more than four times as likely to have larger, more aggressive tumors that extended beyond the thyroid …

In contrast, participants with the highest dust levels of BDE-209 were 14 times as likely to be a PTC patient that did not have a common gene mutation (BRAF V600E). This mutation has been linked to PTC that tends to behave more aggressively."

How to Reduce Exposure to Endocrine-Disrupting Chemicals

EDCs are all around us, but you can reduce your exposure by making informed decisions about your food, water and personal care products. You'll want to filter your drinking water to avoid this common route of exposure. Also avoid products that are stain-resistant, waterproof or nonstick, as most contain PFAS.

Regarding contact lenses, you can avoid PFAS exposure by using glasses instead. While foods grown with PFAS-contaminated sewage sludge are not labeled as such, your best bet for avoiding them is to support sustainable agriculture movements in your area.

Make it a point to only buy food from a source you know and trust, one using safe, nontoxic organic or biodynamic farming methods. To further reduce your exposure, the Environmental Working Group recommends avoiding:[25]

Items that have been pretreated with stain repellants and opt out of such treatments when buying new furniture and carpets.

Water- and/or stain-repellant clothing — One tipoff is when an item made with artificial fibers is described as "breathable." These are typically treated with the PFAS polytetrafluoroethylene (PTFE).

Items treated with flame retardant chemicals, which includes a wide variety of baby items, padded furniture, mattresses and pillows. Instead, opt for naturally less flammable materials such as leather, wool and cotton.

Fast food and carry out foods, as the wrappers are typically treated with PFAS.

Microwave popcorn — PFAS may not only be present in the inner coating of the bag, it also may migrate to the oil from the packaging during heating. Instead, use "old-fashioned" stovetop popcorn.

Nonstick cookware and other treated kitchen utensils — Healthier options include ceramic and enameled cast iron cookware, both of which are durable, easy to clean and completely inert, which means they won't release any harmful chemicals into your home. A newer type of nonstick cookware called Duralon uses a nonfluoridated nylon polymer for its nonstick coating. While this appears to be safe, your safest bet is still ceramic and enameled cast iron.

Oral-B Glide floss and any other personal care products containing PTFE or "fluoro" or "perfluoro" ingredients.

Personal care products with phthalates or triclosan, EDCs commonly found in shampoos, conditioners, moisturizers, cosmetics and other personal care products.

Chemical cleaning products, including floor, toilet, oven and window cleaners, which often contain EDCs. Create your own cleaning products using different combinations of vinegar, baking soda, essential oils and even coconut oil instead.

Household dust — Since flame retardant chemicals are often lurking in dust shed from treated furniture, buy “green” nontoxic furniture, mattresses and building materials whenever possible and use a HEPA filter for your vacuum. When mopping and dusting, use a wet mop or rag to avoid scattering the dust.

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