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The Mercury Connection

We know mercury taints fish. What about people?

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Kristie Williamson kisses her one year -old daughter Rose Ashley Williamson's hand at their home in Anyor, SC. Williamson who would like to have more children is concerned about her level of mercury.

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How the tests were conducted

Our goal was to identify rivers and lakes in South Carolina where freshwater fish have high levels of mercury, then test people who eat fish from these places. We did not focus on the question of mercury in seafood, which has been more widely studied.

To identify mercury hot spots, the newspaper used data from more than 4,783 fish samples collected by the state Department of Health and Environmental Control at 148 locations. From that, the newspaper identified which fishing holes have fish with the highest average levels of mercury.

Two general areas stood out: One on the Edisto River near Givhans Ferry State Park, the second near the Little Pee Dee and Lynches rivers west of Conway. The newspaper then sought people who ate fish from these hot spots, visiting fishing holes and nearby bait shops, boat ramps and homes.

Reporters cut hair from participants and sent the samples to the Environmental Quality Institute at the University of North Carolina-Asheville, which has a certified lab and has done more than 12,000 tests for private and government research efforts, including an ongoing study for Greenpeace and the Sierra Club.

Toxicologists consider hair samples to be one of the best ways to measure long-term mercury exposure, because the metal builds up in hair over time. The tests cost $25 apiece, and the newspaper paid for each test. Participants weren't paid but were given the results of the tests and explanations of what the results likely meant.

The Environmental Quality Institute analyzed the samples using a method known as cold vapor atomic absorption spectrophotometry, a scientifically accepted technique that can detect mercury levels in hair as low as 0.1 part per million.

For a list of the test results and spreadsheets of the DHEC data we analyzed and other special features, please visit www.Charleston.net.

What fish to avoid

Most major rivers and lakes in the Lowcountry have fish contaminated with mercury. Some waterways, such as the Edisto, Lynches and Little Pee Dee rivers, are worse than others. Some saltwater fish also contain high levels of mercury. Deciding which fish are safe to eat takes research. For more information, visit www.scdhec.net/mercury.

As a general guide, here are some freshwater fish that DHEC warns about the most:

Catfish, especially on the Little and Great Pee Dee rivers, Four Hole Swamp, Edisto and Black rivers.

Largemouth bass, especially on the Black, Combahee, Edisto, Little Pee Dee, Great Pee Dee, Coosawhatchie rivers, Four Hole Swamp.

Bowfin (Mudfish), especially on South Santee, Edisto, LittlePee Dee, Great Pee Dee, Coosawatchie rivers, Four Hole Swamp

Chain Pickerel, especially on Little Pee Dee, Great Pee Dee, Lumbee, Edisto rivers, Four Hole Swamp

Warmouth, especially Four Hole Swamp, Edisto River.

Some people who eat fish from South Carolina's rivers and lakes have potentially dangerous levels of mercury, new lab tests for The Post and Courier show.

Health officials have warned for years that many of the state's lakes and rivers are tainted with mercury and cautioned people not to eat certain fish. But the state never checked to see if people were being poisoned, too.

The newspaper's tests found that a few frequent fish-eaters had levels so high they rank among the most mercury-tainted people in the nation.

Mercury is a potent neurotoxin that's linked to birth defects, nerve disorders, heart failure and many other health problems. Mercury levels have risen worldwide since the Industrial Revolution, building up in the tissues of ocean and freshwater fish.

Though mercury taints fish all over the globe, the situation is especially severe in South Carolina, which according to some studies has one of the worst mercury hotspot problems in the nation.

Because mercury levels are so high here, the state Department of Health and Environmental Control tests about 1,800 fish a year. Based on these tests, DHEC issued warnings about contaminated fish in 1,747 miles of rivers, mostly in the coastal plain.

Despite the fish tests and warnings, neither DHEC nor any other state agency has tried in recent years to answer a simple question: Is mercury from these fish getting into people?

The newspaper's mercury tests are the only known effort to measure the toxin in South Carolinians who eat fish from contaminated rivers. The results raise questions about whether state and federal officials are doing enough to reduce mercury pollution and find out its impact on people. The tests were part of a six-month investigation into mercury and its effects in South Carolina. A series beginning today will show:

--Of 41 people tested for The Post and Courier, 17 who eat freshwater fish

from South Carolina rivers had hair samples with mercury levels higher than what the U.S. Environmental Protection Agency considers safe. Twenty-four had samples higher than what's typically found nationally in people who frequently eat fish.

--Six who were tested had mercury levels that would put them in the top 1 percent of those measured in a recent nationwide study. Leading mercury scientists and doctors contacted by the newspaper urged those with the highest levels to consider medical attention.

--State health officials have done little to document this toxin in people, especially those in poverty-stricken rural areas who depend on fish as a main source of food. Three years ago, DHEC acquired a $250,000 scanner capable of measuring mercury in human blood. This year, it acquired another scanner. So far, the agency has tested only one member of the public, a doctor from Hilton Head.

--Some of the state's worst mercury hot spots are in the Lowcountry near industrial polluters. Between Conway and Florence, hot spots form a "Mercury Triangle" where fish are so full of mercury that the state warns against eating a single bite of some species. Highly contaminated fish also are in hot spots on the outskirts of the Charleston metro area in the Edisto River, Four Holes Swamp and the Black River.

--Mercury contamination is a well-documented global problem in ocean fish, especially in large predator fish, such as swordfish and shark. But many freshwater fish caught from South Carolina's mercury hot spots have levels two to five times higher than swordfish off the coast, DHEC data shows. In fact, average mercury levels are so high in fish from some South Carolina rivers that the U.S. Food and Drug Administration could order a national recall if they were sold in stores.

--The mercury contamination discussion has grown more heated since Santee Cooper unveiled a plan to build a new coal-fired power plant in the "Mercury Triangle" on the Great Pee Dee River. If DHEC and the Army Corps of Engineers approve Santee Cooper's permits, the utility would get a green light to release 138 pounds of mercury a year into the air.

The story of mercury contamination in South Carolina is a tale with complex debates and high stakes — especially for people like Robin Creel.

Testing hair for mercury

Robin Creel, 47, is an Edisto Indian who lives on a shady bluff not far from a boat landing on the Edisto River. He has gray eyes and a quick smile. He's eaten fish all his life from these waters, as have his relatives, many of whom live near the river and nearby Four Holes Swamp. The river always has been an important source of food and fun. But lately Creel hasn't been able to fish because of pains in his feet and legs. Sometimes, he has terrible headaches and can't concentrate.

Creel agreed to have his hair tested for the newspaper's effort to better understand whether mercury is building up in the tissues of people who eat fish from mercury hot spots.

Mercury always has had an air of mystery about it. It's the only metal that flows like liquid at room temperature, hence its nickname, quicksilver. Alchemists once believed it was the source of gold. It's also deadly.

A single drop of one form of mercury can be fatal. Hatmakers used mercury in the 1700s and 1800s and developed dementia, tremors and other health problems, inspiring the phrase "mad as a hatter." Mercury has been used in everything from switches in cars to dental fillings, and its silvery shimmer has enticed more than a few children to break open thermometers and play with the quivering blobs.

Mercury is a naturally occurring element and it's usually found in ore. Volcanoes sometimes unlock mercury from this rock during eruptions, spreading it in vast vapor clouds. But mercury pollution today mainly comes from the smokestacks of coal-fired power plants, steel mills, factories, incinerators and gold mining operations. On average, three times more mercury is falling from the sky now than 200 years ago, the world's leading mercury scientists concluded in a report this year.

When mercury in the air falls to the ground, it begins its trek up the food chain. Bacteria transform mercury into methylmercury, a potent form that's more easily eaten and absorbed by fish.

Blackwater swamps and rivers, such as those around Creel's home on the Edisto River, are especially vulnerable. These ecosystems more efficiently convert mercury into methylmercury than others. Because of its blackwater swamps and mercury-emitting industrial complexes, South Carolina has one of the top 5 mercury hot-spot problems in America, according to a study three years ago by Environmental Defense, a conservation group that used EPA data compile its report.

Since 1975, DHEC scientists have been traveling to the Edisto River near Creel's home and other fishing spots around the state, sticking electrodes in the waters and scooping out stunned fish. Lab technicians then put these fish in the scientific equivalent of a blender, sometimes jokingly referred to as a Bass-o-matic. These finely ground tissues are then sent to DHEC's lab for analysis. Based on the results, DHEC issues advisories warning people not to eat certain fish on various rivers, or to eat only so many per week or month.

Finding hot spots

To identify the state's most contaminated fishing holes, The Post and Courier analyzed the results of more than 4,783 fish caught at 148 places across the state.

Two areas stood out: A triangle-shaped section along the Little Pee Dee and Lynches rivers near Conway and, closer to Charleston, in the Edisto River and Four Holes Swamp, where Creel catches most of his fish. Fish in both areas on average had mercury levels higher than the Food and Drug Administration's safety benchmark of 1 part per million. Some of Creel's favorites, largemouth bass and catfish, had mercury levels two to three times higher than the FDA's limit.

The newspaper collected samples of hair from Creel and others who eat fish from these two hot spots and sent them to the Environmental Quality Institute, a lab at the University of North Carolina-Asheville. The lab has analyzed more than 6,000 hair samples for an ongoing national study.

According to the Environmental Quality Institute's study, people typically have mercury levels in hair between 0.06 parts per million for those who eat no fish and 0.47 parts per million for those who eat at least four servings per month. The Environmental Protection Agency says that mercury levels greater than 1 part per million in hair are cause for concern.

Creel's hair had 8 parts per million.

Not only is Creel's reading eight times the EPA benchmark, it's 17 times higher than typical levels of frequent fish-eaters in the Environmental Quality Institute's study. In

fact, Creel's 8 part-per-million result would put him in the top 1 percent of those tested in that study.

Creel said that he eats fish nearly every day, "every chance I get," and that he never gave much thought about DHEC's warnings or whether mercury was building up inside his body.

Now, he wonders if it's behind the health problems he's had over the years: problems with his nerves, headaches, skin problems on his feet and arms that doctors have had difficulty diagnosing. He's scaling back on his diet of fish, and he shakes his head in frustration. "Everybody's going to have to stop fishing in a few years."

Wide range of results

In addition to Creel, the newspaper found 16 others with mercury levels higher than the EPA's benchmark of 1 part per million, including:

--Corbin Roberts, a 19-month-old child from Marion County who ate about two servings of fish per month and had a hair sample of 2.9 parts per million. Corbin's father says his son hasn't shown any symptoms of mercury poisoning, but he's not giving him any fish anytime soon.

--Marion Mitcham, a 57-year-old man who eats as much fish from the Edisto as he can catch. His sample measured 4.9 parts per million, while his wife, Billie, who rarely eats fish, had 0.8 parts per million, six times lower than her husband's sample.

--Perry White, a firefighter from Horry County who ate fish six times a month. His hair sample contained 6.5 parts per million of mercury. He worries that mercury could cause concentration problems and affect his ability to fight fires.

--Wilbur Fipps, an 81-year-old man who regularly fished in the Little Pee Dee River and had 8.5 parts per million in his hair, the highest in the newspaper's study.

And then there were the Williamsons, a family of four that lives near the Little Pee Dee/Lynches hot spot.

Perry and Kristie Williamson have been eating fish for the 12 years they've been married, thinking it was a healthy alternative to store-bought processed food. They love fishing so much they named their son River and daughter Rose Ashley.

All four had mercury levels higher than the EPA's benchmark. Perry, 54, had a sample containing 3.6 parts per million, the highest in the family. Kristie, 34, had 1.7 parts per million. She said she wants another baby but she's afraid to get pregnant now. River, age 11, had 1.5 parts per million, but Kristie is especially concerned about her daughter, who's just 16 months old and had 1.1 parts per million in her sample. Kristie said she's dropped fish from the family's diet.

"I would like to see if the mercury gets out of my system," she said, adding that she's spent hours online researching the mercury issue. "There's just not enough knowledge out there about it."

Some had low levels

In addition to the 17 people who had more than 1 part per million, the newspaper's tests showed seven others with readings higher than 0.47 parts per million, the typical level for people in the general population who often eat fish.

But 17 other frequent fish-eaters had mercury levels below 0.47 parts per million, including seven children and teens.

One teen who eats fish nearly every day from the Edisto had barely detectable levels of mercury.

These low readings in teens mirror results in national studies and reflect the complexity of the mercury issue.

Scientists still aren't sure why some older people tend to have higher levels, or why one person might have higher levels than another, even when both eat significant amounts of fish. Some researchers have found that mercury levels can be affected by diet, smoking, age and other factors.

Experts also can't say for sure at what level a person is being harmed.

"There are still many things we don't know about how mercury affects things at a cellular level," said Kate Mahaffey, the Environmental Protection Agency's top mercury expert and co-author of several ground-breaking mercury studies.

'Diversify their diets'

Nevertheless, Mahaffey and other mercury experts said that high levels of mercury warrant serious attention.

Mahaffey said it's unusual to find people with mercury samples greater than 5 parts per million. "I can't say they're without effects, but I would encourage them to diversify their diets."

Steve Patch, director of the Environmental Quality Institute, said some people in the newspaper's test group had among the highest readings the lab had seen. He said that even at or around the government's 1 part-per-million level, "It's quite possible that there are noticeable neurological deficiencies," mainly concentration problems.

Asked what he would do if his children had samples measuring 2.9 parts per million, the same as one child in the newspaper's tests, Patch said he would take them to the doctor and "make sure no mercury is in their diets."

When told of the 81-year-old with the 8.5 parts-per-million sample, Patch said, "Gosh! That's really scary. It's late, but he should try to cut back on that."

Jane Hightower, a San Francisco doctor who treats patients with mercury-related problems, said it's important to keep hair levels less than one part per million, especially in the young. Even at that reading, she said, "It can have an effect on a baby's brain … but it is so variable. We know it can stop cells from dividing in the brain, and it does so at low levels."

She said people with levels exceeding 6 parts per million, such as those in Horry County firefighter Perry White, should seek medical attention because of the potential for heart problems and other issues. She's found that some of her patients have been in what she calls a "fish fog," and that these symptoms cleared up when they quit eating fish.

Are warnings enough?

The human body can rid itself of mercury over time, and so apparently can fish and other wildlife. A study by Canadian and American researchers published in September found that mercury levels in fish decline in a few years after the sources of mercury are removed. The study raised hopes that efforts to curb mercury emissions could yield relatively quick results.

In recent years, however, the federal government has slowed efforts to reduce mercury emissions on a national level. Statewide, government regulators are wrestling with applications by Santee Cooper to build a $1 billion coal-fired power plant — a new source of mercury pollution. Meanwhile, China and other Asian countries are building hundreds of new coal-fired power plants that create a cloud of emissions that drift around the world.

For people like Robin Creel, the Williamson family and others with high levels of mercury in their bodies, the government's warnings about eating fish provide small comfort. Instead of warning people, he and others who were tested said, why don't we fix the problem?

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