

Podcast: Arsenic in Rice and Other Foods

Anne Johnson: [music] Welcome to Environmental Health Chat, a podcast about how the environment affects our health, from the National Institute of Environmental Health Sciences. I'm your host Anne Johnson.

A lot of the environmental exposures we talk about on this podcast relate to problems human beings have created. Our focus today is on something that's all natural, yet it still poses a significant threat to public health worldwide.

Arsenic is one of Earth's natural elements, and it's found in rocks and soils around the globe. For centuries, people have used arsenic as a poison, and it was a favored murder weapon in the middle ages and renaissance. Today it's perhaps best known as one of the top contaminants of drinking water, affecting an estimated 13 million people in the United States and more than a hundred million people in the rest of the world. People can be exposed to it not only in the water we drink but also in the food we eat.

Today's guest is Dr. Mary Lou Guerinot. She's a biology professor at Dartmouth College and she studies arsenic in one of the most common foods eaten around the world: rice. To find out why rice contains arsenic, we have to start with a little chemistry lesson.

Guerinot: Arsenic is found in two different forms in the soil: one that we call arsenite and one that's called arsenate. Arsenite looks a lot like silicon and so it can be taken up by plants via the same route that it would normally take up silicon. Then arsenate looks like phosphate and phosphate is a nutrient that's required by plants, and so plants will take up arsenate if it's present thinking that it's phosphate.

Johnson: And it turns out that among plants, rice has a particularly strong tendency to take up arsenic.

Guerinot: Rice takes up 10 times as much as other types of plants. So, it's good at taking up silicon and that makes it good at taking up arsenite, because it can't tell the difference between the two.

Johnson: Arsenic is most concentrated in the outer brown husk of the rice grain. That means brown rice contains more arsenic than white rice. Arsenic has also found its way into other foods that are derived from rice, especially those containing something called brown rice syrup.

Guerinot: Brown rice syrup is made from the outer brown bran layer of rice. The food industry has started to replace high fructose corn syrup in products with organic brown rice syrup, but because the arsenic is preferentially accumulated in the outer layers, then when you take that rice bran and use it to make this brown rice syrup, which you then put in things like infant formula and high-energy power bars, you're inadvertently adding arsenic to those products.

Johnson: Chronic exposure to arsenic is associated with several types of cancer, as well as neurological and cardiovascular diseases. Scientists have documented an association between eating rice products and having higher levels of arsenic in the urine. But so far, researchers have had a hard time pinning down exactly what that might mean for people's health.

Guerinot: It's pretty clear now that everyone agrees, yes, there are levels of arsenic in these foods that contain rice products. The question is how much is too much and is the fact that it's there a danger or not because we don't really have any studies that address those issues.

Johnson: While we're still getting a grasp on the actual health risks, Mary Lou is focusing on what can be done to reduce the levels of arsenic in rice.

Guerinot: We're trying to understand the genes involved, the proteins, how the plant takes up arsenic where it puts it, and then we're going to try to find varieties that don't take up as much arsenic or don't put it into the grain. So that's been one approach. And then, of course, as we identify the genes, we could potentially use genetic engineering to, say, modify the transporter so it could tell the difference between arsenic and silicon—that is possible to do in the laboratory—so that we could end up with varieties that would not accumulate arsenic.

Johnson: While that quest is ongoing, there are other things farmers can do to avoid growing rice where arsenic levels are high. At the beginning of this podcast, I said arsenic occurs naturally. That's true, but humans have influenced where arsenic is most concentrated by putting it into products like pesticides.

Guerinot: I think all of the arsenic-based pesticides have been taken off the market in the United States, but they used to use arsenical pesticides. That arsenic, of course, is an element, and it doesn't just disappear, I mean, it just stays around. Other sources of arsenic that I guess are still in use, it's used as a wood preservative, and it does turn up in paints and dyes and some soaps.

Johnson: Knowing about all these sources of arsenic can help farmers think strategically about where it's best to grow—or avoid growing—crops that take up arsenic. Rice farmers are also being encouraged to refrain from flooding rice fields with water as is traditionally done, because rice grown in water absorbs arsenic more readily.

As scientists continue to pursue rice strains and farming practices that reduce the arsenic problem, there are things you can do to limit your exposure. Mary Lou said white rice, basmati rice, and rice grown in California all tend to have lower levels of arsenic than other types of rice. There's also evidence that rinsing rice and then cooking it in a high volume of water can reduce the amount of arsenic in the cooked rice. Other foods that have been linked with arsenic include apple juice, Brussels sprouts, dark meat fish, alcohol, and of course, products containing brown rice syrup. Researchers suggest seeing these foods as things to eat occasionally—not all the time, but not cutting them out of your diet entirely.

You can find more resources about arsenic and what you can do to reduce your exposure at our website. Thanks to Dr. Mary Lou Guerinot for joining us today.

You've been listening to Environmental Health Chat. I'm your host Anne Johnson, and our podcast is brought to you by the Partnerships for Environmental Public Health, a program of the National Institute of Environmental Health Sciences. Find us online at niehs.nih.gov/podcasts. [music]

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