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Ohio State Agriculture, Medical Researchers Test Berries as Cancer-fighters

COLUMBUS, Ohio - If you have any doubts that "five a day" are good for you, here's some fruit for thought: berries could save your life.

Multimedia

[Phruit22.jpg \(893 Kb\)](#)

An interdisciplinary team of Ohio State University food, agricultural, and medical researchers are studying berries to determine if they can stop or slow some of the biological processes that contribute to the development or spread of certain types of cancer. The second-leading cause of death in the United States, cancer is responsible for one in every four deaths in the country, according to the American Cancer Society's 2005 Cancer Facts and Figures report.

This "crop-to-clinic" research project - which has brought together experts from the College of Food, Agricultural, and Environmental Sciences, the College of Medicine and Public Health, the College of Pharmacy, and the College of Dentistry - is looking at the nutraceutical, or disease prevention, value of different berries in fighting oral, esophageal and colon cancers. Several human trials are already underway.

"It's a food-based approach to treating cancer," said Gary Stoner, director of the Cancer Chemoprevention Program in Ohio State's Comprehensive Cancer Center and leader of the team. Stoner has been researching the anticancer properties of berries, particularly black raspberries, for years.

In laboratory studies, Stoner and his colleagues found that the berries inhibited the development of oral, esophageal and colon cancers in rodents that ate enough of the fruit - rats fed diets mixed with 10 percent freeze-dried black raspberries had 80 percent fewer malignant colon tumors compared to rats who ate no berries. The berries were freeze-dried to remove water (berries contain up to 90 percent water), which concentrated the active components by as much as tenfold. The result was a berry powder that was fed to the animals. "Berries prevent carcinogens from being converted into forms that cause DNA damage," Stoner said. "They also slow down the growth of pre-malignant cells."

So what's in berries that make them such promising cancer-fighters?

These tiny fruits contain a number of compounds that have been shown to have anti-carcinogenic properties, said Joe Scheerens, an associate professor with the Department of Horticulture and Crop Science based on the Ohio Agricultural Research and Development Center's (OARDC) Wooster campus. Compounds include vitamins A, C, E and folic acid; selenium; calcium; polyphenols such as ellagic, ferulic and coumaric acids; quercetin; anthocyanins (which give berries their color); and phytosterols such as beta-sitosterol.

Scheerens and a group of researchers led by Steve Schwartz, professor and holder of the Carl E. Haas endowed chair in the Department of Food Science and Technology in Columbus, are unraveling the complex chemistry of berries to find out which compound, or combination of compounds, is responsible for protecting cells against becoming cancerous or stopping their growth once they are cancerous. Researchers from Ohio State's Mansfield campus, University of Akron, Lorain County Community College and South Dakota State University are also involved in this project.

"We are currently using state-of-the-art analytical techniques such as coupled liquid chromatography tandem mass spectrometry to help us measure the components present in berries that are absorbed into cells and tissues," Schwartz said. "Once we identify the compounds and their metabolites, we can better understand the molecular mechanisms responsible for the biological activity of berries to inhibit growth of cancer cells."

Berries being researched include black and red raspberries, blackberries, strawberries, and elderberries. The team is also interested in two new fruits - autumnberry, which grows wild on the East Coast and has a high lycopene content, and cornelian cherry, which is eaten in Europe.

In addition to the chemical properties of the berries, researchers study differences among varieties and cultivars, the effects of environmental factors and processing methods on chemical composition, and the differences in nutrient availability during the different stages of ripening. "The goal of this work is to determine which management practices and varieties produce berries with the maximum cancer-fighting benefits," Scheerens said.

Also involved in the berry research project are The Ohio State University South Centers, part of OARDC and OSU Extension. The South Centers have been promoting berries as an alternative high-value crop for southern Ohio farmers and educating consumers on the health benefits. "The promising results of the berry cancer trials are already creating increased demand and interest within the farming community in Ohio," said Brad Bergefurd, a horticulture Extension educator.

The Centers' contributions to the project include providing fruit for chemical studies, conducting research and demonstration trials to improve crop productivity and quality, and developing plans to market berries as great fruits both to grow and to eat.

"There isn't enough supply to meet berry demand in Ohio, especially for crops such as raspberries that have shown great promise for cancer treatment," said Sandy Kuhn, South Centers berry coordinator. "Our vision is to continue increasing berry acreage and production through efficiency to get more out of the land. We also want to establish connections between the grower and the consumer."

Clinical trials include a study of patients with early-stage colon cancer who are candidates for surgery. Over two to four weeks, they are fed 20 grams of freeze-dried black raspberries daily - equivalent to about 2 1/2 cups of fresh berries per day and, according to Stoner, the human equivalent of the amount found beneficial in animal models.

To find out whether or not the berries work, patients undergo a colonoscopy before starting the treatment so doctors can ascertain the size and position of the tumors; tissue is also extracted to measure several biological and genetic factors that may be linked to tumor growth. Over the course of the trial, study coordinators collect blood and urine samples to assess how fast biochemical or molecular changes may be occurring. Finally, during surgery, surgeons will remove a second piece of tumor and researchers will repeat the same measures taken earlier to see if the berries made any difference in cell growth and death rates, degree of inflammation, activity of certain genes, and the extent of new blood vessel growth at the tumor sites.

Other studies underway are examining the effect of black raspberries in liquid form to treat patients with esophageal cancer. Researchers in another trial are evaluating the berries in a chewy, lozenge form in patients with oral cancers. Down the road, researchers are planning to use a newly developed raspberry bio-adhesive gel to treat people with pre-cancerous lesions in their mouths.

The berry research project has been funded by the state of Ohio through OARDC and by federal monies. Last month, the project received \$750,000 in federal funds from U.S. Rep. David Hobson (Ohio's 7th District) and U.S. Rep. Deborah Pryce (Ohio's 15th District). Hobson and Pryce have contributed an additional \$1.64 million in funding for the project during the past two years.

"The berry research funding will allow The Ohio State University to continue its work that could potentially help thousands of cancer patients," Hobson said. "These studies are not only beneficial to the medical research community, but they will also support Ohio farmers in the berry production industry."

Stoner said the new funds will be used to evaluate the potential protective effect of berries on cancers of

the cervix and skin - two major types of cancer afflicting Ohioans.

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