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How Curcumin Targets Cancer

Analysis by Dr. Joseph Mercola Fact Checked | July 25, 2023

STORY AT-A-GLANCE

- The bioactive ingredient in turmeric is curcumin, responsible for over 150 potentially therapeutic activities in your body
- Curcumin has demonstrated preventive and treatment actions against cancer cells, and may help both reduce the negative effects of chemotherapy agents and intensify the cancer-killing abilities of the drugs
- Consumed alone, bioavailability of curcumin is poor; however, there are methods that may improve absorption and help raise your therapeutic levels

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Turmeric, a yellow curry spice used in Indian cuisine, has a long history of medicinal use in traditional Chinese medicine (TCM) and Ayurvedic medicine. Curcumin is one of the most well-studied bioactive ingredients in turmeric,[1] having over 150 potentially therapeutic activities, including anti-inflammatory, antimicrobial and powerful anticancer actions.

Cancer has an incredible global impact and places a vast financial and emotional burden on the families it touches. Nearly 40% of American men and women will be diagnosed with cancer in their lifetime and over $125 billion is spent annually on medical treatment and patient care.[2]

The American Cancer Society estimated there would be over 1.6 million new cases diagnosed in 2017, equating to 4,630 new cases and 1,650 deaths every day.[3] The most common types of cancer include breast, colon, lung and prostate.[4]

Despite advances in cancer treatment protocols, scientists realize prevention plays an essential role in reducing the number of people who die from the disease. After 30 years of testing more than 1,000 different possible anticancer substances, the National Cancer Institute announced that curcumin has joined an elite group that will now be used in clinical trials for chemoprevention.[5]

Curcumin May Play a Multitargeted Role Against Cancer Cells

In this interview, Dr. William LaValley discusses the interaction curcumin has on cancer and the multiple ways this molecule affects cancer growth. If you have ever been diagnosed with cancer, it may feel as if it grew overnight when, in fact, cancer cells take years to develop.

The progression of a cell from normal growth to cancer happens through several stages. Deregulation of physiological and mechanical processes that initiate and promote the growth of cancer cells makes use of hundreds of genes and signaling routes, making it apparent a multitargeted approach is needed for prevention and treatment.

Research has demonstrated that curcumin has a broad range of actions as it is able to affect multiple cellular targets.[6] Studies have found, based on the activities of curcumin in the body, the spice could be an effective method of cancer prevention, or in treatment when used in conjunction with conventional treatment protocols.

The multifaceted action of curcumin has made it useful in the treatments of several different types of diseases, including colon cancer,[7] pancreatic cancer[8] and amyloidosis.[9]

Curcumin triggers a variety of actions that affect the growth, replication and death of cancer cells. Cancer cells lose the ability to die naturally, which plays a significant role in the hyperproliferation of cells common to cancer. Curcumin is able to turn on the

apoptosis (cell death) signaling pathway, enabling the cells to die within a natural time span.[10]

Cancer cells thrive in an inflammatory environment. Although short-term inflammation is beneficial for healing, long-term inflammation increases your risk of disease. Curcumin is able to block the pro-inflammatory response at several points and reduce the levels of inflammatory cytokines in the body.[11]

The strong anti-inflammatory effects of curcumin may match the effect of some drugs.[12] Early in development, cancer cells learn to replicate and grow in an environment cells normally find inhospitable. Curcumin may change the signaling through several pathways, and put a stop to this replication.[13]

Curcumin may also stop the ability of cancer stem cells from replicating and reduce the potential for recurrence after treatment. Curcumin also helps support your immune system, capable of seeking out and destroying early cancer cells naturally.

Curcumin May Enhance Cancer Treatment and Chemotherapy

Some of the same ways that curcumin works in your body are the processes used to enhance your cancer treatments and chemotherapy.

While some chemotherapy has been developed to target specific cells, most therapy drugs are nonspecific and affect all cells in your body. Some studies in the past decade have demonstrated exciting potential for curcumin in the fight against cancer.

In addition to changes to your cells mentioned above, researchers have found curcumin may help protect your body against the damage caused from chemotherapy and radiation treatments, and it may enhance the effect of these same treatments, making them more effective.

These effects have been demonstrated in animal models treating head and neck tumors,[14] and in culture of human breast, esophageal and colon cancers.[15,16]

Patients treated for chronic myeloid leukemia with chemotherapy exhibited a reduction in cancer growth factor when curcumin was added to the treatment protocol, potentially improving the results of the chemotherapy over being used alone.[17]

Protection against radiation therapy was demonstrated in a study using breast cancer patients receiving radiation therapy.[18] At the end of the study those taking curcumin had less radiation damage to their skin.

Curcumin has also been effective against angiogenesis in tumors, or the growth of new blood vessels to feed the overgrowth of cancer cells, and against metastasis.[19]

Curcumin is able to affect cancer cells through multiple pathways and has fulfilled the traits for an ideal cancer prevention agent as it has low toxicity, is affordable and is easily accessible. However, while effective, it has poor bioavailability on its own.[20]

Poor Absorption Has One Benefit

In my interview with LaValley, he discussed the poor bioavailability of curcumin in raw form. Only 1% of the product will be absorbed; even supplements that have a 95% concentration are absorbed at 1%.

This means, when the supplement is taken alone, it is a challenge to maintain a therapeutic level. However, in the case of colon cancer, this poor absorption into the bloodstream may be an advantage.

As there is poor absorption, higher levels of curcumin stay in the intestinal tract for longer periods of time, having an effect on gastrointestinal cancers. In one study, participants took a 1,080 milligram (mg) dose per day of curcumin for 10 to 30 days between their initial biopsy and surgical removal.

The patients taking the supplement experienced a reduction in blood levels of inflammatory agent, improvement in their body weight and an increased number of dying tumor cells.[21]

A team of scientists at the University of Pittsburgh and at Pondicherry University, India, discovered the bioactive ingredient in turmeric, curcumin, can both prevent and cure bowel cancers.[22] The team found the compound triggered cancer cell death by increasing a level of protein labeled GADD45a.[23] Lead author Rajasekaran Baskaran, Ph.D., who has more than 20 years of experience in cancer research, commented:[24]

> *"Studies on the effect of curcumin on cancer and normal cells will be useful for the ongoing preclinical and clinical investigations on this potential chemopreventive agent."*

As an increased bioavailability and absorption may also improve the actions of curcumin in the body, researchers have studied a variety of different delivery methods, including oral, intravenous, subcutaneous and intraperitoneal, as well as different formulations of the product.[25]

Bioavailability improved when curcumin was delivered as a nanoparticle, in combination with poly(lactic)-co-glycolic acid, liposomal encapsulation[26] and when taken orally with piperine, the active ingredient in black pepper.[27]

Multiple Types of Cancer Affected by Curcumin

Research demonstrates that while curcumin has multiple pathways through which it impacts cancer cells, the substance also has an effect on multiple types of cancer. Studies estimate that genetics may play a role in approximately 5% of all cancers, with the majority of cancer growth attributed to lifestyle choices.[28]

Research demonstrates curcumin exhibits activity against breast cancer and decreases the toxic effect against some of the chemotherapy agents commonly used.[29] Mitomycin C is a potent antineoplastic drug. However, prolonged use may lead to kidney and bone marrow damage, with secondary tumor growth. Curcumin appears to reduce the side effects of Mitomycin C and improve the efficiency of the drug at the same time.[30]

Another study demonstrated that curcumin inhibited the growth and metastasis of lung cancer cells.[31] One of the deadliest cancers worldwide, pancreatic cancer, also appears

to respond to the use of curcumin in preclinical trials.[32] The antiproliferative effects on pancreatic cancer appeared to be from a reduction in oxidative stress and angiogenesis and triggering apoptosis of cancer cells.

Apoptosis, anti-inflammatory actions, reduction in angiogenesis and reduction in the adverse effects of chemotherapeutic agents has also led researchers to consider curcumin an adjunctive therapy in the treatment of liver cancer.[33] Curcumin also inhibited and slowed the development of bladder cancer in rats,[34] stopped the formation of metastasis in prostate cancer,[35] and when combined with ultrasound, increased death of cervical cancer cells.[36]

But not all scientists are convinced by the number of studies over the past 15 years demonstrating the multiple effects curcumin has on the inflammatory response and cancers, as well as the low toxicity profile.[37] In one meta-analysis, researchers claimed curcumin could not meet the criteria for a good drug candidate.[38]

More Benefits to Curcumin

Curcumin offers additional benefits to your health. It may work as well as some anti-inflammatory medications to treat arthritic conditions.[39] In combination with aerobic exercise, curcumin was found to improve endothelial cell function in postmenopausal women,[40] and was also found to ameliorate arterial dysfunction and oxidative stress in the elderly.[41]

Disease processes may increase oxidative stress and free radical formation in your body. Curcumin is a potent antioxidant,[42] but also may boost the function of your body's own antioxidant enzymes.[43]

Your brain can develop new connections powered by brain-derived neurotrophic factor (BDNF).[44] Reduced levels of this hormone may be linked to depression and Alzheimer's disease. However, curcumin can increase your levels of BDNF[45] and effectively reduce your potential for suffering from age-related reduction in brain function.[46]

Researchers have also discovered that curcumin has an effect on several pathways in your body that may reverse insulin resistance, hyperlipidemia and other symptoms associated with metabolic syndrome and obesity.[47] The reduced potential for metabolic syndrome and obesity is related to the anti-inflammatory effects of curcumin, which may also have an effect on heart disease, atherosclerosis and Type 2 diabetes.[48]

Genetic Regulation May Be One Way Curcumin Fights Cancer

It is becoming widely accepted that cancer is not a preprogrammed inevitability, but rather the result of the impact of your environment on genetic regulation that may trigger cancer cell growth. There are multiple influences that may damage or mutate DNA, and consequently alter genetic expression, including:

Nutritional deficiencies	Stress
Free radical damage	Toxins and pollution
Chronic infections	Infectious toxic by-products
Hormonal imbalances	Chronic inflammation

Researchers have demonstrated curcumin may affect more than 100 different pathways in your cells, helping to prevent hyperproliferation of cell growth characteristic of cancer, and aiding in the treatment of the disease. Through the reduction of inflammation, prevention of the development of additional blood supply to support cancer cell growth and destruction of mutated cells to reduce metastasis, curcumin has great medicinal and preventive potential.

Several studies have demonstrated an impact on transcription factors and signaling pathways, and have reviewed the molecular mechanisms curcumin uses to regulate and modulate gene expression.[49,50,51] Overall, curcumin is powerful, cost-effective and has a low toxicity profile.[52]

Using a Curcumin Supplement

Turmeric is a wonderful spice used in Eastern culture cuisine. It is one spice I recommend for your kitchen as it works well with tomato sauces, soups, leafy greens, cauliflower, stir-fries and stews. Choose a high-quality turmeric powder instead of curry powder as studies have found some curry powders have very little curcumin.

If you are looking for therapeutic effects, you may want to consider a supplement. It is difficult to achieve a dose of curcumin used in research solely from your diet. Typical anticancer doses range between 8 grams and 12 grams of curcumin.

You can increase the absorption by making a microemulsion, combining 1 tablespoon of curcumin powder with one or two egg yolks and 1 to 2 teaspoons of melted coconut oil, as the curcumin is fat soluble. Then use a hand blender on high speed to emulsify the powder.

Absorption may also be increased through boiling. Add 1 tablespoon into a quart of boiling water. (If you add it to room temperature water and then boil, it doesn't work as well.) After boiling it for 10 minutes, you will have created a 12% solution and you can drink this once it has cooled down. The curcumin will gradually fall out of the solution over time, and in about six hours it will be a 6% solution, so it is best to drink the water within four hours.

Curcumin is a very potent yellow pigment and can permanently discolor surfaces if you aren't careful. To avoid inadvertently staining your kitchen yellow, I recommend you perform any mixing under the hood of your stove with the exhaust fan on to make sure no powder gets into your kitchen.

Alternatively, it is far easier to take curcumin in supplement form — just make sure it's a high-quality brand that is formulated to increase bioavailability. And, look for a turmeric extract with at least 95% curcuminoids. Just be aware that these are relatively rare and hard to find.

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