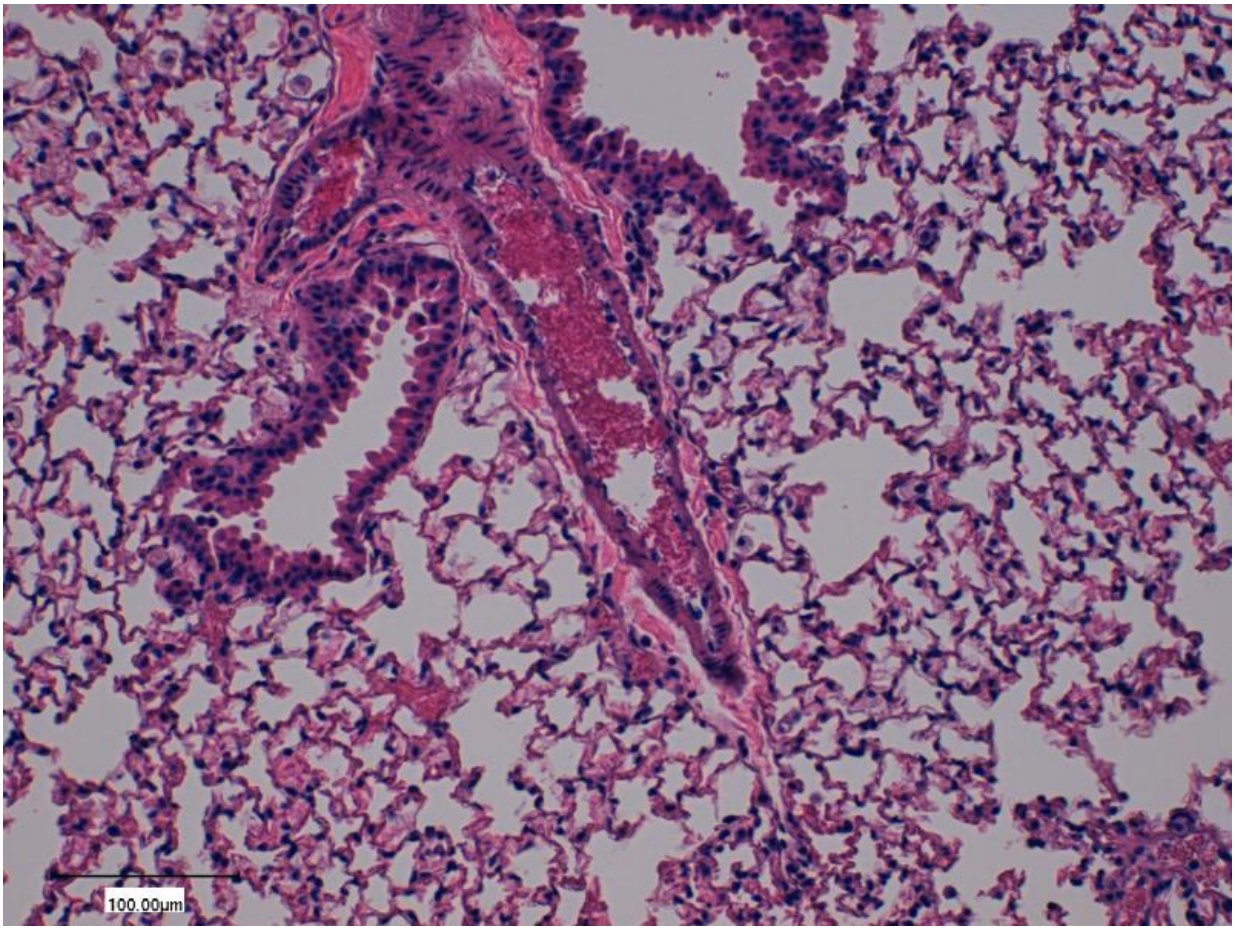
Plant-derived compound may reduce cancer recurrence, spread

May 7 2015



This lung tissue from a mouse was treated with 10-micromolar concentrations of PEITC.

An apple a day keeps the doctor away, and perhaps a serving of broccoli or watercress can help keep cancer at bay.

A compound and an enzyme that occur naturally in cruciferous vegetables—cauliflower, cabbage, broccoli and Brussels sprouts—may help prevent recurrence and spread of some cancers, according to associate professor Moul Dey of the health and nutritional sciences department. She has been doing research on phenethyl isothiocyanate (PEITC) through a five-year grant from the National Institutes of Health for more than $875,000 and support from the Agricultural Experiment Station.

The precursor compound and enzyme in cruciferous vegetables combine during the chewing process to produce PEITC within the body, Dey explained. Though PEITC is a good candidate to develop as a dietary supplement, studies have also shown that sufficient cancer-preventing levels of PEITC can be achieved through diet alone.

Cancer stem cells

When cancer is treated with chemotherapy or radiation, the tumor disappears but the cancer stem cells live on. "These cells are frequently resistant to conventional therapies," Dey said.

Though cancer stem cells make up less than 5 percent of a tumor, they can regenerate the original tumor and migrate through the blood vessels spreading cancer to secondary locations.

"These tiny cells are very difficult to detect in a tumor," Dey pointed, adding that for a long time scientists did not even know they existed. "It's like finding a needle in a haystack."

Promising results

When Dey and her team treated human cervical cancer stem cells with PEITC in a Petri dish, about 75 percent died within 24 hours using a 20-micromolar concentration of the compound.

In other experiments, Dey and her team have found that lower concentrations of PEITC are still very effective. Working with SDSU veterinary pathologist David Knudsen, Dey and her team found that 10-micromolar concentrations of PEITC can dramatically prevent the spread of cancer in mouse lung tissue.

"Preliminary evidence has shown a quite dramatic difference between the lung sections from the PEITC-treated and untreated mice," Dey said. However, she cautioned, although mice provide a model for human diseases, further testing is necessary to determine whether outcomes will be similar in humans.

Based on information from scientific literature, the concentrations of PEITC that Dey and her team typically use in their research—5 to 15 micromolars—may be achieved through diets rich in certain types of cruciferous vegetables, particularly land cress and watercress.

Next, she and her team will examine how PEITC is able to overcome the resistance mechanisms that protect these stem cells from other drugs. "That's the second piece of this work," Dey added.

Provided by South Dakota State University