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Review Article

Curcumin: A Natural Antiinflammatory Agent

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ABSTRACT

Extensive scientific research on curcuma, a natural compound present in the rhizomes of the Curcuma plant of Linn., Has shown its anti-inflammatory action. Curcuma has been found to inhibit arachidonic acid metabolism, cyclooxygenase, lipoxygenase, cytokines (Interleukins and tumor necrosis factor) Nuclear factor-κB and the release of steroidal hormones. Curcuma has been reported to stabilize the lysosomal membrane and cause the accumulation of oxidative phosphorylation without having a strong oxygen-destroying function, which targets its anti-inflammatory properties. In various animal studies, a dose range of 100-200 mg / kg body weight has shown good anti-inflammatory activity and has been shown to have a serious adverse effect on human systems. Oral LD50 in mice was found to have a body weight of more than 2.0 g / kg.

Key Words:Cyclooxygenase (COX); free radical scavenger; inflammatio

INTRODUCTION

Numerous studies have shown that curcuma has broad therapeutic actions such as anti-inflammatory, anti-spasmodic, antimicrobial, anticancer, hepatoprotection and neuroprotection etc. cytokines (ILs and TNF) and NF-κB [1-4]

Preclinical studies

Curcuma's anti-inflammatory properties In albino mice (180–200 g), [5] Arora et colleagues found anti-inflammatory activity in several components of C-derived petroleum ether, which they compared to hydrocortisone acetate and phenylbutazone. The anti-inflammatory activity of the overall petroleum ether extract was found to be lower than that of the individual components A and B. In the cotton pellet method-induced rebellion, the fractions almost behaved as hydrocortisone acetate.

Curcuma isolated from the extraction of turmeric alcohol has been shown to be an effective anti-inflammatory agent. In the study of low toxicity, no toxic effects were observed in mice when they were given for 4 weeks at a dose of 1-2 g / kg. Oral LD50 was found to be 12.2 g / kg. [6-10]

Recently, the anti-inflammatory activity of curcuma has been demonstrated in models of acute and chronic inflammation in rats and mice. [15], [16] In mice with Freud's adjuvant-induced arthritis, the administration of curcuma significantly reduced inflammation compared with control.

Clinical trials

[22] Deodar et al studied the anti-inflammatory action of curcuma in patients with rheumatoid arthritis. Studies have shown significant improvements in morning stiffness, mobility and joint inflammation, and curcuma, which is almost identical to phenylbutazone. [23] Stocker et al studied the anti-inflammatory properties of curcuma in patients with post-surgical inflammation. The drug effect on individual parameters has shown that phenylbutazone and curcumin have better anti-inflammatory responses in these patients compared to placebo.

Curcumin has been proven to reduce edermatic cord edoema and soreness better than phenylbutazone. [24] In patients with oral, breast, body, and skin malignancies, Kuttan et colleagues found that an ethanolic extract of turmeric or curcumin ointment gave symptomatic alleviation. Only one patient in the inpatient setting had a negative reaction.

[25] Curcumin's usefulness in the treatment of chronic anterior uveitis was investigated by Lal et al (CAU). [25] Curcumin was given orally to CAU-treated patients three times a day for 12 weeks at a dose of 375 mg. Only 32 patients out of 53 finished the 12-week study. They were split into two categories: Curcumin was given to 18 patients alone, while 14 patients with a significant purified protein response were given a placebo (PPD)

Mechanism of action of curcumin

Nonsteroidal anti-inflammatory drugs can decrease arachidonic acid metabolism, cyclo-oxygenase (COX) / PG production, lipoxygenase (LOX), and cytokines (IL, TNF, etc.) individually or in combination.

The incorporation of [14C] arachidonic acid (AA) into platelet phospholipids also prevented the deacylation of AA-labeled phospholipids (free AA release) that would otherwise reactivate the calcium ionophore A23187. [27], [28] Mice peritoneal macrophages pre-infused with 10 curMcurcumin or 1 h capsaicin reduced the production of AA in membrane lipids by 82 and 76 percent, respectively; prostaglandin E2 by 45 and 48 percent, leukotriene B4 by 61 and 46 percent, and leukotriene C4 by 34 and 48 percent.

Curcumin inhibits the COX enzyme, which appears to inhibit the formation of specific prostaglandins. [30], [31] Ramsewak et al. demonstrated that curcumins I-III were efficacious against COX-I enzyme containing 125 g / ml and inhibited the enzyme by 32, 38.5, and 39.2 percent, respectively. Curcumins I-III inhibited the COX-II enzyme by 89.7%, 82.5 percent, and 58.9%, respectively, in a solution containing 125 g / ml. [32]

Molecular mechanism and biochemical changes

[33] Zhang et al tested whether curcumin suppressed COX-2 generated by chenodeoxycholate (CD) or phorbol ester (phorbol 12-myristate 13-acetate, PMA) in the majority of the intestine (SK-GT-4, SCC450, IEC-18, and HCA50l 7). Curcumin inhibited COX-2 protein synthesis and prostaglandin E2 synthesis via inhibiting CD and PMA protein synthesis. Curcumin also inhibited CD and PMA-induced COX-2 mRNA increase.

[34] HT-29 colon cancer cancer cells are treated with various dosages of curcumin to see how it affects COX-2 exposure. Curcumin inhibits HT-29 cell proliferation in a concentration and time-dependent manner. COX-2 mRNA and protein expression were significantly reduced, but not COX-1.

[35] Kim et al found that curcumin's inhibitory effect on Janus kinase (JAK)-STAT signalling may aid in brain anti-inflammatory activities. Curcumin successfully reduces ganglioside, Lipopolysaccharide (LPS), or interferon (IFN-) - the induction of COX-2 and inducible NO synthase, important enzymes that regulate inflammatory processes, in both rat primary microglia and murine BV2 microglial cells.

Curcumin reduced the inflammatory response of microglia stimulated by gangliosides, LPS, or IFN-gamma by inhibiting the phosphorylation of STAT1 and 3 and JAK1 and 2 in microglia. The coagulation eruption is started by TF. In normal circumstances, endothelial cells do not express TF. Endothelial cells, on the other hand, produce TF in response to LPS, TNF, and other organisms.

Stabilization of lysosomal enzymes

Many NSAIDs, such as ketoprofen and suprofen, have been shown to prevent neutrophils from releasing lysosomal enzymes. Acid phosphatase and cathepsin D are well-known lysosomal enzymes that act as mediators of inflammation.

Curcumin and ibuprofen were tested for their ability to strengthen lysosomal enzymes Inflammation increased serum phosphatase activity from 7.26 units to 15.4 (+ 112 percent). Curcumin (200 mg/kg) prevented a 50% increase, while buprofen (20 mg/kg) stopped a 61 percent increase. Curcumin was discovered to have a larger effect on the lysosomal membrane than ibuprofen in an in vitro investigation. [36] Curcumin and capsaicin inhibit the release of lysosomal enzymes and eicosanoids in rat peritoneal macrophages, according to kim et al.

Release of hormones

Curcumin's production of endogenous corticosteroids may indirectly aid in lysosomal membrane stabilisation, as glucocorticoids have been shown to have a stabilising effect on lysosomal enzymes in various investigations. [38] The levels of ascorbic acid and cholesterol in the adrenals increased significantly as a result of inflammation. Curcumin at a dose of 200 mg/kg dramatically reduced adrenal ascorbic acid while having no effect on cholesterol levels. Curcumin at a lower dose (100mg/kg) and ibuprofen showed no effect.

Antioxidative effect

Curcumin was found to be a very potent antioxidant. [39] - [40] Curcumin was found to produce hydroxyl radicals in response to Fenton by reducing Fe3 + to Fe2 +. The effect of curcumin as a superoxide scavenger was studied and curcumin was found to be a potent superoxide supplement. They also reported a better association between anti-inflammatory activity and superoxide detoxification properties. Balasubramanyam et al has shown that curcumin eliminates PMA and thapsigargin-induction ROS generation in cells from the control and studies of diabetes.

The dose-dependent pattern of these ROS inhibitory effects shows that curcumin mechanically interferes with PKC and calcium regulation.

[41] Priyadarsini et al investigated the antioxidant activity of curcumin and dimethoxycurcumin in mouse liver microsomes using radioactive lipid peroxidation. They discovered that when lipid peroxidation inhibitors were filtered equally, their efficiency decreased from 82 percent with curcumin to 24 percent with dimethoxycurcumin.

Although the ability to remove hydrogen from both phenolic OH and the CH (2) group of the beta-detox structure was quite similar, these findings suggested that phenolic OH was critical for antioxidant activity and free kinetics. This was subsequently corroborated by a density functional theory (DFT) calculation, which revealed that Ooh hydrogen was a release label in curcumin when compared to CH (2) hydrogen, implying that phenolic OH plays a key role in curcumin activity.

Conclusion

Curcumin has been proven in numerous trials to have a wide range of therapeutic effects, including anti-inflammation, anti-spasmodic, antibacterial, anticancer, hepatoprotection, and neuroprotection. Without having a significant anti-oxygen effect, curcumin is said to maintain the lysosomal membrane and cause the buildup of oxidative phosphorylation. Curcumin's most intriguing attribute is that, while being an antiinfigueatory drug, it has no digestive effects. As a result, curcumin has been demonstrated to be a helpful treatment for conditions like arthritis, cancer, and HIV. More research is needed to investigate its potential in new therapy areas.

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