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The Dental Learning Network

Halitosis: Breath Behaving Badly

7 Homestudy Credit Hours

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Halitosis: Breath Behaving Badly

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Objectives

Upon completion of this course, the student will be able to:

- Describe an effective method for diagnosing the causes of bad breath.
- Name the compounds responsible for odors in the mouth.
- Describe medical conditions that cause or contribute to mouth odor.
- Explain an effective home care routine that can help reduce or eliminate most bad breath that originates from the mouth.

Introduction

Bad breath is a common complaint, yet with no universally accepted “gold standard” of diagnosis, it is impossible to estimate the percentage of the population with “bad” breath. People struggling with bad breath will probably consult with a dental professional before seeking medical advice about the problem.

Most of the literature up to 1940 consists of anecdotes and cures with little scientific study associated with the conclusions. Some of the earliest sound studies came from Dr. Tonzetich of Northeastern University. The researchers used an osmoscope to study the sources and conditions surrounding bad breath. Their results suggested that even though there are several causes of bad breath including those resulting from a systemic or nasopharyngeal pathology or condition, the main source of most halitosis is the oral cavity. Modern research indicates that the dorsum of the tongue is the primary source of halitosis. People with periodontal disease suffer from another type of halitosis that is primarily due to the bacteria in the crevicular fluids from the pockets. [i]

It is very difficult to rate one’s own bad breath. Many people are unaware that they have bad breath or, on the opposite extreme, feel they have very bad breath, but do not.[ii]

Machines are commercially available to assist in the measurement of the gasses thought to be most responsible for bad breath, but dental professionals could smell the odor (called “organoleptic sampling”) in the air expired from the patient's mouth and nose. [ii]

In most cases, bad breath can be reduced or eliminated by proper dental care, oral hygiene, deep tongue cleaning and, if necessary, rinsing with an effective mouthwash.[ii] If the problem persists (or if the patient continues to think the problem persists and it actually doesn’t), the patient should be promptly referred for appropriate medical or psychological care.[ii]

According to one study, fifty percent of middle-aged and older adults have socially unacceptable breath upon arising in the morning. This type of halitosis is readily treated.

People who suffer from persistent uncontrollable halitosis may have an underlying pathology[ii] including:

- Gastrointestinal ulcers
- Gastric reflux
- Respiratory tract infections
- Internal bleeding
- Hiatal hernia
- Diabetes mellitus
- Hepatic cirrhosis
- Leukemia
- Uremia.

Oral malodor appears linked to periodontal disease in some studies, but the conclusion is not supported by other studies.[iii] In cases where periodontal disease is causing the odor, treatment of the disease eliminates the odor. In the same manner, if the cause is dental decay or disease, treatment of the condition removes the halitosis.

Industry-based research studies about halitosis have concentrated on it as a cosmetic problem rather than a medical one. Drinking or rinsing with plain water reduces bad breath for a brief period of time, so theoretically all mouth rinses are somewhat effective. However, many mouth rinses only mask the problem and provide temporary cosmetic relief without engaging the source of the problem.Some patients claim they have halitosis, but actually do not. This "halitophobia" can range in severity from someone worrying about bad breath and practicing obsessive masking and oral hygiene procedures but still carrying on normal life to cases of isolation, complete tooth extraction, and suicide[iv]. If a patient complains of bad breath that is not detectable, refer them to a mental health care professional.[iii]

Introduction

The most popularly accepted theory on bad breath (Tonzetich) is that volatile sulphur compounds (VSCs) hydrogen sulfide and methyl mercaptan are the main components of oral malodor originating from the mouth. Dr. Yaegaki and colleagues have found that hydrogen sulfide is produced from the dorsum of the tongue, while methyl mercaptan and dimethyl disulfide are produced in periodontal disease sites.[iv] Tongue coating is a major source of VSC. This coating consists of epithelial cells from the oral mucosa, microorganisms, and leukocytes from periodontal pockets.

Studies by Drs. Kleinberg and Codipilly of New York showed gram-negative bacteria holding a significant role in oral malodor formation. Gram-positive bacteria are not involved. Sulfur-containing amino acids, cysteine, cystine and methionine also contribute to bad breath. Other gram-negatives: *Fusobacteria*, the black pigmented anaerobes, *Haemophilus*, and *Veillonella* as well as amino acids other than VSC are participants in malodor production.

When the main odoriferous volatiles are applied to an epithelial surface, hydrogen sulfide and methyl mercaptan are lost rapidly and indole/skatole, putrescine, cadaverine, and organic acids are lost more slowly, indicating the substances have an ability to adhere to the surface and prolong the malodor. [v]

Studies on whole saliva have yielded information about oral malodor and theories of dental caries etiology. The whole saliva contains a sample of the microbial population from the hard and soft tissues of the mouth and salivary components. Once centrifuged, sediment of bacteria and epithelial cell elements can be sampled (called salivary sediment). The bacteria are freely floating and attached to the epithelial components. The fluid from the centrifugation is saliva from the oral glands and some gingival crevicular fluid; found especially if the subject had significant inflammation. Studies have shown salivary sediment is metabolically and microbiologically similar to pooled dental plaque. (Denepitiya and Kleinberg, 1982; Singer and Kleinberg, 1983.) [v]

One hundred years ago, Miller added teeth to a mixture of whole saliva and glucose incubated 4 to 24 hours at 37°C. He found that the enamel on the teeth was demineralized and the caries process began (The Miller Acid Decalcification Theory). However, no malodor is produced. Whole saliva with glucose becomes acidic, whole saliva by itself does not. Further studies show that the acidity inhibits bacterial putrefication. The incubated saliva without the glucose is quite odoriferous. Early studies (Sulser, 1939, Berg and Fosdick, 1946; Berg 1947) showed the odor was a result of the bacteria acting on salivary proteins and peptides to yield compounds producing the odor. Tonzetich (1977) confirmed the findings and also showed the air around the incubated saliva is very similar to human breath air. [v] Malodor is produced in saliva that has a neutral or alkaline pH but is inhibited by an acidic pH. Fermentation of sugars inhibit malodor generation but is the basis of caries formation.

Not only are H_2S (hydrogen sulfide) and Ch_3SH (methyl mercaptan) major components of malodor, they are destructive to the oral tissues. They can penetrate and react with the mucosa, making it more permeable to some ions and molecules. Researchers have shown

that mucosa treated with H_2S can be restored to a normal state much more readily than mucosa treated with CH_3SH after the compound is removed. [ii]

H_2S and CH_3SH damage the cell structure, the integrity of collagen, and the metabolism of cells. Studies demonstrated a 70% lower collagen content in tissues treated with the H_2S and CH_3SH as compared to the control tissues. Tests involving periodontal disease show collagen components in crevicular fluid in the diseased sites, and collagen loss of the same amount in surrounding tissues. [ii]

Anaerobic Microflora and the Tongue[vi]

Investigators tested 16 people who complained of bad breath. They began with the hypothesis: "If anaerobic flora on the tongue's surface is the primary source of volatile sulfur compounds in the mouth, then oral malodor should decrease with changes in the bacterial content of the tongue coating, such as:

- a reduction in total bacterial counts;
- an increase in the percentage of facultative microorganisms; and
- a reduction in the ratio of anaerobic over aerobic bacteria."

Previous studies have shown proteolytic activity is important in the production of oral malodor. The microorganisms on the tongue and in dental plaque putrefy proteins, mucins, and peptides to release volatile sulfur compounds as gas in the breath. Studies have shown gram-negative anaerobic bacteria combined with blood serum also produce the VSC. Bacteria such as *Treponema denticola*, *Porphyromonas gingivalis*, *Prevotella intermedia*, *Bacteriodes forsythus*, and *Fusobacterium* when combined with serum, cysteine and methionine produce hydrogen sulfide and methylmercaptan.[vii] *T. denticola*, *P. gingivalis*, and *B. forsythus* produce an enzyme similar to trypsin that can be detected by a commercially available test called a BANA (benzoyl-DL-arginine-2-napthylamide) Test.[viii]

In another study, researchers set out to show that certain types of bacteria on the dorsum of the tongue significantly contribute to the odor in most cases of halitosis. The researchers gathered 8 men and 8 women who had complained of oral malodor. Subjects limited eating and hygiene prior to the first appointment. Examiners reviewed each medical history and documented the patient's dental condition, including a measurement of the oral odor with a portable sulfide monitor and organoleptic assessment. The examiners collected scrapings from the dorsal surface of each individual's tongue. Samples were also taken of plaque on the mesial of the first molars and two random interproximal sites. BANA tests were done on the incubated samples of tongue scrapings and plaque to determine the type of bacteria present. Samples from tongue scrapings were further incubated in anaerobic conditions for one week.

One week after the sample was taken, the subjects started a treatment regimen consisting of tooth brushing, tongue brushing with a toothbrush dipped in chlorhexidine gluconate, and a 60 second rinse of chlorhexidine gluconate twice a day for a week.

Findings of this study include:

- Full-mouth odor is related to tongue odor and the presence and amount of tongue coating but not associated with periodontal factors (pockets, bleeding).
- Surface characteristics of the tongue may effect the amount of odor produced, deep fissures and an increased amount of tongue coating yielded objectionable odors.
- The amount of coating is directly related to the bacterial load especially of anaerobic proteolytic organisms.
- The scores relating to the anaerobic bacteria correlated with the amount of breath odor, indicating these bacteria are primarily responsible for releasing volatile fatty acids in the breath. These acids are perceived organoleptically, but not by the portable sulfide monitor.
- Anaerobic bacteria were found on the tongue but not in interproximal plaque. When the anaerobic bacteria count on the tongue was reduced, oral malodor was reduced.
- *Fusobacterium* (including *F. nucleatum*, *F. fusiform*, and *F. polymorphum*) and *P. intermedia* were found in a majority of the tongue samples. After treatment, these anaerobic bacterium were significantly reduced.

This study gives additional evidence that bacterial activity on the tongue significantly contributes to bad breath. VSC, anaerobic bacteria, tongue coating, and deep fissures are all directly related to oral malodor. This study further supports the theory that gram-negative anaerobic and assaccharolytic bacteria are key in the production of oral malodor.

Diamines[ix]

Researchers Goldberg, Kozlovsky, and Rosenberg designed a study to evaluate the contribution of diamines (especially cadaverine and putrescine) to bad breath. They studied 52 people, most of whom complained of bad breath. The researchers measured:

- the VSC with a portable sulfide monitor,
- mouth odor via organoleptic means,
- plaque index,
- gingival index,
- probing depths,
- BANA test results, and
- levels of cadaverine and putrescine in the saliva.

Results of the study included:

- Cadaverine scores were associated with odor judge organoleptic scores, plaque index scores, and gingival index scores. Cadaverine levels were also relative to the BANA scores and mean probing depth. Cadaverine levels were not associated with VSC levels.
- Putrescine levels were not significantly related to the malodor and periodontal measurements, but were related to cadaverine levels.

In a second experiment, they compared saliva from a patient with periodontal disease to saliva from a patient who had healthy gingiva. The sample from the periodontitis patient had higher cadaverine levels. Putrescine levels in both samples were similar.

In a third experiment, they showed that higher levels of both cadaverine and putrescine were found in deeper pockets than in shallow ones.

The results of this study showed cadaverine levels are associated with malodor and periodontal disease, while putrescine's role is still somewhat unknown.

Correlations Between Volatile Sulphur Compounds and Oral Measurements[x]

Miyazaki et al. conducted a study in 1995 with 2,672 subjects ranging in age from 18 to 64. The research team assessed dental and periodontal conditions, plaque index, and tongue coating. Subjects discussed their medical history, smoking habits, and oral hygiene routines. Volatile sulphur compounds (VSC) were measured using a portable sulphide monitor then analyzed by gender, age, and time of measurement.

Results of this study include:

- There are no significant differences between males and females in similar age group.
- The highest measurement of malodor occurred in late morning and then late afternoon, with the lowest value in the early afternoon.
- Measurements taken before lunch were 50% higher than those taken on different subjects after lunch.
- There is a significant correlation between VSC value and both tongue coating and periodontal conditions.
- Findings suggest that tongue coating may cause oral malodor in the younger generation and periodontal diseases with tongue coating may cause oral malodor in older subjects.
- Age was not commensurate with VSC increase.
- VSC increased quantitatively in subjects with gingivitis compared to control subjects.
- There were no relationships between VSC and dental plaque, tooth brushing habits, the number of decayed teeth, smoking habits, or the subject's perception of their own malodor.

Previous studies showed that age was a factor in increasing periodontal disease and/or tongue coating that would lead to an increase in VSC and oral malodor.[xi] These results would suggest that halitosis may not occur in older people if their periodontal condition is healthy and if there is little coating on the tongue.

Periodontal Disease Related to Bad Breath[xii]

Dr. Yaegaki of Yokohama, Japan conducted studies to investigate the relationship between oral malodor and periodontal disease. He found zinc mouthwash reduced VSC concentration more than 90% for 3 hours. (As an interesting side note: chlorhexidine gluconate mouthwash was specifically not tested in this study because Japanese Ministry of Health and Welfare does not allow it's use in Japan because it has caused anaphylactia in some Japanese people.)

Dr. Yaegaki combined human gingival fibroblast culture with methyl mercaptan in a laboratory setting. He found that the methyl mercaptan interfered with collagen synthesis and actually degraded the collagen cells. The presence of methyl mercaptan may contribute to collagen degradation in periodontal disease.

He tested the effect of VSC on wound healing in a laboratory setting using rats. Results indicated that the wounds treated with VSC did not heal well and the control group without VSC healed very well. The presence of VSC after any kind of oral surgery can delay healing of the area. He suggests zinc mouthwash to reduce the amount of VSC after any oral surgery.

Dr. Yaegaki and Dr. Kato conducted a laboratory test to determine the effect of VSC on oxygen production in human polymorphonuclear leukocytes. Their results indicated that

VSC stimulated active oxygen production in a periodontal pocket and that this accelerates the destruction of periodontal tissues.

Findings presented in a combination of Dr. Yaegaki's studies include:

- Volatile Sulfur Compounds increase the permeability of the cells of the mucosa and collagen solubility.
- VSCs degrade protein and collagen.
- VSCs reduce the synthesis of protein, collagen and DNA.
- Periodontal patients have a higher amount of VSC in their mouth air than those without periodontal disease.
- Periodontal patients had four times more tongue coating, which produced 60% of the VSC in their mouth air.
- The microorganisms responsible for periodontal disease, the tongue coating, and the gingival crevicular fluid all contribute to VSC production in patients who have periodontal disease.
- Zinc mouthwash would reduce VSC and be beneficial for periodontal patients.

Another Study About Oral Malodor and Periodontitis[xiii]

Drs. McCulloch and Bosy from Toronto, Canada set out to answer the question: "Is there a quantifiable relationship between periodontitis and oral malodor?"All professionals would agree that the earlier periodontitis is detected, the better the chance of successful treatment. McCulloch and Bosy postulated that if oral malodor is an indication of early periodontal disease, a diagnostic test could be devised to treat periodontal disease in it's earliest stage. They examined 127 patients, most from the oral malodor clinic at the University of Toronto. Evaluation included: VSC peak, VSC steady-state, organoleptic judging of whole mouth odor, tongue odor from scraping, BANA test of tongue plaque, plaque index, periodontal probings, and organoleptic judging of floss odor.

In a second phase of the test, the patients rinsed with 0.2% chlorhexidine gluconate 3 times a day. The rinsing produced a reduction in the mouth odor, but not in periodontal health.

Conclusions drawn from this study include:

- The halimeter was successfully used to make reproducible measurements of VSC.
- VSC correlations with the halimeter were similar to organoleptic measurements.
- The halimeter and organoleptic tests alone were not a good test for screening of periodontal disease because improvements of halimeter and organoleptic tests did not directly correlate with periodontal health improvements.

Clinical Experiences in Israel[xiv]

Drs. Rosenberg and Leib surveyed 308 people who came to the clinic between February and December, 1992. Sixty percent of the participants were female. The patients provided a medical history and information on their current oral hygiene practices. The patients gave a description of the problem and how greatly it impacted their daily lives. They rated their own oral malodor level on a scale from 1 to 5. Human judges took organoleptic measurements for whole mouth odor, tongue dorsum odor, and nasal odor. Drs. Rosenberg and Leib report three interesting cases from this study. A 28 year old female presented with an oral odor, cigarette odor, and an atypical nasal odor. The doctors referred the patient to an otolaryngologist. Surgery yielded a calcified child's bead that had been in her nose for 25 years.

The second subject was a 19 year old severely mentally retarded male. The odor was typical of nasal odor, and was found especially around his nose, hair, hands, and clothes. He was referred to an otolaryngologist who removed a putrefied paper tissue lodged in the patient's nasal cavity. The odor problem was cured.

The third case was a man who complained of oral malodor, but after examination, malodor was not detected. The man continued to think he had bad breath, even after his family and health professionals denied any problem.

Results of the clinical experiences in this study included:

- Odor judge scores were higher for men even though women gave higher self-scores.
- The odor from the dorsum of the tongue was a major contributor to overall mouth odor.
- No cases of malodor in this study were caused by the stomach.
- Most physiological causes of oral malodor are treatable, but some "halitophobic" individuals may over exaggerate their perception of their own breath. Even after treatment and improvement of the situation, these people are not convinced their halitosis is gone.

Measurement of Oral Malodor

The measurement of bad breath is a difficult task because:

- the gasses are complex,
- it is difficult to sample,
- the samples change with exposure to air or with time,
- there is no standard to measure against, and
- the subject population is limited. [iii]

Five main types of mouth odors are:

- periodontal-type odor from the dental floss or from crevicular fluid in the periodontal pockets;
- odor from the posterior tongue dorsum from the spoon sample;
- denture odor detectable from removable appliances especially if placed in a plastic bag for a few minutes;
- characteristic nasal odor as tested from the air expired from the nose only; and
- smoker's breath. [xx]

Instruments Used to Analyze Mouth Odor

Organoleptic Judging of bad breath.

One of the easiest methods of measurement is using the human nose for organoleptic measurements. The equipment is very portable, widely available, and very inexpensive.

Judging of a person's bad breath by way of organoleptic testing simply means that the one performing the breath evaluation has used their sense of smell (their nose) as the means for making the determination.

Historically this method of breath testing 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.

Organoleptic judging of bad breath. An interesting presentation about bad breath, bad breath testing and bad breath cures is available online at http://www.animated-teeth.com/bad_breath/t1_halitosis.htm.

Organoleptic Scoring Scale [xv]

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

It is difficult to quantify the intensity of an odor. The normal scale for oral malodor judges is a descriptive scale from “no odor”, “weak”, “middle”, and “strong”. It is difficult to quantify a “middle” odor. The base measurement of “no odor” is concrete, but the highest range of “extremely foul” is infinite.

Patients participating in an organoleptic examination should abstain from eating garlic, onion and spicy food for 48 hours before the assessment. They should not use scented cosmetics for 24 hours prior to the assessment. They should abstain from food, drink, oral hygiene and breath fresheners for 12 hours before the assessment. The test should take place 3 weeks after any antibiotic therapy. [xvi]

Sample the patient’s breath by inserting a clear tube into the patient’s mouth. Instruct them to exhale slowly and fill the tube with their breath (it will be undiluted by room air.) Cap the tube and conduct the organoleptic test in another room, away from view of the patient. [xvi]

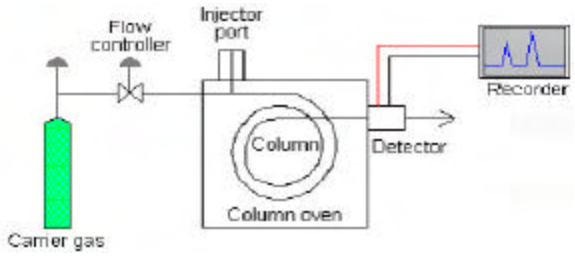
Appraisal of bad breath can differ from one judge to another. Certain factors can influence the individual’s organoleptic senses like: hunger, menstrual cycle, head position, degree of attentiveness and expectation. This method may not be as reliable as others because the olfactory sense acclimatizes to odors and therefore loses sensitivity. If one person is unreliable, perhaps a panel of judges should conduct the testing and the result based on a mean score. Panels were used in some studies without success because of several complications. The most significant variable is that the subject delivers the sample for one

judge then the concentration and composition of the gasses will be different in the following breaths for the other judges. [xvii]

People can be trained as oral malodor judges. A study showed trained judges gave a more reproducible score, and were more closely related to sulfide analysis from a machine.[xviii] Unfortunately, there is no reproducible standard for measuring bad breath, so there is no standard training medium. There are some standard tests for selecting an odor judge[xix], but none specifically for the gasses commonly found in halitosis. Probably the best judge is a dental professional, but people tend to become accustomed to odors after prolonged exposure.

Measuring Bad Breath Scientifically

A gas chromatograph is a highly specialized machine used to identify gasses. The GC is the best tool available at this time for measuring and detecting the components of a malodorous sample. Modern GCs detect levels of 10 different compounds in the breath. Studies have shown that there are more than 100 compounds in breath.



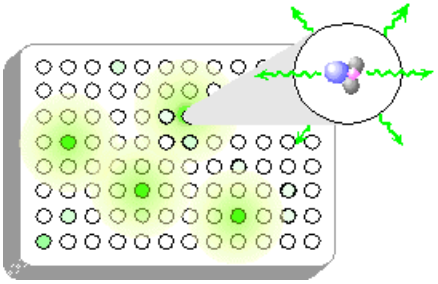
Advantages and Disadvantages of the Gas Chromatograph[ii]

Advantages	Disadvantages
individual gasses can be quantified	it's (relatively) expensive
gasses are measured even if there are very low concentrations	personnel need to be trained to use machine
A gas chromatograph with a flame-photometric detector (GC/FPD) specifically designed to measure only sulfur-containing compounds allows a reliable measurement of the volatile sulfur compounds (VSCs): Hydrogen sulfide(H_2S), and Methyl mercaptan (CH_3SH). Bad breath experts agree that these two compounds are major (90%) components of halitosis.	it's not portable
A gas chromatograph is especially useful in studying the true efficacy of mouthwashes because the masking effect of flavor will not interfere with the machine's ability to measure the VSC content.	a significant amount of time is required for measurement
Nine major studies on halitosis that involved the gas chromatograph used less than 25 subjects for the study because of the time and labor required in using the machine.	

Several researchers use industrial sulfide monitors (like the Halimeter from Interscan Co., Chatsworth, CA). The monitor measurements are more reproducible and the machine recognized reduction of malodor following mouthrinsing better than organoleptic scores, but not as well as a gas chromatograph.

Advantages of the sulfide monitor over the gas chromatograph include: [ii]	Disadvantages include:[ii]
it's less expensive,	it does not separate the gases to measure each sulfide individually,
no training is required for operation,	ethanol or essential oils interfere with the machine's ability to measure the gasses, so it is not appropriate for studies on mouthwash efficacy, and
it's portable, and	it may need periodic recalibration.
it measures quickly so several measurements can be taken consecutively.	

A chemiluminescence detector (SCD) has become commercially available. It boasts better selectivity and sensitivity for measuring low levels of sulfur compounds than all commercially available sulfur-selective detectors. Comparative studies are needed to test this device. As technology increases, it may become possible to measure more of the compounds found in bad breath. Physicians might be able to diagnose certain diseases if they had the ability to detect trace amounts of certain compounds in the breath.



Get an accurate picture of the problem

A complete medical history should be taken and evaluated for health problems or medications that may exaggerate bad breath. An excellent way to get an accurate and more objective view of the patient's problem is to interview a member of their family. They may help in establishing the severity of the problem and at what times of the day the odor is at it's worst, and if the odor at the time of the appointment is indicative of the worst odor. If the odor is not present at the time of the dental appointment, interview to find out the patient's activities in preparing for the appointment.[xx]

A thorough dental and periodontal exam should be completed to rule out disease of soft or hard tissues. Sample the coating of the tongue with a disposable plastic spoon. Sample the plaque from the interdental spaces by drawing floss through a few molar areas.

Classification of Halitosis and Treatment Needs

Once the sample is assessed, the following classification system is applied to the results:

Classification of Halitosis with Corresponding Treatment Needs [xv]

Classification	Treatment Needs*	Description
I. Genuine halitosis		1. Obvious malodor, with intensity beyond socially acceptable level, is perceived.
A. Physiologic halitosis	TN-1	1. Malodor arises through putrefactive process within the oral cavity. Neither specific disease nor pathologic condition that could cause halitosis is found. 2. Origin is mainly the dorsoposterior region of the tongue. 3. Temporary halitosis due to dietary factors (e.g., garlic) should be excluded.
B. Pathologic halitosis		
(i) Oral	TN-1 and TN-2	1. Halitosis caused by disease, pathologic condition or malfunction of oral tissues. 2. Halitosis derived from tongue coating, modified by pathologic condition (e.g., periodontal disease, xerostomia), is included in this subdivision.
(ii) Extraoral	TN-1 and TN-3	1. Malodor originates from nasal, paranasal and/or laryngeal regions. 2. Malodor originates from pulmonary tract or upper digestive tract. 3. Malodor originates from disorders anywhere in the body whereby the odor is bloodborne and emitted via the lungs (e.g., diabetes mellitus, hepatic cirrhosis, uremia, internal bleeding).
II. Pseudo-halitosis	TN-1 and TN-4	1. Obvious malodor is not perceived by others, although the patient stubbornly complains of its existence. 2. Condition is improved by counseling (using literature support, education and explanation of examination results) and simple oral hygiene measures.
III. Halitophobia	TN-1 and TN-5	1. After treatment for genuine halitosis or pseudo-halitosis, the patient persists in believing that he/she has halitosis. 2. No physical or social evidence exists to suggest that halitosis is present.

***Treatment Needs (TN) for Breath Malodor** [xv]

Category	Description
TN-1	Explanation of halitosis and instructions for oral hygiene (support and reinforcement of a patient's own self-care for further improvement of their oral hygiene).
TN-2	Oral prophylaxis, professional cleaning and treatment for oral diseases, especially periodontal diseases.
TN-3	Referral to a physician or medical specialist.
TN-4	Explanation of examination data, further professional instruction, education and reassurance.
TN-5	Referral to a clinical psychologist, psychiatrist or other psychological specialist.
Note: TN-1 is applicable to all cases requiring TN-2 through TN-5	

History of Toothbrushes and Tooth Brushing

Maryly Snow displays samples of her toothbrush collection. Online image available at http://www.berkeley.edu/news/berkeleyan/2001/05/09_tooth.html

The earliest cleaning implement for teeth was excavated in Mesopotamia. It was a gold toothpick thought to be used by Sumerians in 3000 B.C. Some primitive cultures used "chewsticks" a flavorful twig of wood that is chewed or crushed at the end to form a fibrous brush. References to chewsticks in Chinese literature appear as early as 1600 B.C. Chewsticks are still used by some Asian and African people today. Hippocrates' writings around 300 B.C contain descriptions of gum disease, calculus, and treatment of gums.

Toothbrushes resembling our modern versions appeared in England in the late 18th Century. The first U.S. patent for a toothbrush was issued in the 19th Century.

The American Academy of Periodontology identified ideal specifications for toothbrushes in 1919, attempting to develop a standard for the industry.

Today's Toothbrushes

"1950. It all started with a dentist, back in 1950, who created the first Oral-B toothbrush and its soft, end-rounded nylon bristles. Dr. Robert Hutson, a California periodontist, designed and patented the first Oral-B toothbrush. He also created the Oral-B brand name. "The first product was known as the Oral-B 60," said Dr. Hutson, "because it had 60 tufts."

Dr. Hutson started small, with a family business. He would wrap the orders in the basement, then load them in the back seat of the car and take them down to the post office to be mailed.

The role of the dentist was critical from the very beginning. Dr. Hutson said, "I knew I had a good thing but the acceptance by the dentist was something I never expected—having a product that was accepted by the dentist and the dentist in turn told the people about it." Available at http://www.oralb.com/aboutus/history.asp

According to the American Dental Association, an effective toothbrush should have the following characteristics:[xxvi]

- A size, shape and texture that will conform to an individual's needs,
- Easily and efficiently manipulated,
- Impervious to moisture and easily cleaned and dried,
- Durable, inexpensive,
- Flexible, soft bristles, strong, light weight,
- End-rounded filaments,
- Designed for utility, efficiency, and cleanliness.

Toothbrushes are available in a variety of handle types and bristle planes. Orthodontic brushes have a bi-level plane. Others include dome-shaped, rippled and flat.

Toothbrush Selection

Choose brushes with filaments made of synthetic nylon. Brushes made of this material will rinse and dry more completely between brushings. The standardization of the bristle length and shape will facilitate more uniform cleaning of the tooth surface and gingival margin. End-rounded filaments are more effective at the gingival margin and will reduce gingival damage during brushing.

Consider the following factors when selecting a toothbrush for a particular patient:

- **Patient ability:** How well will the patient be able to use the brush to remove plaque from all tooth surfaces without damaging the soft tissue or tooth structure? What is the patient's manual dexterity? Is the patient motivated and willing to use the correct technique with this type of brush?
- **Gingival Health:** How resilient is the gingiva? Is the brush adaptable to the anatomic configurations of the tissue?
- **Tooth Position:** Are teeth crowded? Displaced? Open contacts?
- **Tooth Shape:** Large? Small?
- **Patient Preference:** Does the patient prefer a type of brush. Can they be instructed in proper use of this type of brush, or is it damaging to their dentition?
- **Brushing Method:** The type of brush is dependent on the method of brushing used.

When used correctly, a soft nylon brush with rounded filaments provide:[xxi]

- Effective cleaning in cervical areas.
- Reduction of gingival trauma so patients can brush more thoroughly at the gingival margin without laceration.
- Adaptation toward sulcus area and interproximal areas for better cleaning.
- Thorough cleaning around orthodontic and other fixed appliances.
- Reduction of the chance of gingival recession or tooth abrasion.
    - Effective and comfortable brushing for patients with gingivitis or traumatized tissue.

Basic Toothbrushing Procedure [xxi]

Proper and thorough brushing is best accomplished through an orderly system. Brushing is habitual. Patients may be neglecting areas that are harder to reach simply because they are not thinking about the procedure. The toothbrush handle must be grasped firmly with the whole hand for control of motion and tactile sense of direction. An appropriate pressure must be applied to the tooth surface to remove the plaque without flaring the bristles away from the target area.

Teeth should be brushed in a regular order so each surface is given equal attention. Start with a facial molar region and work around to the opposite side. Then brush the lingual from that side back to the beginning. Repeat procedure on the opposing arch. The sequence should be varied each time: for example, start on the right side in the morning, left side at night. Start in the upper arch one week, lower arch the next. Areas that are difficult or frequently missed should be given double attention.

Most people brush their teeth too quickly, or spend more time with the front teeth than with the back. Thorough brushing should take 3 to 4 minutes. The brusher should count to 7 or 10 in each area to evenly distribute the brushing time.

People should brush their teeth at least 2 times a day and clean interdental areas at least once a day. The last brushing of the day should be right before bed. Reduced salivary flow and lack of mastication during the night facilitate bacterial growth.

Methods of Toothbrushing

The most widely used method of toothbrushing is the scrub brush method in which the brusher vigorously brushes in a back and forth movement. Even though this may be the easiest to teach, it can be detrimental to the tissues and tooth structure.

The Bass Technique or the Modified Bass Technique is currently considered the most effective method for plaque removal at the gingival margin. The filaments should be directed apically to the tooth at a 45° angle to the long axis of the tooth and straight into the sulcus. Using light pressure, allow the bristles to go somewhat into the sulcus without damaging the tissues. The brush is moved in a short, vibrating motion without displacing the bristles from the sulcus for the count of ten. The brush is then moved to the teeth directly next to those brushed, overlapping areas slightly. The lingual areas of anterior teeth can be brushed by holding the brush vertically and using a rolling stroke from the heel of the brush through the whole length of the brush. Occlusal surfaces should be brushed with a scrub brush stroke. [xxii]

Electric Toothbrushes

Power brushes are very popular and widely available. Studies have shown several electric toothbrushes to be effective in plaque removal when used correctly. Electric toothbrushes may be indicated in patients who have limited manual dexterity. Electric toothbrushes should have soft bristles and be used carefully to avoid gingival trauma or cervical abrasion.

Tongue Care

The tongue's filiform and fungiform papillae create a rough,uneven surface. Bacteria, debris, and plaque collect in this surface. The posterior dorsum of the tongue is particularly difficult to clean and has been demonstrated to be an area of odor. The tongue can be gently brushed with a standard soft toothbrush. Use the brush soaked in an antibacterial mouthwash to deliver the substance to the surface of the tongue. Try to reach back to the dorsum of the tongue without choking and be gentle enough to avoid damaging the tongue surface. Try different sized toothbrushes to find the most effective size for you.

Tongue scrapers are made of a flexible material and have ridges to clean the surface of the tongue. These should be used gently also.

Interdental Cleaning

Plaque between the teeth cannot be removed with a toothbrush. Dental floss used correctly removes plaque and debris from the interproximal area.

Waxed floss has been compared to unwaxed floss in several studies[xxi]. There has been no significant difference in plaque removal between the two. Waxed floss resists shredding while unwaxed floss spreads well once it's passed through the contact for a larger cleaning area. Floss before brushing so the fluoride from the toothpaste can be worked into the proximal areas.

Proper Flossing Procedure

Use approximately 12 inches of floss. Grasp floss between thumb and index finger of each hand. Wrap remainder around middle fingers or tie the ends of the floss together to form a large circle. Work floss gently through the contact of the teeth without snapping it into the papillae. Curve the floss in a C shape and slide the floss up and down the tooth surface a few times to dislodge the plaque. It should be moved far enough under the gingiva so that it meets resistance. The distal of one tooth (unless it is the back tooth) and the mesial of another are cleaned without removing the floss from the contact. Floss from distal of the last tooth on one side across the arch to the distal of the last tooth. Repeat with the other arch.

Mouthrinses

While many typical mouthwashes out on the market today merely temporarily cover up bad breath, some do, in fact, help treat the cause. In order for a mouthrinse to do this, it must do one of two things: kills the microorganisms responsible for producing the volatile sulfur compounds or neutralize the sulfur compound themselves.

Recent studies have suggested that mouthrinses with certain active ingredients attack bad breath at its cause and can be very effective treatments. The active components include zinc, chlorine dioxide, cetylpyridium chloride and chlorhexidine gluconate. These have been shown to kill, with varying degrees of success, anaerobic bacteria and/or their chemical products. More research is necessary to know which ones are the most effective and user friendly treatments.

Other Sources of Bad Breath

Introduction

If halitosis persists after debridement of the tongue and proper dental care (including periodontal treatment if indicated and proper oral hygiene) the patient should be referred to their physician for further investigation of a systemic cause.

The following oral conditions present malodor that is not associated with the bacterial load of the dorsum of the tongue:

- Traumatic ulceration
- Dental Abscess
- Herpetic Infections
- Apthous Ulcers
- Candidiasis
- Oral Cancer
- Gingivitis
- ANUG
- Periodontitis
- Xerostomia
- Poor Oral Hygiene

Medications that can contribute to xerostomia include:

- Antihistamines
- Anxiolytics
- Antipshychotics
- Antidepressants
- Antiparkinson Agents
- Antihypertensives
- Anticholinergics
- Diuretics
- Narcotics

Conditions that can contribute to xerostomia include:

- Diabetes
- Anemia
- Vitamin Deficiency
- Radiation
- Chemotherapy
- Menopause
- Emotional Distress

The following systemic sources can contribute to halitosis:

- **Respiratory Problems:** Pharygitis, Pulmonary Bronchitis, Lung Abscess, Pneumonia, Lung Cancer, Foreign Body in Respiratory Tract.
- **Hepatic:** cirrhosis of the liver.
- **Renal:** Renal Failure, Dialysis, Uremia.
- **Gastrointestinal:** Malabsorption Syndromes, Weakening of Esophageal Closure (example: Hiatal Hernia), Ulcers.
- **Other Systemic conditions**: (Including but not limited to) Sjorgren's Syndrome, Leukemia, Dehydration, Starvation, Bulimia, Blood Dyscrasia, Diabetes, Scarlet or Typhoid Fever and trimethylaminuria.

Nasal odor may disclose sinus infections or foreign bodies in the nose. Sometimes nasal malodor exists in some patients with healthy tissues and sinuses. Some samples from the dorsum of the tongue resemble nasal mucus. Postnasal drip onto the dorsum of the tongue may be associated with bad breath. Tonsils may play a part in the production of oral malodor. Craniofacial abnormalities may contribute to bad breath. Systemic diseases account for a small number of cases of halitosis. [xxiii]

The following protocol is used by the Chemosensory Clinical Research Center in Pennsylvania to analyze patients complaining of oral odor not originating from the mouth:[xxiv]

1. Patient collects first morning urine.
2. Patient fasts and refrains from fragrant cosmetics.
3. Organoleptic evaluation by two judges on a scale of 1 to 10.
4. Analysis of breath by gas chromatograph.
5. Determination of resting salivary flow rate.
6. Analysis of nasal air for VSC.
7. Saliva sample taken for incubation and analysis.
8. Baseline saliva sample for Trimethylamine analysis.
9. Lung air collection.
10. Choline administered to patient.
11. Patient gathers samples of urine and saliva each 8 hours for the next 24 hours.
12. The next day, the patient returns all samples to be evaluated for choline (will help in diagnosis of trimethylaminuria). Results from the previous day's tests are discussed. They are examined by a dentist and an Ear, Nose, and Throat Specialist. A sensory examination is done.

Introduction

Sometimes halitosis is linked with serious and sobering consequences. Dr. Yaegaki relates a case involving a 60-year old professional man. Dr. Yaegaki examined the patient to find tongue coating. The patient was instructed in tongue debridement and given a zinc mouthrinse. He returned after 2 weeks and the odor remained. Dr. Yaegaki referred the patient for counseling because the patient was depressed from his wife's death and other issues at his work. The counselor recommended a long vacation, but the patient refused for fear of losing his job. The patient was referred to a psychiatrist, but committed suicide before the treatment could begin.[xii]

The following ideas are generally accepted among the Bad Breath Research Community:

- Volatile sulfur compounds (hydrogen sulfide and methyl mercaptan) are found in bad breath.
- The coating on the dorsum of the tongue is the primary area of bacterial putrefication responsible for most mouth odors.
- Proper home care including tongue cleansing will reduce oral malodor.

The following ideas seem to be conflicting in studies:

- The relationship between oral hygiene and bad breath.
- The relationship between periodontal disease and bad breath.

The Future Direction of Bad Breath Research

Science would benefit from the development of an easy to use machine to analyze other compounds in the breath, especially amines. Studies have indicated that amines are important components of oral malodor, but without being able to measure them, it is not possible to prove.

Research in the area of identifying which compounds (though not malodorous themselves) contribute to the intensity or quality of halitosis would be beneficial. For example, halitosis due to age, an ulcer, and hepatic cirrhosis all contain similar components of VSC but smell distinctly different. These differences in odor may be due to ratios and mixtures of the sulfur-compounds, but there is a possibility that some non-sulfur compound changes the quality of the odor.[ii]

Most cases of bad breath are due to microbial putrefication in the mouth. Oral bacteria produce hydrogen sulfide when exposed to serum or saliva in vitro. Odor from the dorsum of the tongue is different than the odor from subgingival plaque. Research to identify the

reasons for the difference, (for example, if it is from different chemical constituents, the ratios of the components, microbial effects, or a combination of all) would be beneficial. [ii]

Studies are necessary in the area of the effect of volatile H_2S and CH_3SH on cells and tissues. The studies should also contain information about the effect of other salivary products like putrescine and cadaverine. Researchers should investigate the role of VSC in periodontal disease. [ii]

The study of oral malodor and it's components is a growing science that may at the surface appear to be a simplistic exercise in curing a merely social problem. Deeper investigation into the chemical compounds found in halitosis and their effect on tissues and cells may expand our understanding of cell function in normal and diseased tissue. [ii]

Bad breath is difficult to describe or quantify. Odor judges in a clinical setting have a more difficult task in trying to score the intensity or quality of the odor. A study comparing the effectiveness of trained and untrained human judges when sampling bad breath did not clearly demonstrated that training improves the reliability of the judge. [iii]

Some non-sulfur compounds like indole, methylamine, and cadaverine are not volatized from aqueous saliva but are released when they are allowed to dry on the skin. Clinical evaluation by instrumental measurement alone should be discouraged. [iii] Ideally, bad breath should be evaluated using a combination of human odor judges and machines.

The field of halitosis research would benefit from:

- more reliable, portable instruments for measuring VSC,
- a standard scale for assessing oral malodor,
- further studies with larger sections of the population, and
- development of site-specific measurements.

Test

Please mark only one **best** answer to the following questions on the one page answer sheet at the front of the course book. There are 25 questions.

1. Some of the earliest sound studies on bad breath indicated that the_____is the source of most halitosis.
   a. gastrointestinal tract
   b. sinus
   c. circulatory system
   d. oral cavity

2. Organoleptic sampling means:
   a. measurement of odor using a sophisticated commercially available machine.
   b. measurement of bleeding and inflammation in the gingival sulcus using a periodontal probe.
   c. relying on the self-report of the patient for estimation of the degree of malodor.
   d. smelling the expired air or other sample of the subject for presence or lack of odor.

3. The currently accepted conclusion is that volatile sulphur compounds (VSC) are the main component of oral malodor.
   a. True
   b. False

4. The advantages of the gas chromatograph include:
   a. individual gasses can be quantified.
   b. gasses are measured even if there are very low concentrations.
   c. it is portable.
   d. a and b

5. Disadvantages of a gas chromatograph include:
   a. (relatively) expensive,
   b. personnel need to be trained to use machine,
   c. significant amount of time required for measurement.
   d. all of the above.

6. Industrial sulfide monitor measurements have been shown to be more reproducible and recognized reduction of malodor following mouthrinsing better than organoleptic scores.
   a. True
   b. False

7. Advantages of the sulfide monitor over the gas chromatograph include:
   a. less expensive,
   b. no training required for operation,
   c. portable,
   d. measures quickly so several measurements can be taken consecutively.
   e. all of the above.

8. Disadvantages of the sulfide monitor include:
   a. does not separate the gases to measure each sulfide individually,
   b. ethanol or essential oils interfere with the machine's ability to measure the gasses, so it is not appropriate for studies on mouthwash efficacy,
   c. may need periodic recalibration.
   d. all of the above

9. In most cases, bad breath can be reduced or eliminated by:
   a. proper dental care, oral hygiene, deep tongue cleaning and, if necessary, rinsing with an effective mouthwash.
   b. sinus surgery.
   c. antacid use.
   d. antibiotics.

10. Persistent uncontrollable halitosis may have:
   a. Gastrointestinal ulcers
   b. Internal bleeding
   c. Hiatal hernia.
   d. Diabetes mellitus
   e. any of the above

11. The microorganisms on the tongue and in dental plaque putrefy proteins, mucins, and peptides to release volatile sulfur compounds which are released as gas in the breath.
   a. True
   b. False

12. Malodor is produced in saliva that has a neutral or alkaline pH but is inhibited by an acidic pH. Fermentation of sugars inhibit malodor generation but is the basis of caries formation.
   a. True
   b. False

13. In the study about diamines by Drs. Goldberg, Kozlovsky, and Rosenberg, cadaverine levels were:
   a. associated with odor judge organoleptic scores, plaque index scores, and gingival index scores.
   b. relative to the BANA scores and mean probing depth.
   c. not associated with VSC levels.
   d. All of the above.

14. The following conditions present malodor that is not associated with the bacterial load of the dorsum of the tongue:
    a. Traumatic ulceration
    b. Dental Abscess
    c. Herpetic Infections
    d. Apthous Ulcers
    e. all of the above

15. Medications that can contribute to xerostomia include:
    a. Antihistamines
    b. Anxiolytics
    c. Antipshychotics
    d. Anticholinergics
    e. all of the above.

16. Conditions that can contribute to xerostomia include:
    a. Diabetes
    b. Anemia
    c. Vitamin Deficiency
    d. Radiation Treatment
    e. all of the above.

17. The following systemic sources can contribute to halitosis:
    a. Pharygitis,
    b. cirrhosis of the liver
    c. Renal Failure
    d. Ulcers.
    e. all of the above

18. If halitosis persists after debridement of the tongue and proper dental care (including periodontal treatment if indicated and proper oral hygiene), the patient should be referred to their physician for further investigation of a systemic cause.
    a. true
    b. false

19. A complete medical history does not need to be taken if the patient complains of bad breath.
    a. true
    b. false

20. In a normal examination, five main types of odors can be found emanating from the mouth. Which of these is not one of them?
    a. periodontal-type odor
    b. odor from the posterior tongue dorsum
    c. denture odor
    d. athlete's mouth odor
    e. characteristic nasal odor

21. Patients who have oral malodor related to dry mouth should be instructed to
    a. drink extra water.
    b. use a mouthwash containing alcohol.
    c. breathe through their mouths.
    d. All of the above

22. Toothbrush filaments should be made of
    a. straw
    b. wood
    c. brick
    d. synthetic nylon
    e. natural materials

23. Toothbrush filaments should have _ filaments.
    a. rounded
    b. straight
    c. square
    d. uneven

24. The Bass Technique or the Modified Bass should be directed apically to the tooth at a _____ angle to the long axis of the tooth.
    a. 60°
    b. 80°
    c. 45°
    d. 35°

25. The tongue's _____ papillae create an uneven surface.
    a. filiform and fungiform
    b. villiform and williform
    c. rugae and raphae
    d. hydrogen dioxide and methyl mercaptan

(end of test)

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Appendix: Patient Information Sheets

The following information sheets have been designed to be copied and distributed to your patients. Anyone who has purchased this course may use the following sheets. You may use them as they are or retype on office letterhead for personalization.

BAD BREATH

DO I HAVE BAD BREATH?

Just about everyone has a bout of bad breath every now and then. It is very common to wake up with bad breath or have bad breath after eating certain foods.

WHERE DOES THE ODOR COME FROM?

In the most common forms of bad breath, the odor comes from the activity of bacteria in the mouth, usually from the back part of the tongue. Microorganisms in the mouth break down proteins and produce putrid gasses.

Bad breath can come from gum disease, especially if you notice the odor particularly when flossing the areas between the teeth and gums yields a foul odor. Your dentist can provide treatment for gum diseases in various ways, depending on the type and extent of the problem.

BAD BREATH ODOR USUALLY COMES FROM THE ACTIVITY OF BACTERIA IN THE MOUTH

The most common cause of bad breath is bacteria on the back part of the tongue. This bacteria lives deep in the tiny grooves of the tongue and digests proteins to produce putrid gasses.

IS THERE A CURE FOR BAD BREATH?

Bad breath is usually treatable once a proper diagnosis is made.

WHAT SHOULD I DO IF I HAVE BAD BREATH?

Practice thorough oral hygiene including flossing and gentle tongue cleaning. Use an antibacterial mouth wash approved by the ADA. If you still have bad breath, you should make an appointment to see your dentist.

When you make the appointment, tell the receptionist that you want to discuss bad breath. Try to notice when the bad breath is most noticeable. Ask a family member or a friend to help you understand the intensity and odor of your breath.

On the day of the appointment, try not to eat, drink, smoke, chew gum, eat candy, or use mouthwashes for at least 2 hours before the appointment so that a normal sampling can be taken. Try not to wear heavy perfumes or cosmetics that might mask the odor of the breath.

WHAT WILL HAPPEN AT MY APPOINTMENT?

The dentist will ask you questions about your medical history and medications you may be taking now. He or she will also perform a complete examination of your teeth and gums to look for cavities or infections. Some dentists have special machines to test the breath for gasses.

If you have no medical problems and have healthy teeth and gums, the odor probably comes from the back part of your tongue. The dentist can scrape off a plaque from this area using a plastic spoon. The odor coming from this sample can be compared to the general odor.

WHAT TYPE OF TREATMENT IS AVAILABLE FOR BAD BREATH?

If the odor is coming from a dental or gum problem your dentist will recommend dental treatment. The dentist may also suggest regular rinsing with a mouthwash that is scientifically shown to reduce bad breath. If the tongue is the source of the problem, then the dentist can recommend a method of cleaning the tongue, either with a toothbrush, or a special tongue scraper. This method

may be difficult at first because it may trigger your gag reflex, but time and practice will help you overcome this.

Your dentist may also refer you to a clinic that specializes in bad breath, or to another medical expert.

WHAT ELSE CAN I DO?

Normally, the treatment and regular home care your dentist recommends will take care of bad breath. It is important to practice home care daily to prevent the bacteria from colonizing on your tongue.

VISIT THE BAD BREATH INTERNET SITE AT:
http://www.smellwell.com/badBreathOverview.aspx

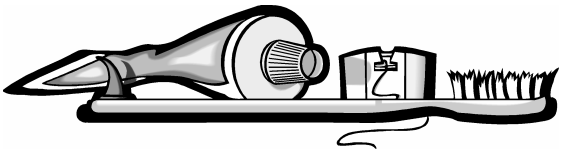
Listed below are some of the Do's and Don'ts regarding bad breath. [xxv] Remember, bad breath is a problem that needs professional attention. Don't mask it - deal with it.

Do's

- Visit your dentist regularly.
- Have your teeth cleaned periodically by a dental professional.
- Floss or otherwise clean between your teeth, as recommended by your dentist. Choose unscented floss so that you can detect those areas between your teeth that give off odors, and clean them more carefully.
- Brush your teeth and gums properly.
- Ask your dentist to recommend a toothbrush or scraper for your tongue. Clean your tongue all the way back gently, but thoroughly.
- Drink plenty of liquids.
- Chew sugar-free gum for a minute or two at a time, especially if your mouth feels dry. Chewing parsley, mint, cloves or fennel seeds may also help.
- Clean your mouth after eating or drinking milk products, fish and meat.
- Unless your dentist advises otherwise, soak dentures overnight in antiseptic solution.
- Get control over the problem. Ask a family member to tell you whenever you have bad breath.
- If someone in your family or a close friend has bad breath, find a kind way to let them know. If you can't tell them directly, leave this fact file lying around. They may get the message.
- Ask your dentist to recommend a mouthwash which has been shown to be clinically effective in fighting bad breath. Use it right before bed time for the best effect.
- Eat fresh, fibrous vegetables such as carrots.

Don'ts

- Don't let your concern about having bad breath run your life. Don't be passive.
- Don't be depressed. Get help. Don't ignore your gums - you can lose your teeth as well as smell bad.
- Don't drink too much coffee - it may make the situation worse.
- Don't forget to clean behind the back teeth in each row.
- Don't brush your tongue with regular toothpaste - it's better to dip your toothbrush in mouthwash for tongue cleaning.
- Don't run to the gastroenterologist for concerns of having bad breath - it usually comes from the mouth and almost never from the stomach.
- Don't give mouthwash to very young children, as they can swallow it.
- Don't clean your tongue so hard that it hurts.
- Don't rely on mouthwash alone - practice complete oral hygiene.



Cleaning Your Teeth and Gums

Proper home care will give you fresh breath and will keep your teeth and gums healthy.

What is Plaque?

Bacteria lives in your mouth. The foods you eat can be turned into acids by this bacteria. The acids can cause decay in the teeth.

Bacteria colonizes and forms a sticky substrate called plaque. Plaque produces irritation to the gums, making them red, tender or bleed easily. If they are irritated for long enough they pull away from the teeth and form pockets where bacteria thrives and infections form. If the gums are not treated, the bone around the teeth can be destroyed. If the supporting bone of the teeth is destroyed, the tooth will be lost.

Regular Daily Home Care of the Teeth and Gums[xxvi]

Plaque forms every day, so you should brush your teeth every day. The American Dental Association recommends the following:

Use a soft-bristled tooth brush to clean your teeth at least twice a day. Use a brush appropriate to the size of your teeth and mouth. Choose a fluoride toothpaste that displays the American Dental Association Seal of Acceptance because it shows the product meets the stringent quality guidelines of the ADA.

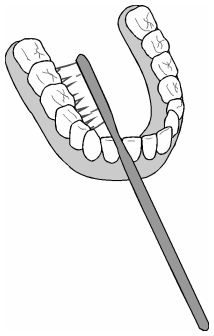
Use dental floss every day to remove plaque and debris where the brush doesn't reach.

Clean your teeth regularly, eat a balanced diet and visit your dentist regularly to protect your valuable teeth and gums.

You probably already know the basics of brushing and flossing, but here are a few pointers to improve your technique.

Brushing Tips

- Place the toothbrush bristles against the gums at a 45-degree angle.
- Move the brush back and forth gently in short (one tooth wide) strokes.



- All surfaces of the teeth need to be cleaned: the inner areas (by the tongue), the outside areas (by the cheeks and lips), and the grooved biting surfaces.
- Turn the brush to use the whole length of it to clean the insides of the upper and lower front teeth.

Flossing

- Break off about 15 inches of a strong floss and wind most of it around one of your middle fingers. Or you can tie the two ends of the floss together to form a circle.

- Wind some of the floss around a

finger of the other hand.

- Hold the floss taunt between your thumbs and forefingers. Guide the floss between your teeth using a gentle back and forth motion. Don't snap the floss between the teeth.
- After the floss is through the tight area between the two teeth, curve it into a C shape against one tooth. Gently slide it up and down the tooth and under the gum line.
- Do the same thing for the side of the other tooth.
- Advance the floss so you use a clean area between each tooth.

Tongue Cleaning

- Gently brush the tongue with a regular toothbrush dipped in an antibacterial mouth wash. Reach back as far as you can without hurting yourself. At first, you may gag, but practice will decrease this natural urge. Rinse the toothbrush well and repeat a few times until the white coating on the surface of the tongue is removed. Be gentle so the delicate tissues are not damaged.
- Special tongue cleaning devices may be used. Gently scrape the surface of the tongue according to the manufacturer's directions.

Mouth Washes

Your dentist may recommend an antibacterial mouth wash. He or she will give you specific directions on when to use it.

Appendix: Halimeter

halimeter_brochure_2004.pdf

http://www.animated-teeth.com/bad_breath/t1_halitosis.htm

> "Bad breath, also known as "halitosis", doesn't have to be an insurmountable problem. Appropriate cures for bad breath are usually very simple once the sufferer understands the fundamental causes of their breath odors. In most cases a person's bad breath is due to anaerobic oral bacteria which have accumulated on the person's tongue and also between and around their teeth."
>
> Our discussion will outline for you some simple tests you can use to determine if you have bad breath, explain to you how and why oral bacteria create bad breath, detail for you where these offending bacteria commonly accumulate and how to effectively minimize them, provide you with explanations regarding the use of tongue scrapers, mouthwashes, and other specialty products, and provide you with some common sense tips which can help you to minimize bad breath.

Bad Breath. [Online] Available http://www.animated-teeth.com/, October 2, 2005.

End Notes

[i] Tonzetich, J. "Preface" In Bad Breath: Research Perspectives.
[ii] Rosenberg, M. "Clinical assessment of bad breath: current concepts."
[iii] Rosenberg, M. "Introduction" In Bad Breath: Research Perspectives.
[iv] Yaegaki, K.; Sanada, K. "Biochemical and clinical factors influencing oral malodor in periodontal patients."
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[xxv] This list of do's and don'ts is the work Dr. Mel Rosenberg, of Tel Aviv University, Israel with help from Dr Stephen Porter and Dr Philip Stemmer. It can be found on the bad breath internet site. Most of the information in this sheet is from his research.
[xxvi] The American Dental Association web site: http://www.ada.org