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Curcumin the Miracle Herbal Drug in Dentistry

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Abstract: ***Curcumin is widely employed as a spice in curries, food additives and dietary pigment. It is widely employed in the management of various diseases in the Indian subcontinent. Curcumin has several pharmacological properties including antimicrobial, anti inflammatory, antiviral, antifungal, antioxidant, chemo sensitizing, radio sensitizing and wound healing activities. It also act like an antiproliferative agent by interrupting the cell cycle, disrupting mitotic spindle structures, inducing apoptosis and micronucleation. The present article focuses on various applications of Curcumin in Dentistry.***

Keywords: Curcumin, Chemosensitizing, Radiosensitizing, Micronucleation

1. Introduction

Herbal medicines are drugs based on plants used to treat diseases and to attain or maintain a condition of improved health.[1] Herbs with medicinal properties are usually better than conventional treatment modalities used and an effective source of treatment for various diseases.[1]

Kasthuri turmeric (Curcuma aromatica Salisb) is a medicinal and aromatic plant belonging to the family Zingiberaceae with several medicinal uses. Turmeric is known as the "spice of life." as well as the "golden spice" in Ayurveda. Turmeric" earthy herb of the Sun" with the orange yellow rhizome was considered as the "herb of the Sun" by the people of the vedic period.[2]

2. Constituents

The main constituents of Turmeric are: Curcumin (diferuloylmethane), demethoxycurcumin, and bisdemethoxycurcumin as well as volatile oils like tumerone, atlantone, zingiberone, sugars, proteins and resins.[3]

3. Chemistry

Curcumin (1,7-bis4-hydroxy-3methoxyphenyl-1,6-heptadiene-3, 5-Dione) is a polyphenolic constituent which is widely employed in the traditional herbal practices.[4]

Turmeric mainly contains carbohydrates (69.4%), protein (6.3%), fat (5.1%), minerals (3.5%), moisture (13.1%). The essential oil from the steam distillation of rhizomes of turmeric mainly contains cineol (1%), alphaphellandrene (1%), sabinene (0.6%), , bornoel (0.5%), zingiberene (25%), sesquiterpines (53%).[5] The melting point of curcumin is 184°C. Curcumin is soluble in acetone, ethanol and but insoluble in water.[4]

4. Pharmacological Actions of Curcumin

Anti Inflammatory Actions

Curcumin suppress the acute and chronic inflammation. Reduction of inflammation is mainly by lowering of histamine levels and by increase in the production of natural cortisone by adrenal glands. There is also inhibition of biosynthesis of inflammatory prostaglandins from the arachidonic acid and neutrophil function[5] **.** In animal studies curcumin inhibited arachidonic acid metabolism and inflammation in mouse skin epidermis by down regulation of the lipoxygenase and cyclooxygenase pathways[6]

Antioxidant property

The antioxidant activity of curcumin depends upon the presence of both the central methylene hydrogens and the phenolic hydrogens. Curcumin either act like a scavenger of hydroxyl radicals or catalyses the formation of hydroxyl radicals The antioxidant activity of curcumin could be mediated through antioxidant enzymes such as superoxide dismutase, catalases & gluthaione peroxidase.[7]

Anti Carcinogenic Effects

It effectively inhibits metastasis (uncontrolled spread) of melanoma and may be especially useful in deactivating the carcinogens in cigarette smoke and chewing tobacco. Curcumin causes inhibition of proliferation of cells, reduction of inflammation, suppression of certain oncogens, inhibition of transcription factors NF-KB & ap-1, COX-2 and prevention of chromosomal damage. It also inhibits tumor implantation, tyrosine kinase c activity, biotransformation of carcinogenesis & induction of gluthiones transferase activity.[7]

Antimicrobial Effects

Curcumin and the oil fraction prevents the growth of variety of bacteria like Staphylococci, Streptococci, Lactobacillus etc and it also inhibits Helicobacter pylori Cag A + strains in vitro. Growth of pathogenic fungi , bacteria, parasites is inhibited by the turmeric extracts.[5]

5. Applications in Dentistry

Aphthous Ulcer

According to Manifer etal Curcumin gel is an effective therapeutic agent in the management of minor apthous ulcer. In this study 28 patients were treated with Curcumin gel containing 2% curcumin and 29 patients were treated with placebo gel twice daily for 2 weeks. Clinical improvement

was noted in Curcumin study group interms of reduced pain intensity and size of aphthous ulcer.[8]

Oral Submucous fibrosis

In studies by Singh S etal Curcumin is an effective, nontoxical and economical agent in the management of Oral submucous fibrosis. In this study 60 patients with OSMF were treated with Turmeric tablet three times daily for 1 months and patients were evaluated in bimonthly basis. Clinical improvement was noted in patients in terms of reduction in burning sensation evaluated through VAS scale.[9]

Oral lichenplanus

Thomas AE etal opined that curcumin gel can be employed as a maintenance drug for the management of Oral lichenplanus after an initial course of corticosteroids.[10]In this study 75 patients with lichen planus were divided into 3 study groups. Group 1 patients were treated with 0.1% triamcinolone acetonide thrice daily in tapering doses, Group 2 patients were treated with curcumin gel thrice daily and Group 3 patients were treated with curcumin gel six times daily. Statistically significant reduction in burning sensation as well as erythema and ulceration was noted in all 3 study groups.[10]

Oral leukoplakia

According to studies by Rai B etal curcumin is effective in the management of Leukoplakia. Here they evaluated 20 patients of oral leukoplakia and 50 normal healthy persons in age group 17-50 years and estimated salivary and serum oxidative markers such as Malonaldehyde, 8-hydroxydeoxyguanosine, vitamin C and E just before the treatment and after curing of lesion. The levels of serum and salivary Vitamin C & E had statistically significant decrease in oral leukoplakia when compared to normal healthy while significantly more in all groups after treatment with curcumin. MDA and 8-OH dG levels were statistically increased in oral leukoplakia when compared to normal healthy while reduced in all groups after treatment with curcumin.[11]

Sub gingival irrigant

1% Curcumin solution is an effective subgingival irrigant in reduction of inflammatory signs of periodontitis than saline and chlorhexidine.[12]

Mouthwash

Turmeric mouthwash (10 mg of curcumin extract in 100 ml of distilled water and 0.005% of flavoring agent peppermint oil with pH adjusted to 4) is an effective mouthwash like chlorhexidine. It is effective in prevention of plaque deposition and gingivitis in addition to mechanical plaque control methods.[12]

Gingivitis and Periodontitis

Paste prepared from 1 tsp of turmeric, ½ tsp of salt and ½ tsp of mustard oil is effective in management of gingivitis and periodontitis. It is adviced to apply the paste to the teeth and gums twice a day.[12]

Dental Plaque Detection System

Dental Plaques are usually stained with dental plaque staining agents, which contain dyes. The dental plaque detection system consists of dental plaque staining agent that contains turmeric extracts, curcumin and a light emitting apparatus. The light emitting apparatus gives out light of wavelength within range of 250 to 500 nm to an object in the oral cavity where the dental plaque staining agent is attached.[1]

Side Effects and Toxicity

No significant side effect and toxicity was observed in either acute or chronic administration of turmeric extract (Curcumin) at standard doses. [3]Turmeric is a herbal product with many health benefits.It is cost effective and is considered to be pharmacologically safe. Usual human consumption of curcumin as a dietary spice ranges up to 100 mg/day. It has been indicated that humans can tolerate a maximum dose to 12 gm/day without any toxic side effects of curcumin up [13]

6. Conclusion

Herbal products are better than other conventional medications in terms of reduced side effects and toxicity. Curcumin being an economical and natural product it is very effective in management of various diseases affecting the oral cavity, teeth and body.

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