

## In flurry of studies, researcher details role of apples in inhibiting breast cancer

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Six studies published in the past year by a Cornell researcher add to growing evidence that an apple a day -- as well as daily helpings of other fruits and vegetables -- can help keep the breast-cancer doctor away.

In one of his recent papers, published in the *Journal of Agricultural and Food Chemistry* (57:1), Rui Hai Liu, Cornell associate professor of food science and a member of Cornell's Institute for Comparative and Environmental Toxicology, reports that fresh apple extracts significantly inhibited the size of mammary tumors in rats -- and the more extracts they were given, the greater the inhibition.

"We not only observed that the treated animals had fewer tumors, but the tumors were smaller, less malignant and grew more slowly compared with the tumors in the untreated rats," said Liu, pointing out that the study confirmed the findings of his preliminary study in rats published in 2007.

In his latest study, for example, he found that a type of adenocarcinoma -- a highly malignant tumor and the main cause of death of breast-cancer patients, as well as of animals with mammary cancer -- was evident in 81 percent of tumors in the control animals. However, it developed in only 57 percent, 50 percent and 23 percent of the rats fed low, middle and high doses of apple extracts (the equivalent of one, three and six apples a day in humans), respectively, during the 24-week study.

"That reflects potent anti-proliferative [rapid decrease] activity," said

Liu.

The studies highlight the important role of phytochemicals, known as phenolics or flavonoids, found in apples and other fruits and vegetables. Of the top 25 fruits consumed in the United States, Liu reported in the same journal (56:18) that apples provide 33 percent of the phenolics that Americans consume annually.

In a study of apple peel published in the same journal (56:21), Liu reported on a variety of new phenolic compounds that he discovered that also have "potent antioxidant and anti-proliferative activities" on tumors. And in yet another study in the same journal (56:24), he reported on his discovery of the specific modulation effects that apple extracts have on cell cycle machinery. Recently, Liu's group also reported the finding that apple phytochemicals inhibit an important inflammation pathway (NFkB) in human breast cancer cells.

Breast cancer is the most frequently diagnosed invasive cancer and the second leading cause of cancer deaths in women in the United States, said Liu.

"These studies add to the growing evidence that increased consumption of fruits and vegetables, including apples, would provide consumers with more phenolics, which are proving to have important health benefits. I would encourage consumers to eat more and a wide variety of fruits and vegetables daily."

Source: Cornell University

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