

How Hazardous Is the Air You Breathe?

Analysis by [Dr. Joseph Mercola](#) ✓ Fact Checked

STORY AT-A-GLANCE

- › Data show PFAS air pollution correlates with blood serum measurements; current measurements are higher than expected, which one researcher says is "an underestimated and potentially important source of exposure"
- › The largest risk may be in young children. Researchers postulate they may be exposed to more PFAS in the air than in foods and drinks. The chemicals are associated with harm to the immune system, thyroid and mammary glands and reproductive system
- › DuPont and Daikin, producers of 6:2 FTOH, the most prevalent PFAS found in the study, knew of the dangers to human health as early as 2010 but hid the information from the public and the FDA
- › Shanna Swan, environmental and reproductive epidemiologist, believes current projections from recent research may result in zero sperm count in humans on or about 2045, in large part from exposure to PFAS
- › Manufacturers are voluntarily phasing out some chemicals, but it may take up to 4.5 years to complete, and the phase-out addresses only a few of the over 4,000 PFAS chemicals in use

Current research shows that per- and polyfluoroalkyl substances (PFAS) not only are contaminating water and food, but also the air you breathe.¹ These are a group of man-made chemicals developed in the 1930s that are resistant to water, heat and oil and are used to make products nonstick.

There are more than 4,700 synthetic chemicals in the group with different properties and applications.² In 1967, there was a deadly fire³ on the Navy aircraft carrier USS Forrestal, killing more than 130 people. Not long afterward, manufacturers developed a PFAS firefighting foam mixture that continues to be used to this day in the military and some fire departments.⁴

PFOA and PFOS are the most extensively studied classes of PFAS. Experts estimate that 98% of the population has detectable levels of PFOA in their bloodstream.⁵ The presence of the chemical has been linked with higher levels of cholesterol and uric acid, which may lead to kidney stones and gout.

Since they are nearly indestructible and do not break down easily, PFAS chemicals have earned the name “forever chemicals.” The Environmental Working Group (EWG), characterizes the damage this way:⁶

“Today nearly all Americans, including newborn babies, have PFAS in their blood, and up to 110 million people may be drinking PFAS-tainted water. What began as a ‘miracle of modern chemistry’ is now a national crisis.”

PFAS in the Air Correlate With Blood Serum Measurements

According to the U.S. Environmental Protection Agency,⁷ when humans or animals eat food or drink water that is contaminated with PFAS, it can be absorbed and build up in the body. Because the chemical does not break down easily, it can also be stored in the body for long periods of time.

The EPA⁸ says that people are exposed to PFAS through food packaging that contains the chemicals, equipment used during food processing and contaminated soil and water used to grow the food. However, current research also finds that PFAS may be absorbed from the air that you breathe.⁹

The study, published in Environmental Science and Technology Letters,¹⁰ sought to quantify the amount of PFAS humans are exposed to since most people typically spend

90% of their time indoors. The researchers used polyethylene sheets to measure the compounds and validated the results using gas chromatography-mass spectrometry.

They also compared the concentration of PFAS in the air and dust against that found in the carpet and elsewhere in the area. PFAS can be categorized as neutral or volatile. In one study published in *Frontiers in Chemistry*¹¹ researchers wrote that short chain PFAS are volatile and can enter the atmosphere and water cycles.

Neutral PFAS chemicals can also be found in the air and snow as demonstrated in one study published in *Scientific Reports* that measured the air-snow exchange. They found this exchange could significantly impact atmospheric concentrations of neutral PFAS in the Arctic.¹²

The research team from the current study was from the University of Rhode Island and Green Science Policy Institute.¹³ They tested 20 sites in 17 different locations. Tom Bruton is a senior scientist at Green Science and on the research team. He said that indoor air pollution is "... an underestimated and potentially important source of exposure to PFAS."

Air Exposure May Be More Dangerous for Children

In the current study,¹⁴ the researchers found that volatile chemicals, specifically fluorotelomer alcohols (FTOHs) were widespread. Measurements in a California kindergarten classroom revealed 6:2 FTOH in concentrations from 9 to 600 ng m-3 (nanograms per cubic meter).

Interestingly, the concentrations in the air, carpet and dust were closely related. This indicated to the researchers that PFAS originating in carpet and dust are the major sources of FTOH in the air.¹⁵ They determined that breathing air contaminated with FTOH was the largest exposure risk in young children.

Research¹⁶ has found a correlation between high levels of PFAS measured in the air in carpeted homes treated with Scotchgard and amounts found in human blood serum.

The current researchers theorized that kindergarteners may be exposed to more PFAS chemicals in indoor air pollution than in the food and drink they consume. Bruton said:¹⁷

“This reinforces that as long as there are PFAS in products that we have surrounding us in our homes and in our lives, there’s going to be some amount that ends up in the air, ends up in dust, and we are going to end up breathing it in.”

In April 2020, the Environmental Defense Fund¹⁸ reported on two publications by FDA scientists in which the scientists confirmed findings that 6:2 FTOH bioaccumulates and the bioaccumulation is greater with lower exposure. The FDA scientists also found that the toxicity and risk have been significantly underestimated.¹⁹

Initially, short chain PFAS chemicals were claimed by the industry as safer alternatives,²⁰ including 6:2 FTOH. However, as the studies from the FDA showed, 6:2 FTOH is more toxic, in large part because of breakdown products that also bioaccumulate.

The EWG²¹ also reports that 6:2 FTOH on its own has demonstrated the ability to harm the immune system, thyroid and mammary glands as well as has a potential carcinogenic effect in animals.

Chemical Giants Knew of the Dangers in 2009

The most prevalent PFAS found in the current study was 6:2 FTOH, which is found frequently in stain guards, floor waxes and food packaging.²² May 12, 2021, The Guardian published an investigative piece²³ that revealed Dupont and Daikin, both chemical giants and producers of PFAS chemicals, knew of the dangers to human health as early as 2009.

However, they hid company studies from the FDA and from the public. The Guardian saw the studies after the Environmental Defense Fund and independent researcher Maricel Maffini obtained them from the companies and the FDA through a Freedom of Information Act (FOIA) Request.²⁴

They discovered that Daikin had withheld a study finalized in 2009 that showed 6:2 FTOH was toxic to lab animals' livers and kidneys. Dupont's company studies were finalized in 2012 but were not shared with the FDA or public. It revealed the chemicals stayed in lab animals much longer than was originally anticipated.

Maffini spoke with a reporter from The Guardian, indicating that if the FDA had been aware of the data, it was unlikely the agency would have approved 6:2 FTOH.²⁵ But it took the FDA until 2020 to work with manufacturers to voluntarily withdraw 6:2 FTOH from food packaging, also giving manufacturers 5 years to accomplish the goal.

Documents acquired through the FOIA show that the FDA had been aware of DuPont's study in 2015. In other words, the FDA has given DuPont a 10-year timeline to remove chemicals that have demonstrable negative effects on human health. Independent researcher, Erika Schreder, science director for Toxic Free Future, commented:²⁶

"The fact that we continue to uncover evidence that the current-use PFAS have similar toxicity to the [long chain] compounds that have been phased out makes a strong argument for regulating harmful chemicals like PFAS as a class."

It was not just the manufacturers who had information about 6:2 FTOH. In 2008, Dupont submitted studies that demonstrated lab animals suffered from liver damage, mottled teeth, and kidney failure.²⁷ Yet the FDA determined that exposure to humans would be lower. Without any supporting evidence they decided the short chain PFASs would not bioaccumulate.

When Dupont reported some of the 2008 study results, it appeared it was written to be purposefully confusing. For example, in one passage the study talked about high doses of PFAS that could lead to blood in the lab animals' urine. They wrote "resulted in a significant reduction in the number of female rats with blood absent in the urine."²⁸

Tom Neltner is the chemicals policy director with the Environmental Defense Fund. He believes some of the deficiencies inside the FDA's chemical approval process include an insufficient amount of safety data up front and no systematic reassessment after the chemicals are on the market.²⁹

Although the FDA defended their process, Neltner said the issues with 6:2 FTOH suggest the process is not sufficient. As the FDA has done in the past and continues to do in the current climate, Neltner said, “They’re making grossly inaccurate assumptions that are not defensible.”³⁰

Will Sperm Count Reach Zero in 2045?

There are experts who believe that the COVID-19 genetic therapy injection program has the intended result of depopulation to meet the “green” goals of the World Economic Forum.³¹ However, if Shanna Swan’s estimates are correct,³² we may be headed for an unpopulated earth. Swan is an environmental and reproductive epidemiologist at Icahn School of Medicine at Mount Sinai in New York.

In her book “Count Down,” she describes the devastation to fertility that has been the result of hormone-disrupting chemicals like PFAS.³³ Swan is on a team of researchers who did a systematic review and meta-analysis of sperm counts from 1973 to 2011.³⁴

They discovered there has been a 60% sperm count reduction in men living in North America, Australia, Europe and New Zealand.³⁵ Using projections from this data, she believes that sperm counts in men across the world will reach zero on or about 2045. In the book Swan and co-writer Stacey Colino point to chemical exposures that are threatening human fertility.

Swan is not the first to find that PFAS chemicals have a significant effect on human reproductive health. One study published in the *Journal of Clinical Endocrinology & Metabolism*³⁶ in 2019 found that increasing levels were positively correlated with “a reduction of semen quality, testicular volume, penile length, and anogenital distance.”

The scientists concluded that the chemicals have a substantial impact and interfere with hormones, “potentially leading to male infertility.”³⁷ Falling sperm count is mirrored in the global fertility rate,³⁸ which fell from 5.05 in 1964 to 2.4 in 2019.

We Drink, Eat and Breathe Ubiquitous Forever Chemicals

July 31, 2020, the FDA³⁹ announced three companies would voluntarily phase out specific short-chain PFAS chemicals used in food packaging. These are found in fast-food wrappers, pizza boxes and to-go boxes. The announcement followed the FDA literature review that noted 6:2 FTOH persists much longer than had been anticipated.

However, the phase-out could take several years. Once the company stops manufacturing, it can take an additional 18 months to sell out the products that have already been produced. In other words, the manufacturer can take up to 4.5 years to phase the chemicals out of production.⁴⁰

Tap water and bottled water are other sources of PFAS exposure. According to the EWG,⁴¹ while most drinking water gets a passing grade from regulatory agencies, the EPA has not added a new contaminant for regulation in more than 20 years. In July 2019, the Commonwealth of Massachusetts⁴² issued an advisory for bottled water from Spring Hill Farm Dairy, which tested positive for PFAS.

The majority of bottled water associated with the contamination was sold inside Massachusetts. But other brands use Spring Hill water and were sold outside the state. As the current study has pointed out, PFAS not only may be consumed in your foods and drinks, but also may be inhaled in indoor air pollution.

In May 2015,⁴³ 205 scientists from 38 countries signed a consensus statement called the Madrid Statement. Their focus was on PFAS, warning about its potential harmful effects including liver toxicity, adverse neurobehavioral effects, hypothyroidism and obesity.

Scientists recommend avoiding all products containing PFAS. You may find helpful tips in the EWG's "Guide to Avoiding PFAS."⁴⁴ In the past, I have also recommended avoiding:

- Pretreated or stain-repellant treatments on clothing, furniture and carpeting
- Products treated with flame-retardant chemicals, including furniture, carpets, mattresses and baby items
- Fast food, microwave popcorn, unfiltered tap water and carry out foods
- Nonstick cookware and treated kitchen utensils

- **Personal care products containing PTFE or "fluoro" or "perfluoro" ingredients such as Oral-B Glide floss**

Sources and References

- ^{1, 9, 13, 17, 22} [The Guardian, August 31, 2021](#)
- ² [National Institute of Environmental Health Sciences](#)
- ^{3, 5} [Live Science, April 30, 2019](#)
- ⁴ [Clean Water Action, PFAS-Containing Firefighting Foams](#)
- ^{6, 41} [Environmental Working Group](#)
- ^{7, 8} [EPA, Basic Information on PFAS](#)
- ^{10, 14, 15} [Environmental Science and Technology Letters, 2021; doi.org/10.1021/acs.estlett.1c00481](#)
- ¹¹ [Frontiers in Chemistry, 2018;6\(103\)](#)
- ¹² [Scientific Reports, 2015;5\(8912\)](#)
- ¹⁶ [Environmental Science and Technology, 2012;46\(23\)](#)
- ¹⁸ [Environmental Defense Fund, April 1, 2020](#)
- ¹⁹ [Food and Chemistry Toxicology, 2020;138\(111210\)](#)
- ^{20, 21} [Environmental Working Group, May 17, 2021](#)
- ^{23, 24, 25, 26, 27, 28, 29} [The Guardian, May 12, 2021](#)
- ³⁰ [The Guardian, May 12, 2021, Last 5 paragraphs](#)
- ³¹ [NOQ Report, May 15, 2021](#)
- ^{32, 33} [The Guardian, March 18, 2021](#)
- ³⁴ [Human Reproduction Update, 2017;23\(6\)](#)
- ³⁵ [The Guardian, February 26, 2021](#)
- ^{36, 37} [Journal of Clinical Endocrinology & Metabolism, 2019;104\(4\)](#)
- ³⁸ [The World Bank, Fertility Rate](#)
- ³⁹ [U. S. Food and Drug Administration, July 31, 2020](#)
- ⁴⁰ [Fox10, August 3, 2020](#)
- ⁴² [Commonwealth of Massachusetts, July 2, 2019](#)
- ⁴³ [Environmental Health Perspectives, May 1, 2015](#)
- ⁴⁴ [Environmental Working Group, Guide to Avoiding PFCS](#)