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Strangely, for Teflon, health concerns start to get sticky

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PHILADELPHIA _ More than 65 years ago in a south New Jersey laboratory, a DuPont Co. chemist accidentally invented a waxy, white powder that would become one of the mainstays of the modern kitchen: Teflon.

Today, this nonstick marvel is getting attention far beyond the stovetop.

A chemical used to make it, perfluorooctanoic acid _ PFOA _ has been turning up in people and animals worldwide: river otters in Oregon, polar bears in the Canadian Arctic, and in the blood of 96 percent of children tested in 23 states.

Scientists are not sure how the chemical is getting into people _ not from using Teflon pans, they say and they don't know whether it poses any danger at current levels.

But the hardy substance does not break down in the environment. And it has been linked to liver and developmental problems in lab rats, prompting an unusually broad review by the U.S. Environmental Protection Agency.

"We need to get to the bottom of this," said Charles Auer, director of the agency's Office of Pollution Prevention and Toxics.

PFOA is just one of dozens of synthetic intruders found in the human body in recent years, thanks to increasingly sophisticated equipment that allows scientists to measure the slightest traces of chemicals.

But this one has drawn unusual scrutiny.

DuPont agreed this month to pay at least $108 million to settle a class-action suit brought by residents near a company plant in West Virginia, where PFOA has been found in the drinking water.

And in July, the EPA _ prompted partly by the research of a Washington-based nonprofit called Environmental Working Group _ accused DuPont of failing to disclose certain health-related information about PFOA from as early as 1981. A public hearing is pending, after which an administrative law judge can impose fines of more than $300 million.

Meanwhile, a growing number of scientists, among them a team at the University of Toronto, think the biggest source of PFOA is not Teflon manufacture, but a related family of chemicals called telomers.

Telomers, made by DuPont and a handful of other companies, are widely used to make grease- and stain-repellent coatings for take-out food boxes, carpets and clothing.

Burger King, for example, stopped selling food in telomer-coated boxes in 2002. McDonald's has said in the past it uses such boxes, but would not say whether it still does.

The various accusations have provoked consternation at DuPont, based in Wilmington, Del., whose executives describe it as a "science company" that cares about the environment.

The company says it has broken no laws and has sharply reduced emissions of PFOA. And studies on plant workers have shown PFOA to be safe, said Don Duncan, president of the Society of the Plastics Industry, an industry group.

"It's not as if we've got people dropping in the streets out there," he said.

In April 1938, Roy Plunkett was experimenting with refrigerants in a DuPont lab in Deepwater, N.J., when something strange happened.

His assistant opened a pressurized metal cylinder to release the gas stored inside, but nothing came out.

The cylinder was too heavy to be empty. Intrigued, they turned it upside down. A mysterious white powder fell out.

The gas molecules somehow had combined to form much longer polymer chains _ a new plastic that would turn out to be more slippery than ice.

Company scientists eventually developed a way to repeat the accident in mass quantities, with a process using another chemical, PFOA. Eventually, Teflon and related substances were used to make pots and pans, medical equipment, airplane parts, and automobile fuel lines.

Then, in 1968, 30 years after Plunkett's discovery, a University of Rochester scientist noticed something odd.

Don Taves, a toxicologist, was testing human blood to see how much fluorine was in it as a result of fluoridated water, which prevents cavities.

The numbers were 10 times what he expected, recalled Taves, now 78. After further research, he became convinced that synthetic perfluorochemicals were at fault.

But Taves said he was not concerned about any health effects, and the findings attracted little attention until 1997.

That year, 3M Co., the Minnesota chemical-maker that made PFOA and sold it to DuPont, was measuring its workers' blood for a related chemical that was produced during the manufacture of Scotchgard.

Company scientists obtained samples from nonworkers as a baseline to compare the workers' blood. To their surprise, the chemical was present in nonworkers, too.

In 2000, the company said it would voluntarily stop making the chemical, perfluorooctane sulfonate, and find a new way to make Scotchgard. At the same time, 3M said it would stop making a related chemical that scientists had been finding in the environment: PFOA.

Faced with the loss of its key supplier, DuPont decided to start making PFOA itself.

Today, the DuPont plant in Fayetteville, N.C., is the nation's lone manufacturer of PFOA.

Sitting in a freezer in a University of Pennsylvania laboratory, hundreds of vials of blood may hold part of the answer to the big question: Is PFOA a risk to human health?

A team led by Edward A. Emmett, a professor of occupational and environmental medicine, is collecting the blood samples from people who live near the DuPont plant in Parkersburg, W.Va.

With a government grant, the team will analyze the samples to see whether there is a connection between PFOA and hormone levels and liver function.

Though various industry studies have found no health effects from PFOA, Emmett said some of the studies were small or not well-designed.

"We're at a pretty rudimentary stage in our knowledge," he said.

And past studies on lab animals have drawn an incomplete picture, in part because their bodies do not handle the

chemical in the same way.

For example, the half-life of PFOA in humans is believed to be about four years, meaning it takes that long for people to flush half of the chemical out of their systems. Rats get rid of the chemical in a matter of days, leaving the interspecies comparisons open to a wide range of educated guesswork.

In a preliminary assessment last year of risks to human development, the EPA found the chemical levels linked to problems in rats to be anywhere from less than 70 to more than 9,000 times the levels found in women and children.

For some subtle health effects, including a weaker immune system and low organ weights, scientists have found no dose of the chemical that is totally safe in rats.

Rather than wait for more studies, critics advocate a precautionary approach: Stop making the suspect chemicals.

"We're already to the point where it is in people and getting near the point where there's significant risk," said Tim Kropp, a toxicologist at Environmental Working Group.

Meanwhile, industry, university and government scientists are hard at work trying to solve the other mystery: How do PFOA and other perfluorochemicals get into people to begin with?

Could it be from the water? The air? Dust from vacuuming stain-resistant carpets? Suddenly, it's a hot research topic.

In the last three years, journals publishing papers on perfluorochemicals have grown tenfold, to nearly 50, according to the journal Environmental Science & Technology.

"Scientists are way behind," said Keri Hornbuckle, a University of Iowa engineering professor. "We're scurrying to figure out all the chemical pathways that these chemicals go through."

One possibility: When people wash their stain- or water-resistant clothes, the chemical coatings may go down the drain and into the environment.

Another theory is that some residues escape into the air, where they break down into PFOA or similar substances _ some of them thought to pose even greater risk.

In a study awaiting publication, DuPont scientists say they find no risk associated with the everyday use of coated clothing, carpets and cookware, among other products. PFOA is not present in these final products except sometimes in trace amounts.

"We can say unequivocally that those articles are safe," said Robert C. Buck, a Ph.D. chemist and senior research scientist for the company.

And the FDA, which has approved 30 perfluorochemicals for food packaging and processing since 1958, says there is no sign of a direct risk from food.

But exposure from package disposal or deterioration must still be ruled out, said George Pauli, a senior official at the FDA's Office of Food Additive Safety.

In short, things have gotten much more complicated since the birth of Teflon in 1938.

The perfluorochemicals are heralded for their durability and nonstick qualities, but some of them may be sticking around too long.
