Review Article

Halitosis: A frequently ignored social condition

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Abstract

Halitosis is a common complaint of one third of the population. It is commonly known as 'bad breath'. The causes of halitosis can both be intraoral (90%) as well as extraoral (10%). Malodor of oral etiology results from the oral cavity itself. Non oral etiology may include various systemic diseases and use of certain drugs. Halitosis can act as a biomarker for various systemic diseases. Organoleptic examination, gas chromatography and portable sulfide monitors are the common methods of measurement of halitosis. Brushing twice daily with tongue cleaning can sufficiently manage halitosis in majority of the population while antimicrobial oral rinses can be prescribed to the non respondents. Necessary investigations and treatment should follow for those having extra oral cause of halitosis.

Key words: *Bad breath, halitosis, malodor*

INTRODUCTION

Halitosis is a crippling social problem with a common complaint of up to one-third of the general population.[1] Halitosis is a lyrical term derived from the Latin word "halitus" (breath) and the Greek suffix "osis" (condition, action or pathological process). In simple words, it means "Bad Breath". It is also called as fetor ex ore or fetor oris.[2]

In most of the cases (90%), halitosis originates within the oral cavity. This is because the oral cavity harbours a large variety of microorganisms which include a large group of Gram-positive bacteria mainly *Streptococci* and a group of anerobic microorganisms such as *Porphyromonas gingivalis*, *Fusibacterium nucleatum* and *Prevotella intermedius*. Among the latter, many are Gram-negative oral bacteria whose proteolytic activity is associated with oral malodour and periodontal disease.[3] Other bacteria associated with gingivitis and/or periodontitis (viz-*Actinobacillus actinomycetemcomitans*, *Campylobacter rectus*, *Peptostreptococcus micros*, *Bacteroids forsythus, Eubacterium* species and *Spirochetes*) are known to produce large amounts of volatile sulfur compounds (VSC) which are malodorous.[4]

The plaque pH and the acid-base metabolism of oral bacteria also play a central role in malodor formation. Alkaline conditions are favorable to the production of the putrefactive end products that are malodorous and harmful to the oral soft tissues. Some salivary chemical compounds also cause halitosis. These compounds are putrescine, cadaverine, histamine, indole and skatole.[5]

The dorsal posterior part of tongue has a coating of millions of organisms. During swallowing, soft food that most of us eat do not abrade the coating significantly, and the resultant whitish-gray layer of debris and microorganisms remains intact. During the putrefaction of debris on the tongue, hydrogen sulphide and methyl mercaptan are produced, both of which have been related directly to oral malodour.[6] Few of these are nasal inflammation, postnasal drips, chronic sinusitis, diabetes mellitus, liver insufficiency, primary biliary cirrhosis, uremia, lung carcinoma, decompensated liver cirrhosis and trimethylaminuria.[7] The majority of patients have blood-borne halitosis which is caused due to the presence of elevated levels of dimethyl sulphide.[8]

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Malodor of oral etiology may result from microbial metabolism on the tongue dorsum and periodontium, and is modulated by low salivary flow at certain times during the day, food impaction, improper dental restorations, unclean dentures and diet. Non-oral etiology may include upper and lower respiratory tract conditions, neurological and gastrointestinal disorders, various systemic diseases and use of certain drugs.[9]

Hence, halitosis can act as a biomarker for a number of systemic diseases. The following are some of the typical examples.

1. Diabetes mellitus may have acetone breath due to excretion of acetone through lungs.[10]
2. A sweet odor, which some describe as that of a 'dead mice' has been associated with liver insufficiency.[10,11]
3. A 'fish odor' can suggest kidney insufficiency. Severe hepatic failure leads to 'fetor hepaticus' characterized by fresh cadaver smell.[10,11]
4. An 'acid sweet' smell is indicative of rheumatic fever.[2]
5. The breath of patients with lung abscess or bronchiectasis is described as that of odorous rotten meat smell.[2]
6. Putrefaction of pancreatic juices in stomach produces 'hunger breath' smell.[2]
7. The smell of 'rotten apple' has been associated with unbalanced insulin-dependent diabetes, which leads to accumulation of ketones.[10,11]

Therefore, knowledge of the factors causing halitosis may be helpful in early diagnosis of certain systemic conditions.

Halitosis is generally diagnosed by organoleptic examination. It is a sensory test scored on the basis of the examiner's perception of a subject's oral malodor.[12] This is often referred to as "organoleptic" or "hedonic" assessment.[12,13] It can also be measured by gas chromatography is considered the gold standard for measuring oral malodor because it is specifically analyzes VSCs, the main cause of oral malodor.[14]

Treatment for halitosis is aimed at the reduction of oral malodor. Brushing twice daily along with tongue cleaning can reduce malodor to a great extent.[11,15] Oral rinses containing antimicrobial agents such as chlorhexidine (CHX), cetylpyridinium chloride (CPC), essential oils, chlorine dioxide, hydrogen peroxide and triclosan can be prescribed. In case the halitosis persists even after treating for the intraoral causes or if the halitosis is traced to be from extraoral causes, necessary investigations and treatment of the cause should be followed. The use of halitosis as a symptom or a sign of systemic diseases dictates that the follow-up of halitosis is must.[11]

The treatment of oral malodor mainly (intraoral origin) should preferably because related. Because oral malodor is caused by the metabolic degradation of available proteins to malodorous gases by certain oral microorganisms, the following general treatment strategies can be applied.[1]

MECHANICAL REDUCTION OF INTRAORAL NUTRIENTS AND MICROORGANISMS

The dorsal surface of most tongues usually has significant observable debris. Greasy foods rich in fat contribute significantly to accumulation of tongue debris.[11] Brushing studies indicate that the tongue was the main source of CH_3SH and H_2S.[16] Because of the extensive accumulation of bacteria on the tongue, tongue cleaning has been emphasized.[1] From the 15th century to the 19th century, tongue cleaning was known to be practiced primarily by the affluent leisure class.[17]

Tongue cleaning has been advocated to reduce the amount of tongue coating and the bacterial load on the tongue surface.[18] Brushing of the dorsum of the tongue has been reported to reduce the number of microorganisms and the plaque *in vitro*. The plaque forming potential of *Streptococcus salivarius* percentage is also decreased following tongue brushing.[19]

Tongue cleaning has an additional benefit of improving taste sensation.[11] It was found that tongue brushing increased taste acuity in geriatric patients especially in denture wearers by removing the thick layer of plaque.[18]

Cleaning of the tongue can be carried out with a normal toothbrush, but preferably with a tongue scraper if a coating is established.[11] It was found that cleaning tongue with any hard device such as a plastic strip remove debris and the bacteria especially *Streptococci*.[20]

Until more controlled clinical research guides recommendations on methods and frequency of tongue cleaning the following suggestions appear to be logical:[18]

1. Place the tongue as far out of the mouth as possible.
2. Observe the location of debris accumulations. Unfortunately the debris is on the most posterior aspect of tongue.

3. Place the tongue cleaner/scraper as far posterior as possible and place force on the implement to flatten the tongue, making the scraper conform to the surface of the tongue. Gagging reflex often is elicited, especially when using brushes practice help to prevent this.
4. Pull the cleaner forward slowly to the front of the mouth. Depending on the food eaten recently, the accumulation removed from the tongue will range from a water like, relatively clear solution to viscous, pigmented, mucous-like debris.
5. Remove the debris from the cleaning device by placing it under a stream of running water.
6. Repeat the scraping procedure several times until further debris cannot be removed.
7. Clean and dry the cleaning device and store it until the next use.

People with halitosis are well-advised to repeat the tongue cleaning procedures several times during the day. However, clinical research is necessary to determine the optimum number of times per day for tongue cleaning.

CHEMICAL REDUCTION OF ORAL MICROBIAL LOAD

Mouth rinsing is a common oral hygiene practice dating back to ancient times.[21] Mouthwashes are easily accessible, high ethanol products, marketed without-child resistant packaging. Mouthwashes, nowadays, have an alcohol content that varies from 6 to 26.9%.[20] The active ingredient in oral rinses is usually antimicrobial agents such as CHX, CPC, essential oils, chlorine dioxide, hydrogen peroxide and triclosan.[11]

CHX

CHX-is a diguanidohexane with pronounced antiseptic properties. It is considered the most effective antiplaque and antigingivitis agent.[11] The first report of the antiplaque property of CHX was made by Schroeder in 1962.[22] Its antibacterial action can be explained by disruption of bacterial cell membrane by the CHX molecules, increasing the permeability and resulting in cell lysis and death.[11] In gingivitis and periodontitis, CHX mouthwashes are used to inhibit or reduce plaque-associated bacteria and as prophylaxis after periodontal surgery.[23] CHX can be used alone CHX-Alc (0.2%) or in combination with other formulation like CHX-NaF (0.12% CHX + 0.05% NaF) or Halita/CHX-CPC-Zn (0.05% CHX + 0.05% CPC + 0.14% Zn lactate) or AmF/SnF_2 mouth rinse. All these formulations result in significant reduction in microbial load of tongue and saliva.[11,24]

Besides this CHX rinses have several undesirable side effects, so are not advised for continuous, long-term usage. Some side effects are discoloration, changes in taste perception, occasional irritation caused by noxious stimuli such as chemicals, heat, cold, galvanism and radiation, desquamation, alcohol intoxication, epithelial peeling, mucosal ulceration, gingivitis and petechia.[21]

Essential oils

Essential oils-Listerine or essential oil mouthwash, a phenolic compound was also used. Several other mouthwashes were used but they do not possess the antimicrobial potential of either CHX product or essential oil preparations. Plaque reductions of 20-35% and gingivitis reductions of 25-35% have been reported.[11]

TWO-PHASE OIL: WATER MOUTHRINSE

These mouthrinses are highly effective in reducing bad breath parameters.[25] A twice daily rinse showed reductions in both VSC and organoleptic rating.[11] Two phase oil:water combinations have several possible advantages over single-phase mouthwash[21]

1. Their relative effectiveness in binding and desorbing oral microorganisms.
2. Since the bacteria and oral debris are stained blue by the food color, they can be macroscopically and microscopically observe to adhere to the oil droplets following rinsing, affording direct observation and self-assessment.
3. The two-phase mouthwash formulations do not contain alcohol, a substance which has potential side effects.

Triclosan

Triclosan (2,4,4-trichloro-2-hydroxy-diphenyl ether) is a lipid-soluble antibacterial agent that has recently been introduced into oral hygiene products such as tooth pastes and mouth rinses. Triclosan is insoluble in water and has to be solubilized in organic solvents or detergents in formulations to allow delivery of the triclosan molecule in a bioavailable form. Triclosan has been shown to exhibit both anti plaque and anti-inflammatory effect. A formulation of triclosan seems to be particularly effective in reducing VSC, oral bacteria and oral malodour.[26]

RENDERING MALODOROUS GASES NON-VITAL

Metal salt solution

Zinc is an ion with two positive charges (Zn^{++}), which will bind to the twice negatively loaded sulfur radicals, and thus can reduce the expression of the VSCs.[11] Zinc is relatively non-toxic and is non-cumulative, whereas although copper is slightly more toxic, the normal hemostasic mechanisms could maintain zero copper balance with the doses intended for prophylactic purposes. The non-toxic zinc and stannous ions had a great effect on H_2S and CH_3SH. Furthermost, mercury, cadmium and cuprous ions were shown to have strong anti-VSC effect, whereas lead ions had little effect on VSC production *in vitro*.[27]

Ascoxal T tablets developed to reduce salivary viscosity and combat plaque and gingivitis consisted of ascorbic acid, sodium percarbonate and copper sulfate is believed that the anti-halitosis effects are as a result of copper ions present in the preparation. The special effect of Halita may result from the VSC conversion of zinc, besides its antimicrobial action.[27]

Oxidizing lozenges and chewing gums

Full-strength lozenges are effective in reduction of over malodor over a 3-hour period. More recent findings have demonstrated a 90-minute effect for the regular strength-oxidizing lozenges in reducing posterior tongue malodor. The anti-malodor effect may be due to the activity of dehydroascorbic acid, which is generated by peroxide-mediated oxidation of ascorbate present in lozenges. Chewing gums on the other hand is considered to be helpful in reducing bad breath during the day by stimulating saliva flow and mechanical cleansing.[28]

MASKING THE MALODOR

Treatments with rinses, mouth sprays and lozenges containing volatiles with a pleasant odour have only a short-term effect. Another pathway is to increase the solubility of malodorous compounds in the saliva by lowering the pH of saliva or simply increase the secretion of saliva; a larger volume allows retention of larger volumes of soluble VSCs. In order to lower the pH, an orange juice may be sufficient. The latter can also be achieved by ensuring a proper liquid intake or by using a chewing gum.[11]

CONCLUSIONS

Halitosis is a crippling social problem.[17] Surprisingly, a problem of this magnitude has been neglected by dental professionals, even though the most common cause is related to microbiota of oral cavity.[18] Several methods are available in the market for the measurement of halitosis but more than an objective assessment, halitosis is a subjective perception of people. Halitosis emerging from intraoral causes can be easily and effectively treated with the use of daily oral hygiene maintenance aids, but halitosis of extraoral origin needs to be explored further and hence treated as of utmost importance. Hence, although halitosis may be a sign or symptom not seemingly needing any immediate care, the wider implications that halitosis has warrants its treatment at a priority basis.

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