

Effects of Curcumin on Health of Humans

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ABSTRACT: *Turmeric, a spice known for its medicinal properties for a long time, has attracted interest both from the medical/scientific community and from culinary lovers, as it is the primary source of curcumin polyphenol. It helps to treat oxidative and inflammatory disorders, metabolic syndrome, arthritis, hyperlipidemia, and anxiety. It can also help to prevent pain and muscle soreness caused by exercise, thereby improving healing and efficiency in healthy individuals. Furthermore, a comparatively low dosage of the complex will offer health benefits for patients who have not had health problems reported. Its antioxidant and anti-inflammatory effects can be linked to most of these benefits. Because of its low bioavailability, which seems to be mainly due to weak absorption, rapid metabolism, and fast removal, ingesting curcumin alone would not contribute to the related health benefits. Bioavailability can be improved by many elements. Piperine, for instance, is the main active ingredient of black pepper and has been shown to improve bioavailability by 2000 percent when mixed in a complex with curcumin. Many health benefits are offered by curcumin coupled with stimulating agents. The purpose of this analysis is to provide a concise summary of the abundance of studies on the beneficial effects of curcumin.*

KEYWORDS: *Antioxidant, Anti-Inflammatory, Arthritis, Curcumin, Turmeric.*

INTRODUCTION

Turmeric is a spice that has earned a great deal of attention from both the medical/scientific and culinary realms. Turmeric is a herbaceous perennial rhizomatous plant (*Curcuma longa*) of the ginger family. The therapeutic uses of turmeric, the source of curcumin, are already known since ancient times, but only lately has the potential to establish the specific mechanism(s) of activity and the bioactive components been studied. The key natural polyphenol present in the rhizome of *Curcuma longa* (turmeric) and in others of *Curcuma* spp. is curcumin (1,7-bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione), also called diferuloylmethane. Due to its antioxidant, anti-inflammatory, antimutagenic, antimicrobial, and anti-cancer features, *Curcuma longa* has historically been used as a medicinal herb in Asian countries[1].

It has been demonstrated that curcumin, a polyphenol, targets multiple signalling molecules while also showing cellular level behaviour, which has tended to explain its numerous health benefits. Inflammatory disorders, metabolic syndrome, discomfort and aid with the treatment of inflammatory and incurable vision problems have been found to be helpful. Moreover, the kidneys have been found to benefit from it[2].

Although curcumin supplements tends to contain myriad medicinal benefits, many of these advantages are attributed to its antioxidant and anti-inflammatory impact. Given its potential advantages by inflammatory and antioxidant pathways, its low bioavailability, which appears to be mainly due to poor absorption, rapid metabolism, and rapid removal, is one of the main problems with ingesting curcumin by itself. By addressing these different pathways, multiple agents have been studied to enhance curcumin's bioavailability. In order to improve its bioavailability, most of them have been designed to block the metabolic pathway of curcumin. For eg, the main active ingredient of black pepper is piperine, a proven bioavailability enhancer, and an improvement of 2000 percent in curcumin bioavailability is correlated with it. Therefore, by incorporating agents such as piperine that increase bioavailability, the problem of low bioavailability tends to be overcome, thereby forming a curcumin complex[3].

In several different ways, curcumin is recognised and used worldwide for many possible health benefits. For starters, curcumin-containing turmeric has been used in curries in India; it is served in tea in Japan; it is used in cosmetics in Thailand; and is used as a colourant in China; it is served in beverages in Korea; it is used as a disinfectant in Malaysia; it is used as an anti-inflammatory agent in Pakistan; and it is used as an antiseptic in the U. S. in mustard sauce, cheese, butter, and chips. There are many types of curcumin online, such as pills, tablets, ointments, energy drinks, soaps, and cosmetics. Curcuminoids were authorized as 'Generally Accepted As Safe' (GRAS) by the US Food and Drug Administration (FDA) and clinical

trials have demonstrated good tolerability and safety profiles, including at doses between 4000 and 8000 mg/day and concentrations up to 12,000 mg/day, with a 95% concentrations of three curcuminoids: curcumin, bisdemethoxycurcumin, and demethoxycurcumin. The purpose of this analysis is to provide a concise summary of the myriad of studies on curcumin's potential health benefits. Because of the breadth of the literature, instead of examining the detailed literature associated with cancer as well as other systemic diseases, we have opted to concentrate on the benefits associated with certain common health problems and on advantages for healthier individuals[4].

DISCUSSION

Mechanisms of Action

Antioxidant

The two key pathways describing the bulk of the impact of curcumin on the different conditions mentioned in this study are antioxidant and anti-inflammatory properties. Systemic markers of oxidative stress have been found to promote curcumin. There is proof that antioxidants such as superoxide dismutase (SOD) may enhance serum function. A recent systematic review and meta-analysis of randomised control evidence related to the effectiveness of distilled curcuminoid ingestion on oxidative stress markers revealed that curcuminoid supplements had a major impact on all oxidative stress markers examined, including SOD and catalase plasma activities, and also glutathione peroxidase (GSH) serum concentrations. It is interesting to point out that all of the studies included in the meta-analysis used some sort of formulation and four out of six used piperine to address bioavailability problems. The impact of curcumin on free radicals is carried out by many multiple pathways. Various forms of free radicals can be scavenged, like reactive oxygen and nitrogen species (ROS and RNS respectively); the function of GSH, catalase and SOD enzymes involved in the neutralisation of free radicals can be modulated; ROS-generating enzymes such as lipoxygenase/cyclooxygenase and xanthine hydrogenase/oxidase can also be blocked. In contrast, curcumin is a lipophilic compound that makes it an effective peroxy radical scavenger, so curcumin is often known as a chain-breaking antioxidant, including vitamin E[5].

Anti-Inflammatory

In multiple chronic disorders, oxidative stress has been involved, and its pathological mechanisms are closely similar to those of inflammation, in that one can be readily caused by another. In addition, inflammatory cells are known to release a variety of reactive species at the site of inflammation that induces oxidative stress, that indicates the association between oxidative stress and inflammation[6].

In fact, an intracellular signalling cascade that promotes pro-inflammatory gene expression may be triggered by a variety of reactive oxygen/nitrogen species. In the production of several chronic diseases and disorders, inflammation has been reported. These include Alzheimer's disease (AD), Parkinson's disease, multiple sclerosis, seizures, cerebral accident, coronary disease, metabolic syndrome, cancer, allergies, asthma, bronchitis, colitis, inflammation, renal ischemia, psoriasis, diabetes, obesity, stress, exhaustion, and AIDS syndrome gained through immune deficiencies. In certain disorders, tumour necrosis factor α (TNF- α) is a significant mediator of inflammation and this effect is regulated by the activation of a nuclear factor (NF)- κ B transcription factor. Whereas TNF- α is said to become the most potent activator of NF- κ B, NF- κ B also controls the expression of TNF- α . In addition to TNF- α , most inflammatory cytokines, gram-negative bacteria, various viruses that cause disease, environmental toxins, biological, physical, mechanical, and psychological tension, high glucose, fatty acids, ultraviolet radiation, tobacco smoke, and other factors that cause disease are all triggered by NF- α . Consequently, against some of these disorders, substances that downregulate NF- κ B and NF- κ B-regulated gene products have clinical effectiveness. It has been shown that curcumin inhibits the activation of NF- κ B enhanced by many various inflammatory stimuli. Curcumin has also been shown to inhibit inflammation outside the reach of this analysis via several different pathways, thus endorsing its mode of action as a prospective anti-inflammatory agent[4][7].

Arthritis

Osteoarthritis (OA), a chronic joint condition, is one specific illness connected with inflammation, both acute and chronic. It impacts more than 250 million people around the world, contributing to higher healthcare costs, impairment in everyday living practises and, consequently, reduced quality of life. While

OA was once predominantly regarded a degenerative and non-inflammatory disease, it is now recognised as having inflammatory features, including elevated levels of cytokines, and also being theoretically related to systemic inflammation. There are several prescription treatment options, and there is no cure; but several are expensive and have unnecessary adverse effects. The interest in holistic therapies, especially dietary supplements and natural medicines, is also growing. The anti-arthritic effects of curcumin in humans with OA and rheumatoid arthritis (RA) have been demonstrated in many trials[1][8].

Metabolic Syndrome

The theory that curcumin can modulate systemic inflammation has ramifications beyond arthritis, because several diseases influencing many processes have been correlated with systemic inflammation. Metabolic syndrome (MetS), which involves insulin resistance, hyperglycemia, high blood pressure, low high-density lipoprotein cholesterol (HDL-C), high low-density lipoprotein cholesterol (LDL-C), high triglyceride levels, and obesity, especially visceral obesity, is one such disorder. By increasing insulin sensitivity, preventing adipogenesis, and decreasing high blood pressure, inflammation, and oxidative stress, curcumin has shown to reduce many characteristics of MetS. Furthermore, there is evidence that curcuminoids modulate gene expression and activity of lipoprotein metabolism-related enzymes, contributing to a decrease in plasma triglycerides and cholesterol [and increased concentrations of HDL-C]. Obesity and overweight are also associated with chronic low-grade inflammation; while the precise causes are not evident, pro-inflammatory cytokines are assumed to be produced. These cytokines are believed to be at the centre of the complications involved with diabetes and cardiovascular disease. It is, however, essential to treat inflammation[9].

Healthy People

The bulk of human curcumin trials to date have been in populations with current health conditions. Maybe that's because trials on healthier patients can be daunting in that if biomarkers are common at baseline, advantages may not be as evident and observable. Therefore, the greatest insight into any future health benefits of healthier individuals can be provided by following topics over time, but such trials can be time-consuming and expensive. Make cross-comparisons between the few experiments that have been performed can be challenging since reports have used different doses, sometimes as high as 1 g. It should be remembered that only since it is greater than what most people might receive by drinking the spice itself will this be deemed a high dosage[10].

Side Effects

There is a long-established success rate for curcumin. The Allowable Daily Intake (ADI) amount of curcumin, for instance, as per JECFA (Joint United Nations and World Health Organization Expert Committee on Food Additives) and EFSA (European Food Safety Authority) reports, is 0–3 mg/kg body weight. The safety and effectiveness of curcumin has been supported by many studies on healthy subjects. Any negative side effects have been reported, given this very well protection. In a dose response sample, seven participants who received 500-12,000 mg and observed for 72 h experienced diarrhoea, fever, rash, and yellow stool. In an another research, nausea and diarrhoea and a rise in serum alkaline phosphatase and lactate dehydrogenase content were recorded in some subjects given 0.45 to 3.6 g/day curcumin for one to four months[11].

CONCLUSION

For its various health effects, which tend to function mainly through its anti-oxidant and anti-inflammatory pathways, Curcumin has gained worldwide recognition. When curcumin is paired with substances like piperine, that greatly improves its bioavailability, these advantages are better accomplished. Analysis shows that curcumin can assist in oxidative and inflammatory disorders, metabolic syndrome, arthritis, anxiety, and hyperlipidemia control. It can also assist in the treatment of exercise-induced inflammation and muscle soreness, thereby improving healing and eventual results in healthy persons. Moreover, for those who do not have diagnosed health issues, a comparatively low dosage will provide medical benefits.

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