



Research review paper

Curcumin, a component of golden spice: From bedside to bench and back



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ABSTRACT

Although the history of the golden spice turmeric (*Curcuma longa*) goes back thousands of years, it is only within the past century that we learned about the chemistry of its active component, curcumin. More than 6000 articles published within the past two decades have discussed the molecular basis for the antioxidant, anti-inflammatory, antibacterial, antiviral, antifungal, and anticancer activities assigned to this nutraceutical. Over sixty five clinical trials conducted on this molecules, have shed light on the role of curcumin in various chronic conditions, including autoimmune, cardiovascular, neurological, and psychological diseases, as well as diabetes and cancer. The current review provides an overview of the history, chemistry, analogs, and mechanism of action of curcumin.

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Introduction

Curcumin is the active ingredient of the dietary spice found in the rhizomes of *Curcuma longa*, a plant in the ginger family. Turmeric, a common oriental spice that gives curry powder its yellowish color, is frequently used in Asian cooking, particularly Indian, Pakistani, and Thai cooking. Turmeric has been consumed for medicinal purposes for thousands of years. Extensive research on curcumin over the past few decades has revealed the health benefits of this ingredient to the modern era; in fact, numerous published articles, audio recordings, and videos on this subject are available to the public. Some links to videos about curcumin's health benefits are summarized in Table 1.

Isolation of curcumin

Because curcumin is insoluble in water, an organic solvent has been used for its isolation. Anderson et al. (2000) developed a technique for isolating curcumin from ground turmeric. They magnetically stirred the ground turmeric in dichloromethane and heated at reflux for 1 h. The mixture was suction-filtered, and the filtrate was concentrated in a hot-water bath maintained at 50 °C. The reddish-yellow oily residue was triturated with hexane, and the resulting solid was collected by suction filtration. Further TLC analysis (3%

methanol–97% dichloromethane) showed the presence of all three components (Anderson et al., 2000). Recently, Bagchi (2012) described extraction of curcumin from turmeric powder with the use of a solvent consisting of a mixture of ethanol and acetone. Chemical analyses have shown that turmeric contains protein (6.3%), fat (5.1%), minerals (3.5%), carbohydrates (69.4%), and moisture (13.1%). The essential oil (5.8%) obtained by steam distillation of the rhizomes contains α -phellandrene (1%), sabinene (0.6%), cineol (1%), borneol (0.5%), zingiberene (25%), and sesquiterpenes (53%); curcumin (3%–6%) is responsible for the yellow color. Now numerous biotech companies are isolating curcumin commercially, making it available to everyone. Some of these include Biotech Pharmacal Inc., Santa Cruz Biotechnology, Curcumin-Shijiazhuang Ivchuan Biotechnology Co. Ltd, Xiaoyuan Biotechnology Co., Ltd., and Anubhav Biotech Ltd.

Discovery of curcumin

Curcumin was discovered about two centuries ago by Vogel and Pelletier, who described it as a “yellow coloring-matter” from the rhizomes of *C. longa* (turmeric) (Vogel and Pelletier., 1815). Pure curcumin was prepared in 1842 by Vogel Jr. (Vogel., 1842). The possible structure of curcumin was reported by several chemists in the subsequent

Table 1
Online video describing the use and health benefits of curcumin.

Topic	Links
How curcumin helps prevent and treat cancer	http://www.youtube.com/watch?v=QNLt1fZR1BI
Turmeric curcumin—natural cancer-fighting spice reduces tumors	http://www.youtube.com/watch?v=oP7S5VDHtFY
Truly essential curcumin cures cancer in 1 year	http://www.youtube.com/watch?v=YgG0o9EGkmo
Turmeric curcumin—cancer cure and more!	http://www.youtube.com/watch?v=cKzOyLxpSS4
Curcumin kills cancer cells	http://www.youtube.com/watch?v=pAzwGKC_Cls
Curcumin benefits—all you should know about curcumin benefits	http://www.youtube.com/watch?v=PmunAxElzoc
Curcumin for cancer prevention	http://www.youtube.com/watch?v=9iGWifv6ldo
Anti-cancer and other health properties of curcumin	http://www.youtube.com/watch?v=ArzTQsG1yVw
Samidirect cancer testimonial team chairman club	http://www.youtube.com/watch?v=3vQrgT4xric
Cancer fighting super food curcumin turmeric tumeric haldi	http://www.youtube.com/watch?v=INUbV_pgPqM
Curcumin extraction	http://www.youtube.com/watch?v=_R3fL-ucUSA
SFWC lifestyle and cancer awareness workshop 4	http://www.youtube.com/watch?v=pDmpulNjGaE
Curcumin for the prevention of polyyps for FAP	http://www.youtube.com/watch?v=e7EGeVTBbqw
Why is curcumin a suitable anti-cancer agent?	http://www.youtube.com/watch?v=Nj4WJs5t5g
Professor Bharat B Aggarwal discusses curcumin	http://www.youtube.com/watch?v=Zht2Q5D0RdY
Cancer cure turmeric natural cancer cure	http://www.youtube.com/watch?v=jqj6EqjSvWV8
Curcumin for colon cancer	http://www.youtube.com/watch?v=eIQFAv6hNRo
Curcumin reduces risk of HPV-related cervical cancer	http://www.youtube.com/watch?v=2yJoE7F2IM8
Curry spice, curcumin and fermented soy research and cancer	http://www.youtube.com/watch?v=OXqN5UckhFk
Curcumin a big medicine—turmeric curcumin health talk	http://www.youtube.com/watch?v=01PcxGtgr4
McCord curcumin cancer chemotherapy	http://www.youtube.com/watch?v=XX9nF8_SQmM
Turmeric: naturally reverse cancer, arthritis and inflammation	http://www.youtube.com/watch?v=YS-nyqBjeGc&list=PL4E92A08A28D8A361
Brain injury recovery, curcumin, minority health	http://www.youtube.com/watch?v=KTH4jBYOudA
Benefits of curcumin capsules	http://www.youtube.com/watch?v=y5mh1Tukv8rU
Theracurmin—a major breakthrough in curcumin absorption	http://www.youtube.com/watch?v=EQYnkOkc6C8
Curcumin—life extension videos	http://www.youtube.com/watch?v=yJLma3m9zy8
Interaction of curcumin nanoformulations with human plasma proteins	http://www.youtube.com/watch?v=4Yq7IAyStYQ
Curcumin in prevention of cancer	http://www.youtube.com/watch?v=xmxyZY9eRo
Turmeric remedy for cancer : “Arishina Cancerge Ramabhana”	http://www.youtube.com/watch?v=ofi4URRTewM
Curcumin (turmeric) is a potent anti inflammatory	http://www.youtube.com/watch?v=8PN7X3RsVRs
Turmeric with black pepper—curcumin—turmeric curcumin capsules	http://www.youtube.com/watch?v=KpCLEujpL0A
The benefits of curcumin	http://www.youtube.com/watch?v=ZHu280-mf7E
La curcumine anti cancer (incroyable)	http://www.youtube.com/watch?v=iAdMnvXEI58
Curcumin side effects	http://www.youtube.com/watch?v=TAGjkaGipHo
Curcumin and your health—your health	http://www.youtube.com/watch?v=SWbHFHb6r6Q
Turmeric curcumin, joint supplement for athletes, anti inflammatory	http://www.youtube.com/watch?v=yOasvOUZoSg
How to use turmeric	http://www.youtube.com/watch?v=cafoiHQjvPw
Using turmeric to prevent and cure cancer	http://www.youtube.com/watch?v=FXllreujNyo
Curcumin may help prevent type 2 diabetes	http://www.youtube.com/watch?v=KnAW-aQZk6U
Curcumin—turmeric benefits—uses and curcumin capsules	http://www.youtube.com/watch?v=SoeAvQTL5EK
Smart tips—anti-cancer kitchen spice	http://www.youtube.com/watch?v=tvahuahhrZw
Curcumin & lycopene aid prostate health & issues	http://www.youtube.com/watch?v=DT0fkvwCnmY

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