



Important of Health Benefits of Curcumin Consumption in Regular Diet

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Abstract

Curcumin is a turmeric extract having significant scientific values because of its medicinal importance. Consumption of curcumin can act against many pathogens to provide support to the body immune system. Curcumin is also known for its specific actions such as selective activation and inactivation of genes for the betterment of the cells. The consumption of curcumin is useful as an anti-oxidant, anti-inflammatory, anti-microbial and an anti-tumor compound, which boosts the body immune system from its immunomodulatory actions. The consumption of curcumin is also can be benefited in DNA repair mechanism, it is known for its cellular repairing properties and helps to prevent the apoptosis of normal cells. Metabolically curcumin is a poorly absorbable compound, which limits its potential action against the said phenomenon. Curcumin is recommended to consume with milk, pepper or any fat molecules to increase the bio-availability of this molecule.

Keywords

Curcumin; Anti-oxidant; Anti-inflammatory; Anti-tumor; Apoptosis

Introduction

Curcumin is a potent bioactive compound present most commonly in the roots *Curcuma longa* plant, commonly known as turmeric plant [1]. It is well known for its importance in traditional medical practices [1]. Use of curcumin in medicines has been reported long before in the traditional medicines, which tells us the importance of curcumin related to common health issues [1,2]. Nutritional intake of curcumin could be effective against several problems such as cellular microbial infection, oxidation, free-radical scavenging, inflammation and cancer [1,3]. Curcumin acts as an effective anti-inflammatory agent, which is known to prevent the inflammatory pathway by blocking several pro-inflammatory cytokines, TNF- α and TGF- β pathway [4]. Some reports have been suggested that the intraperitoneal (IP) administration of curcumin could regulate the BLM-induced lung epithelial injury and its progression to pulmonary fibrosis (PF) [4,5]. Curcumin treatment involved in the regulation alveolar epithelial cell (AEC) apoptosis and fibroblast proliferation during the development of PF [4]. Also, it has been noticed that oral administration of curcumin provides very less curcumin to our body when compared to IP model [5].

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Recent scientific reports said that the normal intake of curcumin in the form of turmeric powder is not a preferable way of curcumin consumption [5]. The literature suggested that the direct intake of isolated curcumin could increase the bioavailability of curcumin and its action related to various health hazards [2,5]. Preferably, curcumin consumption is most appropriate to take with milk, pepper, honey or with any edible oil [6]. It has been noticed that the curcumin is a fat-soluble compound and also the intake with the pepper increases the curcumin absorption by interacting with the piperine, which increases the curcumin absorption by 2000% [6]. Curcumin is also known for its beneficial effects on gene regulation, which in turn has the special ability to activate or inactivate the gene expression to regulate the cellular function [5,7]. It also involved in the modulation of cell proliferation and apoptosis regulating the cancer related health issues [5,8]. Curcumin is well known for its anti-inflammatory action involved in the down-regulation of various inflammatory molecules such as chemokine, macrophages, neutrophils, TNF- α , IL-1 and IL-6 [5,9,10]. Curcumin has the ability to modulate the immune system, which can effectively controls the activity of T-cells, B-cells, neutrophils, natural killer cells, dendritic cells and macrophages [8]. It is also reported that the curcumin diet could suppress the COPD like airway inflammatory disease and lung cancer progression in mice [8]. Curcumin also could regulate the DNA methylation, histone modification and miRNAs activity that play a key role in the diseases such as cancer, COPD, ARDS, ALI, and IPF [5,7-10]. This review provides the brief comprehensive knowledge about health benefits of curcumin and its action at the molecular level.

Common health benefits of curcumin

Traditionally curcumin is well known for its nutritional factors and medicinal values. Various health benefits of curcumin have been reported throughout the world, major among those is antioxidant property [11]. Modern food habits, such as fried and over salted could generate free radicals which are known to damage the cell by oxidation of cellular components. Free radical scavenging is one of the major properties of curcumin, which could act upon it and balance the anti-oxidant state of the body [12]. This oxidative damage to the cell could be involved in the promotion of inflammatory response, which is mediated through neutrophils, macrophages, inflammatory cytokines and various other molecules [4]. The potent anti-inflammatory properties of curcumin could effectively act against these inflammatory molecules either by oral gavages or by IP [5]. It could block the inflammatory pathway by down-regulating the various inflammatory cytokines such as IL-1, IL-6 and IL-17A [4,5]. These inflammatory molecules are further connected with several other pathways which determine the pathogenic progression of disease in any condition [4,5].

It is also been observed that the curcumin is actively involved in the prevention of platelet clumping to improvise circulatory system [13]. It may happen via inhibition of thromboxane synthesis and potentiation of prostacyclin synthesis [13]. Curcumin is also known for its anti-mutagenic properties, which helps to prevent chemotherapy or radiation therapy side effects while treating cancer [14,15]. It can effectively inhibit metastasis of skin cancer cells and deactivate the carcinogen produced from smoke or tobacco chewing

[14,15]. The specific action against the microbes also can be seen by using curcumin, which can act as a harmful agent against the microbes and inhibits the growth of bacteria, parasites and pathogenic fungi [16].

Curcumin on gastric system and its metabolism

Curcumin intake may effectively improve the gastric system and helps to cure the gastric ulcers [17]. A clinical study conducted at phase II trial using 25 patients have demonstrated that the effect of curcumin on the gastric ulcer. In this study daily five times administration of turmeric (600mg) showed that the complete healing of gastric ulcer in 48% patients after 4 weeks and healing in 76% patients after 12 weeks [1,17]. This indicates the effectiveness of curcumin on body metabolic system and its performance.

The metabolism of curcumin limits its action due to poor bioavailability and uptake [18]. Curcumin basically undergoes metabolic O-conjugation to curcumin sulfate, and curcumin glucuronide [3,19]. Bio reduction of curcumin produces tetrahydrocurcumin, hexahydrocurcumin, octahydrocurcumin and hexahydrocurcuminol [18,20,21]. It is reported that major biliary metabolites of curcumin are hexahydrocurcumin and glucuronides of tetrahydrocurcumin [22]. The minor biliary metabolites found were the traces of ferulic acid and dihydroferulic acid [3,22]. These metabolites are biologically very active and exhibit the properties such as anti-oxidative, anti-inflammatory and anti-cancer activities [22].

Despite of multiple medicinal values, low absorption or poor bioavailability of curcumin limits its specific action in the clinical trials [20,23,24]. Clinical formulation of curcumin has become the major problem due to its poor physicochemical properties in the biological systems [25]. Curcumin is insoluble in water and easily degrades at neutral to basic pH [25]. There are several formulations such as nanoparticles, complexation with phospholipids, cyclodextrins, liposomes, solid dispersions have been tried in order to increase the bioavailability of curcumin [26-28]. Piperine has been found to enhance the absorption and bioavailability of curcumin in clinical studies [6,29]. This development attributed to the inhibition of curcumin metabolizing enzymes, thereby bypassing the first pass metabolism [6,29]. Despite safety and pharmacological activity, the curcumin action remains limited due to lack of suitable delivery system to develop as a therapy [20,23,24,29].

Conclusion

Various scientific literatures have concluded that the curcumin has the immense biological activity, which could be used to regulate various diseases as well as modulation of our immune system. Dietary intake of isolated curcumin could be more effective compared to whole turmeric powder. In future, curcumin therapy could be used as a key treatment modality to treat the health problems such as inflammation, cancer, microbial infection, gastric ulcer and free radical scavenging.

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