RESEARCH PAPER

Halitosis: A Contemporary Review on Diagnosis and Clinical Management

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Aim

This review outlines a structured approach to the diagnosis, prevention, and management of halitosis, emphasizing the role of both dental and primary care practitioners.

Methods

Relevant literature on the etiology, microbiology, diagnostic tools, and management of halitosis is reviewed, with particular insight on intraoral and extraoral causes, volatile sulfur compounds production, and patient-centered treatment approaches.

Results

Evidences indicates that halitosis is predominantly intraoral in origin, with tongue coating and periodontal disease as major contributors. Microbiological analysis highlights the role of anaerobic Gram-negative bacteria producing volatile sulfur compounds such as hydrogen sulfide and methyl mercaptan. While diagnostic tools such as organoleptic assessment, gas chromatography, and sulfide monitors exist, standardized protocols remain limited. Current interventions—tongue cleaning, antimicrobial rinses, probiotics, and psychosomatic support—demonstrate variable success, with randomized controlled trials still scarce.

Conclusion

Halitosis has significant social and psychological consequences. Effective management requires accurate diagnosis, interdisciplinary collaboration, and integration of oral and systemic health care. Further research, especially randomized trials and microbiome-based therapies, is needed to develop evidence-based guidelines.

Keywords: Halitosis, volatile sulfur compounds, microbiome, tongue coating, organoleptic scoring, management

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Introduction

Halitosis, commonly known as bad breath, is a frequent complaint among patients and one of the most socially distressing oral conditions. Despite its high prevalence—ranging from 6–23% in Asian populations to nearly 50% in Western countries—it remains under-recognized in both dental and medical practice. For many individuals, halitosis is not only a cosmetic concern but also a source of embarrassment, social isolation, and psychological distress.[1]

The condition is multifactorial. While 80–85% of cases originate intraorally, extraoral causes such as gastrointestinal, respiratory, or systemic diseases must also be considered.[2] The underlying microbiology, particularly the role of anaerobic Gram-negative bacteria producing volatile sulfur compounds (VSCs), has been increasingly recognized as central to pathogenesis. However, clinical evaluation remains inconsistent due to the lack of standardized diagnostic tools and protocols.[3]

Primary care providers are often the first point of contact for patients with halitosis, yet many lack awareness of its causes and evidence-based treatment options. This review synthesizes current knowledge on the etiology, microbiome, diagnosis, and management of halitosis, highlighting the importance of interdisciplinary collaboration and the urgent need for standardized guidelines(Table 1).

Category	Subtypes	Examples
Genuine Halitosis	*Physiological*	Morning breath, reduced salivary flow, tongue coating

	Pathological – Intraoral	Periodontal disease, pericoronitis, caries, defective restorations, xerostomia, peri-implantitis
	Pathological – Extraoral	ENT infections (tonsillitis, sinusitis, atrophic rhinitis), respiratory diseases (bronchiectasis, pneumonia), gastrointestinal causes (GERD, H. pylori ulcers), systemic disorders (diabetes, hepatic/renal failure, metabolic disorders)
Pseudohalitosis	–	Patient reports malodor but undetectable clinically; improves with reassurance
Halitophobia	–	Persistent belief of bad breath despite absence of clinical evidence

Table 1 : Classification of Halitosis

Discussion

Halitosis is not only a dental concern but a multifactorial condition with significant psychosocial and interdisciplinary implications. Evidence consistently shows that intraoral factors, particularly tongue coating and periodontal disease, account for most cases. However, systemic and extraoral causes—such as ENT, gastrointestinal, metabolic, and psychological disorders—should not be overlooked. This highlights the importance of a holistic diagnostic framework rather than an exclusively dental approach.[4]

Microbiome research has expanded our understanding of the role of anaerobic bacteria such as *Porphyromonas gingivalis*, *Treponema denticola*, and *Solobacterium moorei*, all of which produce volatile sulfur compounds (VSCs).[5] These insights support the use of probiotics, antimicrobial rinses, and microbiome-modulating therapies as promising adjuncts. Yet, most current evidence is limited to small clinical trials or observational studies, with randomized controlled trials (RCTs) still scarce.

Psychological aspects such as pseudohalitosis and halitophobia remain underdiagnosed but can substantially impair quality of life. Incorporating psychological screening and timely referral into patient management is therefore essential. Equally, clinicians must be sensitive in their communication, as empathy and reassurance can significantly influence treatment outcomes.

From a clinical standpoint, the absence of standardized diagnostic tools and clear evidence-based guidelines continues to limit consistency in halitosis management. A structured diagnostic pathway integrating organoleptic evaluation, validated chairside devices, and, when indicated, referral for systemic assessment is needed (Table 2).

Method	Description	Advantages	Limitations
Organoleptic scoring	Examiner smells exhaled air from mouth/nose at fixed distance	Gold standard, inexpensive	Subjective, low reproducibility
Gas Chromatography (GC)	Detects and quantifies volatile sulfur compounds (VSCs)	High sensitivity & specificity	Expensive, complex, not routine
Sulfide Monitors (Halimeter)	Portable device measuring sulfur-containing gases	Easy, quick, semi-quantitative	Limited to sulfur gases, underestimates malodor

BANA Test	Detects specific bacteria (e.g., *P. gingivalis, T. forsythia*)	Complements VSC analysis	Limited scope, not widely used
Saliva odor / wrist lick tests	Patient self-assessment or examiner scoring	Simple, patient-involving	Very subjective, poor standardization
Molecular assays (PCR, DNA probes)	Detect halitosis-associated bacteria	High specificity	High cost, limited to research

Table 2: Diagnosis of Halitosis

Management

A 2006 Cochrane review confirmed that tongue scrapers were slightly but significantly more effective than toothbrushes for reducing tongue coating and halitosis.[6] Similarly, a 2008 Cochrane systematic review on mouthrinses concluded that formulations containing chlorhexidine, cetylpyridinium chloride, zinc, or chlorine dioxide can reduce oral malodor in the short term, although chlorhexidine was associated with side effects such as tooth staining and altered taste.[7] Another Cochrane review noted that sugar-free chewing gum and similar interventions may provide transient relief, but evidence quality remains low. These findings emphasize the need for further randomized controlled trials to establish durable, evidence-based management strategies.

Successful management of halitosis depends on accurate diagnosis, identification of underlying causes, and an individualized treatment plan. Approaches include mechanical cleaning, antimicrobial and chemical therapies, probiotic interventions, psychosocial support, and systemic treatment when extraoral causes are identified.

Mechanical approaches: Effective control begins with mechanical disruption of bacterial biofilms. Tongue scraping has been shown to significantly reduce volatile sulfur compounds (VSCs). A Cochrane review reported that tongue scrapers are slightly more effective than toothbrushes in reducing tongue coating and malodor.[7] Interdental cleaning also contributes to improved outcomes by reducing microbial reservoirs.

Chemical and antimicrobial therapies: Mouthrinses containing chlorhexidine (CHX), cetylpyridinium chloride (CPC), zinc salts, and chlorine dioxide have demonstrated benefits in reducing oral malodor. A Cochrane systematic review concluded that these rinses offer short-term reduction in halitosis, although CHX may cause tooth staining and taste alteration. Combined low concentrations of CHX and zinc have been reported to exert synergistic effects on VSC reduction.

Adjunctive therapies: Sugar-free chewing gum and other masking agents may provide temporary relief.[8] However, evidence from a Cochrane review suggests that the effect is transient and of low certainty Essential oils, triclosan, chlorine dioxide, and herbal agents such as tea tree oil have also been studied, with some showing modest benefit.

Microbiome-targeted approaches: Probiotics such as *Lactobacillus salivarius* WB21 have shown promise in modifying the oral microbiome and reducing halitosis. Photodynamic therapy and alpha-bisabolol are emerging options under investigation.[9]

Systemic and interdisciplinary management: Extraoral causes—including gastrointestinal, ENT, respiratory, and systemic diseases—require appropriate medical or surgical interventions. H. pylori eradication, management of GERD, or treatment of chronic sinusitis may resolve halitosis when systemic pathology is present.[10]

Psychological support: Patients with pseudohalitosis or halitophobia often require counselling and, in some cases, psychiatric intervention. Empathetic communication and reassurance are central to improving patient quality of life.

In summary, current evidence supports a multimodal approach that combines mechanical cleaning, antimicrobial mouthrinses, and psychosocial support. While several interventions have demonstrated short-term benefit, high-quality randomized controlled trials are still needed to establish durable, evidence-based protocols (Table 3).

Approach	Examples / Agents	Mechanism	Notes
Mechanical reduction	Tongue scraping, toothbrushing, interdental cleaning	Removes biofilm, reduces bacterial load	Tongue scrapers more effective than toothbrushes
Chemical	Chlorhexidine (CHX),	Reduces bacterial	CHX effectiv

antimicrobial	cetylpyridinium chloride (CPC), triclosan, essential oils	growth & VSC production	e but causes staining with long use
VSC neutralization	Zinc salts, chlorine dioxide, metal ions	Neutralizes sulfur compounds	Often combined with antimicrobials
Probiotics	*Lactobacillus salivarius WB21*, other oral probiotics	Restores healthy oral microbiome	Emerging evidence, promising adjunct
Adjunctive therapies	Photodynamic therapy, herbal products (tea tree oil, propolis), alpha-bisabolol	Antimicrobial/oxidative effects	Still under investigation
Systemic/Medical management	GERD treatment, antibiotics for H. pylori, ENT/sinus surgery if indicated	Addresses underlying systemic cause	Needs interdisciplinary referral
Psychological support	Counseling, CBT, psychiatric referral for halitophobia/ pseudohalitosis	Addresses psychosomatic aspects	Essential in selected patients
Masking agents	Sugar-free gum, mints, peppermint oil, fluoride rinses	Temporary odor masking	Only symptomatic relief

Table 3 : Management of Halitosis

Conclusion

Halitosis is a prevalent condition with wide-ranging social, psychological, and clinical implications. While intraoral causes predominate, clinicians must also recognize systemic and psychosomatic contributors. Effective management relies on accurate diagnosis, empathetic communication, and an interdisciplinary approach involving dental, medical, and psychological care.

Despite the availability of multiple treatment modalities, strong evidence—particularly from randomized controlled trials—remains limited. There is a pressing need for standardized diagnostic protocols and research into microbiome-targeted therapies. Until such evidence emerges, personalized treatment plans combining mechanical, chemical, and supportive interventions remain the most practical approach.

Clinical Implications

For clinicians, halitosis should be approached as a multifactorial condition that requires careful differentiation between intraoral, extraoral, and psychosomatic causes. Early recognition and management in primary care can prevent unnecessary referrals and reduce patient anxiety. Mechanical tongue cleaning combined with antimicrobial mouthrinses provides the most effective first-line strategy, while systemic or psychosomatic cases demand interdisciplinary referral. Incorporating empathetic communication and patient education is essential to improving outcomes and enhancing quality of life.

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