

Stain repellent chemical linked to thyroid disease in adults

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A study by the University of Exeter and the Peninsula Medical School for the first time links thyroid disease with human exposure to perfluorooctanoic acid (PFOA). PFOA is a persistent organic chemical used in industrial and consumer goods including nonstick cookware and stain- and water-resistant coatings for carpets and fabrics.

Published in the journal [Environmental Health Perspectives](#), The study revealed that people with higher concentrations of PFOA in their blood have higher rates of thyroid disease. The researchers analysed samples from the US Centers for Disease Control and Prevention's nationally representative National Health and [Nutrition Examination Survey](#) (NHANES).

Tamara Galloway, a professor Ecotoxicology at the University of Exeter and the study's senior author, says: "Our results highlight a real need for further research into the human health effects of low-level exposures to [environmental chemicals](#) like PFOA that are ubiquitous in the environment and in people's homes. We need to know what they are doing."

"There have long been suspicions that PFOA concentrations might be linked to changes in thyroid hormone levels," adds study author, David Melzer, a professor of Epidemiology and Public Health at the Peninsula Medical School. "Our analysis shows that in the 'ordinary' adult population there is a solid statistical link between higher concentrations of PFOA in blood and thyroid disease."

PFOA is a very stable man-made chemical that excels at repelling heat, water, grease, and stains. It is used during the process of making common household and industrial items including nonstick pots and pans, flame-resistant and waterproof clothing, wire coatings, and chemical-resistant tubing. PFOA can also be formed by the break-down of certain other highly fluorinated chemicals used in oil and grease-resistant coatings on fast-food containers and wrappers and in stain-resistant carpets, fabrics, and paints.

The study included 3966 adults aged 20 and older whose blood serum was sampled between 1999 and 2006 for PFOA and other perfluoroalkyl acid (PFAA) compounds, including perfluorooctane sulphonate (PFOS). The researchers found that the individuals with the highest 25% of PFOA concentrations (above 5.7ng/ml) were more than twice as likely to report current thyroid disease than individuals with the lowest 50% of PFOA concentrations (below 4.0ng/ml). The most specific analysis included 163 women and 46 men who reported having current thyroid disease and who were taking thyroid medication at the time the blood samples were taken. The models used in the analysis were adjusted for potential confounding factors, such as age, gender, ethnicity, smoking, and body mass index.

Previous animal studies carried out by other scientists have shown that the compounds can affect the function of the mammalian thyroid hormone system. This is essential for maintaining heart rate, regulating body temperature and supporting many other body functions, including metabolism, reproduction, digestion and mental health.

The findings are important because research has shown that PFAAs are found in water, air and soil throughout the world, even in remote polar regions. PFOA and PFOS have also been detected in the blood of people from across the globe, as well as in wildlife including birds, fish, and polar bears.

The main source of human exposure to PFOA and PFOS remains uncertain but is believed to be through diet. However, people may also be exposed through the PFAAs used in consumer goods such as textiles, footwear, furniture, and carpets, which can contaminate indoor air and dust.

Although more research is needed to understand the mechanism by which PFOA and PFOS may affect human thyroid functioning, it is plausible that the compounds could disrupt binding of thyroid hormones in the blood or alter their metabolism in the liver. However, this new evidence does not rule out the possibility that having thyroid disease changes the way the body handles PFOA and/or PFOS. The presence of the compounds might also prove to be simply a marker for some other factor associated with thyroid disease.

Thyroid diseases, particularly hypothyroidism, are much more common in women than men. However, in terms of the link between PFOA and thyroid disease, the researchers found no evidence of a statistically different effect between the sexes. The researchers also found a link between thyroid disease and higher concentrations of PFOS in men, but not in women.

Although previous studies of people living in communities near where PFOA and PFOS are manufactured did not find an association between exposure to these chemicals and thyroid hormone functioning, the largest study of such exposed communities is currently underway. (The 'C8' study of communities near DuPont's Washington Works plant, including Marietta, OH, and Parkersburg, WV, both in the US).

Provided by Peninsula College of Medicine and Dentistry

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