

Curcumin Starves Cancer Cells to Death

By Kirk Stokel

Over **4,500** published studies describe the **anti-cancer** effects of **curcumin**.

Researchers are intrigued by a promising discovery that **curcumin** selectively **starves tumor cells** to death.¹

Curcumin does this by depriving cancer cells of the ability to make and use **ATP**, the energy currency within cells.²

Since most cancer cells generate ATP in a **different** way than healthy cells, curcumin *selectively kills* tumor cells with **no impact** on healthy tissues.

These newly uncovered **energy-disrupting properties** of curcumin further support the preventive potential of this botanical compound.

Cutting Cancer's Energy Supply

Cancer cells require tremendous energy to promote their rapid, uncontrolled growth, and they have developed numerous methods to support that energy demand.

In particular, cancer cells have an unusual, *oxygen-free* mechanism of extracting energy from glucose to produce **ATP** (adenosine triphosphate). This process helps most cancer cells survive in the low-oxygen environments they generate as they grow rapidly.²

Scientists conducted a study to determine if this process can be reversed in cancer cells.

Since many different types of cancer use the same metabolic trick to extract energy, the researchers studied curcumin's impact on a variety of tumor lines, including leukemia, breast, melanoma (skin), and colon cancers.²

This study shed new light on curcumin's ability to starve cancer into submission by interfering with how tumors cells use energy.

Let's look at the findings one at a time.

Curcumin Blocks ATP Production

First, the researchers found that curcumin can sharply reduce how much energy is available to the cancer cells.²

This study showed that curcumin was able to:

- 1) Reduce levels of ATP-*synthase* (the enzyme that creates ATP) in all four tumor cell lines in culture,
- 2) Reduce cellular levels of ATP in three of the four cell lines, and
- 3) Lower the ratio of high-energy ATP to lower-energy AMP in all four cell lines.

Curcumin Slows Tumor Growth

Next, researchers implanted aggressive skin cancer (melanoma) cells into live mice. Half the mice were treated with curcumin and the other half served as the control group.²

Just **2 days** into the study, the curcumin-treated mice were demonstrating significantly slower tumor growth. Tumor growth remained significantly slower for the entire period of the study.

Not surprisingly, ATP-*synthase*, ATP levels, and the ATP/AMP ratio were all significantly lowered in the curcumin group. These results indicate that **energy starvation** was a mechanism of action by which curcumin slowed tumor growth.

Curcumin Prevents New Blood Vessel Growth

Cancers need to trigger new blood vessel development (called *angiogenesis*) to support their nutrient needs as they rapidly grow. **Blocking** this process is an important way to limit the growth and spread of a tumor.

After removing tumors from the mice in this study, the researchers found that the **curcumin-supplemented** animals' tumors had fewer new blood vessels compared with control-fed mice.

This indicates that curcumin reduced the tumors nutrient energy access by limiting blood flow.²

Curcumin's Known Tumor-Fighting Properties

This most recent study adds to an abundance of evidence pointing to curcumin's potent cancer-fighting abilities. It focuses on curcumin's unique ability to combat a variety of cancers by cutting off their energy supply.

Previous studies have shown curcumin's tumor-fighting properties in multiple specific types of cancer. Here are some highlights from the most recent literature.

Colorectal Cancer

Cancers of the colon and rectum are among the most common malignancies in men and women. Curcumin has a long track record of achievements in preventing colorectal cancers.

A Phase IIa human clinical trial has shown that **4 grams**/day of curcumin significantly reduces the number of *aberrant crypt foci* found during endoscopy. This is a critical finding because if aberrant crypt foci are left untreated, they can produce malignant tumors.³

Weight loss is common in cancer patients. A human study showed that colon cancer patients who were supplemented with curcumin gained more weight, had less inflammation, and had increased numbers of cancer cells dying by *apoptosis*.⁴ This effect has been traced to curcumin's ability to activate a "programmed cell death" gene in tumor cells.

Finally, curcumin has been shown to selectively reduce the survival of *cancer stem cells*.⁵ These cells account for much of the metastatic spread and tumor recurrences seen in aggressive malignancies. Cutting their numbers is an appealing approach to preventing tumors from spreading.

While a high-dose (**4,000 mg**) of curcumin was used in this study, more *bioavailable* curcumin forms can enable one to achieve a similar dose with two capsules a day.

WHAT YOU NEED TO KNOW

Curcumin Starves Cancer Cells to Death

- Curcumin is a powerful, multi-functional polyphenol that is gaining increasing recognition for its cancer chemopreventive properties.
- A new study shows that curcumin sharply restricts cancer cells' ability to extract energy from glucose in the blood.
- This mechanism is especially appealing for cancer chemoprevention because it would target the great majority of cancers.
- Previous studies also show that curcumin can reduce inflammation, prevent chemical stress, shut down cancer-promoting pathways, and interfere with malignant cells' growth and development.
- These multiple mechanisms of action make it clear that curcumin should be a central element of any comprehensive cancer chemoprevention regimen.

Breast Cancer

Breast cancer is the most common cancer in women, and it's the second leading cause of cancer deaths among women worldwide.^{6,7}

Curcumin has shown promise in combatting breast cancer. This is especially true of **estrogen receptor-negative tumors**, which respond poorly to cancer chemotherapy.⁶

Studies show that giving curcumin to animals with implanted human breast cancers shrinks the tumors, deprives them of their blood supply, and triggers their self-destruction by apoptosis.^{6,8}

More recently, research revealed that curcumin can also combat breast cancer by reversing the excessive *methylation* of certain genes that is associated with increased cancer development.⁹

Prostate Cancer

Prostate cancer strikes one in nine American men, yet is among the most preventable cancers because of its slow growth.¹⁰

Curcumin has multiple actions against prostate cancer. It defends prostate cells against the dysfunctional proteins produced during cancer progression. It also slows invasion of nearby healthy tissue by the cancer, which helps to keep the tumor at a lower grade (meaning it grows more slowly and has a better prognosis).¹¹⁻¹³

One study showed that when human prostate cells were implanted into mice, they grew into sizable tumors. But when these animals were supplemented with curcumin, the tumors grew **27% more slowly**. In addition, the time it took to double levels of *prostate specific antigen* (PSA) was extended or delayed by about **two-fold**.¹⁴ (Doubling time is an indicator of how aggressive the cancer is.)

Curcumin can also reduce tumor-derived testosterone production in prostate cancer cells.¹⁵ This is a hidden source of male hormones that often contributes to *treatment-resistant* disease.¹⁶ This development offers a welcome new approach to treating these challenging tumors.

Liver Cancer

Liver cancer is increasing in incidence worldwide, spurred by epidemic hepatitis C virus and rampant fatty liver disease.¹⁷

In lab studies, curcumin was shown to help prevent liver cancer by reducing inflammatory signaling, inhibiting cell growth, and activating cell death by apoptosis.¹⁸⁻²⁰ It has also been shown to reduce populations of liver cancer stem cells.^{19,21}

In one study, curcumin inhibited the growth of liver cancer cells, while also promoting their death by apoptosis. And in a mouse model of liver cancer, treatment with curcumin caused the tumors to grow much more slowly.²²

And, in an exciting development, a study published in **2018** showed that when curcumin is combined with the AMPK-activator drug *metformin*, the combination worked better than either alone in preventing growth, metastasis, and new blood vessel formation in *hepatocellular carcinoma*, the most common—and most deadly—type of liver cancer.²³

Lung Cancer

A new study shows that curcumin sharply restricts cancer cells' ability to extract energy from glucose in the blood.

Lung cancer continues to be the top cause of cancer-related deaths, making it a huge priority for prevention.^{24,25}

An abundance of animal and basic lab studies show curcumin's potential against lung cancer.

For example, curcumin has been shown to reduce the growth of implanted human lung cancers in mice.²⁶ Lab studies on lung cancer show that curcumin alters proteins required for metastasis, boosting the function of immune cells that are inactivated by cancers, and targeting blood vessel growth.^{24,26,27}

A unique way in which curcumin combats lung cancer is by modulating microRNA inside cancer cells.²⁸⁻³⁰ These short stretches of genetic material regulate how the main genes in tumor cells are translated into functional proteins.

Studies reveal that curcumin inhibits lung cancer cell growth by *downregulating* a gene that promotes tumor formation, while *upregulating* genes that suppress transformation.²⁸ Other research shows similar favorable modulation of miRNAs involved in metastatic spread.³⁰

Summary

Curcumin is the polyphenol that gives the yellow color to the spice turmeric. It has been front and center in the scientific press for years—mostly recognized for its ability to suppress **inflammation**.^{2,31,32}

Curcumin has also been shown to prevent cancer progression through a variety of mechanisms. Most recently, a study found that curcumin starves cancer cells of much-needed energy.

This mechanism is especially appealing for cancer prevention because it would target the great majority of cancers.

This confirms previous studies showing that curcumin has specific effects against colorectal, breast, prostate, lung, and liver cancers.

Starving malignant cells of their energy supply is an ideal way of boosting our bodies' natural cancer resistance, helping it quench cancer long before a tumor is detectable.

If you have any questions on the scientific content of this article, please call a Life Extension® Wellness Specialist at 1-866-864-3027.

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