

# Diagnosis and Treatment of Halitosis

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### Introduction

Most adults and many children suffer from bad breath (halitosis) occasionally, chronically or regularly at specific times of the day. Public awareness and concern for this phenomenon is evidenced by the support of an \$850 million mouthwash industry in the United States despite wide agreement that commercially available products have no significant effect on breath malodor.<sup>1</sup>

Physicians and dentists are generally poorly informed about the causes and treatments for halitosis. It is the purpose of this paper to review briefly our current understanding of the etiologies of halitosis and current developments in its diagnosis and treatment. The clinical techniques and strategies for diagnosis and treatment that are described below have been drawn from the research methods and results of Tonzetich<sup>2</sup>, Preti<sup>3</sup>, Rosenberg<sup>4</sup>, Yaegaki<sup>5</sup>, and Bosy<sup>6</sup> as well as my own experience in treating over 600 hundred patients presenting with a chief complaint of "bad breath."

Research reports about the etiologies of breath malodor agree that the vast majority of halitosis originates with the anaerobic bacterial degradation of sulfur containing amino acids within the oral cavity resulting in the emission of hydrogen sulfide (H<sub>2</sub>S), methyl mercaptan (CH<sub>3</sub>SH) and dimethyl sulfide (CH<sub>3</sub>SCH<sub>3</sub>), collectively referred to as volatile sulfur compounds (VSC).<sup>2-5,7</sup> Therefore, it is most reasonably the responsibility of dentists to diagnose and manage breath malodor. When systemic or other non-oral etiologies are suspected, dentists must be prepared to prescribe the appropriate medical referrals. While there are many common non-oral diseases cited in the literature<sup>8-10</sup> for which halitosis can be a symptom, halitosis typically occurs late in the pathogenesis of these diseases when other more obvious or more urgent symptoms are present.<sup>7,11,12</sup> Rapid onset, and progressively intensifying breath malodor is suggestive of an infective process, possibly secondary to carcinomas or other localized pathologies in the airway.<sup>8,11</sup> However, patients with a sole, chief complaint of long-standing, chronic halitosis have, almost without exception, either an oral etiology for halitosis or no halitosis at all.

## Imaginary Halitosis

In dealing with patients seeking professional care for halitosis, one must be prepared to differentiate between those patients who emit above average malodor, those who emit average or near average malodor but are more sensitive to it, and those who emit below average or no odor but believe that their breath is offensive despite objective evidence to the contrary. In the former two cases treatment for malodor is warranted; in the latter it is not.

There are many patients who complain of chronic bad breath for whom no objective evidence of breath malodor can be identified.<sup>8,13-17</sup> Olfactory reference syndrome is a recognized psychiatric condition in which there occurs a somatization of some distress resulting in a belief on the part of the patient that an offensive odor emanates from some body part usually the mouth. This condition interferes with normal social interactions for fear of offending others with breath malodor and has been described in the psychiatric literature for over 100 years.<sup>13,14</sup> Affective disorders and schizophrenia were reported to develop in patients whose initial complaints were limited to breath malodor, and some success has been reported in treating olfactory reference syndrome with tricyclic antidepressants and the neuroleptic pimozide.<sup>15-17</sup> If breath malodor cannot be detected organoleptically from a patient complaining of bad breath, if above normal VSC cannot be demonstrated instrumentally and if the patient cannot provide reliable third-party verification of an odor problem, olfactory reference syndrome ("Imaginary halitosis") must be considered.

## Oral Causes of Breath Malodor

Tonzetich<sup>2</sup> demonstrated that incubated whole saliva produced a putrid odor and that hydrogen sulfide ( $H_2S$ ), methyl mercaptan ( $CH_3SH$ ) and dimethyl sulfide ( $CH_3SCH_3$ ) were the principal malodorants. When the saliva is filtered, incubated supernate alone produces very little VSC. Saliva filtrate contains dead epithelial cells, live and dead bacteria, white blood cells, other blood elements and food debris all of which are rich in proteins and amino acids. Through a series of painstaking experiments, Tonzetich and co-workers established that the malodorous volatiles produced by incubated whole saliva was due to the action of anaerobic bacteria on sulfur-containing amino acids derived from degraded proteins present in salivary filtrate. He also observed that the incubated saliva of patients suffering from periodontal disease produced a more rapidly developing and a more intense evolution of VSC. VSC that evolved from substrates high in the amino acid cystine were high in hydrogen sulfide, while VSC that evolved from high methionine substrates evolved VSC high in methyl mercaptan.

Direct measurement of breath volatiles using gas chromatography-mass spectroscopy confirmed that *in vitro* mechanisms of VSC production in incubated saliva was similar to what occurs in human mouths that produce malodor. Kostelc<sup>18</sup> and others<sup>19,20</sup> have shown that patients suffering from periodontal disease produced more breath malodor and VSC than patients with healthy periodontiums. However, it has been reported that periodontal disease is not a prerequisite for the production of high levels of orally generated VSC and consequent oral malodor.<sup>6</sup> I have personally seen many young children, young adults with no clinical evidence of periodontal diseases, adults with inactive and/or well controlled periodontitis, and totally edentulous patients who have high levels of orally generated VSC and oral malodor. Some of these patients have extremely intense malodor and extremely high VSC in their mouth air. Yaegaki<sup>5</sup> and others<sup>21-23</sup> have identified the tongue and other soft tissue surfaces of the mouth as principle locations of intra-oral bacterial growth and odor production.

## **Diagnosis and Treatment of Orally Generated Breath Malodor**

Before their first visit to the office, patients are instructed to abstain from food, breath fresheners, and oral hygiene for 6 hours; smoking for 12 hours; scented cosmetics for 24 hours; onions, garlic, and spicy foods for 48 hours; and antibiotics for 3 weeks. The first step in diagnosing the cause of a patient's complaint of bad breath is to determine if the complaint is objectively verifiable. A history of recent and repeated verbal confirmations of breath malodor from friends or family members is usually a reliable indicator. Separate organoleptic assessments of oral, nasal and pulmonary air are performed and recorded independently by two operators in manners similar to those described by Rosenberg<sup>24</sup> and Preti.<sup>3</sup>

Comparative VSC concentrations in oral, nasal and pulmonary air are determined with a sulfide monitor modified since first described by Rosenberg. The instrument is equally sensitive to H<sub>2</sub>S and CH<sub>3</sub>SH in the range of 0-500 ppb with a 0-100 mv full-scale analog output which drives a small penwriter. If nasal air VSC concentration and malodor are above normal and significantly higher than those of oral or pulmonary air, the patient should be examined carefully for oral-antral or oro-nasal fistulas and referred for a nasal endoscopy. Should lung air VSC concentration and malodor be above normal and significantly higher than those of oral or nasal air, the patient should be referred for laryngoscopic and pulmonary examinations, and liver function studies should be considered. In the vast majority of cases the organoleptic and VSC assessments indicate that the oral cavity is the source of malodor.

The patient is given a complete dental examination since crown and bridge washouts, uncontrolled periodontal diseases and other dental infections can contribute to orally generated breath malodor. Localized dental infections are often the source of patients' complaints of self-perceived bad tastes or odors which are not necessarily perceived by others. With the exception of anterior crown and bridge cement washouts, dental and periodontal diseases need not be treated definitively in order to gain control of breath malodor. However, the ease with which patients can maintain control of their malodor after treatment is enhanced by traditional treatments of infective dental and periodontal diseases.

Because orally generated breath malodor is caused by the emission of thiols and sulfides by anaerobic bacteria, treatment is directed toward permanently reducing oral anaerobes. For this purpose an intraoral liquid-air spray device and an ultrasonic intraoral dental cleaner unit have been designed to deliver an irrigant<sup>26</sup> for antiseptic debridement of the hard and soft tissues of the mouth. Following this procedure patients are instructed in the use of home soft tissue cleaner and a high oxidation potential mouth rinse.<sup>26</sup> The regime performed two times daily, in the morning and evening, is sufficient to maintain control of breath odor in most individuals after undergoing the in-office antiseptic debridement.

After treatment and maintenance instructions, patients are instructed in a method for assessing breath odor at home for 2-4 weeks after treatment. Patients then return for a post treatment evaluation at which all organoleptic and VSC assessments are repeated under the same pre-visit conditions and at the same time of day as the pre-treatment evaluation. Adjustments in the timing and frequency of the regimen are sometimes necessary if the home assessment indicates malodor breakthroughs at specific times of day.

Utilizing these diagnostic and treatment techniques, breath malodor was totally eliminated in 97% of all patients presenting with some degree of verifiable breath malodor as judged by the above described organoleptic and VSC assessments. The remaining 3% (11 patients) had either significant improvement with which they were satisfied or admitted to not following the maintenance regimen. As judged by a post-treatment follow-up questionnaire mailed to 1,343 patients between 4 and 20 weeks after in-office treatment, 78% of respondents indicated that they had experienced "significant improvement" in their breath odor as a result of treatment and maintenance. Another 18% indicated a "somewhat significant improvement" while 4% indicated "no improvement."

## **Conclusion**

Bad breath is a major concern for many people. Because it nearly always originates from the mouth, it can and should be diagnosed and treated professionally by dentists. There is no "stand-alone" product solution for halitosis nor do traditional standards of dental or periodontal care necessarily eliminate the problem. Recent developments in the understanding of the etiologies of breath malodor have spawned new techniques for its assessment and management. A clinical protocol for diagnosing and treating chronic halitosis has been outlined here that is highly effective, reliable and leads to long-term patient satisfaction.

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