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USE OF TURMERIC IN TREATMENT OF ORAL DISEASES: A REVIEW

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ABSTRACT

Tumeric is a spice that comes from the root Curcuma longa, a member of the ginger family, Zingaberaceae. In Ayurveda, tumeric has been used for its medicinal properties for various indications and through different routes of administration, including topically, orally, and by inhalation. Curcuminoids are components of tumeric, which include mainly curcumin (diferuloyl methane), demethoxycurcumin, and bisdemethoxycurcmin. Turmeric has long been used as a treatment for inflammation, skin wounds and tumors. Curcumin has a variety of therapeutic properties including anti-oxidant, analgesic, anti-inflammatory and antiseptic activity. Curcumin has shown anti-proliferative effect in multiple cancers, and is an inhibitor of the transcription factor NF- kB and downstream gene products (including c-myc, Bcl-2, COX-2, NOS, Cyclin D1, TNF-α, interleukins and MMP-9).

KEYWORDS: Turmeric; Oral lesions; Precancerous oral lesions; Recurrent aphthous stomatitis.

INTRODUCTION

Curcumin (diferuloylmethane) is the chief component of the spice turmeric and is derived from the rhizome of the East Indian plant Curcuma longa. Curcuma longa is a member of the Zingiberacae (ginger) family of botanicals and is a perennial plant that is native to Southeast Asia.[1] Turmeric contains a class of compounds known as the curcuminoids, comprised of curcumin, demethoxycurcumin and bisdemethoxycurcumin.[2] Curcumin is the principal curcuminoid and comprises approximately 2-5% of turmeric. Curcuminoid is responsible for the yellow color of the spice as well as the majority of turmeric's therapeutic effects.[1] Aside from being employed as a flavoring and coloring agent in food, turmeric has also been widely used in Ayurvedic medicine for its anti-oxidant, antiseptic, analgesic, antimalarial and anti-inflammatory properties. As a natural product curmin is both non-toxic as well as diversified in its inhibitory effects on a multiple of pathways involved in carcinogenesis and tumor formation.[3] Curcumin has been consumed as a dietary supplement for centuries and is considered pharmacologically safe.[4] The curcumin (1, 7-bis [4-hydroxy-3-methoxyphenyl]-1, 6-heptadiene-3, 5-Dione) is the active ingredient in the herbal remedy and dietary spice turmeric (Curcuma longa Linn). Curcumin is an orange yellow crystalline powder. Minor amount of oils and resins naturally occurring in turmeric are usually present.[5]

PROPERTIES OF CURCUMIN

Curcumin has antioxidant, anti-inflammatory, antiviral and antifungal actions. Studies have shown that curcumin is not toxic to humans. Turmeric helps to prevent atherosclerosis by reducing the formation of bloods clumps.[6]

ACTIVE CONSTITUENTS

The active constituents of turmeric are the flavonoid curcumin (diferuloylmethane) and various volatile oils, including tumerone, atlantone, and zingiberone.[6]

PHARMACOLOGICAL EFFECTS

Following are the common pharmacological action of curcumin:

1. ANTIOXIDANT EFFECTS

Curcumin is a lipophilic polyphenol and thus it is insoluble in water, but is readily soluble in organic solvents such as dimethylsulfoxide, acetone and ethanol.[7] The antioxidant activity of the curcuminoids comes by virtue of their chemical structure. The curcuminoids consist of two methoxylated phenols connected by two α, β unsaturated carbonyl groups that exist in a stable enol form.[8]

2. ANTI-INFLAMMATORY EFFECTS

Curcumin has been shown to suppress the activation of NF-$_k$B, an inducible transcription factor that regulates the expression of a host of genes involved in inflammation, cellular proliferation and cell survival.[9,10,11] Genes regulated by NF-$_k$B include cyclooxygenase-2 (COX-2), I$_k$Ba, TNF-α, cyclin D1, ICAM-1, c-myc, Bcl- 2, MMP-9, inducible nitric oxide synthase (iNOS), and interleukins including IL-6 and IL-8.[12-15]

3. ANTICARCINOGENIC EFFECTS

Curcumin has been studied in multiple human carcinomas including melanoma, head and neck, breast, colon, pancreatic, prostate and ovarian cancers.[16-19] Epidemiological studies attribute the low incidence of colon cancer in India to the chemopreventive and antioxidant properties of diets rich in curcumin.[20] Curcumin's potent anti-oxidant and free-radical quenching properties play an important role in the inhibitory effects of the compound on the initial stages of carcinogenesis. It has been shown that curcumin has the ability to suppress UV irradiation-induced DNA mutagenesis and induction of cellular SOS functions.[21]

4. EFFECTS ON CELL CYCLE AND APOPTOSIS

Cellular growth and proliferation is a highly regulated event in normal cells, and derangements of the cell cycle can lead to uncontrolled proliferation and contribute to the malignant phenotype of tumor cells. The mammalian cell cycle consists of four main stages: G1, S, G2 and M, with G1 and G2 being referred to as "gap" phases between the events of DNA synthesis and mitosis, respectively.[22]

5. CARDIOVASCULAR EFFECTS

Turmeric lowers cholesterol and triglyceride levels, decreasing susceptibility of low density lipoprotein (LDL) to lipid peroxidation, and inhibiting platelet aggregation.

6. GASTROINTESTINAL EFFECTS

Constituents of Curcuma longa exert several protective effects on the gastrointestinal tract. Sodium curcuminate inhibits intestinal spasm and p-tolymethylcarbinol, a turmeric component, increased gastrin, secretin, bicarbonate, and pancreatic enzyme secretion.[6]

7. PREGNANCY AND LACTATION

Although there is no evidence that dietary consumption of turmeric as a spice adversely affects pregnancy or lactation, the safety of curcumin supplements in pregnancy and lactation has not been established.[6]

ORAL APPLICATION OF TURMERIC

Following are the common oral application of the turmeric.[23]

- Rinsing the mouth with turmeric water (boil 5 g of turmeric powder, two cloves, and two dried leaves of guava in 200 g water) gives instant relief.
- Massaging the aching teeth with roasted, ground turmeric eliminates pain and swelling.
- Applying the powder of burnt turmeric pieces and bishop's weed seed on teeth and cleaning them makes the gums and teeth strong.
- Applying a paste made from 1 tsp of turmeric with ½ tsp of salt and ½ tsp of mustard oil provides relief from gingivitis and periodontitis. Rub the teeth and gums with this paste twice daily.

CURCUMIN AS A SUBGINGIVAL IRRIGANT

Curcumin 1% as subgingival irrigant results in significant reduction in bleeding on probing and redness, when compared with chlorhexidine and saline group as an adjunctive therapy in periodontitis patients. Curcumin acts similarly to aspirin and aspirin like anti-inflammatory drugs in diminishing inflammatory mediators of arachidonic acid metabolism.[24]

EFFECT OF CURCUMIN ON HUMAN GINGIVAL FIBROBLASTS

Several studies have also revealed apoptosis of human primary gingival fibroblasts (hPGF) cells at lower dose like 1, 10 and 25µM of curcumin but at higher doses like 50, 60, 75 and 100µM, was statistically significant high apoptosis was noted. They have also found that the effect of curcumin treated normal human fibroblasts and microvascular endothelial cells (hMVEC) using MTT assay and observed that lower doses of curcumin stimulated the proliferation of normal human fibroblasts and hMVED, whereas higher doses inhibited it.[25]

USE OF CURCUMIN IN DENTAL-PLAQUE DETECTION SYSTEM

Dental plaques are not easy to identify by the naked eye. So plaques are generally stained with dental-plaque staining agents, which contain dyes, to reveal their location. The dental-plaque detection system includes a dental-plaque staining agent, which contains turmeric extracts and curcumin; and a light-emitting apparatus, which gives out light having a wavelength within a range of 250 to 500 nm to an object in the oral cavity where the dental-plaque staining agent is, attached.[23]

PIT AND FISSURE SEALANT

It has been found that tinted pit and fissure sealant is used for applying on tooth surfaces in order to prevent or reduce the incidence of dental caries. This sealant can be produced from a composition containing acrylic monomer and at least one colorant selected from the group consisting of Annatto extract, turmeric extract, and β-Apo-8.-Carotenal.[26]

ORAL PRECANCEROUS LESIONS AND CONDITIONS

Curcumin has a major role in the treatment of various precancerous conditions and precancerous lesions. Turmeric extract and turmeric oil have demonstrated oncopreventive activity in in vitro and in vivo animal experiments. The local symptoms of burning sensation and pain were reduced and partial reversal of opening of the mouth was also observed.[27]

RECURRENT APHTHOUS STOMATITIS

Reports have shown that in patients with recurrent aphthous ulcers who used conventional antiseptic gel, the lesion healed only after the period of time as in previous attacks. They experienced no early reduction in pain or frequency of recurrence. The patients who used curcumin oil reported that ulcers started healing earlier than in previous attacks; there was also early reduction in pain. A follow up for one year has shown no recurrence in these patients.[25]

CONCLUSION

Turmeric is a popular spice frequently used in Indian foods and curry. Curcumin (1, 7-bis [4-hydroxy-3- methoxyphenyl]-1, 6-heptadiene-3, 5-Dione) is the most active constituent of turmeric curcuminoids obtained from the rhizome of Curcuma longa. Curcumin is classified as a polyphenol compound that gives turmeric its bright yellow colour. Besides being a popular dietary supplement, it is used as a food colouring agent. Curcumin holds a high place in Ayurvedic medicine as a “detoxifier of the body,” and today, science has documented

several diseased conditions that can be healed by the active ingredients of turmeric. Curcumin has been found to have antioxidant, anti-tumor, anti-inflammatory, antiviral, antibacterial, antifungal properties, analgesic, anti-allergic, antioxidant, antiseptic and thus has a potential against various diseases.

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