Scientists develop tool to trace metabolism of cancer-fighting tomato compounds

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The University of Illinois scientists who linked eating tomatoes with a reduced risk of prostate cancer have developed a tool that will help them trace the metabolism of tomato carotenoids in the human body. And they've secured funding from the National Institutes of Health to do it.

"Scientists believe that carotenoids—the pigments that give the red, yellow, and orange colors to some fruits and vegetables -- provide the cancer-preventive benefits in tomatoes, but we don't know exactly how it happens," said John W. Erdman, a U of I professor of human nutrition.

The researchers will use isotopic labeling of three tomato carotenoids with heavier carbon atoms than are commonly seen in nature, which will allow tracking of the tomato components' absorption and metabolism in the body, he said.

"We have two questions we'd like to answer. First, are the carotenoids themselves bioactive, or are their metabolic or oxidative products responsible for their benefits? Second, is lycopene alone responsible for the tomato's benefits, or are other carotenoids also important?" he said.

Previous Erdman animal studies have shown that whole tomato powder, which contains all of the fruit's nutritional components, is more effective against prostate cancer than lycopene alone.

"Lycopene, which gives the fruit its red color, has received a lot of attention—it's even advertised as an ingredient in multivitamin

supplements, but two little-known colorless carotenoids, phytoene and phytofluene, probably also have benefits," said Nancy Engelmann, a doctoral student in Erdman's laboratory who helped to develop the new method.

Engelmann learned to optimize the amount of carotenoids in tomato cell cultures by treating already high-achieving tomato varieties with two plant enzyme blockers. The best performers were then chosen for culturing and carbon-13 labeling, she said.

The scientists grew tomato cells with non-radioactive carbon-13 sugars, yielding carbon molecules that are heavier than the 12-carbon molecules that exist elsewhere, Erdman said.

"These heavy carbon molecules are then incorporated into the carotenoids in the tomato cell cultures. The result is that researchers will be able to track the activity of lycopene, phytoene, and phytofluene and their metabolites," he said.

Thanks to NIH funding, U of I researchers and colleagues at The Ohio State University are preparing to use this new tool to study carotenoid metabolism in humans.

"It's exciting that we now have the means to pull off this human study. It's work that should move us forward in the fight against prostate cancer," he said.

More information: The research was published in the September 2010 issue of the *Journal of Agricultural and Food Chemistry*.

Provided by University of Illinois at Urbana-Champaign