Study Links Synthetic Chemicals to Liver Damage

PFAS, synthetic chemicals found in many common products, may be contributing to an increase in liver problems, such as fatty liver disease.

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Certain chemicals in the products we use, including fabrics, food packaging, and cooking and cleaning products, can be harmful to human health.

Researchers have become concerned about a chemical group called per- and polyfluoroalkyl substances, known as PFAS. There are thousands of types of PFAS. They are known as “forever chemicals” because many break down very slowly in the environment and accumulate in human tissues, such as the liver.

Common products that may contain PFAS include some grease-resistant paper, fast food containers and wrappers, microwave popcorn bags, pizza boxes, and candy wrappers.

Studies have found detectable levels of PFAS in virtually all U.S. adults. The health effects of PFAS are potentially many, as they have been reported to affect fetal growth, organ development, reproduction and other health outcomes. Studies have shown that they can interfere with hormone regulation and the immune system.

In recent years, diagnoses of a health condition called non-alcoholic fatty liver disease (NAFLD) has been on the rise without any clear reason why. Exposure to certain toxins can increase the risk for NAFLD. A team led by Elizabeth Costello, Sarah Rock, and Dr. Lida Chatzi at the University of Southern California Keck School of Medicine investigated whether PFAS affect the liver.

The team collected and reviewed data from 111 research studies involving PFAS and the liver—25 in people and 86 in rodents. They looked at reported data on several PFAS, including three that are commonly found in people: perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), and perfluorononanoic acid (PFNA).

The researchers also examined levels of liver enzymes in the studies, including alanine aminotransferase, or ALT. ALT is a helpful enzyme to study because high levels of ALT are a marker of liver damage in both humans and rodents.

The study, which was funded primarily by NIH's National Institute of Environmental Health Sciences (NIEHS), appeared on April 27, 2022, in Environmental Health Perspectives.

The team found that all three common PFAS chemicals were associated with elevated levels of ALT in the blood. This was true in both human and rodent studies. In the rodent studies, PFAS exposure was also linked to steatosis, the initial stage of fatty liver disease.

Although the human data connecting PFAS and liver effects was limited, this systematic review of many human and animal studies suggests a link between PFAS and NAFLD. Few of the studies looked at the effects of PFAS on liver damage in both males and females separately, but those hinted that the outcomes differed. This suggests the potential mechanisms for how PFAS might affect the liver could be tied to the activity of certain hormones. More research is needed to uncover the mechanisms by which PFAS might injure the liver, and to what extent.

"This research clearly shows that PFAS need to be taken seriously as a human health concern because even after they are phased out, they persist in the environment," Costello says.

In light of recent findings about the health effects of PFAS, the U.S. Environmental Protection Agency recently announced new actions they are taking toward combating PFAS pollution.

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