



Spices and Breast Cancer

A new United States study has found that compounds derived from the spices turmeric and pepper could help prevent breast cancer by limiting the growth of stem cells, the small number of cells that fuel a tumor's growth.

Researchers at the University of Michigan Comprehensive Cancer Center, have found that when the dietary compound curcumin, which is derived from the Indian spice turmeric, and piperine, derived from black peppers, were applied to breast cells in culture, they decreased the number of stem cells while having no effect on normal differentiated cells.

Curcumin and piperine have been explored by other researchers as a potential cancer treatment. But this paper, published online in the journal *Breast Cancer Research and Treatment*, is the first to suggest these dietary compounds could prevent cancer by targeting stem cells.

Turmeric is a spice that comes from the root of *Curcuma longa*, a member of the ginger family, Zingiberaceae. In traditional medicine, turmeric has been used for its medicinal properties for various indications and through different routes of administration, including topically, orally, and by inhalation.

In Nigeria, it is called atale pupa in Yoruba; gangamau in Hausa; nwandumo in Ebonyi; ohu boboch in Enugu (Nkanu East); gigir in Tiv; magina in Kaduna; turi in Niger State; onjonigho in Cross River (Meo tribe).



Turmeric, also known as curcuma, produces a root that is used to produce the vibrant yellow spice used as a culinary spice so often used in curry dishes.

One of turmeric's components is curcumin, a type of phytochemical known as a polyphenol. Research findings suggest that phytochemicals, which are the chemicals found in plants, appear to help prevent disease. As the bioactive component of turmeric, curcumin is readily absorbed for use by the body.

Botanically called *Piper nigrum* (uziza in Ibo) is of plant family Piperaceae. The fruits and seeds are used to cure dyspepsia (indigestion), diarrhea, cholera, piles, urinary problems, boils, rheumatism, toothaches and headaches. Black



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pepper is also used to stabilise the womb in women after birth.

Ground black pepper is one of the most commonly consumed spices. Black pepper has been shown to have antioxidant, anti-inflammatory, antibacterial and antimutagenic properties and helps improve digestion. Black pepper is a dietary source of vitamin C, vitamin K and manganese. The spiciness of black pepper is due to its piperine content. Piperine has been shown to significantly increase the bioavailability of selenium and beta-carotene, among other nutrients. Black pepper and piperine have been shown to inhibit the development of carcinogen-induced colon and lung cancers in laboratory animals.

Piperine has been shown to enhance breast stem cell sensitivity to curcumin, a component of the spice turmeric. Curcumin may decrease breast cancer risk in part by reducing breast stem cell self-renewal and enhancing

differentiation of breast stem cells.

Lead author Dr. Madhuri Kakarala, clinical lecturer in internal medicine at the U-M Medical School and a research investigator at the VA Ann Arbor Healthcare System said: "If we can limit the number of stem cells, we can limit the number of cells with potential to form tumors."

Cancer stem cells are the small number of cells within a tumor that fuel the tumor's growth. Current chemotherapies do not work against these cells, which is why cancer recurs and spreads.

Researchers believe that eliminating the cancer stem cells is key to controlling cancer. In addition, decreasing the number of normal stem cells, unspecialized cells that can give rise to any type of cell in that organ, can decrease the risk of cancer.

In this study, a solution of curcumin and piperine was applied to the cell cultures at the equivalent of about 20 times the potency of what could be consumed through diet. The compounds are available at this potency in a capsule form that could be taken by mouth.

The researchers applied a series of tests to the cells, looking at markers for breast stem cells and the effects of curcumin and piperine, both alone and combined, on the stem cell levels. They found that piperine enhanced the effects of curcumin, and that the compounds interrupted the self-renewal process that is the hallmark of cancer-initiating stem cells. At the same time, the





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compounds had no effect on cell differentiation, which is the normal process of cell development.

Kakarala said: "This shows that these compounds are not toxic to normal breast tissue. Women at high risk of breast cancer right now can choose to take the drugs tamoxifen or raloxifene for prevention, but most women won't take these drugs because there is too much toxicity. The concept that dietary compounds can help is attractive, and curcumin and piperine appear to have very low toxicity."

In addition, tamoxifen or raloxifene are designed to affect estrogen, which is a factor in most, but not all breast cancers. In fact, the aggressive tumors that tend to occur more often in women with a family history or genetic susceptibility are typically not affected by estrogen. Because curcumin and piperine limit the self renewal of stem cells, they would impact cancers that are not estrogen sensitive as well as those that are.

Researchers are planning an initial Phase I clinical trial to determine what dose of curcumin or piperine can be tolerated in people. The trial is not expected to begin accruing participants until spring.

Previous studies have shown that people whose diets are rich in turmeric have lower rates of breast cancer as well as prostate, lung and colon cancers. Research at the M.D. Anderson Cancer Centre in Houston, United States suggested that curcumin, an active component in turmeric, may help prevent the spread of breast cancer. In studies of mice, researchers found that curcumin

helped stop the metastasis of breast cancer cells to the lung. Human studies following up on this finding are now in progress.

In the M.D. Anderson study, researchers injected mice with breast cancer cells from a woman whose disease had spread to her lungs. The cells began to grow in the mice and then were surgically removed. The mice then were divided into four groups: one got no treatment, one got curcumin, one got the cancer drug Taxol and the fourth group got curcumin plus Taxol. Cancer spread to the lungs among half the mice in the curcumin-only group and 22 per cent of those in the curcumin/Taxol group. The other groups fared far worse: among the mice that received Taxol alone 75 per cent developed lung tumors; and the cancer spread to the lungs among 95 per cent of the mice who were given no treatment.