

Unique tomatoes tops in disease-fighting antioxidants

February 27 2007

Deep red tomatoes get their rich color from lycopene, a disease-fighting antioxidant. A new study, however, suggests that a special variety of orange-colored tomatoes provide a different form of lycopene, one that our bodies may more readily use.

Researchers found that eating spaghetti covered in sauce made from these orange tomatoes, called Tangerine tomatoes, caused a noticeable boost in this form of lycopene in participants' blood.

"While red tomatoes contain far more lycopene than orange tomatoes, most of it is in a form that the body doesn't absorb well," said Steven Schwartz, the study's lead author and a professor of food science and technology at Ohio State University.

"The people in the study actually consumed less lycopene when they ate sauce made from the orange tomatoes, but they absorbed far more lycopene than they would have if it had come from red tomatoes," he said. "That's what is so dramatic about it."

The tomatoes used for this work were developed specifically for the study – these particular varieties aren't readily available in grocery stores. The researchers suggest that interested consumers seek out orange- and gold-colored heirloom tomatoes as an alternative to Tangerine tomatoes, but caution that they haven't tested how much or what kind of lycopene these varieties contain.

Lycopene belongs to a family of antioxidants called the carotenoids, which give certain fruits and vegetables their distinctive colors. Carotenoids are thought to have a number of health benefits, such as reducing the risk of developing cancer, cardiovascular disease and macular degeneration.

"The tomato is a wonderful biosynthetic factory for carotenoids, and scientists are working on ways to enhance the fruit's antioxidant content and composition," Schwartz continued.

The findings appear in a recent issue of the Journal of Agricultural and Food Chemistry.

Lycopene is a carotenoid that contains a variety of related compounds called isomers. Isomers share the same chemical formula, yet differ in chemical structure. In the case of tomatoes, the different lycopene isomers play a part in determining the color of the fruit.

Several years ago, Schwartz and his colleagues discovered the abundance of several of these isomers, called cis- lycopenes, in human blood. But most of the tomatoes and tomato-based products we currently consume are rich in all-trans-lycopene.

"We don't know why our bodies seem to transform lycopene into cis-isomers, or if some isomers are more beneficial than others," Schwartz said.

The researchers don't know if tomatoes rich in cis-lycopene would provide greater health benefits to humans, but the study's results suggest that tomatoes can be used to increase both the intake and absorption of the health-beneficial compounds.

The researchers made spaghetti sauce from two tomato varieties –

tangerine tomatoes, which get their name from their orange skin and are high in cis-lycopene, and a tomato variety chosen for its rich beta carotene content.

The tomatoes were grown at an Ohio State-affiliated agricultural research station in northwestern Ohio. Following harvest, both tomato varieties were immediately processed into canned tomato juice and concentrated. Italian seasoning was added for taste.

The 12 adults participating in the study ate two spaghetti test meals – one included sauce made from tangerine tomatoes, while the other featured sauce made from the tomatoes high in beta carotene. The participants were asked to avoid tomato and beta carotene-rich foods for 13 days before eating each test meal.

Researchers drew blood right before each participant ate and again every hour or two up to 10 hours after the meal. They analyzed the blood samples for lycopene and beta carotene content.

Lycopene absorption from the tangerine tomatoes was 2.5 times higher than that absorbed from the beta carotene-rich tomatoes and, Schwartz said, from typical red tomato varieties. Cis-lycopene levels spiked around five hours after eating the tangerine tomato sauce, and at this point during absorption the levels were some 200 times greater than those of trans-lycopene, which were nearly non-existent. While cis-lycopene is by far the most abundant isomer in these tomatoes, they do contain trace amounts of trans-lycopene.

The participants' bodies also readily absorbed beta carotene from the beta carotene-rich tomatoes.

"Right now, only carrots and sweet potatoes are a more readily available, richer source of beta carotene," Schwartz said. "And this carotenoid is a

major source of vitamin A for a large proportion of the world's population. Its deficiency is a serious health problem in many developing countries.

"Our study showed that a tomato can also increase beta carotene levels in the blood," Schwartz said. While these special tomatoes were grown just for this study, the researchers have pre-commercial lines of both varieties available.

He conducted the study with Ohio State colleagues David Francis, an associate professor of horticulture and crop science; Steven Clinton, an associate professor of hematology and oncology and human nutrition; Nuray Unlu, a former postdoctoral researcher in food science; and Torsten Bohn, a former postdoctoral fellow in food science at Ohio State.

Source: Ohio State University

Citation: Unique tomatoes tops in disease-fighting antioxidants (2007, February 27) retrieved 9 April 2024 from <https://medicalxpress.com/news/2007-02-unique-tomatoes-tops-disease-fighting-antioxidants.html>

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