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Review

A Review of the Anti-oxidation, Anti-inflammatory and Anti-tumor Properties of Curcumin

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Abstract

Sinafaravar pharmaceutical Company has produced Curcuma-sina that helps people have healthier lives. Curcuma-Sina shows strong anti-oxidation, anti-inflammatory and anti-tumor properties. This product is including *Curcuma longa* and Piper *nigrum*. Anti-inflammatory products are being used to remedy chronic inflammatory disorders and cancers. Thus, there is an urgent need to develop safe and effective medicines for the long-term use. Researchers have studied small molecules derived from natural sources with the aim of developing new treatments for clinical features. Curcuma longa and Piper *nigrum*, are well known to have beneficial clinical effects. *Curcuma longa* has various therapeutic effects on different diseases. However, it has limited tissue distribution, low serum levels and apparent rapid metabolism in human. To increase *Curcuma longa* bioavailability, *Piper nigrum*, known as a natural adjuvant increases the bioavailability of Curcuma longa.

Keywords: *Curcuma longa*, *Piper nigrum*, Antioxidation, Anti-inflammatory, Anti-tumor.

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Introduction

Curcuma-Sina is a drug which contains Curcuma longa and Piper nigrum. Curcuma-Sina has strong antioxidation, anti inflammatory and anti tumor activities. At the following, we introduce compounds of this product.

Curcuma longa is a spice of ginger family (Zingiberaceae) described as having yellow color rhizomes which are horizontal underground stems that send out shoots and leaves. The yellow color is largely derived from fat-soluble polyphenolic pigments called curcuminoids. The yellow pigment segregated from the rhizomes of Curcuma longa is more commonly called curcumin or turmeric [1, 2].

The dietary phytochemical curcumin has a long history of medical use in Asia for a wide variety of medical situations [3]. For hundreds of years it has mostly been part of the diet of people in a number of countries such as Iran and India [4, 5].

Many medical researchers have studied on curcumin due to its different remedial effects on many diseases. Curcumin has received consideration mostly due to its anti-inflammatory, anti-oxidant, anti-tumoral, apoptosis-inducing and anti-angiogenesis effects, which were reported in many studies [6].

Curcumin has multilateral purpose in cellular pathways that makes this agent able to relocate multiple attempts [7]. These therapeutic influences of curcumin have been discussed in many experiments for many diseases [8-12]. (Figure. 1)

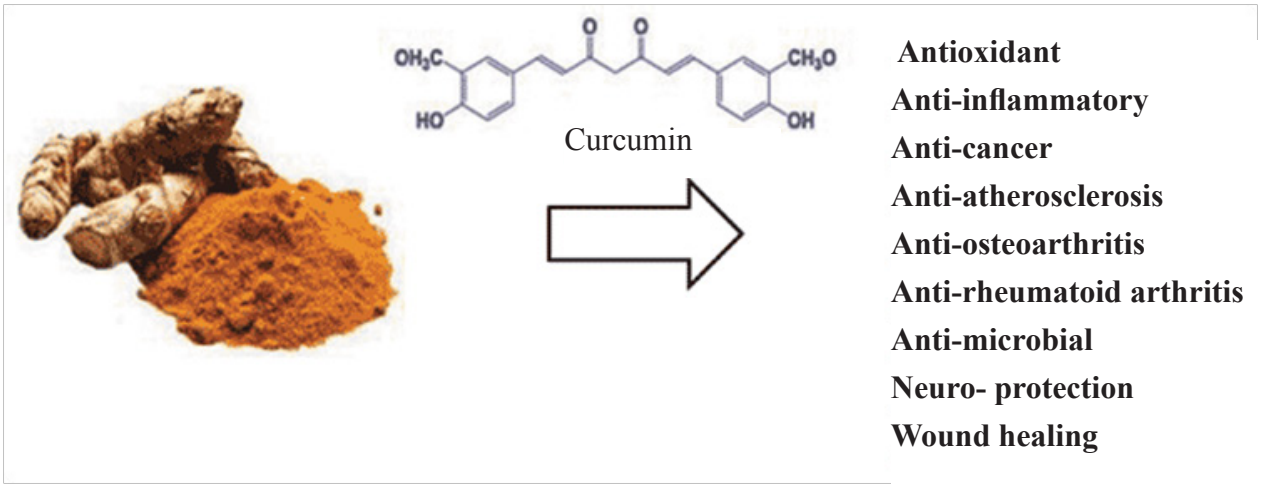

Figure 1: The therapeutic influences of curcumin

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The antioxidant activity

Oxidative stress has an important role in the cause of various diseases including inflammation, cancer, diabetes, cardiovascular diseases, cell injury and liver disorders. Experimental models have been reported to consider the therapeutic effects on various materials as well as curcumin in this matter [13].

Antioxidants are materials which destroy or postpone oxidation of oxidative stratum such as carbohydrates, amino acids, lipids and genome damage in cells. Various diseases may be occurred if the rate of free radicals and antioxidants becomes off balanced [14]. Natural antioxidants play a major role in the preservation of health and in cure of various disorders [15, 16]. Curcumin is one of the most important indigenous antioxidants with a broad aspect of medical properties. Various research using various models have confirmed curcumin conservation despite oxidative factors for the whole body [17-20].

Curcumin is a free radical scavenger and a suppressor of genome injury, particularly in attendance of some particles such as Cu or Fe ions [21-23]. Curcumin is adherent to many ions that modulates the antioxidant attributes and radical scavenging effects [24, 25].

The anti-inflammatory activity

Curcumin has been well known with anti-inflammatory capability. Many of the activities associated with curcumin are related to its ability to inhibit inflammations [26].

Anti-inflammatory mechanisms of curcumin including inhibition of nuclear factor kappa-B (NF-κB) that plays an important role in signal transduction pathways preoccupied in diseases and various cancers, inhibited metabolism of arachidonic acid with lipoxygenase and scavenging of free radicals beget in this pathway. Also, it reduces expression of inflammatory cytokines such as IL-1b, IL-6 and TNF-α, eventuating in growth inhibition of cancer cell lines and down-regulation of enzymes such as protein kinase C, that interfere inflammation and abnormal cell proliferation [27-30].

The anti-cancer activity

Cancer is a high proliferative disturbance of a normal cell with missed cellular homeostasis. It inchoates to fundamentally activate an extravagance of genes that are convicted in cell cycle, invasion, survival, metastasis and angiogenesis. A study suggests that arranged inflammatory pathways play a major function in regiment of chronic diseases especially cancer [31]. The chronic inflammation drives cancer initiation and development whit increased production of pro inflammatory mediators, such as cytokines, chemokines, reactive oxygen species (ROS), over expression of oncogenes, cyclooxygenase (COX-2), matrix metalloproteinase (MMPs), intracellular signaling pathway mediators, transcription factors such as nuclear factor κB (NF-κB), signal transducer, activator of transcription 3 (STAT3), protein kinaseB (AKT), activator protein 1 (AP1) that drive tumor cell proliferation, transformation, invasion, metastasis, angiogenesis, chemoresistance and radio resistance [32, 33]. It has been proven that pro-inflammatory mediators are linked to tu-

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mor formation. Curcumin's anti-tumoral effects have been shown in many of preclinical cancer models, including colorectal, pancreatic, gastric, prostate, hepatic, breast, oral cancers, leukemia and at various cell lines of carcinogenesis [34]. In addition, curcumin confiscates cell cycle's advancement independent of prevention of prostaglandin synthesis [35].

According to this different finding, curcumin engages with plenty of extracellular and intracellular molecules that are actively involved in cancer initiation and progression [36-39].

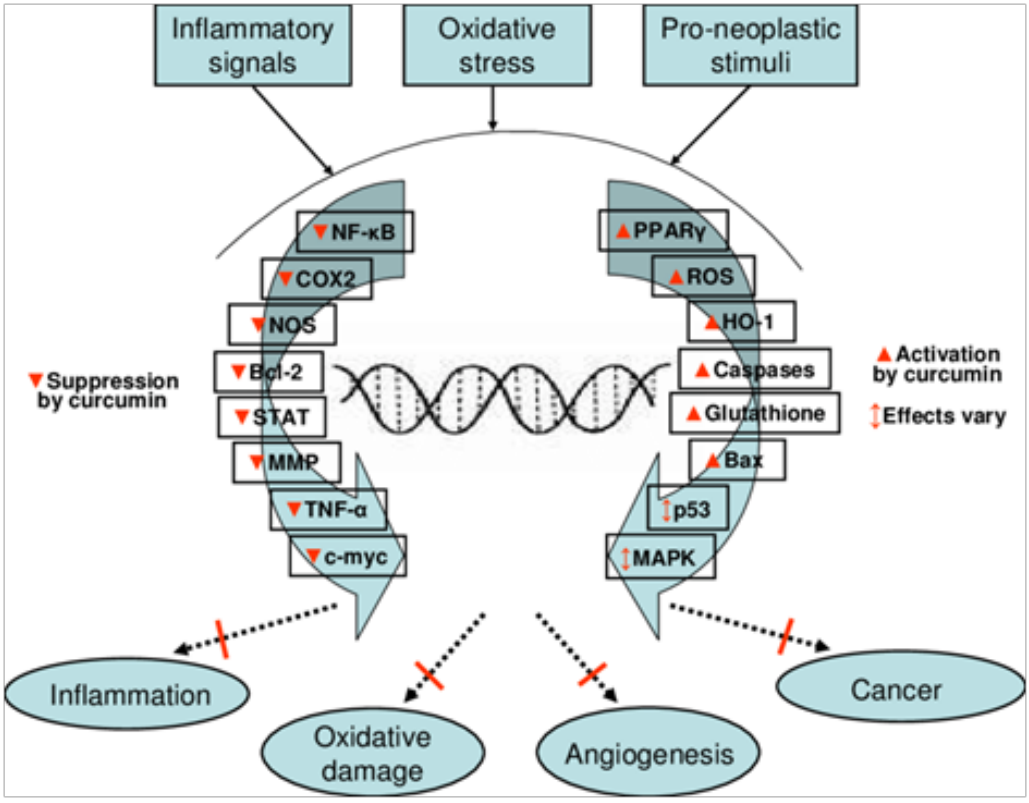

Figure 2: Cellular activities of curcumin and molecular mechanisms of action

Bioavailability of Curcumin

Curcumin bioavailability is so poor in humans. Although curcumin has hopeful features for prevention and treatment of various disorders, clinical uses have been bereaved by insignificant absorption, fast metabolism, short biological half-life and down oral bioavailability [40, 41]. The main problems of bioavailability of curcumin are low serum levels, limited tissue broadcast and rapid metabolism [42]. Therefore, superior doses are urgent to make many drugs [43]. Studies on curcumin have detected some potential ways to improve the bioavailability, boost circulation, improve penetrance and resistance to metabolic proceedings. Multiple formulations have helped including nanoparticles, phospholipid complexes, liposomes, micelles, and adjuvants [44-49].

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One of the natural adjuvants is piperine, the main part of Piper nigrum, known to improve the bioavailability of curcumin. This effect of piperine on the pharmacokinetics of curcumin has been shown to be much greater in humans than in animal study. A study shows that piperine increases the serum compactness, measure of absorption and bioavailability of curcumin in both animal and humans with no deleterious effects [50].

Increased bioavailability of curcumin has been found to be associated with piperine. Intestinal sorption of curcumin was also detected comparatively higher when provided concomitantly with piperine, and has constancy significantly longer in the body tissues [51, 52].

Combination therapy including curcumin and a bio activator such as piperine could promote the cellular uptake of curcumin and modulate the pharmacokinetics effect of curcumin which may cause to albumin binding interactions which are expected to increase the efficacy of curcumin [53, 54].

Piperine is a promising natural source with potential for therapeutic use. Piperine is also known to promote the bioavailability of some pharmacological agents by inhibiting drug metabolism or increasing absorption [55, 56]. Piperine has antioxidant ability, it scavenge free radicals and reactive oxygen species against oxidative injury that might be due to the presence of flavonoids and phenolic contents.

Piper nigrum inhibit the oxidative stress by preventing lipid peroxidation, lipoxygenase and arresting hydroxyl and superoxide free radicals and decreasing carcinogenesis [57-64]. Also, piperine has effective immunomodulatory and antitumor activities with inhibit tumors formation [65-67]. According to studies, the antitumor activity of piperine may be related to its immunomodulatory properties that involves the activation of cellular and humoral immune responses [68, 69]. Piperine inhibits the production of proinflammatory mediators including, IL6 and PGE2, furthermore by inhibiting tumor necrosis factor-α (TNF-α) it can induce activation of NF-κB via blocking IκBα kinase activation [70-72].

Conclusion

Since earliest times, curcumin has been used in Asian countries against human affliction. Contemporary science has describe the molecular basis for the pharmaceutical uses of curcumin. Numerous studies over the past decade have demonstrated the safety and efficacy of this phenol and have provided a solid basis for evaluating its efficacy in human clinical trials. ¬Despite its efficacy and safety, limited curcumin bioavailability continues to be highlighted as a major concern. However, in attempting to improve the bioavailability of curcumin, several strategies have been explored such as blocking of metabolic pathways by concomitant administration with other agents like piperine.

Conflict of Interest

None.

Acknowledgment

None.

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