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Self-perception of breath odor

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Bad breath is a common oral condition and a reason why patients seek dental counsel.^{1,2} In approximately 85 percent of cases, halitosis is the result of microbial activity in the mouth.^{3,4} Reasons for oral-based malodor include poor oral hygiene, periodontal disease, faulty dental restorations and debris buildup (including postnasal drip) on the posterior area of the tongue dorsum.⁵ Although Grapp⁶ demonstrated the importance of the tongue dorsum in oral malodor in 1933, the realization that the tongue is a major source of malodor only now is gaining wide recognition. The nasal passages constitute the second most likely source of halitosis.^{4,7}

In many cases, a patient's complaint of bad breath does not appear to have an objective basis.

Many systemic conditions can cause bad breath, but they rarely are encountered in the general population. Major predisposing factors toward bad breath^{3,5} are summarized in the box "Physiological Factors Predisposing Toward Bad Breath."

Treatment options are relatively straightforward when the clinician can objectively verify the presence of oral malodor. In many cases, however, the patient's complaint of bad breath does not appear to have an objective basis. In this article, we focus on the psychophysiological factors that affect how people assess and relate to their own bad breath.

THE BAD BREATH PARADOX

Many factors influence the way in which we generally perceive odors. Gabassi and Zanuttini⁸ point out that qualitative judgments of odors largely depend on a person's experience and personality traits. In this context, how we perceive our own breath odor is even more complex. Generally speaking, people appear to be unable to tell whether they have bad breath. This inability—termed the bad breath paradox⁹—results in millions of

Background. Bad breath, also known as halitosis, is a common concern for millions of people. Yet there is almost no reliable way for people to properly assess their breath odor. While many develop faulty perceptions about having bad breath that affect their entire lives, others who have halitosis are unaware of their condition.

Overview. The authors discuss the issues affecting self-perception of breath odor in patients who complain of halitosis, as well as in a more general, "noncomplaining" population. The article presents self-perception of breath odor as a multifactorial, psychophysiological issue that is related closely to one's body image and psychopathological profile.

Conclusions. Based on their data, the authors suggest that every patient has a breath odor self-image. This self-image ranges from little or no distortion to severe psychopathology. Because treating patients with a specific complaint of oral malodor primarily is the responsibility of the dental practitioner, several treatment approaches are outlined: collecting odor samples from the mouth to increase objectivity, involving a confidant in diagnosis and follow-up, corroborating odor judges' scores with objective measurements, increasing the patient's sense of control over the problem and obtaining guidance from mental health professionals, when necessary.

Clinical Implications. Dentists increasingly are being called on to help patients with complaints of bad breath. In diagnosing and treating such cases, dentists should consider psychological and physiological factors.

people who have bad breath, but are unaware of it, while millions of others who do not have discernible bad breath think they do. The consequences of this paradox are immense.

People who are not aware of their bad breath may encounter romantic,



**PHYSIOLOGICAL FACTORS
PREDISPOSING TOWARD BAD BREATH.***

- Postnasal drip
- Periodontal diseases
- Poor oral hygiene
- Poor dental care (for example, faulty restorations or dentures)
- Xerostomia
- Stress
- Menstruation
- Certain foods (for example, garlic, onion, alcohol)
- Tonsil infections
- Nasal infections and obstructions
- Tonsilloliths (occasionally)
- Bronchial and lung infections (rare)
- Carcinomas (rare)
- Diabetes (rare)
- Kidney failure (rare)
- Trimethylaminuria (fish odor syndrome) (rare)
- Gastrointestinal problems (very rare)

* Data from: Rosenberg³ and Attia and Marshall.⁵

social and professional rejection without knowing why. Since bad breath and other body odors are intimate topics, few of us are willing to confront people who have this problem. This is unfortunate, as bad breath often is indicative of oral and medical conditions that can be treated.

On the other hand, so-called “halitophobics” spend their entire lives obsessed with the thought that others perceive them as having bad breath. This obsession causes them to severely restrict their behavior, avoid social interactions and regularly attempt to cover up a problem that does not exist. In Japan, 80 percent of the patients who visited a halitosis clinic claimed to be “self-conscious” of the condition, but only 24 percent actually had halitosis.¹⁰ In Canada, 0.5 to 1.0 percent of the adult general population worries about bad breath to the extent that it reflects everything they do (Murray Stein, M.D., University of California, San Diego, personal communication, January 1999).

Various physiological and psychological explanations have been proffered to explain why people are unaware of their own bad breath. In the literature, an early reviewer commonly cited adaptation, or dulling of the senses after continuous exposure to a stimulus—in this case one’s own volatile oral odors—suggesting that we become inured to our own bad breath over time.¹¹ Our initial work did not support this premise. Instead, we found significant positive correlations when we compared subjects’ psychological parameters and attempts to assess their own bad breath.^{12,13}

In some cases, certain cues (box, “Cues Occa-

**CUES OCCASIONALLY
MISINTERPRETED AS INDICATING
BAD BREATH.**

- Self-perception of unpleasant taste (very common)
- Tonsilloliths
- Other family member with bad breath
- White coating on tongue
- Behavior of others (opening windows, rubbing noses, placing hand over mouth)

sionally Misinterpreted as Indicating Bad Breath”) that are not indicative of bad breath may be perceived as being so. These misread cues contribute to the heightened self-perception of those obsessively concerned about malodor.

Previous authors have attempted to understand distortions in self-perception of odors, including oral malodor, in the context of various psychopathological disorders¹⁴⁻¹⁹ (box, “Psychological Disorders Associated With Distortions in Self-Perception of Odors”). One relevant example is patients who complain of various body odors (axillary, fecal or genital) that appear to have no objective basis. These patients may have somatic delusions or an olfactory reference syndrome.¹⁵ Cases of “delusional halitosis” were presented in the literature by Davidson and Mukherjee,¹⁷ Iwu and Akpata,¹⁸ and Oxtoby and Field.¹⁹ Halitophobia also may be considered in the context of body dysmorphic disorder, in which people are preoccupied with some imagined body effect or slight physical abnormality (for example, the appearance of their nose). Halitophobics often display other psychological phenomena, such as compulsive toothbrushing and withdrawal from social interactions.^{3,7}

**SELF-ASSESSMENT IN WORRIERS
AND NONWORRIERS**

During our initial investigation at Tel Aviv University, Israel, from 1992-1995, we asked subjects to actually smell and rate the odors coming from their mouths, tongues and saliva. We were able to confirm the subjectivity inherent in peoples’ attempts to score their own oral malodor,²⁰ but we were not able to find any support for the premise that adaptation (dulling of the senses) was involved. For example, subjects who worried about bad breath rated their own bad breath levels as being higher than did an impartial odor judge. This is the opposite of what one would expect if adaptation occurred; if subjects had

become accustomed to their own bad breath, they would tend to score their own breath odor lower than would the odor judge. Instead, subjects' self-scores of their bad breath were based on what they previously had assumed it would be. These preconceived assumptions were completely unassociated with impartial results obtained by an odor judge and laboratory measurements; the assumptions were, however, significantly related to psychopathological indexes such as obsession-compulsion, depression, anxiety, phobic anxiety and paranoid ideation.¹² Furthermore, these preconceived notions were recalcitrant and did not become objective over time.²¹ These results suggest that subjective self-perception is relatively deep-seated and intractable among people who worry about bad breath.

Most of the people whom we initially tested were "bad breath worriers," or people who volunteered to participate in the study because of a specific self-interest concerning breath odor. When we later looked at a more general population (60 subjects, 55 percent men; mean age 35.5 years, \pm 10 years, standard deviation), we found that self-assessment of general oral malodor was more objective and positively associated with the odor judges' scores and laboratory measurements.²² Interestingly, we also found significant negative correlations when we compared these subjects' self-assessments of their general oral malodor and body image scores. Subjects who had more positive feelings about their bodies generally tended to score themselves as having less oral malodor (Table 1²²⁻²⁴). Finally, we observed significant positive correlations with psychopathological parameters^{22,25} in this population of "nonworriers" (Table 2).

BREATH ODOR IMAGE

Collectively, the data suggest that self-perception of one's own bad breath has psychological elements, not only among those preoccupied by bad breath concerns, but also among the general population. One way to examine this phenomenon is in terms of the body image concept.

The concept of body image has been expanded in recent times to refer to "the picture we have in our mind of the size, shape, and form of our bodies and to the feelings concerning these characteristics."²⁶ Although body image has been used primarily with reference to size, shape and form, we suggest that it can be extended to other

PSYCHOLOGICAL DISORDERS ASSOCIATED WITH DISTORTIONS IN SELF-PERCEPTION OF ODORS.

DISORDERS WITH BODY IMAGE AS A CENTRAL DEFINING FEATURE*

Monosymptomatic Hypochondriacal Psychosis, or MHP. A single hypochondriacal delusion, distinct from the remainder of the personality, which reaches a delusional intensity (with certainty).

Olfactory Reference Syndrome. Subtype of MHP that is characterized by a delusion of smell emanating from one's own body, which others cannot detect.[†]

Body Dysmorphic Disorder. An exaggerated preoccupation with some imagined defect or slight physical abnormality (delusional disorder of the somatic type that represents an overvalued idea but with no certainty).

DISORDERS ASSOCIATED WITH, BUT NOT PRIMARILY FOCUSED ON, BODY IMAGE‡

Depression. Patients presenting olfactory hallucinations associated with death, deterioration and so forth.

Schizophrenia. Schizophrenic patients who have smell hallucinations (fecal and other bodily odors predominating).

Posttraumatic Stress Disorder. Patients re-experiencing odors after exposure to a traumatic experience in which there were actual odors present.

* Source: Pruzinsky.¹⁴

† Source: Pryse-Phillips.¹⁵

‡ Source: Greenberg.¹⁶

senses, including smell. In this context, each of us has a specific "breath odor image" that affects self-perception of breath odor.

Pruzinsky and Cash²⁷ suggested using the plural term "body images"; each image refers to a different aspect of the body. Major themes of body images discussed by Pruzinsky and Cash²⁷ are as follows:

- They are highly personalized and subjective experiences relating to perceptions, thoughts and feelings about the body, not necessarily congruent with physical reality.
- They encompass the perception of and attitude toward the particular body part (in this case, breath odor).
- They are intertwined with feelings about the self.
- They are socially influenced (it is likely that the massive advertising campaigns conducted to sell hygiene products increase awareness of and sensitivity to personal odors in general and breath odor in particular).
- They control how people feel and think about their bodies and perceive the world (for example,

TABLE 1

PEARSON CORRELATION COEFFICIENTS AMONG ORAL MALODOR SELF-PERCEPTION, IMPARTIAL ODOR EVALUATIONS AND BODY IMAGE CHARACTERISTICS.*

	SELF-PERCEPTION†	ODOR JUDGE‡	VOLATILE SULFIDES§
Odor Judge	0.53***	—	—
Volatile Sulfides	0.40***	0.36***	—
Body Image**	-0.30**	-0.14	-0.26

* Source: Koriat.²²
 † Self-perception of present oral malodor on a visual analog scale, or VAS, ranging from 1 (no odor) to 10 (extremely foul odor).
 ‡ Evaluation of subjects' oral malodor by an impartial odor judge on the VAS scale.
 § Measurement of volatile sulfides in subjects' mouth by using the Interscan 1170 sulfide monitor (Interscan Corp).²³
 ** Significant correlations, $P < .01$ (Pearson, one-tailed).
 †† According to the Body Investment Scale developed by Orbach and Mikulincer.²⁴
 ††† Significant negative correlations, $P < .05$.

TABLE 2

PEARSON CORRELATION COEFFICIENTS BETWEEN PSYCHOPATHOLOGICAL TRAITS AND ORAL MALODOR SELF-PERCEPTION.*

PSYCHOPATHOLOGICAL TRAITS†	SELF-PERCEPTION OF ORAL MALODOR‡ (r =)
Somatization	0.14
Obsession-Compulsion	0.03
Depression	0.26§
Anxiety	0.13
Hostility	0.42***
Phobic Anxiety	0.10
Paranoid Ideation	0.22§
Psychoticism	0.25§
Personal Sensitivity	0.25§
Global Symptomatic Index	0.25§
Positive Symptom Total	0.15
Positive Symptom Distress Index	0.11

* Source: Koriat.²²
 † Scales according to a psychopathological symptom survey developed by Derogatis.²⁵
 ‡ Self-perception of present oral malodor on a visual analog scale, ranging from 1 (no odor) to 10 (extremely foul odor).
 § Significant correlation, $P < .05$ (Pearson, one-tailed).
 *** Significant correlation, $P < .01$ (Pearson, one-tailed).

those patients who worry about having halitosis tend to be preoccupied not only with their breath odor but also with other people's breath).²⁸
 — They influence behavior, particularly in interpersonal relationships, in which a self-percep-

tion of bad breath can cause people to refrain from social encounters and even, in extreme cases, entertain thoughts of suicide.⁹

INCREASING THE OBJECTIVITY OF MOUTH ODOR SELF-ASSESSMENT

Investigations that we have conducted in recent years have led us to conclude that when the odor sample is removed from the body proper, objectivity of self-assessment increases.^{20,29,30} In our initial study, when subjects were asked to rate their whole mouth odor by cupping their hands over their mouths, their self-assessments showed no correlations with objective parameters. Similarly, when we asked them to score tongue odor using the wristlick test, the self-assessments were highly subjective. When the saliva samples were placed in Petri dishes, however, the subjects' self-assessments of saliva odor correlated significantly with odor judges' scores and dental indexes.²⁰

Subsequently, a study involving 124 subjects conducted by Greenstein and colleagues²⁹ showed that self-assessment of posterior dorsal tongue odor that was obtained using a plastic spoon resulted in significant correlations between self-evaluation of odor and the evaluations of an impartial odor judge. Zalmon³⁰ similarly found highly significant

correlations between self-assessment of interdental odor sampled by a toothpick and concomitant odor judges' scores. One possible explanation for the increased objectivity is that when the odor stimulus is removed from the body, sub-

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jects are less likely to relate to it in terms of their body images, and their objectivity improves.

TREATMENT

Collectively, the data suggest that every patient has a breath odor self-image. This self-image can range from little or no distortion to severe psychopathology. When a patient's self-image is relatively objective or only moderately distorted, the clinician has an excellent chance of treating not only the objective complaint but also the way the patient relates to the problem. In extreme cases, collaboration with a mental health professional is necessary. Many halitophobic patients, however, do not agree to seek psychological counsel for self-perceived bad breath,²⁸ and, thus, the dentist continues to be a last recourse. In this context, the dentist should encourage the patient to address the problem. There are several possible approaches that we suggest.

To increase the objectivity of self-estimation of breath odor, we suggest removing odor samples from the patient's body; for example, using a spoon to take samples of the odor coming from the posterior region of the tongue dorsum and allowing the patient to smell the spoon; using a dental toothpick to sample interdental odor and presenting it to the patient. Although the patient initially may grossly overestimate the impact of this odor on the overall mouth odor, it can act as a starting point and allow the patient to have more control over the problem.

Another way is to involve a confidant. Since the patient's complaints are likely to be somewhat subjective, a close family member or trusted friend can provide assistance in confirming whether the patient generally does have bad breath, as well as whether the patient's breath odor at the time of the dental appointment is the typical odor; and in monitoring the objective improvements after treatment and home care to help both the patient and dentist. Previous studies have shown that in the absence of input from a third party, patients have trouble sensing the actual improvements in their oral malodor after intervention.^{21,31}

Odor judges' scores should be supported by other objective measurements. As patients sometimes are unwilling to accept the odor scores rendered by the dental professional and staff members, clinicians can use commercially available objective measurements such as a sulfide monitor benzoyl-DL-arginine-naphthylamide, or BANA,

tests,^{31,32} which have been shown to correlate with odor judges' scores. Such testing also is helpful in demonstrating improvements over time. These tests do not preclude the need for the clinician to make a quantitative and qualitative organoleptic assessment of the actual oral odors, as they may or may not correlate on an individual basis with odor levels, and the odor type is an important clue to its origin.

Rather than inform a patient that he or she does not have bad breath, clinicians can suggest that there might be an odor, but that it is barely detectable and not evident at the time of consultation. The professional then can recommend appropriate oral hygiene protocols, again providing the patient with a sense of increased control over the problem.

In cases in which a halitophobic patient's distorted breath odor image does not resolve, dental professionals should seek guidance from mental health professionals who are experienced in treating psychopathologies focusing on bodily experience. Unfortunately, most halitophobic patients refuse to acknowledge that they may have a psychological problem.¹⁰ This, in turn, prevents them from receiving adequate psychological treatment and prolongs their suffering and social isolation. Dentists may want to suggest that patients pay one visit to a mental health professional before totally rejecting this direction. Additional guidance from mental health professionals will help dentists provide support to these patients.

CONCLUSION

Bad breath is a common problem that usually originates in the oral cavity. People who complain about having bad breath may harbor a self-perception that does not reflect objective findings. When treating patients who complain about having bad breath, clinicians should relate not only to physiological odor and associated parameters but also to the nature of the subjective complaint. We have found that both actual and perceived bad breath should be dealt with as continuous parameters. In addition, because of the multifactorial complexity of the problem, those who have bad breath should be treated individually, rather than be categorized. Having patients smell samples removed from their bodies and involving confidants may allow patients to deal with the problem in a more objective manner. ■

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