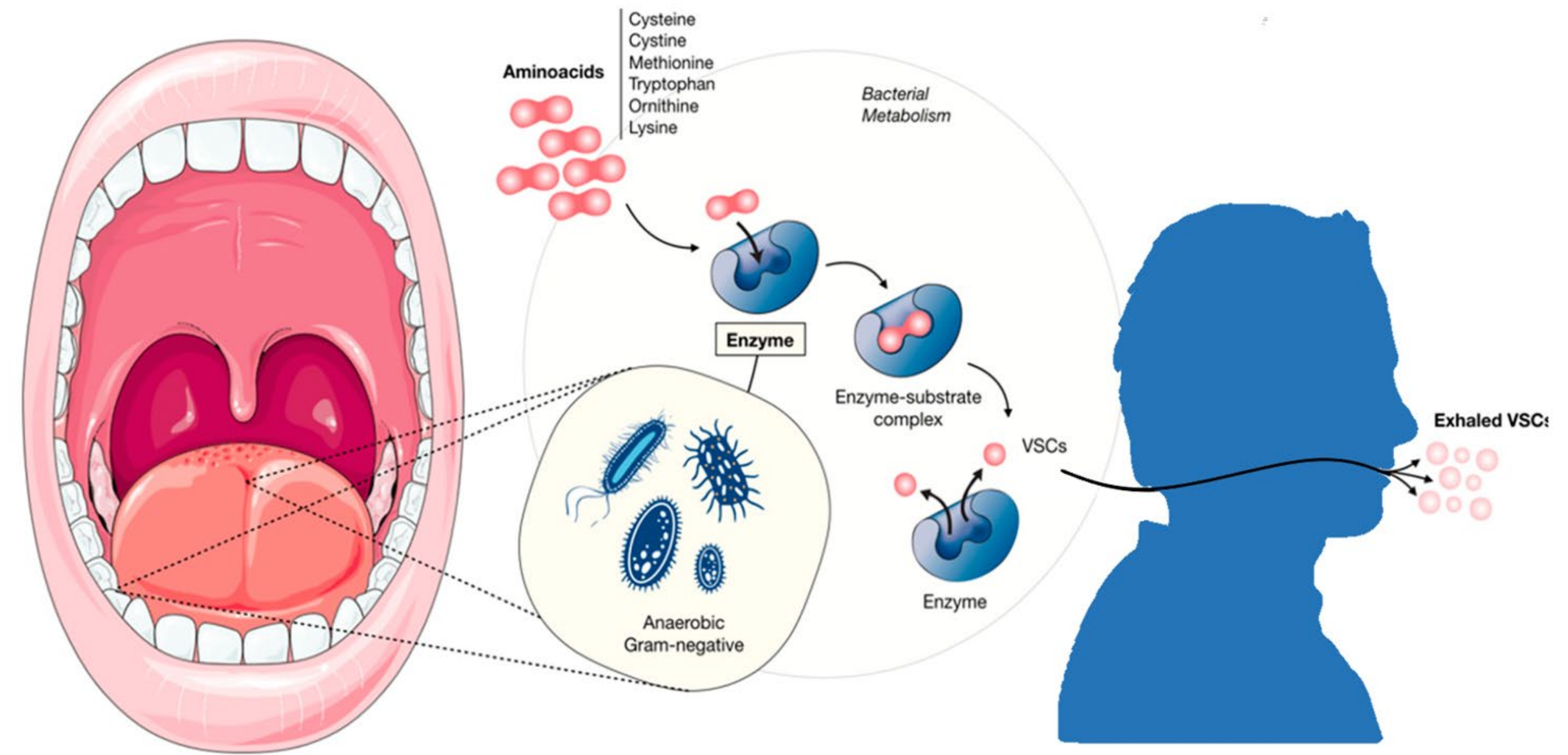


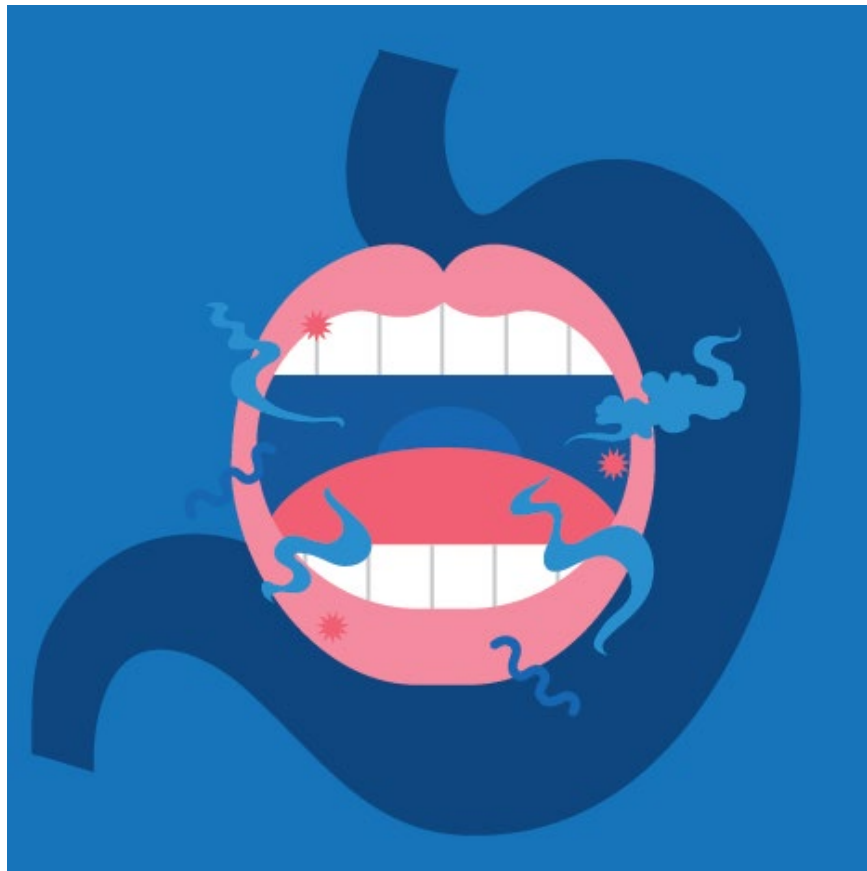
## Introduction

Halitosis or oral malodor is a condition caused by the putrefaction of sulfur-containing amino acids. It affects 30–50% of the population and causes social rejection, reducing quality of life, and self-esteem [3]. Often, patients wonder why they have a constant occurrence of bad breath. Even though they may have optimal home care that is recommended by a dental professional, they still experience a perpetual odor coming from their mouth. Some questions they may ask themselves are, “Where is this coming from? Why do I have this? What if it was brought to a patient's attention that the reason they experience halitosis is due to their gut! Recent studies show that GERD (gastroesophageal reflux disease) has a significant linkage to the cause of halitosis seen in many patients[2]. As dental hygienists, it is in our hands to help our patients find a solution to this problem. One easy solution that we may introduce is oral probiotics such as probiotic mouth rinses, lozenges, chewable tablets and more. [9]



## GERD Related Halitosis

- Gastroesophageal reflux disease or also known as GERD is a condition when the lower esophageal sphincter becomes weak or relaxes making stomach contents such as undigested food, regurgitated bile, and stomach acids into the esophagus. [1]
- GERD represents one of the most frequent health problems in the world. Approximately 10% of the American population suffer from daily heartburn and about one third have periodic symptoms. [4]
- Bad breath, also known as halitosis, is an unpleasant odor that comes out of the mouth or nose with exhaled air. Studies have shown that halitosis is a common symptom of gastroesophageal reflux. [2]



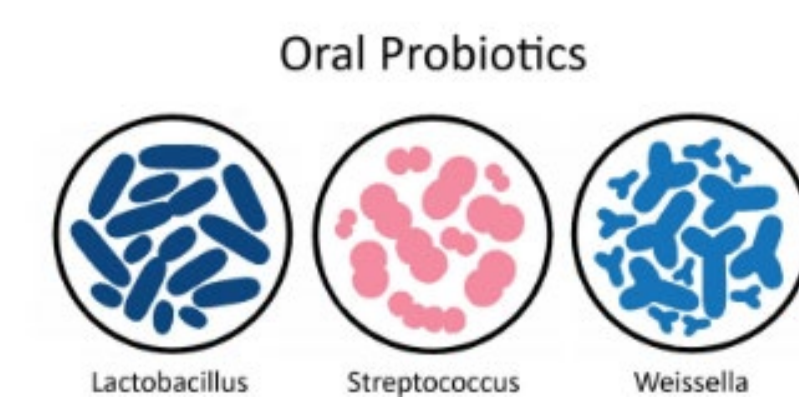
- Halitosis is the third most common disease for patient referral to the dentist. [6]
- Bacterial reservoirs such as the dorsum of the tongue, saliva and periodontal pockets are where anaerobic bacteria degrade sulfur-containing amino acids to produce the foul-smelling Volatile Sulfur Compounds (VSCs). [5]
- VSCs: hydrogen sulfide, methyl mercaptan, and dimethyl sulfide. [5]
- The bacterium is a Gram-negative organism inhabiting mainly the mucosa of the pre-pyloric part of the stomach and duodenum, less often the lining of the esophagus. The bacteria may temporarily appear in the mouth of patients with coexisting gastroesophageal reflux disease. [2]
- There are two ways one may develop halitosis as a symptom of gastroenterological origin. The first is the transesophageal release of VOCs into the mouth through the upper gastric sphincter, and the second is the adsorption of VOCs into the bloodstream with their diffusion through lungs. [2]

## Resolve With Oral Probiotics

Oral probiotics are strains of bacteria that promote good oral health. Bacteria naturally exist in the oral cavity, and oral probiotics help boost levels of beneficial bacteria. This helps prevent certain dental conditions that can arise from high levels of harmful bacteria in the mouth, such as halitosis.

Under anaerobic conditions, Gram-negative bacteria (*Fusobacterium nucleatum*, *Porphyromonas gingivalis*, *Prevotella intermedia*, and *Treponema denticola*) degrade food proteins and produce Volatile Sulfur Compounds (VSCs), contributing to halitosis. [5]

- *Weissella cibaria*, is an oral probiotic in tablet form that suppresses the concentrations of VSCs from halitosis causing microorganisms. [8]
- *Weissella cibaria* functions by suppressing the concentrations of VSCs from halitosis through the secretion of water-soluble glucan and hydrogen peroxide. [8]
- *Lactobacillus strains L.reuteri and L.salivarius* were tested in the form of mouthwash and subgingival delivery has proven to be effective against halitosis. [7]
- The decrease in halitosis tested with the *Lactobacillus* strains was attributed to the decrease in red complex bacteria such as *P. gingivalis* and *T. forsythia*, organisms that are involved in the production of VSCs. [7]
- *Streptococcus thermophilus* inhibited the growth of *Porphyromonas gingivalis*, and its spent culture medium was shown to reduce the emission of VSCs gas. [5]
- *Streptococcus Salivarius K12* suppressed the growth of all Gram-positive bacteria. [5]



Probiotic species (or strain)	Cariogenic pathogens
<i>Lactobacillus lactis</i> NCC2211	<i>Streptococcus sobrinus</i> OIM176
<i>Lactobacillus fermentum</i>	<i>Streptococcus mutans</i>
<i>Lactobacillus rhamnosus</i> GG	<i>S. mutans</i>
<i>Lactobacillus reuteri</i> ATCC 55730	<i>S. mutans</i>
<i>Lactobacillus salivarius</i> BGHO1	<i>S. mutans</i>
<i>L. rhamnosus</i> GG and <i>Lactobacillus bulgaricus</i>	<i>Porphyromonas gingivalis</i> , <i>Fusobacterium nucleatum</i> and streptococcal species
<i>Lactobacillus</i> strains	<i>S. mutans</i> and <i>P. gingivalis</i>

## Conclusion

Oral health has a direct impact on an individual's well-being and quality of life. Oral diseases can limit the individual's capacity of eating, speaking and smiling thereby greatly affecting one's personal and social life. Studies have shown the direct role of probiotics in inhibiting oral pathogens as well as changing the oral microenvironment which acts as a deterrent for further colonization by the pathogens [5]. When offering oral hygiene care to patients, it is a dental hygienist's responsibility to suggest preventative changes. As clinicians, by offering the option of probiotics to our patients, we can help alleviate oral symptoms such as halitosis and GERD. Newfound research suggests that probiotics are a growing topic, and more information is to be determined. Education is an integral part of dental hygiene care. Thus, there is great importance in suggesting solutions that not only pertain to oral health but systemic health as well.

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## Role Of Dental Hygienist

Prevention starts with the dental hygienist. There are many ways that we can play a role in not only reducing but potentially eliminating GERD-induced halitosis.

- Complete a thorough patient health history: Asking open-ended questions allow clinicians to determine whether patients with active halitosis also suffer from GERD.
- Active listening: Allow patients to explain what they are experiencing to evaluate and further assess their needs.
- Plan for interventions and implement a plan: With the help of the dentist, suggest the use of probiotics to the patient; oral probiotics such as lozenges, mouth rinse, dentifrices, chewable tablets, and more [3].
- Evaluate progressive changes: Clinically evaluate the patient every re-care appointment to see if the probiotics are effective for the specific patient.