CEDARS-SINAI MEDICAL CENTER NEWS

Media Contact: Cynthia Harding
Telephone: 310-423-4768
E-mail: Cynthia.harding@cshs.org

PEPPER COMPONENT HOT ENOUGH TO TRIGGER SUICIDE IN PROSTATE CANCER CELLS

LOS ANGELES (MARCH 15, 2006) – Capsaicin, the stuff that turns up the heat in jalapeños, not only causes the tongue to burn, it also drives prostate cancer cells to kill themselves, according to studies published in the March 15 issue of *Cancer Research.*

According to a team of researchers from the Samuel Oschin Comprehensive Cancer Institute at Cedars-Sinai Medical Center, in collaboration with colleagues from UCLA, the pepper component caused human prostate cancer cells to undergo programmed cell death or apoptosis.

Capsaicin induced approximately 80 percent of prostate cancer cells growing in mice to follow the molecular pathways leading to apoptosis. Prostate cancer tumors treated with capsaicin were about one-fifth the size of tumors in non-treated mice.

“Capsaicin had a profound anti-proliferative effect on human prostate cancer cells in culture,” said Sören Lehmann, M.D., Ph.D., visiting scientist at the Samuel Oschin Comprehensive Cancer Institute at Cedars-Sinai and the UCLA School of Medicine. “It also dramatically slowed the development of prostate tumors formed by those human cell lines grown in mouse models.”

Lehmann estimated that the dose of pepper extract fed orally to the mice was equivalent to giving 400 milligrams of capsaicin three times a week to a 200 pound man, roughly equivalent to between three and eight fresh habañera peppers – depending on the pepper’s capsaicin content. Habañeras are the highest rated pepper for capsaicin content according to the Scoville heat index. Habañero peppers, which are native to the Yucatan, typically contain up to 300,000 Scoville units. The more popular Jalapeño variety from Oaxaca, Mexico, and the southwest United States, contains 2,500 to 5,000 Scoville units.

As described in their study, the scientists observed that capsaicin inhibited the activity of NF- , a molecular mechanism that participates in the pathways leading to apoptosis in many cell types.
Apoptosis is a normal cellular event in many tissues that maintains a balance between newer replacement cells and aged or worn cells. In contrast, cancer cells seek to be immortal and often dodge apoptosis by mutating or deregulating the genes that participate in programmed cell death.

“When we noticed that capsaicin affected NF-κB, that was an indication that we might expect some of the apoptotic proteins to be affected,” said the study’s senior author, Phillip Koeffler, M.D., director of Hematology and Oncology, Samuel Oschin Comprehensive Cancer Institute at Cedars-Sinai, and professor at UCLA.

The pepper extract also curbed the growth of prostate cancer cells through regulation of androgen receptors, the steroid activated proteins that control expression of specific growth relating genes.

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In prostate cancer cells whose growth is dependent on testosterone, the predominant male sex steroid, capsaicin reduced cell proliferation in a dose-dependent manner. Increased concentrations of capsaicin caused more prostate cancer cells to freeze in a non-proliferative state, called G0/G1.

Prostate cancer cells that are androgen independent reacted to capsaicin in a similar manner. Capsaicin reduced the amount of androgen receptor that the tumor cells produced, but did not interfere with normal movement of androgen receptor into the nucleus of the cancer cells where the steroid receptor acts to regulate androgen target genes such as prostate specific antigen (PSA). Capsaicin also interfered with the action of androgen receptors even in cells that were modified to produce excess numbers of androgen receptors.

The hot pepper component also reduced cancer cell production of PSA, a protein that often is produced in high quantities by prostate tumors and can signal the presence of prostate cancer in men. PSA content in the blood of men is used as a diagnostic prostate cancer screening measure. PSA is regulated by androgens, and capsaicin limited androgen-induced increases of PSA in the cancer cell lines.

More men in the United States develop prostate cancer than any other type of malignancy. Every year, more than 232,000 new cases of prostate cancer are diagnosed in the U.S., and more than 680,000 develop the disease worldwide. Approximately 30,000 men die from prostate cancer in the U.S. each year, which is about 13 percent of all new cases. Worldwide, there are 221,000 deaths – approximately 31 per cent – among men with prostate cancer.

Lehman conducted the studies in Koeffler's laboratory in collaboration with UCLA cancer researchers Akio Mori, James O'Kelly, Takishi Kumagai, Julian Desmond, Milena Pervan, and William McBride. Mosahiro Kizaki, a former post-doctoral fellow in Koeffler's laboratory who initiated the capsaicin studies, is currently at the Keio University School of Medicine, Tokyo, Japan.

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