RECENT TREATMENT MODALITIES FOR MANAGEMENT OF ORAL MALODOR

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Abstract

Oral hygiene is the practice of keeping the mouth and teeth clean to prevent dental problems, most commonly dental cavities, gingivitis, periodontal diseases and bad breath. Halitosis, oral malodor or bad breath is a universal, medico social problem in all communities and refers to the unpleasant odour that originates from the mouth or elsewhere. The condition is multi factorial in etiology and may involve both oral and non oral conditions. Non surgical periodontal therapy as well as photodynamic therapy and laser treatment results in significant reduction of organoleptic score.

1. Introduction

Halitosis or more simply Bad Breath is derived from the Latin words Halitus (Breath) + Osis (Bad). Halitosis is a term used to describe noticeably unpleasant odour exhaled in breathing. It should be considered as a symptom and not a disease. Oral Malodor is a term especially used to describe the odour emanating from the oral cavity. Diagnosis and management require a multidisciplinary approach with primary healthcare clinician, an ENT specialist, dentist, gastroenterologist, nutritionist, endocrinologist and clinical psychologist involved¹. Since halitosis is a very common problem in developing countries like India, there emerges various newer treatment modalities which when combined with conventional approaches, had a significant effect in reducing the level of Volatile Sulphur Compounds (VSCs).

2. Modern treatment modalities

- Photodynamic Therapy
- LASER
Probiotics
- Herbal Remedies
- Chemicals used as mouth rinses

2.1 Photodynamic Therapy (PDT)

PDT was discovered by Oskar Raab and Hermann von Tappeiner in 1900. In 1970s, this method was developed as a treatment for cancer. Antimicrobial PDT has been recently employed as a treatment option for localized infections. It involves the use of a non-toxic light sensitive photosensitizer combined with visible light at the appropriate wavelength to coincide with the absorption spectrum of the photosensitizer, which reaches a state of excitation after absorbing the photons, reacting with the oxygen in the medium to form reactive oxygen species (ROS). This phototoxic reaction induces the destruction of bacterial cells.

PDT can be done along with LASER, LED and dyes. In a recent study, antimicrobial PDT with *Bixa orellana* extract and blue light LED has been used for the reduction of halitosis. *Bixa orellana*, popularly known as “urucum” is a plant native to Brazil.

LASER

Commonly used Lasers are LED, Diode, CO₂, Nd:YAG, Iridium. Finkelstein Y et al evaluated the tonsils as a source of halitosis and to assess the efficacy of laser CO₂ cryptolysis for the treatment of oral bad breath caused by chronic fetid tonsilitis. A study comparing the efficacy of Laser Therapy (LT) and antimicrobial photodynamic therapy (aPDT) as adjunct to mechanical debridement (MD) on the management of halitosis study reported a significant reduction in bacterial colony forming units on the dorsum of tongue among patients with coated tongue receiving MD with aPDT compared to MD alone.
2.3 HERBAL REMEDIES

2.3.1. Turmeric

Curcuma zedoaria is widely used and has a large margin of safety for human consumption. Ficker et al.\(^5\) consider that these specimens (from the Zingiberaceae family) are excellent candidates for the development of phytotherapeutic anti-fungals. Aqueous solutions of 7.1% (for mouthwashes), obtained from hydro-alcoholic extracts of Curcuma zedoaria, can be used as auxiliaries for the mechanical control of dental plaque and gingivitis\(^6\). Turmeric mouthwashes as well as gels available for aphthous ulcers helps in keeping a healthy oral environment.

2.3.2. Green Tea

Camellia sinensis has effects on a variety of micro-organisms, and although the mechanism is unclear, the potential of Epigallocatechin gallate (EGCg), the main antimicrobial tea catechin, in reducing periodontal disease has been suggested. EGCg inhibits CH\(_3\)SH production, mRNA and protein expression\(^7\). Several bacteria and fungi are sensitive to the extracts of Camellia sinensis\(^8\). Among them were Escherichia coli and strains of Staphylococcus aureus.

2.3.3. Tulsi

The pharmacological activity of Ocimum sanctum (Tulsi) has been well documented in the field of dentistry. Ocimum sanctum has been tested against a variety of microorganisms like Candida albicans, Staphylococcus aureus, enteric pathogens, Klebsiella, Escherichia coli and Proteus. In addition, stems and leaves of Ocimum sanctum contain a variety of constituents that may have antibacterial activity, including saponins, flavonoids,
triterpenoids and tannins that forms high molecular weight complexes with soluble proteins in saliva, increases bacterial lysis on tooth surface and saliva. A study comparing the efficacy of Tulsi with chlorhexidine and hydrogen peroxide mouthwashes concluded that tulsi is effective in reducing halitosis and also cost effective but not at par with the later two.

PROBIOTICS

Probiotics are living microbes, or food ingredients containing living microbes that beneficially influence the health of the host when used in adequate numbers. The general mechanism of probiotics can be divided into 3 main categories:

1. Normalization of the intestinal micro biota
2. Modulation of the immune response
3. Metabolic effects

Studies have shown reduction of oral VSC levels considerably after use of probiotics. The W. cibaria isolates resulted in higher ecological pH than that which would normally be observed in conjunction with Lactobacilli, PROBIOTICS IN DAILY USE- Food, mouthwash, tablets
encouraging with regard to its utility\textsuperscript{12}. Probiotics are commercially available in the form of lozenges, toothpaste, chewing gums or mouthwash. These are-

- Gum Perio Balance
- PeriBiotic
- Bifidumbacterium, Acilact, Vitanar
- Wakamate D
- Prodenti

2.5 RECENT CHEMICALS USED AS MOUTHRINSES

- Chlorine dioxide
- Ozone water
- Hydrogen Peroxide
- Propolis
- Licorice
- Curcumin

2.5.1. Chlorine dioxide

Many studies have suggested that ClO\textsubscript{2} and the chlorite anion (ClO\textsubscript{2}\textsuperscript{−}) directly oxidize VSCs to non-malodorous products and consume the amino acids such as cysteine and methionine, which acts as precursors to VSCs\textsuperscript{13}. Moreover, the chlorite anion is powerfully bactericidal to microorganisms, thereby preventing bad breath.

2.5.2. Ozone

Ozone is a powerful disinfectant, used as a mouth rinse, cavity cleaner and spray.

\textbf{Biological actions of Ozone}\textsuperscript{14} -

1. Antimicrobial effect
   Among cariogenic bacteria \textit{Streptococcus mutans} and \textit{Streptococcus sobrinus} are the most sensitive.

2. Immunostimulating effect

3. Anti hypoxic effect

4. Biosynthetic Effect

5. Activates angiogenesis
6. **Intensifies remineralization potential of mineralized tooth**

2.5.3. **Hydrogen Peroxide**

Bad breath may be temporarily reduced by using a hydrogen peroxide rinse. Hydrogen peroxide at a concentration of 1.5% can be taken as an oral antiseptic. Hydrogen peroxide is a powerful oxidizer which kills most bacteria including aerobic bacteria\(^{15}\).

2.5.4. **PROPOLIS**

Propolis, is derived from the Greek pro – ‘for or in defense of’ and polis – ‘the city’, hence, ‘defender of the city/hive’. It is also known as bee glue. The constituents of Propolis include polyphenols, waxes, aromatic acids, and volatile oils. Treatment of lichen planus, candidal infections, angular cheilitis, xerostomia, orthodontic traumatic ulcers, erupting teeth, pulp capping, temporary restorations and dressings, covering tooth preparations, mummifying caries deciduous teeth, Socket ‘covering’ after extraction, dry socket (similar to ‘bone wax’ and Whitehead’s varnish), Pre-anesthetic (topical), Pericoronitis, etc\(^{16}\).

![RAW PROPOLIS](image1)

![RAW PROPOLIS BEING DISSOLVED](image2)

![PROPOLIS BEING EXTRACTED](image3)

![FINAL PROPOLIS EXTRACT USED AS MOUTHWASH](image4)

**Fig.2**: Propolis mouthwash, used in the treatment of halitosis

2.5.5. **CHEMICALS USED AS MOUTHRINSES**

- **Licorice (Mulethi)**

Innovations and recent research in dentistry witnessed a new herbal material named licorice. Glycyrrhiza glabra, known as Licorice root, is one such medicinal plant that has been used since ancient times to relieve coughs,
sore throats, bad breath, gastric inflammation as a traditional herbal remedy. Glycyrrhizin has been reported to inhibit the synthesis of insoluble glucans required for biofilm formation by interfering with glucosyl transferase activity of the cariogenic bacterium *S. mutans*.

- **Curcumin**

Turmeric (haldi), a rhizome of *Curcuma longa*, is a flavourful yellow-orange spice. Components of turmeric are named curcuminoids, which include mainly curcumin (diferuloyl methane), demethoxycurcumin, and bisdemethoxycurcumin and various volatile oils including tumerone, atlantone, and zingiberone.

**DENTAL APPLICATIONS OF TURMERIC**

1. **Dental pain** like plaque and inflammation, cavities, bad breath
2. **Periodontal problems**
   As a topical application and as a mouthwash.
3. **Local Drug Delivery System**
   2% whole turmeric gel can be used as an adjunct to scaling and root planning.
4. **Subgingival Irrigant**
   1% curcumin solution can cause better resolution of inflammatory signs than chlorhexidine and saline irrigation as a subgingival irrigant.
5. **Pit and Fissure Sealant**
   Annatto extract, turmeric extract, and β-Apo-8′-Carotenal.
6. **Anti-cancer properties**

Curcumin has been found to arrest carcinomatous cells in the G2/M phase of cell cycle, in which cells are more susceptible to cytotoxic effects of radiotherapy.

7. **Pre-cancerous lesions**

**2.5.6. MISCELLANEOUS**

- **Tea**

Tea is an aqueous infusion of the leaves of *Camellia sinensis* and can be categorized into 3 main types: oxidized black tea, semi oxidized oolong tea, and non oxidized green tea. Tea drinkers can benefit from the antioxidants and phytochemicals, such as vitamin C, carotenoids, tocopherols, polyphenols, and flavonoids, present in tea. These polyenols reduce the volatile sulphur compounds and eliminates the oral bacteria that contributes to bad breath. Green tea catechins incorporated in mouthwashes help in reducing oral malodor.

- **Fluorides**

The antiabrasive and antierosive effects on dentin after rinsing the mouth with a green tea extract (0.61%) were comparable to those observed after rinsing with a fluoride extract (250 ppm) or chlorhexidine extract (0.06%). The fluoride content of black tea is 5 times higher than that of green tea. In Japan, an in situ experiment was
performed in which a chewing gum containing green tea extract was used as the source of fluoride. Anti-carious activity helps in controlling S. mutans, thereby controlling bad breath.

- **Honey**

Various products derived from the beehive, such as honey, propolis, and royal jelly (RJ), are medicinally beneficial to humans. Honey is composed of sugars (glucose and fructose), vitamins, protein, fatty acids, trace minerals, and enzymes.

Honey has been reported to reduce the incidence of caries by reducing colonization by *S. mutans* in patients with radiation induced xerostomia and as anticalculus agent in mouthwashes and toothpastes. Honey can be used as a natural dressing for management of dry socket. Thus, the antimicrobial nature of honey helps to kill the harmful oral bacteria.

- **Royal Jelly (RJ)**

In an in vitro tooth avulsion model, RJ solution was more effective for the storage and transportation of avulsed teeth than milk or Hank’s balanced salt solution.

- **Berries**

Berries are a rich source of various nutrients and phytochemicals that protect from various diseases. The nutritional and therapeutic value of berries is because of their high content of antioxidants, polyphenols, minerals, and vitamins.
The antioxidant activity of polyphenols inhibits and modulates various receptors, transcription molecules and enzymes involved in infection, malignancy, inflammation, and neurodegeneration\(^{28}\). Vitamin C, present in berries helps in combating gingivitis which cause halitosis.

- **Olive Oil**

Olive oil is an integral component of Mediterranean cuisine. Massaging the gums with olive oil for 10 minutes daily for 3 weeks significantly reduced the *S. mutans* and *Lactobacillus spp.* counts as well as plaque scores. This reduction was comparable to that caused by chlorhexidine gel\(^{29}\), which reduced dry mouth and therefore halitosis. Reduces bad breath by a process of **oil pulling**\(^{30}\).

3. **Conclusion**

Halitosis is an extremely unappealing characteristic of socio cultural interactions and may have long-term detrimental after effects on psychosocial relationships since it is a recognizable common complaint among the general population. As technology is getting more advanced, newer chemicals as well as natural products have gained a lot of importance in the market owing to patient’s economic conditions. Only with proper diagnosis, identification of the etiology, treatment of bad breath can be carried out. Patient’s satisfaction after treatment of halitosis has lead to improvement in their social life.

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