

New testing method hints at garlic's cancer-fighting potential

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Researchers have designed a urine test that can simultaneously measure the extent of a potential carcinogenic process and a marker of garlic consumption in humans.

In a small pilot study, the test suggested that the more garlic people consumed, the lower the levels of the potential carcinogenic process were.

The research is all about body processes associated with nitrogen-containing compounds, scientists say. These processes include nitrosation, or the conversion of some substances found in foods or contaminated water into carcinogens.

"What we were after was developing a method where we could measure in urine two different compounds, one related to the risk for cancer, and the other, which indicates the extent of consumption of garlic," said Earl Harrison, Dean's Distinguished Professor of Human Nutrition at Ohio State, an investigator in Ohio State University's Comprehensive Cancer Center, and senior author of the study.

"Our results showed that those were inversely related to one another - meaning that the more we had the marker for garlic consumption, the less there was of the marker for the risk of cancer."

Ultimately, the scientists hope to find that a nutritional intervention could be a way to stop the process that develops these carcinogens. This

process is most commonly initiated by exposure to substances called nitrates from certain processed meats or high-heat food preparation practices, or to water contaminated by industry or agricultural runoff.

About 20 percent of nitrates that are consumed convert to nitrites. A cascade of events can convert these compounds into what are called nitrosamines, and many, but not all, nitrosamines are linked to cancer.

Vegetables also contain nitrates, but previous research has suggested that the [vitamin C](#) in vegetables lowers the risk that those nitrates will convert to something toxic. Researchers suspected that nutrients in garlic could have similar antioxidant effects as vitamin C.

The study is published in a recent issue of the journal *Analytical Biochemistry*.

The research began with the small human study based at Penn State University. Researchers there fed participants a weeklong diet lacking any nitrates or garlic. They then gave the participants a dose of sodium nitrate - in a formulation that would not become toxic, but which would show a marker in the urine of the potentially toxic process.

Groups were then treated with capsules containing varying levels of garlic: 1, 3 or 5 grams of fresh garlic, or 3 grams of an aged garlic extract. A separate group received 500 milligrams of ascorbic acid, or vitamin C. Both the nitrate formula and treatments were given for seven days. Urine samples were collected from all of the participants every other day for seven days.

That research team then turned to Harrison and colleagues, who explored the methods required to precisely quantify biomarkers in urine for both the garlic consumption and the presence of nitrosoproline, the indicator that nitrosation has occurred.

Harrison's group developed the [urine test](#) using a method called gas chromatography-mass spectrometry.

Gas chromatography separates components of a mixture to detect specific substances, and has been used previously to quantify nitrosoproline. The addition of mass spectrometry to the analysis allowed for determination of the chemical structures of molecules in the sample - in this case, the presence of a specific compound that is released in urine after garlic is eaten.

When the test was used on the urine samples from the pilot garlic study, it showed that the participants who had taken garlic had lower concentrations of the marker for nitrosation than did those who took no garlic. Though the differences were slight, the consumption of 5 grams of garlic per day was associated with the lowest level of the marker for potential carcinogens. A single garlic clove typically can weigh between 1 and 5 grams.

Vitamin C had a similar effect in lowering the marker for nitrosation.

Harrison, also an investigator in the Center for Advanced Functional Foods Research and Entrepreneurship at the Ohio Agricultural Research and Development Center, noted that previous research has suggested that garlic and other plants with sulfur-containing compounds offer a variety of potential health benefits. Many questions remain about exactly what those benefits are and precisely how garlic works as a nutritional intervention.

"The precise mechanism by which garlic and other compounds affect nitrosation is under extensive investigation, but is not clear at this time," he said.

"What this research does suggest, however, is that garlic may play some

role in inhibiting formation of these nitrogen-based toxic substances. This was very small pilot study, so it's also possible that the more garlic you have, the better it would be.

"So if you like [garlic](#) and you like garlic-containing foods, go out and have as much as you want. There's no indication it's going to hurt you, and it may well help you."

Provided by The Ohio State University

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