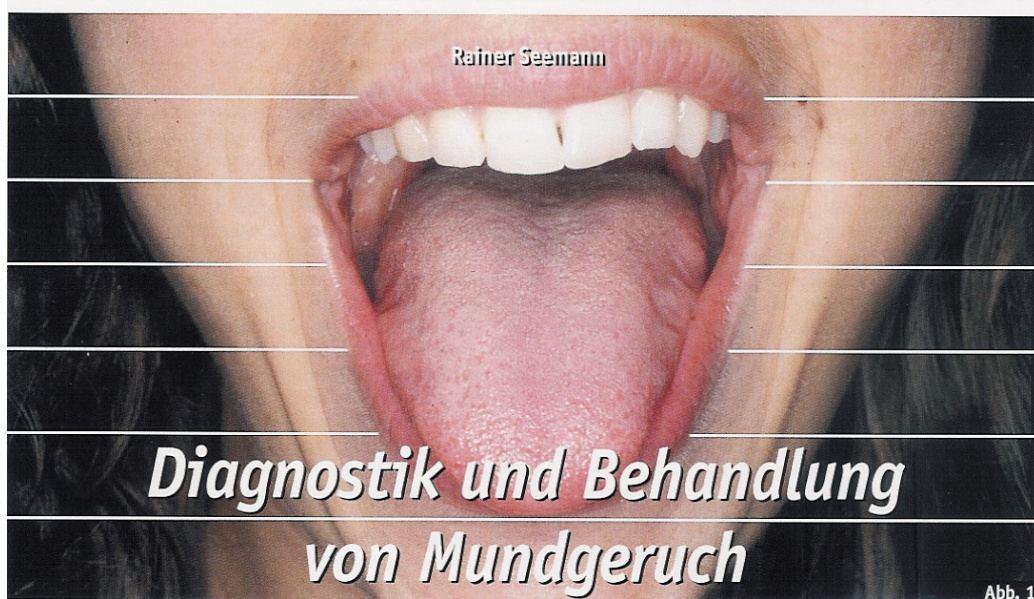


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Diagnosis and treatment of halitosis

Illustration no. 1: Patients with unfavourable tongue morphology are particularly prone to the formation of fur coating of the tongue.



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Summary

In contrast to the widespread view that bad breath is caused by disorders of the intestines, the majority of cases originates from the mouth as a result of microbial putrefaction. In this context bacterial tongue coating plays an important role. Patients suffering from bad breath should therefore first seek help from a dental professional, who should systematically examine the patient for the primary cause of his bad breath. If no oral reasons can be determined by the dentist the patient should definitely be transferred to an ear, nose- and throat-specialist or an specialist for internal medicine, because the oral malodor might be a symptom of a serious disease.

Introduction

According to the small number of epidemiological data available, around 25% of the population suffers from at least occasional halitosis and around 6% suffers from permanent halitosis (MIYAZAKI et al. 1997). Dentists are also affected by it. According to a survey carried out by the ZM magazine, 7% of the dentists questioned said that they suffer from permanent halitosis (SEEMAN 1999).

It is becoming increasingly clear that it is not – as frequently presumed – a problem with the stomach which is the most frequent cause of the foetor, but rather that it is the oral cavity which forms the most frequent source of the unpleasant smell. Up until now, the most reliable information on the frequency of the different causes of halitosis comes from installations which have established special halitosis consultancy hours. According to this data, the cause of around 90% of cases of halitosis is to be found in the oral cavity, followed by disorders in the ears, nose and throat area. It is seldom that an internal basic disease is responsible (DE LANGHE et al. 1997). This frequency distribution means that we tend to neglect further potential causes for unpleasant breath. In order to take a conscientious anamnesis and diagnosis, one should be familiar with possible differential diagnoses. Chart no. 1 contains a list of possible causes of halitosis whose treatment generally requires consultation with other medical disciplines. Despite this, the dentist should always be the first contact partner for the treatment in cases of halitosis.

The information described in the following paragraph and recommendations are based on available scientific literature and years of experience from the interdisciplinary halitosis consultation times of the Charité in Berlin.

Oral cause of halitosis

The unpleasant smell emanating from the mouth of the affected is generally caused by products generated by microbial metabolism. Micro-organisms produce foul-smelling substances such as hydrogen sulphide, methylmercaptan, putrescine or cadaverine from organic substrates such as dead tissue, food left-overs, saliva etc. (TONZETICH and RICHTER 1964, TONZETICH 1978, GOLDBERG et al. 1997, DE BOEVER et al. 1994, DE BOEVER and LOESCHE 1995, MCNAMARA et al. 1972). With the aid of gas chromatographic and spectrophotometric measurements, it was established that the volatile sulphur compounds (VSC) are very important (TONZETICH and RICHTER 1964, TONZETICH et al. 1991, TONZETICH 1971). VSCs include hydrogen sulphide, dimethyl sulphide and methylmercaptan.

According to the latest information available, we presume that it is not the existence of individual species of bacteria which leads to the formation of halitosis, but rather that it is the combination of up to 80 odour-producing types of bacteria which is responsible. These bacteria usually belong to the gram-negative spectrum and are particularly prevalent in the oral cavity area, especially in “hiding places” such as spaces between the teeth, on the edges of crowns or in gum pockets (TONZETICH 1978, BOSY et al. 1994, YAEGAKI and SANADA 1992). It is largely unknown that the tongue can also be a frequent carrier of these bacteria. It is usually the dorsal area which is affected by the formation of the coating (BOSY et al. 1994, DE BOEVER and LOESCHE 1996). This coating is a collection of the remainder of organic materials, micro-organisms and their decomposing products. Generally, people with very distinct grooves in their tongues tend to be affected more than others by the formation of this coating (DEBOEVER and LOESCHE 1996) (see illustration no. 1). The actual cause for an increased formation of coating on the tongue, however, is not explicitly clear. Factors influencing this formation of the coating can be behavioural patterns such as breathing through the mouth, snoring or taking certain medicines which lead to the mucosa drying out. Psychic stress and smoking also increase the problem.

Chart no. 1: Causes of halitosis

Oral area: coating of the tongue, insufficient oral hygiene and infection (stomatitis, gingivitis, parodontosis, candidiasis, insufficiently maintained false teeth, protruding crown edges, exposed root canals), pemphigus, morbus behcet, Stevens-Johnson syndrome, abscesses, ulcerating and decaying tumours.

ENT area tonsillitis, sinusitis, pharyngitis, diphtheria, glandular fever, Plaut-Vincent angina, foreign objects, abscesses, Lues III, chronic rhinitis (ozaena), postnasal drip, ulcerating and decayed tumours

Internal area:discharging bronchitis, pneumonia, foreign objects, abscesses (on the lung), gangrene of the lung, granulomatosis, diverticule, oesophagitis, gastro-intestinal disorders, diabetes mellitus, precoma states and coma (uraemia, coma hepaticum, yellow fever, medicines (e.g. dimethyl sulphoxide), trimethylamine, ulcerating and decayed tumours

Practical procedure

Overview

First of all, a comprehensive anamnesis had to be made during the systematic investigation into halitosis. This was followed by an investigation to establish whether objectifiable halitosis is present and how severe it is. Should an unpleasant odour be present, there then follows the determination of the cause. Should sources for an unpleasant smell be present in the oral cavity, they are treated by the dentist using the treatment options available to him. Should the introduced measures not be successful, an ear, nose and throat doctor and possibly an internist are included in the diagnosis and treatment. It is extremely helpful if good contact exists between the ENT doctor and the internist, as many colleagues do not have much information about the possible causes of halitosis from the oral cavity area.

Should there be no objectifiable halitosis determined following several examinations carried out by several different examiners despite the patient's subjective sensation of suffering from halitosis, then it is referred to as pseudo-halitosis or halitophobia, the treatment of which requires the intervention of a psychologist. Chart no. 2 describes a systematic division of the forms of halitosis starting from the cause (YAEGAKI and COIL 2000).

The procedure in detail

1. Comprehensive anamnesis

For many patients, it is a major breakthrough to confide in somebody about their embarrassing suffering. The first consultation should therefore take the form of a private conversation during which dentist and patient sit directly opposite each other. The making of a general and a special anamnesis gives the dentist clues as to possible causes for the halitosis. Alongside the standard questions on the patient's general state of health, the dentist should purposely ask how long the patient has already suffered from the problem and whether there are other people who also notice the smell. Furthermore, the special anamnesis should contain questions about

oral hygiene, the state of oral hygiene, tongue coating, disorders of the ENT area, diet and general lifestyle.

The end of the consultation is a good opportunity to sit down with the patient and select one person from the patient's acquaintances to confide in who can act as a sort of independent observer to offer feedback on further courses of action once the therapy has commenced. This confidante is relatively important, as the affected person can only partially estimate the degree of his own smell (DELANGHE et al. 1997, MALASI et al. 1990, JOHNSON 1995, DELANGHE et al. 1997, YAEGAKI 1997).

2. Diagnostic procedure

As the majority of patients can only make a very unreliable assessment of their own smell, the first part of the test consists of determining whether objectifiable halitosis is actually present. It can be a major problem should the patient insist that he or she has unpleasant halitosis although none can be determined. This phenomena of pseudo-halitosis can even become a phobia and assume extreme forms. During our consulting hours, a 70-year old lady reported that she had suffered from terrible halitosis since her early adolescent years which was responsible for the fact that she has never been married. In fact, no foetor could be determined despite us having carried out several examinations. Concerted questioning of the lady in question revealed that she had never consulted anybody about the problem and that she based her assumption of having terrible halitosis on other peoples' reactions. She described how people would hold their noses or turn away whenever she would speak to them. She even took rejection by her friend's dog to be a sign of her halitosis. The patient could not be convinced to consult a close acquaintance or to bring anybody with her.

Organoleptic examination

The easiest way of determining the presence of halitosis is with the aid of one's own sense of smell, which is described as an organoleptic or hedonic measurement. The patient should not have taken any antibiotics for at least three weeks before the examination, should not have eaten any garlic, any onions or any other heavily spiced food for at least 48 hours and have not used any perfumed cosmetics for at least 24 hours. Ideally, for reasons of standardisation, the patient should not have had anything to eat during the past 12 hours, not have had anything to drink except water, not have smoked, not cleaned his or her teeth, and not used mouthwash or chewed chewing gum. The examiner should also not have consumed any drinks such as coffee, tea or juice which could influence the sense of smell. He / she should neither should smoke nor use perfumed cosmetics.

The examiner is to evaluate the intensity of the smell of the expirium at a distance of 10 cm from the patient's mouth (ROSENBERG et al. 1991). It is usual to classify the results into five degrees of intensity (illustration no. 3). It is obvious that this procedure is not a very valid measuring method, especially for inexperienced persons. Furthermore, it is extremely embarrassing to go to a doctor and breathe on him / her in order that the intensity of an unpleasant smell can be evaluated! YAEGAKI and COIL therefore recommend the use of a screen to physically divide the patient and the examiner (YAEGAKI and COIL 2000).

In order to carry out a simple organoleptic measurement of halitosis at the dentist's, we recommend a very simple method which grades the intensity of the halitosis into one of three degrees of intensity:

- if halitosis is noticeable from a distance of around one metre from the patient during the making of the anamnesis, this corresponds to the degree of intensity 3,
- if the patient is sitting on the dentist's chair and an unpleasant smell can be ascertained from a distance of 30 cm during the consultation, this corresponds to the degree of intensity 2,
- if an unpleasant smell can only be ascertained at a distance of 10 cm from the patient's mouth when the patient utters the letter "A", this corresponds to the degree of intensity 1
- if no smell is determined, this corresponds to the degree of intensity 0.

This pattern can be extended for experienced examiners to include the degrees of intensity 2- and 2+ depending on how unpleasant the smell is considered.

Instrumental reading

A gas chromatograph can be used to carry out an instrumental reading. However, this is very time-consuming, expensive and impracticable for the dentist. There has been a so-called Halimeter[®] on the market since the beginning of the 1990s (from the Ansyco company of Karlsruhe). Using this device, it is possible to determine the concentration of volatile sulphur compounds (VSC) directly in the dentist's chair (illustration no. 2) (ROSENBERG et al. 1991). The patient inserts a mouthpiece into the slightly open mouth and, after a short while, the concentration of volatile sulphur compounds is shown in VSC (part per billion volatile sulphur compounds) on a display. The reading can be forwarded to a recorder or a PC for representation in graphic form. The Halimeter supplies sufficiently reproducible values yet is not completely unproblematic (ROSENBERG et al. 1991, ROSENBERG et al. 1991). It only measures sulphur compounds – it is not possible to automatically deduce the cause of the smell. Nevertheless, the device is very useful as it helps the patient to confide in a doctor and it serves the purpose of controlling the course of the treatment. Many patients would rather trust a measuring device than their doctor's nose in such a highly-sensitive matter as this. If the VSC value sinks during the treatment, this is an important sign of confirmation for the affected patient. If a doctor has to convince a patient that he / she has no determinable unpleasant mouth odour, although the patient is convinced of it, it can also be useful to engage the help of an instrumental reading. In Japan, similar devices are available based on the principle of a semiconductor and efforts are being made to refine instrumental tests with the aid of so-called artificial noses (SHIMURA et al. 1997, MATTA 1996, YAEGAKI 1997). However, such an instrumental test should always be backed up with an organoleptic test in order to track down the source of the smell.

Localisation of the source of the smell

If an objectifiable smell is present, its source must be identified. In order to do this, the determined smell must be compared to the smell of samples taken from the suspect locations (e.g. from the inter-dental spaces or from the tongue).

Chart no. 2: Classification of halitosis (modified according to YAEGAKI and COIL 2000)

Classification	Characteristics
I Real halitosis	Distinct foetor exceeding the socially tolerable level
A) Physiological halitosis	Temporarily occurring foetor originating in the oral cavity, in the absence of any specific illness or pathological process. The source of the smell is usually the dorsal part of the back of the tongue. Temporary foetor arising as the result of consuming certain foods, drinks and tobacco products and should be excluded.
B) Pathological halitosis	<p><u>Oral cause:</u> foetor caused by a pathological process within the oral cavity and caused by a coating of the tongue, modified by pathological conditions (e.g. paradontopathy, xerostomia)</p> <p><u>Extra-oral cause:</u> foetor from the ENT area (e.g. nasal, paranasal, laryngeal). Foetor from the respiratory tract and the upper digestive tract.</p> <p>Foetor due to other general illnesses (e.g. diabetes, cirrhosis of the liver, uraemia)</p>
II Pseudo-halitosis	Patient complains of halitosis although nobody else notices it. The situation can be improved by enlightening the patient through the use of literature and discussing the results of the examination.
III Halitophobia	Patient complains of halitosis although nobody else notices it. Enlightening the patient by using literature and discussing the results of the examination can not convince the patient that no foetor exists.

Chart no. 3: Degree of intensity of the halitosis measured by means of an organoleptic test (YEAGAKI and COIL 2000)

Chart no. 3 Category	Description
0	No perceptible smell
1	Smell is perceptible but not found unpleasant
2	The perceived smell is slightly unpleasant
3	A distinctly unpleasant smell can be perceived
4	A very unpleasant smell can be perceived, yet can be tolerated by the examiner
5	The unpleasant smell is so strong that the examiner cannot tolerate it and he instinctively turns away from it

Illustration no. 2: The concentration of oral volatile sulphur compounds (VSC) can be determined using the Halimeter

Illustration no. 3: Defective inter-dental and sub-gingival plaque arising from insufficient oral hygiene are often the cause of halitosis

Illustration no. 4: The use of a tongue cleaner (from One Drop Only) can remove a bacterial coating from the tongue

Should a foetor be present and there is no cause for it to be found in the oral cavity, the patient ought to be sent to an ENT specialist. It is advisable that the relevant ENT colleague be informed about the results so that he is familiar with the results of the examinations which have already been carried out. We therefore work very closely with the ENT department of Charité. Should there be no ascertained cause of the halitosis in the ENT area, the patient should be sent to an internist for further diagnosis.

It is only when the cause of the halitosis has been clearly identified that treatment should be started. Unfortunately, we often encounter patients during our consultancy hours who have already undergone all kinds of medical and operative therapies without any clear diagnosis having been made. It must be mentioned that one of the causes of this poor state of affairs is that doctors do not have a concept for tackling this and that the unpleasant organoleptic examinations have not been practically carried out.

3. Therapeutic procedure

Therapeutic procedure generally depends on the determined cause. If an oral cause has been established, it should be treated systematically and purposely with relevant and freely available “dental tools”. If oral hygiene itself is the basic cause, then the patient is advised to improve this with individual prophylaxis sessions and a better oral hygiene routine, especially in relation to inter-dental methods. The examination is repeated following the treatment. If parodontitis is present, this is treated systematically (see illustration no. 3). Modern concepts also include the tongue in the treatment concept. This procedure – known as full-mouth disinfection – comprises the mechanical debridement of all pockets within 24 hours along with the application of chlorine hexidine into all inter-dental niches including cleaning the tongue. Please refer to the overview article from Quiryne et al. for details (QUIRYNEN et al. 2001).

If the tongue is involved, the patient can be given a tongue cleaner in order to ensure the correct diagnosis. The patient is to be requested that he / she apply 1% chlorine hexidine (Corsodyl®) to the tongue twice a day following cleaning of the tongue (illustration no. 4). Due to its brush component, the tongue cleaner manufactured by the One Drop Only company (SEEMANN et al. 2001) is ideal for this purpose. A clear improvement will be observed within a few days. The Halimeter® readings shall sink considerably and, organoleptically, there should be no more perceived halitosis. If the treatment works, then use of the chlorine hexidine preparation should be stopped and a purely mechanical tongue cleansing should be carried out. The patient will be invited to a further brief examination. If the mechanical cleansing process is sufficient, then the treatment will remain thus, otherwise the cleansing must be supported by the use of a mouthwash or an antimicrobial toothpaste (e.g. Colgate Total), which is applied to the tongue (HOSHI and VAN STEENBERGHE 1996). From our own observations during our consultancy hours, we are justified in making the statement that the tendency of a coating forming on the tongue reduces when oral hygiene is improved, especially inter-dental hygiene, and when individual prophylactic appointments are kept.

4. Procedure in the case of pseudo-halitosis and halitophobia

Should, despite subjective symptoms, no halitosis be determined in a patient, the examination should be repeated at different times of the day and, in order to verify the organoleptic findings, two further examinations must be carried out. An ENT specialist and internist should also exclude any other organic causes. Should there still be no perceptible foetor, the findings should be discussed in detail with the patient. Should the enlightenment of the patient via professional information and consultation convince the patient that he or she doesn't actually have halitosis, this is described as pseudo-halitosis (see chart no. 2) (YAEGAKI and COIL 2000, YAEGAKI and COIL 1999). Several low Halimeter readings can be used to help convince the patient of this.

In comparison, those patients suffering from a halitophobia require treatment from a psychologist. However, the majority of these patients refuse such psychological therapy (see chart no. 2) (YAEGAKI and COIL 2000, YAEGAKI and COIL 1999).

It is interesting that it is sometimes a different body odour which can be responsible for other peoples' rejection of the patient. This leads the patient to mistakenly think that rejection is due to halitosis, therefore putting doctors on the wrong track.

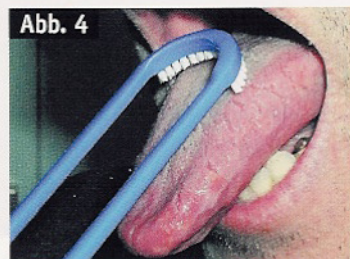
5. Procedure in the case of patients who do not know that they have halitosis

A completely different problem altogether is when somebody has halitosis yet does not realise it as no-one dares mention it to him / her. These people should be frankly informed of the problem. The affected person is generally thankful for the information. The affected person usually has an idea that he or she suffers from halitosis yet was unsure and didn't feel confident enough to confide in anybody about it. The inhibition level of mentioning halitosis to somebody is reduced by also offering help. If a dentist would like to send out a discreet and tactful signal to his or patients that he or she is familiar with the subject of halitosis, it is recommended that the question "Do you occasionally suffer from halitosis?" be included in the anamnesis form which the patient has to complete at the outset of his or her treatment. If the patient answers in the affirmative, then it is easy to address the subject.

Conclusion

The occurrence of halitosis should always be taken seriously, as in rare cases it could be a symptom of a serious disease. However, in most cases the unpleasant smell is caused by microorganisms within the oral cavity and can be successfully treated by employing normal "dental tools". This should ensure that all practising dentist are in the position to treat the majority of patients suffering from this problem.

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Illustrations no. 2, 3 and 4

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