



## Review article

### Halitosis: Discover the Cause and Say No to It !!!! - An overview

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#### ABSTRACT

Halitosis or bad breath is a common problem in humans, because of its individual nature this condition can cause social humiliation, emotional and psychological anguish leading to a lack of self-esteem, self-image, and self-confidence. Many patients complaining of halitosis have actual malodor of various causes, whereas others have almost no malodor. It has been suggested that halitosis is a symptom associated with systemic, somatic, emotional status and psychologic disorders. Oral malodor is primarily associated with the condition of the mouth, related to oral hygiene, dental and mucosal status. The foremost step in halitosis is finding the etiology, as the correction of underlying disorder itself can solve the problem. Malodor due to somatic origin can be corrected by dentist, but those subjects of nonoral pathologic halitosis should be referred to medical professional for further investigation and treatment of primary disorders. Persons with pseudohalitosis or halitophobia need to be counseled, with education and explanations of investigative results. In this paper we have discussed the wide range of etiological factors for halitosis and their management.

**KEY WORDS:** Halitosis, Halitophobia, Oral malodor, Pseudohalitosis.

#### INTRODUCTION

Halitosis is a medical term, first coined by the Listerine company in 1921 to describe unpleasant breath, regardless of its sources, oral or non-oral [1]. The scientific term, oral malodor is especially used to describe the odor from the oral cavity. It is a common complaint of both genders and occurs worldwide having multifactorial etiology [2]. 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 or Stomatodysodia (dysodia in Greek refers to stench)[3,4].

Today oral malodor is one of the foremost growing concerns of patients as it is fundamental to their overall personality and is a matter of concern for many individuals who want to

be presentable among his peers and in the social arena. Humans emit a variety of volatile and nonvolatile molecules that are influenced by genetics, diet, stress and disease [5].

**Types of Halitosis:** Halitosis or breath malodor can be subdivided as True, Pseudo halitosis and Halitophobia.

**1. True halitosis:** It is a real halitosis and further classified by Lu Dominic 1982 as Physiological and Pathological halitosis [6].

**Physiologic Halitosis:** It includes halitosis caused by dietary components, deleterious habits, morning breath, secondary to xerostomia caused by physiologic factors [6]. More than half of the general population suffers from physiologic halitosis for some time during a normal day [7].

This is usually seen after sleep due to prolonged lack of masticatory activity or any events that lead to stagnation of saliva in the mouth [8]. A hungry state like fasting also lead to this type of halitosis of oral origin Human body is subjected to variations in metabolic activity in the deferent intervals of each day which also may produce some physiologic halitosis and regressive changes occurring while aging also produce physiologic malodor in elderly people [9].

**Pathologic halitosis:** It occurs secondary to diseases of oral tissues like gingivitis, periodontitis, acute necrotizing ulcerative gingivitis, residual post-operative blood, debris under dental appliances, ulcerative lesions of the oral cavity, coated tongue secondary to xerostomia of salivary gland diseases, tonsilloliths etc [10].

## 2.Pseudohalitosis:

Also called Psychogenic or psychosomatic halitosis, it is a delusional halitosis occur in apparently healthy individuals who complain of chronic bad breath that no one else can smell, for which no local or systemic disease causing oral malodor could be found [11]. This problem may occur in people who tend to exaggerate normal body sensations. Sometimes this is caused by a serious mental disorder such as schizophrenia and person with obsessional thoughts may have an overwhelmed sense of feeling dirty and person who is paranoid may have the delusion that his organs are rotting. Both these persons feel their breath smells bad. This condition is effectively managed by counseling (using literature support, education and explanation of examination results) and simple oral hygiene measures [10]. If the problem continues, person benefit from seeing a psychoanalyst.

**3. Halitophobia:** Some individuals continue to insist that they have halitosis even after they have been treated for genuine or pseudo-halitosis. Such individuals are categorized as halitophobic [10].

## Etiology of halitosis:

Clinical surveys have shown that over 90% of all breath malodor originates in the mouth. In only 10% of cases, cause can be traced back to an internal or ENT problem [10].

## Halitosis secondary to local factors:

**Temporary halitosis:** It results from hot/spicy and salty food, certain drinks, alcoholic beverages, coffee and most common from garlic, onion, cured foods like salamis, cooked food such as kippers [12] and tobacco consumption causes mouldy odor [13].

**Morning breath:** In the morning everybody has some degree of halitosis and there is a physiological reason for this. During sleep, the flow of saliva is reduced drastically and tongue and cheek move very little, this allows food residues to stagnate in the mouth and dead cells that are normally shed from the surface of tongue and mucosa. As bacteria starts to work on them and digest them, an unpleasant smell is released, this process is biologically known as putrefaction/rotting. Anyone suffering from nasal congestion and breathes through mouth is more likely to suffer from this to a greater extent. This morning breath generally disappears after brushing of teeth and breakfast, as saliva starts to flow and residues are washed away [10].

**Smoking (cigarettes/cigars):** Breath smells like ash tray and smoking also reduces salivary flow, therefore further exacerbates the problem [14].

**Crash dieting/fasting:** When the body is no longer supplied with energy giving carbohydrates it first breaks down glucose stored in the muscles and liver in the form of glycogen. But this does not last long, after few hours, the body begins to breakdown fat stores and the waste product of their metabolism like ketones endows the breath with a distinctive sweet and sickly smell [14].

## Oral bacteria:

Person's mouth is a home for hundreds of different species of bacteria and there is a constant battle for living space between bacteria which do generate waste products causing bad breath, more specifically gram negative anaerobic bacteria e.g.: *Prevotella intermedia*, *Porphyromonas gingivalis*, *Fusobacterium nucleatum*, *Tannerella forsythensis*, *Treponema denticola*, *Aggregatibacter*, *Actinomycetemcomitans*, *Atopobium parvulum*, *Campylobacter rectus*, *Desulfovibrio species*, *Eikenella corrodens*, *Eubacterium sulci*, *Fusobacterium species* and *Peptostreptococcus micros* etc. A layer of plaque as thin as 0.1-0.2 mm becomes depleted to oxygen, precisely in which anaerobic bacteria flourish. So, as more and more plaque builds up and proliferate and thus increasing the level of malodor.

## Where do the bacteria causing halitosis are live in oral cavity?

The bacteria causing halitosis live in gingival sulcus and on the surface of tongue especially posterior region. The surface texture of individual's tongue will influence the amount of coating that tends to accumulate. Fissured tongue, grooved tongue, and lingua plicata have more potential to accumulate bacteria laden coating than those with smoother tongue surface. The tongue coating can be classified and is given in Table1 [10,15].

**Table.1 – Classification of tongue coating [10]**

<b>Degree 0</b>	No visible coating
<b>Degree 1</b>	< 1/3 covered by easily removable coating
<b>Degree 2</b>	< 2/3 covered by easily removable coating and < 1/3 covered by not easily removable coating
<b>Degree 3</b>	> 2/3 covered by easily removable coating
<b>Degree 4</b>	> 2/3 covered by not easily removable plaque

**Bacteria that live at and below person's gum line:** In periodontal disease the deep recesses of periodontal pockets are difficult to clean, this creates the ideal anaerobic environment for the bacteria that causes malodor. Other reasons for oral malodor are candidiasis, deep carious lesions, exposed pulps with open root canals, extraction wounds, interdental food impaction, necrotizing ulcerative gingivitis (NUG), necrotizing ulcerative periodontitis (NUP), acrylic prosthesis and Vincent's angina [10].

**Halitosis secondary to systemic disorders:[9]**

Extraoral halitosis might also be a manifestation of a serious systemic disease, such as chronic uremia, hiatus hernia, hepatic cirrhosis, diabetic ketacidosis, ulcerating and decomposing tumors of the body.

**Respiratory tract diseases:** It may be because upper respiratory tract diseases such as chronic sinusitis, atrophic rhinitis, nasal obstruction, nasopharyngeal abscess and carcinoma of the larynx. The lower respiratory tract diseases such as bronchitis, bronchiectasis, pneumonia, pulmonary abscess and carcinoma of the lungs [10].

**Gastrointestinal diseases:** Unpleasant odor from the lower gastrointestinal tract is due to belching or vomiting, because the esophagus is normally collapsed. Zenker's Diverticulum is a hernia in esophageal wall, allowing accumulation of food and debris and thus putrefaction. It can cause a significant breath odor because it is not separated from oral cavity by any sphincter. Gastric reflux, is a common cause of morning

halitosis, in this there is reflux of gastric juice, bacteria and digested food into the pharynx. Even gastric hernia, intestinal gas production, pharyngo-oesophageal diverticulum, pyloric stenosis or duodenal obstruction, hepatic failure (feter hepaticus) also leads to halitosis [10].

**Halitosis secondary to medications:**

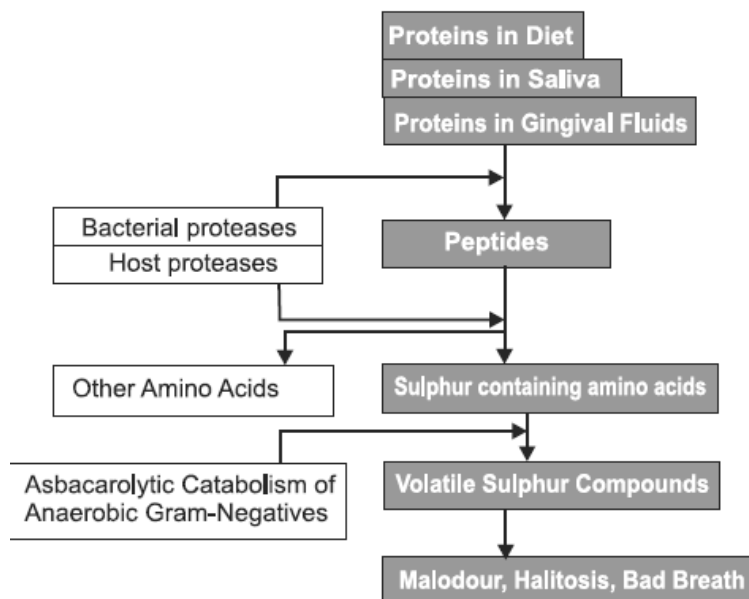
Some drugs, such as metronidazole, an antimicrobial, can cause perception of metallic taste and malodor. Eucalyptus containing medications impart a melon like odor. Arsenic smells of rotten onions. Amitriptyline (a tricyclic anti-depressant), certain anti-hypertensives, sedatives, hypnotics, anti-allergic drugs which dry up saliva as a side effect, also add to the problem [10].

**What makes the breath to smell awful ?**

Just like human's the bacteria that live in person's mouth go through their lives consuming food especially high protein diet, as a result of proteolysis of protein substrates mainly sulfur containing amino acids such as cysteine, cystine and methionine are released. They are present in free form in saliva and gingival crevicular fluid. These putrefactive changes can occur in both physiology and pathology leading to physiological and pathological halitosis respectively. It is given in Flow chart 1.

These compounds found to be gaseous in nature i.e Volatile sulfur compounds (VSC's) namely hydrogen sulfide, methyl mercaptan, dimethyl sulfide and disulfide, allyle mercaptan, allyle methyl sulfide, propyl mercaptan, methyl propyl sulfide, carbon disulfide, dimethylamine, ammonia and trimethylamine to named a few.[16,17]

**Flow chart 1. Mechanism of production of Volatile sulfur compound from proteins [18]**



**Production of Volatile sulfur compounds (VSC's)**

In intra-oral halitosis CH<sub>3</sub>SH and for lesser extent H<sub>2</sub>S are the main contributors and the CH<sub>3</sub>SH is the main contributor for extra-oral or blood borne halitosis, due to a hitherto unknown metabolic disorder.

Volatile fatty acid such as valerate, butyrate and propionate are all malodorous. When hormonal, gastro-intestinal, renal, or metabolic pathologies are the cause, additional malodorous molecules are produced; they circulate in the blood and are expressed through the expired air or gingival crevicular fluid (GCF)[19]. Different types of malodors and their origin are given in Table 2.

**Table. 2 - Different types of breath malodor according to their most likely origin [10]**

Type of Malodor	Origin
Like rotten eggs	Indicates volatile sulfur compound(VSC),which in most cases are associated with periodontitis or coated tongue
Sweet (like dead mice)	Cirrhosis of the liver: beside VSC, aliphatic acids (butyric,propionicacid),methylmercaptan, etanethiol, dimethyl sulphide
Like rotten apples	Not well controlled insulin-dependent diabetes: accumulation of ketones
Like Fish	Kidney insufficiency or trimethylaminuria (very rare metabolic disease) : uremia and accumulation of di- and trimethylamine

**Self assessment tests for Halitosis: [20]**

There are indirect routes to test our own breath by self assessment experiments and classification of subjectivity perceived halitosis is given bellow in Table.3

**Table. 3 - Classification of Subjectivity perceived Halitosis [10]**

<b>Degree 0</b>	From approximately 10 cm distance, have the patient say "A". No unpleasant smell is perceived.
<b>Degree 1</b>	From approximately 10 cm distance, have the patient say "A". An unpleasant smell is perceived
<b>Degree 2</b>	From approximately 30 cm distance, an unpleasant smell is perceived during a conversation
<b>Degree 3</b>	From approximately 1m distance, i.e. during the anamnesis talk, an obvious bad breath is perceived.

**Professional diagnosis of halitosis:**

For the diagnosis of halitosis the patient's history is extremely important and its severity has to be measured initially and after the treatment.

- Patient should be asked to describe the type of smell that is being noticed depending on the origin, different smells may be distinguished.
- Who noticed the bad breath- patient himself (halitophobia/pseudohalitosis) or others?
- Under which circumstances was the bad breath experienced? Only in the morning (temporary bad breath), after meals (due to certain foods or spices), or after lying down.
- The clinician should ask about the frequency (e.g., every month), time of appearance with in the day (e.g., after meals can indicate a stomach hernia) etc. One of the major challenges in judging halitosis is self reported halitosis. Thus, it is helpful if the patient is accompanied by candidate who is able to give more objective picture. For eg: a spouse, friend or family members.

There are several tests available for the diagnosis of halitosis, each test has some merits, demerits and uses, it is summarized in Table 4.

**Table 4. Different types of tests for Halitosis**

Named of test	Method of test	Merits	Demerits	Uses
<b>Organoleptic Testing[10]</b>	researchers test by using their senses of smell i.e. their nose as the means for making the diagnosis	Noses are readily available, inexpensive and noses can detect up to 10,000 different smells.	Not totally objective. Another is that factors other than just breath odors can and do influence organoleptic evaluations.  Factors such as hunger, menstrual cycle, head position and the degree of attentiveness and expectation can each influence a judge's interpretation of the smell.  The training of examiner is required & examiner's smell may be impaired due to ones own halitosis, or temporary deterioration of smelling (eg: rhinitis).	As nose is used for diagnosis.No instruments are required, so inexpensive
<b>Instrument assessment[20]</b>	This definitely quantify the precise level of specific compound present in breath.	Definite quantification of level of specific compound in breath is possible	Relatively expensive, requires personnel with special training to operate them, not portable equipment and time consuming.	Primarily for scientific purpose
<b>Halimeter [10]</b>	It is a specialized type of sulfide monitor and it	It requires no special training to	Patient has to be kept fasting for 4 hours. It test for only	For follow-ups, psychological

	produces a mean by which tester can quantify degrees of bad breath in parts per billion (ppb).	use, is portable measurements can be made quickly and apparatus comparatively inexpensive	sulfide compounds	support during treatment and many patients trust the result of a device more than dentists nose
<b>BANA Test</b> [10]	Bacteria that produce bad breath can be detected by performing BANA test.  Bacteria, in question have the characteristic of being able to produce an enzyme that degrades the compound BANA (benzoyl-D,L-arginine naphthylamide)	-	Just by detecting the bacteria we can't completely manage the halitosis	-
<b>Electronic Noses</b>	Artificial Noses, are supposed to provide quantification and classification of exact smells	-		
<b>Chemiluminescence</b>	Recent method introduced in 1999. The sample containing sulfur compound is mixed with the tests mercury compound, the resulting reaction causes fluorescence	It provides better selectivity and sensitivity when measuring low levels of sulfur compounds as compared to halimeters.		

### How to prevent and cure halitosis of various causes?

A simple classification with corresponding treatment needs was reported by Miyazaki et al. **Ken Yaegaki, Jeffrey M. Coil**, (2000) suggested that treatment of physiologic halitosis (TN-1), oral pathologic halitosis (TN-1 and TN-2) and pseudo-halitosis (TN- 1 and TN-4) would be the responsibility of dental practitioners.

Oral pathologic halitosis is caused mainly by periodontal disease, a condition effectively managed by periodontal treatment. Additionally, dental treatment may be necessary to correct faulty restorations that might contribute to poor oral health (TN-2). Furthermore, patients with genuine halitosis who undergo successful reduction of halitosis by TN-2 or TN-3 yet still believe that they have to refer to a psychological specialist (TN-5) and Pseudohalitosis almost always requires referral for clinical psychologist management. In Table.5 treatments needs for halitosis has been given.

**Table.5: Treatment needs (TN) for halitosis [19]**

Category	Description
<b>TN - 1</b>	Explanation of halitosis and instructions for oral hygiene (support and reinforcement)
<b>TN - 2</b>	Oral prophylaxis, professional cleaning and treatment for oral diseases especially periodontal disease
<b>TN - 3</b>	Referral to a physician or medical specialist
<b>TN - 4</b>	Explanation of examination data, further professional instructions, education and reassurance
<b>TN - 5</b>	Referral to a clinical psychologist, psychiatrist or other psychological specialist



As the prevention is always better than cure, practicing certain routine measures helps to maintain good breath. Here general points are given as bad breath remedies, they are as follows:

- Frequent sipping or drinking plenty of water
- Rinsing the mouth with water often.
- Stimulate your mouth for flow of saliva by drinking juices made of citrus fruits
- Clean your mouth well especially after eating high protein content food
- The treatment of physiological halitosis is by minimizing the food supply for anaerobic bacteria by thorough brushing, flossing and tongue cleaning measures in order to remove plaque and any food debris.
- By practicing high fibre vegetarian diet
- By taking periodic professional oral prophylactic measures from dentist
- Sugar free chewing gums, breath mints, lozenges, drops and sprays help to control halitosis
- Denture hygiene measures in patients wearing artificial dentures- thoroughly scrubbing the dentures with toothbrush or specialized denture brush on both inside and out, placing them in antiseptic solution

In spite of above measures if problem still persist by consulting dental specialist appropriate treatment can be taken for underlying dental diseases or if it is due to systemic diseases or drug induced halitosis, then consultation of medical personnel for further investigations and treatment becomes mandatory.

#### **Halitosis treatment by chemicals:**

- A) **Antibacterial mouthwashes:** They have the ability to kill bacteria, so reduces anaerobic bacteria that produce VSC's and hence halitosis Eg: 0.2% Chlorhexidine, Triclosan ((2, 4, 4-trichloro-2-hydroxydiphenylether), Zinc rinses, Amine fluoride / Stannous Fluoride, 3% Hydrogen peroxide
- B) **Mouthwash that neutralizes VSC's:** The ingredients found in some mouthwashes have the capability to neutralize VSC's and/or the compounds from which they are formed. Eg: Chlorine Dioxide, Essential oils containing mouth washes (Listerine)
- C) **Herbal remedies:** natural products like yogurt (Probiotics), lemon water, mint leaves, vinegar, cardamom seeds, cloves are beneficial in reducing halitosis

#### **Treatment for orodental diseases:[21]**

Oral prophylactic procedures such as supra and sub gingival scaling and elimination of periodontal pockets should be undertaken. Carious teeth have to treat by restoration or endodontic treatment or extractions.

#### **Management of halitophobic individuals:**

These individuals can be reassured by using a simple 'air bag' technique, which is a self assessment organoleptic technique. In this a food grade thin transparent plastic cover of 8x10 inches size is taken and instructed to seal his/her mouth with the open end of plastic bag and inhale through the nose and exhale through mouth in short bursts [21,22]. As the air is odor free, patient will get convinced that they are not suffering from halitosis. Sometimes Selective Serotonin Reuptake Inhibitor, which increases the concentration of serotonin in the brain, can help to treat this phenomenon[23].

#### **Treatment for systemic diseases:**

Halitosis secondary to systemic range of problems, the underlying diseases should be treated promptly by referring the patient to respective medical specialist.

#### **CONCLUSION**

Halitosis emerging from intraoral source can be easily and effectively treated with the use of daily oral hygiene measures, but malodor of systemic origin require exploration of underlying diseases and hence treated as of utmost importance. Hence, though halitosis may be a sign or symptom not apparently needing any instantaneous care, the wider implications that halitosis has necessitate its treatment at a priority basis.

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