Curcumin- Nature's Remedy for Oral Diseases

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Abstract: Turmeric is a spice, used in India and other Asian countries for centuries because of its medicinal properties.¹ It is derived from the roots of the plant Curcuma longa, which is a member of the Zingiberaceae family.¹⁻⁴ Curcumin, the principal Curcuminoids found in Turmeric, is generally considered as the most active constituent responsible for its therapeutic benefits. In addition to Curcumin, the turmeric is also composed of other Curcuminoids like demethoxycurcumin, bisdemethoxycurcumin and essential oils that have been responsible for the therapeutic effects.¹⁻³Recent, evidences suggested that Curcumin has multiple mechanisms of actions like anti-inflammatory, antioxidant, antimicrobial and anticancer activities. This, lead to the renewed scientific interest in this ancient spice to prevent and treat various oral diseases including oral cancer.¹ The aim of this article is to review the pharmacological actions and therapeutic benefits of Curcumin in the treatment of oral diseases.

Keywords: Curcumin, Curcuminoids, Oral diseases, anti inflammatory, antioxidant

1. Introduction

Nature has gifted mankind with various natural plant resources; many of these natural products derived from plants have played a pivotal role in the health care both in ancient and modern society. Though the mechanisms of action of traditional medicines are shrouded in mystery; man has relied upon them for their medicinal values and beneficial effects for the treatment of various ailments. Great Healers, in one form or another are sought out by us as a part of our daily diet .One such regularly used culinary spice in the house hold eaten throughout Asia as a food both in raw and cooked forms is Turmeric. Curcumin is derived from the rhizome (underground stem), and is an active component of plant Curcuma longa.¹

Ever since its historical discovery, Curcumin has assayed an extremely crucial role. It was used in ancient Indian medicine for the treatment of illnesses due to its antiseptic, antifungal, anti-inflammatory and antioxidant properties. ^{1,2}A need for a newer, safer, cheaper and effective therapy to enhance people's health made a way for this natural medicinal spice with innumerable healing properties into modern medicine. This review is an attempt to provide a much deeper understanding of Curcumin and its therapeutic potentials for various oral diseases.

2. History of Curcumin

Curcumin is considered as one of the most beneficial compounds due to its medicinal properties. It is extracted from the turmeric plant (Curcuma longa); the history of which dates back to about 5,000 years as a principal healing agent in traditional system of medicine.^{1,2} Sushruta's Ayurvedic Compendium, dating back to 250 BC,

recommends use of turmeric to relieve the effects of poisoned food.³

The advancements in the field of medicine lead to the discovery of Curcumin, two centuries ago when Vogel and Pelletier reported the isolation of "yellow coloring material" from the rhizomes of Curcuma longa and named it as Curcumin in 1842.^{1,2,6} In the decades that followed, several chemists reported possible structures of Curcumin. Milobedzka and Lampe in 1910 identified the chemical structure of Curcumin as diferuloylmethane.¹⁻³ Further work by the same group in 1913 resulted in the synthesis of the compound.¹¹ Subsequently, Srinivasan separated and components quantified of Curcumin the by chromatography.^{1,3} From there on, more than 100 components, including the volatile oils that have the therapeutic properties have been isolated from turmeric and the research still continues.^{1,2}

3. Composition

Curcumin occurs naturally in the rhizome of Curcuma longa, which is grown commercially and sold as turmeric.¹ Curcumin is the phytochemical that gives turmeric its yellow color and is now recognized as being responsible for most of the therapeutic effects. Curcumin isolated from turmeric plant, once believed to be a single component later found to have three closely related species.^{1,2}

The Curcuminoids constitute approximately 5% of most turmeric preparations are a mixture of three principal compounds: Curcumin (Curcumin I), demethoxycurcumin (Curcumin II), and bisdemethoxycurcumin (Curcumin III).¹⁻⁶ All the three Curcuminoids are equipotent in exhibiting the therapeutic actions. Hence, most of the studies refer Curcumin as a whole component rather than individual

Volume 6 Issue 8, August 2017 <u>www.ijsr.net</u> Licensed Under Creative Commons Attribution CC BY components. The turmeric also contains several volatile oils like germacrone; termerone; β -termerones; β -bisabolene; α -curcumene; zingiberene bisacurone; alkaloids and sterols. These Curcuminoids and essential oils have been reported to be the main components responsible for eliciting the medicinal properties.¹⁻²

4. Mechanisms of Action of Curcumin

Over the decades several studies have identified various molecular mechanisms of action of Curcumin. It modulates numerous molecular targets by altering their gene expression, signaling pathways or through direct interaction.

Anti inflammatory action:

Curcumin act via single or combination of any of the mechanism involving inhibition of arachidonic acid metabolism, inhibition of cyclooxygenase (COX), inhibition of the prostaglandin synthesis, inhibition of lipoxygenase (LOX), inhibition of cytokines (IL, TNF) release of steroidal hormones from the adrenals and stabilization of lysosomal membrane.^{1-3,6}

A study conducted by Srivastava et al demonstrated that Curcumin inhibited the incorporation of arachidonic acid into platelet phospholipids and inhibited the deacylation of phospholipids. Thus inhibits synthesis of prostaglandins through inhibition of COX enzyme.⁶ Ramsewak et al demonstrated that Curcumin I–III were active against COX-I enzyme with 125 μ g/ml and showed 32%, 38.5% and 39.2% inhibition of the enzyme, respectively. They suggested that Curcumin reduces pro-inflammatory cytokine synthesis via inhibition of LOX enzyme.⁶

Recent studies have demonstrated that nuclear factor κB (NF- κ B) was involved in regulation of COX-2 & iNOS expression. Surh suggested that Curcumin down-regulated the levels of COX-2 and iNOS through suppression of NF- κ B.⁶

Stabilization of lysosomal enzymes by Curcumin is also one of the mode in which Curcumin shows its anti-inflammatory action. A Study conducted by Srivastava R et al comparing Curcumin and ibuprofen showed Serum phosphatase activity increased from 7.26 to 15.4 units due to inflammation. They concluded that Curcumin prevented the increase by 50% and hence, showed lysosomal membrane stabilization effect .⁶

Antioxidative effect

Curcumin is a unique antioxidant, the presence of the hydroxyl groups in the chemical structure of all the Curcuminoids ensures antioxidant activity. Curcumin, shows free radicals scavenging action and also inhibits the formation of reactive oxygen species (ROS) like hydroxyl radicals, superoxide radicals, peroxyl radicals and peroxynitrite.⁷

Curcumin contains two electrophilic unsaturated carbonyl groups, which can react with nucleophiles such as glutathione. Curcumin and its compounds have been recently demonstrated to induce the activities of detox system.¹⁻³ Curcumin was found to generate hydroxyl radicals through the Fenton reaction by reducing Fe3+ to Fe2+.

Reddy ACP et al conducted a study on the effect of Curcumin and eugenol on the generation of reactive oxygen species in model systems were investigated. Both Curcumin and eugenol inhibited superoxide anion generation in xanthine-oxidase system to an extent of 40% and 50% respectively. The OH-radical formation was inhibited to an extent of 66% and 46%, respectively, by Curcumin and eugenol. They concluded that Curcumin prevented the oxidation of Fe²⁺ in Fentons reaction which generates OH radicals.⁷

Curcumin through ROS-dependent mechanism perturbs multiple cell signaling molecules is known to exert its anticancer effect either by scavenging or by generating reactive oxygen species (ROS). They also reported a better correlation between anti-inflammatory activity and superoxide scavenging property.⁷ Balasubramanyam et al demonstrated that Curcumin abolished ROS generation in cells from control and diabetic subjects. The pattern of these ROS inhibitory effect by Curcumin proves it to be a potent antioxidant.⁷

Curcumin is capable of scavenging oxygen free radicals, such as superoxide anions and hydroxyl radicals, which are the initiators of lipid peroxidation. The lipid peroxidation has a main role in the inflammation, in heart diseases, and in cancer.^{7,9} Jayaprakasha et al demonstrated the protective effect of Curcumin against the cytotoxic effects of ethanol by measuring lipid peroxidation in terms of thiobarbituric acid reactive substances of malondialdehyde formed/100gm tissue. They found that the amount of lipid peroxidation was increased by ethanol only by two folds compared to control. but with liver cells pretreated with Curcumin the level of peroxidation lowered to reach linid control level.^{6,7}Priyadarsini et al evaluated the antioxidant mechanism of Curcumin and dimethoxy Curcumin by radiation-induced lipid peroxidation in rat liver microsomes. They concluded that at equal concentration, the efficiency to inhibit lipid peroxidation is changed from 82% with Curcumin to 24% with dimethoxy Curcumin.⁶

5. Antimicrobial Action

Studies have reported that Curcumin show a broad-spectrum of antimicrobial activity that includes antibacterial, antiviral and antifungal activities.⁸

a. Anti bacterial

One of the probable antibacterial mechanisms of actions is by inhibition of the cell dynamics.Curcumin via inhibition of assembly dynamics of FtsZ in the Z-ring can possibly suppress the bacterial cell proliferation. Kaur S et al conducted a study to evaluate the inhibitory effect against FtsZ on E. coli and B. subtilis. They concluded that Curcumin could suppress the FtsZ assembly leading to disruption of both the prokaryotic cell division causing the bacterial cell death.⁸

A study conducted by Niamsa N et al to asses the antibacterial activity of C. longa rhizome extract and they demonstrated that Curcumin is a potent bacterial agent with minimum inhibitory concentration value of 4 to 16 g/L and minimum bactericidal concentration value of 16 to 32 g/L

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against S. epidermis ATCC 12228, Staph aureus ATCC 25923, Klebsiella pneumoniae ATCC 10031 and E. coli ATCC 25922.⁸

b. Anti viral

It has been demonstrated that Curcumin as a plant derivative has a wide range of antiviral activity against different viruses. Therapeutic target for antiviral activity of Curcumin is by reduction of viral RNA expression, protein synthesis, and virus proteasus. In addition, it was found to have a protective effect on cells against virus-induced apoptosis and cytopathic activity.⁸

The clinical trial conducted by Ungphaiboon S on HIV patients using clear liquid soap containing 0.5% w/v ethanol extract of C. longa rhizome demonstrated reduced the wound infections and 100% decrease in itching symptom and it also affected the abscess to convert to dryness scabs (78.6%).⁸

Chen DY et al conducted a study on the anti-influenza activity of Curcumin against influenza viruses PR8, H1N1, and H6N1. The results showed more than 90% reduction in virus yield in cell culture using 30 μ M of Curcumin against influenza viruses.⁸ Divya CS et al conducted a study to evaluate Antitumor action of Curcumin in human papillomavirus. They concluded that Curcumin showed inhibitory activity against the expression of E6 and E7 genes of HPV-16 and HPV-18 that are highly oncogenic human papilloma viruses.⁸

c. Antifungal activity

Traditionally turmeric was used in food products, as it prevented fungal related spoilage of food. Extensive research on has been carried out proving Curcumin, a derivative of turmeric as a natural antifungal agent.⁸

The mechanism demonstrating antifungal effect of curcumin was found to be down regulation of desaturase leading to significant reduction in ergosterol of fungal cell. Reduction in ergosterol results in accumulations of biosynthetic precursors of ergosterol causing cell death via generation of ROS and reduction in proteinase secretion are other possible critical factors for antifungal activity of Curcumin.⁸

Ungphaiboon S et al conducted a study using the methanol extract of turmeric and demonstrated antifungal activity against Cryptococcus neoformans and Candida albicans with MIC values of 128 and 256 μ g/mL, respectively.⁸

A study conducted by Neelofar K et al to evaluate efficacy of Curcumin against 14 strains of Candida isolates proved that Curcumin is a potent fungicide compound against Candida species with MIC values range from 250 to $2000 \,\mu\text{g/mL}$.⁸

A study by Khan N et al demonstated anti-Candida activity of Curcumin against 38 different strains of Candida including some fluconazole resistant strains and clinical isolates of C. albicans, C. glabrata, C. krusei, C. tropicalis, and C. guilliermondii. The MIC₉₀ values for sensitive and resistant strains were 250–650 and 250– $500 \mu g/mL$, respectively. Further more they suggested that possible mechanism for cell death of Candida species was through intracellular acidification via inhibition of H^+ extrusion.⁸

Tsao SM et al studied antifungal activity of Curcumin on 200 clinical isolates of Candida species. They demonstrated fungicidal activity for Curcumin with MIC value of $32-128 \mu g/mL$. Combination of Curcumin with amphotericin exhibited synergistic activity, suggesting that combination treatment of Curcumin with existing fungicidal agents provided significant effect against systemic fungal infections.⁸

d. Anti carcinogenic

Curcumin as an anticarcinogenic is one of the most common agent under extensive medical research .various in vitro and in vivo studies have reported that there are several pathways and molecular targets that play an active role in the stages those relating to invasion, growth, metastasis, inflammation, angiogenesis and survival of cancer cells.⁹

A wide variety of effects of Curcumin are mediated by its capability to act as a free radical scavenger, to alter gene expression of various stress protein and genes involved in angiogenesis, and to inhibit activity of many important transcription factors, an anti-inflammatory, as there is suggestive evidence that inflammation may have an active role in the three phases of carcinogenesis by its ability to selectively modify various cell signalling molecules.⁹

Curcumin regulates the expression of inflammatory cytokines (*e.g* Tumor Necrosis Factor-alpha (TNF- α) and Interleukins(IL-1), growth factors (*e.g.*, VEGF, EGF), growth factor receptors (*e.g.*, EGFR, HER-2, AR), enzymes (*e.g.*, Cyclooxygenase-2 (COX-2), Lipooxygenase (LOX), matrix metallopeptidase 9 (MMP9), adhesion molecules (*e.g.*, intracellular adhesion molecule-1 (ICAM-1), vascular cell adhesion molecule-1 (VCAM-1), and endothelial leukocyte adhesion molecule-1 (ELAM-1) ,apoptosis related proteins (*e.g.* Bcl-2, caspases) cell cycle proteins (*e.g.* cyclin D1). Curcumin modulates the activity of several transcription factors (*e.g.* NF- κ B, AP-1, STAT) and their signalling pathways.⁹ However, detailed review in this regard is beyond the scope of this article.

6. Curcumin in Oral Diseases

Curcumin, the most active polyphenolic constituent shows a wide range of beneficial properties. Evidence on the diversified therapeutic approaches of Curcumin for most of the diseases makes it a potential agent to be used in various oral diseases.

1) Aphthous ulcers:

Aphthous ulcers are among the most common oral lesions in the general population. Due to the undetermined etiology of ulcer formation, there is no definite treatment and mainly treatment aimed at relieving the symptoms. It has been observed in various studies that Curcumin showed effective relief of these symptoms due to its anti inflammatory activity (Table 1).

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Table 1						
Author	Year	Curcumin dosage	Patients	Outcome		
Halim DS ¹⁰	1994	Curcumin powder.	20	Both Curcumin and triamcinolone had similar efficiency in treatment		
et al				of RAS		
Antharjanm	2009	Curcumin oil	10	The ulcers started healing earlier & there was also early reduction in		
\mathbf{R}^{11} et al				pain in Curcumin group.		
Manifar S ¹²	2012	Curcumin gel	29	Curcumin gel significantly reduced pain intensity.		
et al		(2%Curcumin)				
Deshmuk RA ¹³	2014	Cure next oral gel	60	Both Curcumin and triamcinolone had similar efficiency in treatment		
et al		(10mg/1gm of C.longa)		of oral RAS		

2) Gingival and Periodontal disease

The clinical signs of gingivitis and periodontitis include changes in the morphology of the affected gingival tissue, which causes loss of teeth. Gingival & Periodontal treatment aims to cure inflamed tissue and reduce the number of pathogenic bacteria. various studies in this regard suggested Curcumin through its anti-inflammatory, antimicrobial properties make it a favorable agent in the treatment of gingival and periodontal diseases(Table 2).^{4,5}

Table 2				
Mouth wash				
Author	Year	Curcumin dosage	Patients	Outcome
Waghmare P ¹⁴	2011	Turmeric mouthwash (10 mg/	100	Reduction in total microbial count was observed in both the
et al		100 ml of water)		groups
Mali AM ¹⁵	2012	Curcumin mouthwash	60	Curcumin mouthwash can be effectively used as an adjunct to
et al		(0.1% turmeric mouthwash)		mechanical plaque control
Muglikar S ¹⁶	2013	Curcumin mouthwash	30	They concluded that both Curcumin and chlorexidine showed
et al				significant improvement in clinical features.

Local drug delivery system				
Suhag A ¹⁷	2007	Subgingival irrigation	20	The results indicated that Curcumin group showed significant
et al		Curcumin (1% solution)		reduction in bleeding on probing (100%) and redness (96%).
Behal R ¹⁸	2011	2% whole turmeric gel	30	The was a significant reduction in plaque index, gingival index,
et al				sulcus bleeding index, probing pocket depth, and gain in
				attachment loss
Gottumukala	2014	Curcumin based	60	The results demonstrated that, both the groups (chlorexidine and
SN ¹⁹		collagen(50mg/cm ²)		Curcumin) produced significant reduction in clinical &
et al				microbiological parameters
Farjana HN	2014	Curcuma gel (10gms of	10	They concluded that application of oral curcuma gel thrice daily
et al ²⁰		curcuma extract)		for a period of three weeks showed decrease in gingival
				inflammation.
Anitha V ²¹	2015	Curcumin gel	30	They concluded that Curcumin showed a significant difference
et al		(250gm Curcumin+95ml		over chlorhexidine in reducing the microbial & clinical parameters
		glycerol)		evaluated
Anuradha B	2015	Curcumin gel (Cure next).	30	Significant reduction clinical parameters and gain in clinical
et al ²²		Each gram contains10mg C.		attachment level were demonstrated in both the groups.
		longa extract		
Shama V ²³	2016	Curcumin gel (Cure next).	20	The concluded that topical application of C. longa extract was
et al		Each gram contains10mg C.		effective in the treatment of gingivitis/mild periodontitis.
		longa extract		
Roopa DA ²⁴	2016	Curcumin gel (Cure next).		They concluded that the gel containing curcuma longa extract was
et al		Each gram contains10mg C.	30	efficient in treating gingivitis due to its anti-inflammatory property
		longa extract		

3) Potentially malignant oral disease

Oral Potentially malignant disorders are a group of disorders of varying etiologies, usually tobacco, characterized by mutagen associated spontaneous or heredity alterations or mutations in the genetic material of oral epithelial cells with or without clinical and histomorphological alterations that may lead to oral squamous cell carcinoma transformation.²⁵ Due to its antioxidant, an anticancerous & anti-inflammatory property Curcumin plays a key role in the treatment of these diseases(Table:3)

Table 3					
Leukoplakia					
Author	Year	Curcumin dosage	Patients	Outcome	
Rai B ²⁵ et al	2010	Curcumin caplets (900mg	25	The patients with oral Leukoplakia, showed significant	
		Curcumin,		symptomatic relief and also reduction in clinical size of the	
		80gm demethoxycurcumin, 20mg		lesion by treatment with Curcumin.	
		bidemethoxycurcumin)			
Oral lichen planus (OLP)					

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Chainani-Wu N ²⁰	2007	Curcumin- 2000mg/day	33	They concluded that Curcumin at this dose was tolerable.
et al		In addition, all subjects received		Further they suggested future studies with a larger sample size,
		prednisone at 60 mg/day for the		higher dose of Curcuminoids without an initial course of
		first 1 week.		prednisone.
Rai B ²⁵ et al	2010	Curcumin caplets (900mg	25	It was noted that the markers in saliva, serum and vitamin
		Curcumin, 80gm		level increased in patients suffering from lichen planus.
		demethoxycurcumin		· · · · · · · · · · · · · · · · · · ·
		20mg bidemethoxycurcumin)		
Chainani Wu 27	2012	Curcumin (up to 6 000 mg/day	100	They concluded that higher dosages of Curcumin (up to 6 000
et al	2012	Curculini (up to 0,000 mg/uay	100	mg/day) helped a significant number of OLP patients
et al				symptomatic relief
Circula V/ 28-4 -1	2012	Transaction a finder and	10	Communication and a setting associate both in terms of
Singh v et al	2015	Turmeric ointment	10	Curcumin showed positive results both in terms of
		(turmeric + glycerin)		symptomatic relief and decrease in size of the lesion.
Keshari D ²⁹ et al	2015	cure next oral gel	27	They have concluded that Curcumin can be used as a safe
		(10mg/1gm of		alternative Furthermore there were no side effects in study
		C longa)		group proving antifungal activity of Curcumin
Kia SJ ³⁰ et al	2015	5% Curcumin oral paste	50	They concluded that Curcumin is a safe alternative & the
				combination strategies are more efficient in treatment of early
				periodontitis
Amirchaghmaghi	2016	Curcumin tablets	20	They demonstrated no significant difference between the
M et al ³¹		(2000 mg/day)		Curcumin and control groups.
		Oral Submu	cous Fib	rosis (OSMF)
Hastak K ³² et al	1997	Turmeric in any of the three form	58	It was found to be effective in decreasing the number of
indotait in ot al		i e Alcoholic extracts of turmeric	20	micronucleated cells both in exfoliated oral mucosal cells and
		turmeric oil and turmeric oleoresin		in circulating lymphocytes
Deepa DA ³³ et	2010	Curcumin cansule turmeric oil(/18	The results were almost equal by use of either of the form of
al	2010	Qgm oil)	40	Curcumin
$D_{ai} D^{24} at al$	2010	9giii 0ii)	25	Curcumin.
Kai D et al	2010	Curcumin capiets	23	Curcumin snowed significant decrease in burning sensation
		(900mg Curcumin,		and improvement in mouth opening
		80gm demethoxycurcumin,		
1 24		20mg bisdemethoxyc- urcumin)		
Agarwal N ³⁴ et al	2014	Turmix	30	They concluded that there was significant decrease in burning
25		(<i>C. longa</i> 300 mg, Piperine 5 mg)		sensation but mouth opening was not significantly improved.
Karthik PM ³⁵	2014	Ground mixture of Turmeric+	30	It was found that jaggery & turmeric application showed a
et al		jaggery		very good prognosis in the inter incisal mouth opening
				recorded.
Yadav M ³⁶ et al	2014	Turmix	40	They inferred that Turmix proved to be beneficial and
		(C. longa 300 mg, Piperine 5 mg)		effective in the management of early OSMF
Hazarey VK ³⁷	2015	Curcumin lozenges	33	They concluded that Curcumin proved to be beneficial and
et al		(400mg Curcumin)		effective in the management of OSMF
Srivastava A ³⁸ et	2015	Paste of 1 gm of turmeric powder	45	They results showed decrease in burning sensation and
al		& tulsi powder in glycerine.		significant increase in the mouth opening.
		1 6,		The improvement in mouth opening and the decrease in
Devaraiu RR ³⁹	2017	4% Curcumin orabase	30	burning sensation were statistically significant
et al	/			6
		I		

4) Head and neck cancer:

Anticarcinogenic activity of Curcumin is multifaceted. In head and neck cancers the use of Curcumin is still in the stage of invitro studies. Lo Tempio MM et al demonstrated that Curcumin caused Growth suppression of HNSCC cell lines with decreased NF-kB activation.⁴⁰ Cohen AN demonstrated Suppression of Interleukin 6 and 8 production in head and neck cancer cells with Curcumin via inhibition of Ikappa beta kinase invitro.⁴¹

5) Radiation mucositis

Mucositis is the painful inflammation and ulceration of the mucous membrane, usually as an adverse effect of chemotherapy and radiotherapy for cancer. Curcumin showed remarkable results in the management of mucositis (Table:4)

Author	Year	Curcumin dosage	Patients	Outcome
Elad S ⁴² et al	2013	Curcumall mouthwash	7	Reduction in compliance criteria for Curcumin mouthwash group
Saldanha SP ⁴³ et al	2014	Curcumin mouthwash	29	The authors concluded that both mouth washes were individually
				effective but on comparison turmeric mouth wash was better than saline.
Rao S ⁴⁴ et al	2014	Turmeric solution (400mg	80	They concluded that turmeric solution provided significant benefit by
		Curcumin in 80 ml water)		reducing the severity of mucositis
Patil K ⁴⁵ et al	2015	Curcumin mouthwash	20	The authors concluded that turmeric mouth wash was better than
				chlorexidine gel and there was better patient compliance
Charantimath S ⁴⁶ et	2016	Cure next oral gel	40	They concluded that Curcumin gel is effective and safer alternative in
al		(10mg/1gm of C.longa)		treatment of oral mucositis.

Table 4

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7. Miscellaneous

a. Pit and fissure sealant: Curcumin through its anti microbial property causes reduction of caries. This sealant can be produced from a composition comprising a polymerizable resin system containing acrylic monomer and group consisting of Annatto extract, turmeric extract and Apo-8-Carotenal.⁴

b. Intracanal medicament: It has been reported that E. faecalis is the predominant microbe seen in root canal of the infected teeth.⁴⁷ Curcumin through its anti microbial activity, acts as an intra canal medicament in the endodontic treatment. Neelakantan P ⁴⁷et al conducted an invitro study on 30 extracted teeth using Turmeric extract(5% turmeric powder in 10 ml water) and concluded that Curcumin showed antibacterial activity against E. faecalis.simillarly, Prabhakar A ⁴⁸ et al in 2013 conducted an invitro study in 40 extracted tooth and reported 54% inhibition of E. faecalis using Turmeric extract(200gms in 500ml water), proving it to be an efficacious intracanal medicament

8. Adverse Effects

Generally considered safe, but may cause nausea, stomach upset, gastric irritation, diarrhoea & allergic reaction. Singh B et al in 2015 reported allergic contact mucositis in a patient using Curcumin gel, however they concluded that it may be due to the dyes like erythrosine used in the preparation.⁴⁹

9. Future Challenges

The major concerns with Curcumin are low oral bioavailability that can be attributed to its poor absorption, high rate of metabolism and rapid elimination from the body.⁴⁷ Therefore, novel strategies using the nanotechnology in drug delivery, Curcumin with other combinations like turmeric oil, piperine & metal complex are being aggressively explored to enhance the bioavailability.⁵⁰

10. Conclusion

Throughout the human history, there has been a conspicuous concern for health care and the cure of the disease, even though the concepts themselves took a very long time to develop into a body of knowledge.¹From time immemorial, we have been using Curcumin, in the form of turmeric to attain the state of well-being. Currently, several proven studies clearly suggest that Curcumin has an edge over conventional allopathic treatment that suffer the limitation of low benefit to high risk ratio.^{1,2} However, there is less information and research in this field. Therefore, further research is required to determine the optimal dosage, bioavailability, and bio-efficacy of Curcumin drugs.

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