



Curcumin Longa: A Journey from Kitchen to Lab

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ABSTRACT Nutraceutical is a food or a food ingredient that provides medical and health benefits. Polyphenols play an important role in the maintenance of health and prevention of diseases. Among polyphenols, the most widely used substance is Curcumin. Curcumin derived from the herbal remedy and dietary spice turmeric. Curcumin (diferuloylmethane) is an orange-yellow component of turmeric (*Curcuma longa*), a spice often found in curry powder. Traditionally known for its anti-inflammatory effects, *C. longa* has a long history of the curative use in the Ayurvedic and Chinese systems of medicine. It has proven properties like anti-inflammatory, antioxidant, antimicrobial, hepatoprotective, immunostimulant, antiseptic, and antimutagenic. Due to these properties, it is quite useful in dentistry as well. It has a role in the treatment of periodontal diseases and oral cancers. Turmeric can also be used as a pit and fissure sealant, mouth wash, and subgingival irrigant in different preparations. It can also be used as a component in local drug delivery system in gel form.

KEYWORDS : Curcumin, Dental Usage, Medical therapy, Turmeric

Introduction:

Medicinal plants have been used as a traditional treatment agent for numerous human diseases since ages in many parts of the world. In rural areas of the developing countries, they continue to be used as the primary source of medicine.¹ About 80% of the people in developing countries use traditional medicines for their health care. The frequent use and misuse of the currently used therapeutic agents has led to the evolution of resistant strains of common pathogens as well as increased incidence of adverse effects associated with their usage. Hence, the search for alternative products continues, and natural phytochemicals isolated from plants used as traditional medicines are considered as a good alternative source. As only 1% of approximately 5,00,000 plant species worldwide has been phytochemically investigated until date, there is great potential for discovering novel bioactive compounds.²

In recent years, modern science has uncovered so many remarkable qualities in turmeric in particular for the spice's amazing potential to prevent and heal various health issues. Some research even shows how turmeric can boost oral health greatly, offering support for issues like gingivitis, mouth cancer, and much more.

Turmeric, a member of the ginger family, lends itself as a distinctive yellow-orange spice for cooking. It also has a lengthy history in Ayurvedic and Chinese medicines as a remedy for minor digestive tract, liver, gallstone, menstrual and inflammatory problems. The plant reaches heights of 3 feet and produces spikes of yellow flowers and pairs of lance-shaped leaves that sprout from a fleshy rhizome, or root. Its rhizome contains an orange pulp, the source of turmeric's medicinal value.³

Turmeric is a spice that comes from the turmeric plant. It is commonly used in Asian food. We probably know turmeric as the main spice in curry. It has a warm, bitter taste and is frequently used to flavour or color curry powders, mustards, butters, and cheeses. But the root of turmeric is also used widely to make medicine. It contains a yellow-colored chemical called curcumin, which is often used to colour foods and cosmetics.⁴

India produces nearly the whole world's turmeric crop and consumes 80% of it. With its inherent qualities, Indian turmeric is considered to be the best in the world. The fresh spice is much preferred to the dried spice in South East Asia. The fresh rhizome is grated and added to curry dishes; it is also used as a yellow curry paste in Thailand. Due to Indian influence, turmeric has also made its

way into Ethiopian cuisine. Besides flavouring food, the most common uses of turmeric are to purify the blood and remedy skin conditions. Many people are familiar with turmeric as a traditional Middle-Eastern spice, but few know of its medicinal virtues.^{5,6}

Turmeric is comprised of a group of three curcuminoids: Curcumin (diferuloylmethane), demethoxycurcumin, and bisdemethoxycurcumin, as well as volatile oils (tumerone, atlantone, and zingiberone), sugars, proteins, and resins. Curcumin is a lipophilic polyphenol that is nearly insoluble in water but is quite stable in the acidic pH of the stomach. Commercial available form where curcumin is used as the main ingredient: Capsules, Mouth wash, Subgingival irrigant, Pit and fissure sealant.⁷

Medical Therapeutic Usage of Curcumin Longa:

Turmeric is used for arthritis, heartburn (dyspepsia), joint pain, stomach pain, Crohn's disease and ulcerative colitis, bypass surgery, hemorrhage, diarrhea, intestinal gas, stomach bloating, loss of appetite, jaundice, liver problems, *Helicobacter pylori* (*H. pylori*) infection, stomach ulcers, irritable bowel syndrome (IBS), gallbladder disorders, high cholesterol, a skin condition called lichen planus, skin inflammation from radiation treatment, and fatigue.⁸

It is also used for headaches, bronchitis, colds, lung infections, fibromyalgia, leprosy, fever, menstrual problems, itchy skin, recovery after surgery, and cancers. Other uses include depression, Alzheimer's disease, swelling in the middle layer of the eye (anterior uveitis), diabetes, water retention, worms, an autoimmune disease called systemic lupus erythematosus (SLE), tuberculosis, urinary bladder inflammation, and kidney problems.⁹

Some people apply turmeric to the skin for pain, ringworm, sprains and swellings, bruising, leech bites, eye infections, acne, inflammatory skin conditions and skin sores, soreness inside of the mouth, infected wounds, and gum disease. Turmeric is also used as an enema for people with inflammatory bowel disease.¹⁰

In food and manufacturing, the essential oil of turmeric is used in perfumes, and its resin is used as a flavour and colour component in foods. Turmeric contains the chemical curcumin. Curcumin and other chemicals in turmeric might decrease swelling (inflammation). Because of this, turmeric might be beneficial for treating conditions that involve inflammation.¹¹

Anti-oxidant effects: Water- and fat-soluble extracts of turmeric

and its curcumin component exhibit strong antioxidant activity, comparable to vitamins C and E.¹²

Hepatoprotective effects: Turmeric has been found to have a hepatoprotective characteristic similar to silymarin. Animal studies have demonstrated turmeric's hepatoprotective effects from a variety of hepatotoxic insults.

Anti-inflammatory effects: The curcumin and volatile oils manifest anti-inflammatory effects. Curcumin given orally in cases of acute inflammation was found to be as efficacious as phenylbutazone or cortisone, and one-half potent in cases of chronic inflammation.

Anti-microbial effects: Growth of bacteria, parasites, and pathogenic fungi is hampered by the turmeric extracts and the essential oil of *C. longa*.

Cardiovascular effects: Protective effect of turmeric on the cardiovascular system lowers the triglyceride and cholesterol levels to decline the susceptibility of low-density lipoprotein (LDL) to lipid peroxidation, and hampers platelet aggregation.¹³

Dental therapeutics usage of Curcumin Longa:⁶

Dental problems can be relieved with the help of turmeric in the following ways. Dental pain ground, roasted turmeric eliminates pain and swelling of the aching teeth by massaging. Periodontal problems ½ tsp of mustard oil, 1 tsp of turmeric and ½ tsp of salt can be used to prepare a paste and utilized to treat gingivitis and periodontitis. This paste is used to rub gums and teeth twice a day.

Curcumin-Periodontal Disease Link: Turmeric contains curcumin, a key constituent known for its antioxidant and anti-inflammatory effects. Turmeric relieves pain and inflammation linked with gum disease by preventing the action of a gene that creates gum-irritating chemicals. This deprives bacteria of a site to grow, aiding in the relief of bad breath and periodontal disease.

Dental pain: Massaging the aching teeth with roasted, ground turmeric eliminates pain and swelling.

Curcumin and Aphthous Ulcers: Antharjanm and Balan have reported a case those 10 patients who used curcumin oil, ulcers started healing earlier than in previous attacks and there was also early reduction in pain. A follow up for one year has shown no recurrence in these patients. Whereas, patients who used conventional antiseptic gel. The lesion healed only after the period of time as in previous attacks.

Curcumin and Oral Infections: The most commonly used anti-microbial formulations include therapeutic agents; which suffer serious side effects, in addition to resistance shown by microorganisms. This is the most common problem encountered in managing oral infection and is related primarily to systemic drug therapy.

Curcumin and Precancerous lesions:¹⁴ Oral lesions are often chronic, intensely painful and can spontaneously remit, consequently hindering normal day life activities. The easy access to the lesion allows the use of local delivery formulations to directly treat the disease without causing adverse side effects. These lesions are currently managed by invasive surgery and approximately one-third of these lesions will reoccur after surgery. Scientists have found Curcumin, an extract of the common Indian spice Turmeric to be effective in treating leukoplakia, an oral pre-cancer lesion. The clinical trial involved 223 subjects with leukoplakia who were treated randomly with either curcumin or placebo. After the six months intervention, subjects were followed up for another six months. The study found that 67% of the patients who received curcumin responded to the treatment and the medication was well-tolerated. Compared to other medications used to treat oral pre-cancer lesions where one usually observes relapse rates of up to 64% after cessation

of medication, with curcumin, only 7% relapse was observed.

Future challenges

One of the major concerns with developing curcumin for clinical efficacy is its low oral bioavailability that can be attributed to its poor absorption, high rate of metabolism in the intestines, and rapid elimination from the body. Also, little information is available to determine its safety in higher doses. Nanotechnology-based novel strategies are being aggressively explored worldwide to enhance curcumin's bioavailability and reduce perceived toxicity.

Conclusions

As the number of research studies on the therapeutic effects of Curcumin keeps on increasing across the globe. It could be concluded that Curcumin holds a promising future in local therapeutic applications specific for oral diseases such as precancerous lesions and aphthous ulcers. This review highlighted that curcumin is safe, non-toxic, effective and economical alternative with no side effects for many traditional drugs used in oral infection and periodontal diseases. Development of novel drug delivery systems such as nanoparticles and solid lipid nanoparticles loaded with curcumin seems to be very promising in enhancing its efficacy in addition to its stability and likely to be one of the thrust areas of research in future to optimize the use of this golden magical powder. Moreover, future research is required to determine the long-term effects of curcumin on a large number of subjects clinically.

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