



# Report on Research

College of Agricultural, Consumer and Environmental Sciences

## Worried About Prostate Cancer? Tomato-Broccoli Combo Shown to Be Effective

A new University of Illinois study shows that tomatoes and broccoli — two vegetables known for their cancer-fighting qualities — are better at shrinking prostate tumors when both are part of the daily diet than when they're eaten alone.

“When tomatoes and broccoli are eaten together, we see an additive effect. We think it’s because different bioactive compounds in each food work on different anti-cancer pathways,” said University of Illinois food science and human nutrition professor John Erdman.

In a study published in the January 15 issue of *Cancer Research*, Erdman and doctoral candidate Kirstie Canene-Adams fed a diet containing 10 percent tomato powder and 10 percent broccoli powder to laboratory rats that had been implanted with prostate cancer cells. The powders were made from whole foods, so the effects of eating the entire vegetable could be compared with consuming individual parts of them as a nutritional supplement.

Other rats in the study received either tomato or broccoli powder alone; or a supplemental dose of lycopene, the red pigment thought to be the effective cancer-preventive agent in tomatoes; or finasteride, a drug prescribed for men with enlarged prostates. Another group of rats was castrated.

After 22 weeks, the tumors were weighed. The tomato/broccoli combo outperformed all other diets in shrinking prostate tumors. Biopsies of tumors were evaluated at The Ohio State University, confirming that tumor cells in the tomato/broccoli-fed rats were not proliferating as rapidly. The only treatment that approached the tomato/broccoli diet’s level of effectiveness was castration, said Erdman.

“As nutritionists, it was very exciting to compare this drastic surgery to diet and see that tumor reduction was similar. Older men with slow-growing prostate cancer who have chosen watchful waiting over chemotherapy and radiation should seriously consider altering their diets to include more tomatoes and broccoli,” said Canene-Adams.

How much tomato and broccoli should a 55-year-old man concerned about prostate health eat to receive these benefits? The scientists did some conversions.

“To get these effects, men should consume daily 1.4 cups of raw broccoli and 2.5 cups of fresh tomato, or 1 cup of tomato sauce, or ½ cup of tomato paste. I think it’s very doable for a man to eat a cup and a half of broccoli per day or put broccoli on a pizza with ½ cup of tomato paste,” said Canene-Adams.

Erdman said the study showed that eating whole foods is better than consuming their components. “It’s better to eat tomatoes than to take a lycopene supplement,” he said. “And cooked tomatoes may be better than raw tomatoes. Chopping and heating make the cancer-fighting constituents of tomatoes and broccoli more bioavailable.”



“When tomatoes are cooked, for example, the water is removed and the healthful parts become more concentrated. That doesn’t mean you should stay away from fresh produce. The lesson here, I think, is to eat a variety of fruits and vegetables prepared in a variety of ways,” Canene-Adams added.

Another recent Erdman study shows that rats fed the tomato carotenoids phytofluene, lycopene, or a diet containing 10 percent tomato powder for four days had significantly reduced testosterone levels. “Most prostate cancer is hormone-sensitive, and reducing testosterone levels may be another way that eating tomatoes reduces prostate cancer growth,” Erdman said.

### Tomato-Broccoli, cont.

Erdman said the tomato/broccoli study was a natural to be carried out at Illinois because of the pioneering work his colleague Elizabeth Jeffery has done on the cancer-fighting agents found in broccoli and other cruciferous vegetables. Jeffery has discovered sulfur compounds in broccoli that enhance certain enzymes in the human body, which then act to degrade carcinogens.

“For ten years, I’ve been learning how the phytochemicals in tomatoes affect the progression of prostate cancer. Meanwhile Dr. Jeffery has been investigating the ways in which the healthful effects of broccoli are produced. Teaming up to see how these vegetables worked together just made sense and certainly contributes to our knowledge about dietary treatments for prostate cancer,” said Erdman.

Authors of the tomato/broccoli study are Kirstie Canene-Adams, Brian L. Lindshield, Elizabeth H. Jeffery, and John W. Erdman Jr. at the U of I and Shihua Wang and Steven K. Clinton of The Ohio State University. The study was funded by the American Institute for Cancer Research and the U.S. Department of Agriculture.

The U of I study of the effects of tomato carotenoids on serum testosterone was published in the December 2006 issue of the *Journal of Nutrition*. Authors are Jessica K. Campbell, Chad K. Stroud, Manabu T. Nakamura, Mary Ann Lila, and John W. Erdman Jr. Funding was provided by the National Institutes of Health’s National Cancer Institute.