You might have a spoon's worth of microplastics - in your brain.

Elizabeth Weise
USA TODAY

Published 12:48 p.m. ET Feb. 3, 2025 | **Updated 1:21 p.m. ET Feb. 3, 2025**

The average brain may contain a spoonful of plastic, a new study suggests.

The number of tiny bits of plastic found in human brains increased dramatically between 2016 and 2024, with the highest amounts found in the brains of people who had dementia.

By 2024, the average brain studied by scientists at the University of New Mexico contained the equivalent of one plastic throw-away spoon, about 7 grams worth, said Dr. Matthew Campen, a toxicologist and professor of pharmaceutical sciences at the university and lead author of the study, published Monday in the journal Nature Medicine.

For reference, the average adult human brain weighs about 3 pounds, typically between 1,300 and 1,400 grams.

While human livers and kidneys also showed increases, the concentrations in brains were seven to 30 times greater, the study found. There was also a higher concentration of micro- and nanoplastic particles in the brains of people with a documented dementia diagnosis than in those without.

The research highlights growing concerns about the level of microplastics in the environment, which are increasingly being found in the human body.

The research "gives one pause," said Jason Richardson, a professor of physiology at the University of Georgia who was not involved in the research.

"They're at a much larger concentration in the body than many of us would have expected," he said.

Researchers think the growing amount of plastic humans are exposed to could be behind the increase but say the potential implications for human health remain unclear.

As plastic breaks down over time, it degrades into smaller and smaller bits – eventually small enough to slip inside the human body.

Most of the plastics the scientists found in brain, kidney and liver tissue were extremely small, less than 200 nanometers.

"That's roughly the size of two COVID viruses side by side," said Campen. A human hair is approximately 80,000 to 100,000 nanometers wide and a sheet of paper is about 100,000 nanometers thick by comparison.

Campen and colleagues at the University of New Mexico tested samples of liver, kidney, and brain tissues from people who had died and underwent autopsy in 2016 and in 2024. That included a total of 52 brain specimens, 28 from 2016 and 24 from 2024.

The particles were found in all of the samples.

There was not much difference between the amounts of plastic found in liver and kidney tissues between 2016 and 2024.

However, samples from 2016, all from the part of the brain involved in thoughts, emotions, judgment and memory, had substantially higher concentrations of plastic particles.

The quality of the research was extremely good, said Gary Miller a professor of environmental health at Columbia University, who was not involved in the research. These kinds of studies, especially on human brains, are difficult and require great care to ensure that there's been no contamination of the tissue, he said.

"This was a very well-conducted study with excellent technique that clearly demonstrate these things are in people's brains," he said. "It's very compelling evidence."

Given the difficulty of doing testing on living people's brains "it's not a bad sample size for an initial study," Richardson said.

How does plastic get into the brain?

The researchers do not know how microplastics get into the brain. In general, it's believed microplastic particles enter the body when people eat, drink, or breathe them in. Such

particles have been found in multiple parts of human bodies: arteries, hearts, lungs, blood, placentas, breast milk, penis and testicles, among others.

Finding the particles in higher concentrations in the brain was a surprise because of the blood-brain barrier, which protects the brain against infection.

"For those of us who work in the brain, showing that the highest levels (of microplastic) were measured in that organ is profound and a bit concerning," Richardson said.

The researchers think one reason there are higher levels of microplastic in the brain is because the liver and kidneys are built to filter toxins from the body, said Marcus Garcia, a doctor of pharmacy at the University of New Mexico and part of the team that did the research.

"We think the liver and kidney are doing their jobs," he said. "On the other hand, the brain has limited clearance systems," he said.

Another possibility is that brain tissue is about 60% fat, meaning the plastics might stick to it better.

"If you've ever cleaned a Tupperware bowl that had bacon grease or butter in it, you know it's hard to get fat off plastic," said Campen. "It's possible the nanoparticles are hijacking their way in through lipids."

Is the amount of plastic in the brain increasing over time?

Scientists who study the amount of plastic accumulating in the human body find that the amounts are increasing over time, mirroring the increase of plastic in our environment.

People in the 1920s, before the invention of plastic, would have had none, whereas people today live in an environment where plastic is ubiquitous.

The amount of plastic in the environment is doubling about every 10 to 15 years, Campen said.

The New Mexico researchers did find that the amount of plastic in the brains of people who were older when they died was not significantly different from younger people.

"This suggests that our bodies do clear these nanoparticles, we're not just accumulating them over our lifetimes," Campen said.

This means that lowering the amount of environmental plastic could eventually decrease the amount of plastic building up in our bodies, he said.

How dangerous are plastic particles in the brain?

At this point, it's not definitively known whether, or if, it is dangerous to have plastic microplastic particles in the brain. It would also be extremely difficult if not impossible to avoid them, Campen said.

"They really are everywhere," he said. He didn't think people should make dramatic changes in their diet or lifestyle "to avoid something that may not be avoidable."

His group is investigating the potential sources of microplastic in the environment, including the soil, plants and meats to hopefully get a sense of the amount in the food chain.

"Just the presence of the plastic doesn't necessarily indicate that they're causing negative effects," Richardson said. But there are concerns.

"I certainly don't feel comfortable with this much plastic in my brain, and I don't need to wait around 30 more years to find out what happens if the concentrations quadruple," he said in a statement.

Even if the plastic particles do not leach chemicals into the body, merely their presence could have an effect, Miller said.

Asbestos is a good example of something similar. It was long thought to be an inert compound that wasn't biologically reactive and couldn't cause any problems.

However, it became clear that having tiny pieces of asbestos in the lung can trigger an immune response.

"The lung's immune cells hate it and they try to clear it out," Miller said. "Then you get an inflammatory response."

The same could be true of micro- and nanoplastic particles.

"When you put a foreign object in the body, our immune system doesn't like it. It can set off an inflammatory cascade that goes on for years or decades – it's going to have consequences," Miller said.

Why would people with dementia have more plastic in their brains?

The researchers don't know why the 12 brains they tested from people who had dementia had more plastic than those that didn't and don't know if it's cause or effect. But they're leaning toward effect.

"Remember, dementia is a disease where the brain-blood barrier is impaired and the brain's clearance mechanism is impaired," Campen said.

In addition, as people age, and in people with dementia, the brain also loses volume.

"Is it the cause? Is it symptomatic? I don't know, but it's certainly worthy of future study," Miller said.

Children could be at highest risk from plastic in the brain

Because the brain is relatively protected by the blood-brain barrier, there is at least some defense by the body. However, two groups are at special risk, Richardson warned.

"In very young children, the blood-brain barrier is not fully developed," he said. And, as people age the processes that protect the brain are less agile.

That said, it's too soon to worry, he said.

"At this point, we don't have enough data to say this is something you should be seriously concerned about," he said. "It hasn't been established whether or not these (particles) can cause adverse effects."