



Halitosis – Etiology and Diagnosis

KEYWORDS

breath malodour, halitosis, volatile sulphur compounds

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ABSTRACT

Halitosis is an unpleasant condition that causes social restraint. The condition is multifactorial in etiology and may involve both oral and non-oral conditions. Patients with halitosis may seek treatment from dental clinicians for their perceived oral malodour. Patients with halitosis may seek treatment from dental clinicians for their perceived oral malodour.

Introduction

Halitosis is defined as breath that is offensive to others, caused by a variety of reasons including but not limited to periodontal disease, bacterial coating of tongue, systemic disorders and different types of food. (American Academy of Periodontology 2001)¹. It is one of the most frequent claims from patients to the dentist. Halitosis term originates from the Latin "halitus" means "breath" and the Greek "osis" means "abnormal" or "diseased". In simple words also known as "Bad Breath, Foul Odour, Fetor ex ore, Fetor oris". (Kapoor et al 2011)²

Halitosis, can be subdivided as real halitosis, pseudohalitosis and halitophobia.

True halitosis / Real halitosis

Real halitosis can be further subdivided into physiological and pathological halitosis. Physiologic halitosis includes halitosis caused by dietary components, deleterious habits, morning breath, secondary to xerostomia caused by physiologic factors. Pathologic halitosis occurs secondary to pathologic conditions or oral tissues like gingival and periodontal diseases like periodontitis, acute necrotizing ulcerative gingivitis, residual post-operative blood, debris under dental appliances, ulcerative lesions of the oral cavity, Halitosis may be associated with coated tongue, may occur due to xerostomia secondary to salivary gland diseases, tonsilloliths.

Pseudohalitosis

Patients who suffer from pseudohalitosis complain of the existence of halitosis though it is not perceived by others. This condition can be managed effectively by counselling (using literature support, education and explanation of examination results) and simple oral hygiene measures.

Halitophobia

Some individuals continue to insist that they have halitosis even after they have been treated for genuine or pseudohalitosis. Such individuals are categorized as halitophobic. Halitophobia may be considered when no physical or social evidence exists to suggest that halitosis is present. (Kapoor et al 2011)²

Etiology

The etiology of halitosis has been subject to a historical controversy.

Temporary halitosis: It results from hot/spicy food, certain

drinks, alcoholic beverages, coffee and most common from garlic, onion, salty foods, spices, curries. Tobacco consumption causes mouldy odour. Hyposalivation/ Xerostomia (dry mouth) also leads to bad breath. (Kaltschmitt and Eickholz 2005)³

Morning breath: Everybody has a degree of halitosis, first thing in the morning. 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 gums and from the inside of cheek to accumulate. As bacteria starts to work on them and digest them, an unpleasant smell is generated.

Smoking (cigarettes/cigars): Breath smells like ash tray. Smoking also reduces the flow of saliva and therefore further exacerbates the problem.

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 a few hours, the body begins to breakdown its fat stores and the waste product of their metabolism, ketones, endows the breath with a distinctive sweet and sickly smell. This can be seen in those who has vigorously worked out and exercised and not taken sufficient carbohydrates before or after. People on a high protein diet experience the same effect for similar reasons.

Bacteria: Bad breath is usually caused by bacteria that live in person's mouth. Bacteria, just like humans, go through their lives consuming food and excreting waste. The waste products produced by some oral bacteria are sulphur compounds. These odoriferous waste products usually lie at the root of person's bad breath problem.

Bacteria may live on person's tongue or may be present in the supragingival and subgingival plaque.

Other reasons for oral malodour are candidiasis, deep carious lesions (particularly after food lodgement), exposed pulps and open root canals, extraction wounds, interdental food impaction, necrotizing ulcerative gingivitis (NUG), necrotizing ulcerative periodontitis (NUP), acrylic prosthesis and Vincent's angina.

Malodour of Extraoral Origin: Refer table 1 for the possible causes.

Ear- Nose- Throat Disorders	Tonsillitis Sinusitis Pharyngitis Diphtheria Abscesses Chronic Rhinitis Postnasal Drip
Pulmonary Disorders	Chronic Bronchitis Bronchiectasis Bronchial Carcinoma
Gastrointestinal Tract Disorders	Zenker's Diverticulum Gastric Hernia Regurgitation Esophagitis Intestinal Gas Production
Systemic Metabolic Disorders	Diabetes Mellitus Trimethylaminuria
Liver Disorders	Cirrhosis
Kidney Disorders	Chronic Glomerulonephritis

Table 1: Extra Oral Causes of Halitosis

Certain breath odours are of diagnostic significance for the physician.

For example, the acetone odour of diabetic ketoacidosis, the ammonia smell of uremia and the rotten egg smell of liver failure is due to the inability of the liver to break down diethyl sulphide, which is released due to bacterial action. This is excreted through the lungs.

Medications: Some drugs, such as metronidazole, can cause breath malodor. Metronidazole, an antimicrobial, also leads to the patient's perception of metallic taste, which is often confused with breath odour. Eucalyptus containing medications impart a melon like odour. 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.

Production of Volatile Sulphur Compounds (VSC)

The unpleasant smell of breath mainly originates from VSCs which comprise of hydrogen sulfide (H_2S), methyl mercaptan (CH_3SH), dimethyl sulfide ($CH_3)_2SH$, dimethyl disulfide ($CH_3)_2S_2$, as first discovered by Tonzetich. They all are thiols; containing a characteristic -SH group which is formed when the oxygen atom in hydroxyl group is replaced by sulphur. Oral thiols are toxic byproducts of gram negative anaerobic bacterial metabolism of sulphur containing amino acids (cysteine, cysteine and methionine) that reside in saliva, GCF, the gingival and periodontal pocket and tongue surface. This bacterial metabolism is of putrefactive nature and leads to oxygen depletion. Volatile fatty acids such as valerate, butyrate and propionate are all malodorous. When hormonal, gastro-intestinal, renal, or metabolic pathologies are the cause, additional malodorous molecules can be produced; these circulate in the blood and are expressed through the expired air or gingival crevicular fluid.

Other waste products are:

Cadaverine: Smell associated with corpses

Putrescine: Produced by decaying meat;

Skatole: Human faecal matter;

Isovaleric acid: Sweaty feet. (Kapoor et al 2011)²

Examination for Halitosis

Patient history plays a major and decisive role in identifying the cause of halitosis.

The three main methods of analyzing oral malodour are:

gas chromatography (GC)

sulphide monitoring.

organoleptic measurement

Gas chromatography

GC, performed with apparatus equipped with a flame photometric detector, is specific for detecting sulphur in mouth air. GC is considered the gold standard for measuring oral malodour because it is specific for volatile sulphur compounds (VSC), the main cause of oral malodour. However, the GC equipment is not compact, and the procedure requires a skillful operator; therefore, it is impractical for practitioners to equip their offices for GC. (Yaegaki and Coil 2000)⁴.

Recently a small, portable gas chromatograph (Oral Chroma, Abilit, Henderson, Nevada) has been introduced, which makes this technique available for periodontal clinics. It has the capacity to measure the concentration of three key sulphides separately. (Kapoor et al 2011)²

Sulphide monitoring

Sulphide monitors analyze for total sulphur content of the subject's mouth air. Although compact sulphide monitors are portable and easy to use, most are not specific for VSC. For example, the Halimeter (Interscan Co., Chatsworth, CA) has high sensitivity for hydrogen sulphide, but low sensitivity for methyl mercaptan, which is a significant contributor to halitosis caused by periodontal disease. Thus, the most reliable and practical procedure for evaluating a patient's level of oral malodour is organoleptic measurement.

Organoleptic assessment

Organoleptic measurement is a sensory test scored on the basis of the examiner's perception of a subject's oral malodour. It is considered as a gold standard for measuring halitosis. In this testing, the researchers use their senses of smell i.e. their nose as the means for making the determination. Historically, this method has been a frequent choice among dental researchers. Noses are readily available, inexpensive to obtain and operate and to their credit, noses can detect up to 10,000 different smells. One of the problems associated with using this method is that it is not totally objective. Another is that factors other than just breath odours 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 what they smell.

Organoleptic measurement can be carried out simply by sniffing the patient's breath and scoring the level of oral malodour. By inserting a translucent tube (2.5 cm diameter, 10 cm length) into the patient's mouth and having the person exhale slowly, the breath, undiluted by room air, can be evaluated and assigned an organoleptic score (table 2) However, to prevent the patient from seeing the examiner sniffing from the tube, a privacy screen is often used. The tube is inserted through a privacy screen (50 cm – 70 cm) that separates the examiner and the patient. The use of a privacy screen allows the patient to believe that they have undergone a specific malodour examination rather than the direct-sniffing procedure.

For reliable diagnosis, the oral malodour assessment should preferably be carried out on two or three different days, if possible. This is especially important when either pseudohalitosis or halitophobia is suspected.

Conditions for Organoleptic Measurement

The recommended examination procedures are described

below. Patients are instructed to abstain from taking antibiotics for three weeks before the assessment, to abstain from eating garlic, onion and spicy foods for 48 hours before the assessment and to avoid using scented cosmetics for 24 hours before the assessment. Patients are instructed to abstain from ingesting any food or drink, to omit their usual oral hygiene practices, to abstain from using oral rinse and breath fresheners, and to abstain from smoking for 12 hours before the assessment. The oral malodour examiner, who should have a normal sense of smell, is required to refrain from drinking coffee, tea or juice, and to refrain from smoking and using scented cosmetics before the assessment. (Yaegaki and Coil 2000)⁴

Category	Description
0	Absence of odour. Odour cannot be detected
1	Questionable odour. Odour is detectable, although the examiner could not recognize it as malodour
2	Slight malodour. Odour is deemed to exceed the threshold of malodour recognition
3	Moderate malodour. Malodour is definitely detected
4	Strong malodour. Strong malodour is detected, but can be tolerated by examiner
5	Severe malodour Overwhelming malodour is detected and cannot be tolerated by examiner (examiner instinctively averts the nose)

Table 2: Organoleptic Scoring Scale (Miyazaki et al 1999)⁵

Other methods are chemiluminescence and use of artificial nose.

Utilizing Chemiluminescence

One of the most recent methods for detecting the com-

pounds associated with bad breath. It was introduced in 1999. When a sample containing sulfur compound is mixed with the tests mercury compound, the resulting reaction causes fluorescence. Advantage: It provides better selectivity and sensitivity when measuring low levels of sulfur compounds as compared to halimeters.

Zinc oxide and Nitrogen chemiluminescence detectors

These chemiluminescence detectors permit the precise measurement of nitrogen compounds such as indole & cadaverine in organic matrices. This helps to determine whether these nitrogen compounds are present in mouth air.

Electronic Noses

Also called as Artificial Noses, are supposed to provide quantification and classification of exact smells (Shimura et al, 1997). Originally it was developed for quantitative assessment of smells in food or beverage. However, an application to diagnosis of halitosis appears reasonable. (Kapoor et al 2011)²

Conclusion

Oral malodour (halitosis or bad breath) is an offensive odour of oral cavity and may disturb interpersonal communication and social activities. The oral region is the most frequent origin of halitosis. The dentist and in particular the periodontist should be aware of this issue and should be able to offer adequate treatment. Hence health education and preventive intervention; such as tooth brushing instruction, and treatment regimens targeting periodontal disease as well as tongue cleaning should be incorporated to reduce levels of these compounds in mouth air.

Furthermore, by excluding an oral etiology of halitosis, the dentist may identify medical problems and refer the patient to the appropriate specialist.

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