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The Countless Health Benefits of Curcumin

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STORY AT-A-GLANCE

- Curcumin is the compound in turmeric that makes the rhizome a yellow-gold color. Turmeric has been used in traditional medicine for 4,000 years and there have been over 3,000 papers published on it within the last 25 years
- In the raw state, curcumin has poor bioavailability; but new delivery systems can raise serum concentrations. Curcumin has neuroprotective properties, showing evidence of improving memory, learning, mitigating cognitive impairment and positively affecting those with multiple sclerosis (MS), ALS, Huntington's, stroke and autism
- Anti-inflammatory properties may help with pain control in those with osteoarthritis or after surgery. The safety and nontoxicity of curcumin, even at high doses, have been documented in human trials
- Researchers have also found that curcumin has a unique property which both promotes and suppresses angiogenesis, which is important in wound healing and cancer treatment

Interest in curcumin is growing as the discovery of new delivery systems increases the bioavailability of the compound.[1] Curcumin is the major biologically active polyphenolic compound of turmeric. Turmeric has long been used in Indian cuisine and medicinal use in traditional Chinese medicine and Ayurvedic medicine.[2] Curcumin is the compound that gives turmeric its yellow color.

Studies have suggested that curcumin is a powerful ally in the treatment of several conditions, such as mood disorders and pain control. Importantly, curcumin can cross the blood-brain barrier[3] and has potent neuroprotective properties, which suggests it

could be useful for neurodegenerative disorders. The cosmetic and fabric industry also uses turmeric and curcumin.[4]

In its raw form, curcumin has a very poor absorption rate. Generally, just 1% of the product is absorbed by your body.[5] Researchers have investigated a variety of different methods to improve absorption. This has included formulations to optimize bioavailability and delivery methods.

Those that appeared to improve the absorption include delivery as a nanoparticle, combination with polylactic-co-glycolic acid, liposomal encapsulation, and taken orally with piperine,[6,7] the active ingredient in black pepper.

Consumer Interest in Curcumin Rises as Bio Delivery Improves

Turmeric is derived from the rhizome of a plant in the ginger family native to Southeast Asia. Curcumin is used in supplements and also in cosmetic products designed to reduce inflammation, which may help acne, eczema, and even slow the appearance of skin aging.[8] Rising interest has created a market, which experts believe will grow to $191.89 million by 2028.[9]

This represents a compound annual growth rate (CAGR) of 16.1% from 2021 to 2028. Product demand has also risen in the food industry, which uses turmeric for natural flavoring and coloring.[10] The antioxidant and anti-inflammatory properties of turmeric and curcumin are the basis of many of the health claims and foundation for many of the research studies evaluating the compound's ability to impact many bodily systems.[11]

However, poor bioavailability of the supplement has hindered scientific study as it is nearly impossible to raise serum concentrations by consuming the supplement alone.[12] New drug delivery techniques have included a nanoparticle system, which researchers have found “increases all the biological and pharmacological benefits of curcumin.”[13]

Several nanoencapsulation techniques were developed to overcome the low therapeutic effects of the compound. To date, many of these are still being researched to find a

promising therapeutic candidate for consumer use.[14] Other research has focused on compounds that may be administered concurrently that could enhance absorption.

One study found when curcumin was combined with piperine, the major active component of black pepper, it increased the bioavailability of the combination by 2000%.[15] However, studies have also shown that piperine inhibits enzymes used to metabolize some drugs and thereby raises the plasma concentration, which can trigger severe adverse side effects.[16]

Curcumin Has Neuroprotective Properties

Natural plants have been used for medicinal purposes throughout history, and turmeric is no exception. There is evidence it was used in human health as far back as 4,000 years ago and there have been over 3,000 papers published on it within the last 25 years.[17]

One animal study[18] analyzed the effect that curcumin may have on learning and spatial memory in adult and aged mice. The researchers found the animals receiving curcumin performed significantly better than those who did not. They believe the results show that curcumin helps mitigate the cognitive impairment associated with a decrease in brain cell proliferation and neuroblast differentiation.

Several papers have suggested evidence that curcumin plays a role in the prevention and treatment of other neurodegenerative diseases, such as Alzheimer's disease,[19] Parkinson's disease[20] and memory impairment without dementia.[21] Other brain disorders that have been positively affected by the administration of curcumin include multiple sclerosis, Huntington's disease, stroke, autism and amyotrophic lateral sclerosis (ALS).[22]

Researchers have also found older adults who took the supplement for at least four weeks showed a significant improvement in working memory, general fatigue and contentedness.[23] A second study[24] examined the effects of curcumin on individuals who had no history of dementia. They followed 40 people between the ages of 50 and 90 years who had mild memory complaints for 18 months.

The data showed[25] that those who took curcumin had significant improvements in memory and attention, as well as mild improvement in mood and significantly fewer amyloid and tau signals in the amygdala and hypothalamus, areas of the brain that control some memory and emotional functions. The study's first author, Dr. Gary Small, said in a press release:[26]

> *"Exactly how curcumin exerts its effects is not certain, but it may be due to its ability to reduce brain inflammation, which has been linked to both Alzheimer's disease and major depression."*

One meta-analysis[27] of six short-term, placebo-controlled clinical trials showed that curcumin "appears to be safe, well-tolerated and efficacious among depressed patients," and could serve as a "novel antidepressant."

Curcumin also has shown an effect on neuropsychiatric disorders. According to the Anxiety and Depression Association of America,[28] anxiety disorder is one of the most common mental illnesses and may develop from a complex set of risk factors.

A second study[29] of 123 people diagnosed with major depressive disorder compared curcumin intervention groups to a placebo group. They found those using curcumin experienced improvements without a difference in outcome using three different doses of curcumin. Additionally, three of the trials also reported significant antianxiety effects.

Another literature review[30] assessed the benefits of curcumin on several psychiatric disorders. The researchers wrote that the influence of curcumin on several biological activities may be responsible for the results. Additionally, many of these biological activities "are dysregulated in several neuropsychiatric disorders."[31]

Anti-Inflammatory Properties Promote Pain Control

Arthritis is a common diagnosis that affects up to 54.4 million people in the U.S. A 2019 report from the Arthritis Foundation[32] estimates this number will increase 49% to 78.4 million people by 2040. Additionally, they estimate the number whose activities are limited due to arthritis will jump from 43.5% with the condition in 2015 to 52% by 2040.

People often turn to anti-inflammatory and pain medications to help relieve the pain and discomfort from arthritis. The Arthritis Foundation[33] lists several pain relief options to potentially improve activity levels, including topical and oral nonsteroidal anti-inflammatory drugs, steroids, hyaluronic acid, platelet-rich plasma and stem cell injections. Yet, many of these treatments have a list of side effects and are not always well-tolerated.

The safety and nontoxicity of curcumin, even at high doses, have been documented in human trials.[34] Curcumin has been studied for pain relief in those with osteoarthritis, which is the most common form of arthritis.[35] In one study[36] of 139 people with knee osteoarthritis, researchers compared those taking curcumin against those taking diclofenac twice-daily for 28 days.

On Days 14 and 28 there were no statistically significant differences between people taking curcumin and those taking diclofenac in pain measurements. Additionally, the people taking curcumin had fewer episodes of flatulence, statistically significant weight loss and did not require an H2 blocker to reduce excess stomach acid, which 28% of those using diclofenac did.

Researchers found that curcumin had an effect on reducing pain similar to diclofenac, but was better tolerated and had fewer side effects. Similar results have been found in studies that evaluate curcumin for pain control after surgery.

One study[37] looked at patient-reported outcomes after laparoscopic cholecystectomy and despite issues with bioavailability, those taking curcumin had better mean pain scores during the first and second week after surgery and better fatigue scores in the first three weeks.

In an animal study,[38] researchers found that curcumin reduced the perception of pain in “incision-induced inflammation, nociceptive sensitization, spontaneous pain and functional gait abnormalities.” A second animal study[39] found similar results, including pain relief in a dose-dependent manner. Additionally, curcumin treatment appeared to facilitate recovery.

Curcumin: Endothelial Angiogenesis Suppression and Generation

Researchers have also found that curcumin has a unique property in which it both promotes and suppresses angiogenesis. One study[40] published by the University of California-Riverside[41] demonstrated that curcumin could promote vascular tissue growth, which may eventually be used to help regenerate injured tissue or to heal chronic wounds.

According to 2020 estimates,[42] nearly 2.5% of the U.S. experiences chronic wounds and an analysis[43] of Medicare data in 2018 identified roughly 8.2 million people with chronic wounds that may or may not have been infected. The estimated cost of treatment ranges from $28.2 billion to $96.8 billion.

The research was built on hyaluronic acid hydrogels, which earlier research[44] showed were highly stable, even after being injected through a fine clinical needle or undergoing sterilization. Additionally, they showed good biocompatibility in lab testing. The researchers synthesized curcumin magnetic nanoparticles which they dispersed in a hyaluronic acid hydrogel.[45]

When tested in stem cell culture, they found it promoted vascular endothelial growth factor (VEGF) and vascular tissue growth. The magnetic properties allowed the scientists to direct the movement of the nanoparticles to the desired location.

They believe this suggests a unique delivery system to help heal injured tissue and concluded, "Overall, our magnetic hydrogels integrated the desirable properties of cytocompatibility and angiogenesis with magnetic guidance, thus proving to be promising for improving tissue regeneration."[46]

As the researchers from the University of California noted in a press release,[47] curcumin has also demonstrated the ability to suppress cell growth in malignant tumors. Researchers have found this in several types of cancer, including small cell lung cancer,[48] breast cancer,[49] pancreatic cancer[50] and ovarian cancer.[51]

Effect on Inflammation May Improve Eye Health

The anti-inflammatory effects of curcumin may also affect eye health. Eye conditions can be difficult to treat and may affect your eyesight. Anterior uveitis[52] is an eye condition that can result from trauma or is associated with other health conditions such as tuberculosis, rheumatoid arthritis and viral infections. In some cases, there is no obvious underlying cause.

In one study,[53] patients with anterior uveitis received a 375 mg dose of curcumin three times a day for 12 weeks. There were 32 participants who completed the 12-week study and results showed that curcumin was effective in reducing symptoms and recurrences in the following three years.

In addition to being a potent antioxidant,[54] curcumin also boosts the function of your own antioxidant enzymes.[55,56,57] Overall, curcumin appears to be powerful, cost-effective and has a low toxicity profile.

As such, it could be a valuable supplement, especially for the aging population. In younger people, the beneficial impact on pathways that help reverse insulin resistance, metabolic syndrome and obesity[58,59] are worth noting. In all, I believe curcumin is a valuable nutritional addition worthy of consideration for all-around good health since inflammation drives so many different disease processes.

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