

THE IMPORTANCE OF ORAL HEALTH AND NORMAL AMOUNTS OF STOMACH ACID

The mouth and microbes

Depending on saliva flow rates, there are 1 million microbes in one milliliter (ml) of saliva.¹ One teaspoon, 5 mL, therefore, contains as many as 5 million microbes.

Humans swallow between 1 and 2 quarts of saliva every 24 hours. In 24 hours, therefore, roughly 1 billion microbes enter the stomach.

Additional sources of microbes in saliva from accessory organs.

Increased numbers of microbes may reach the oral cavity and enter the saliva if infection or inflammation exists in the nose, facial sinuses, tears, drainage from the middle ear and/or phlegm from the lungs.

Dry mouth may increase microbial load

Those with dry mouth may swallow much less saliva and have higher concentrations of microbes remaining in their mouth² increasing their risk of dental decay (cavities) and damage to their gums and supporting tissue in their mouth (gingivitis and peritonitis). The total number of microbes in saliva, therefore, may increase beyond the usual 5 million per teaspoon.

Causes for dry mouth

Reduced salivary flow rates and dry mouth may occur in any of the following diseases or conditions:

- Diabetes
- Stroke
- Alzheimer's dementia
- AIDS
- Sjogren's syndrome
- Use of specific types of medications for depression
- Use of specific types of medications for high blood pressure

- Antihistamines
- Decongestants
- Muscle relaxants
- Use of specific types of pain medications
- Aging
- Sleep apnea with use of a CPAP machine
- Mouth breathing
- Cancer chemotherapy
- Radiation therapy to the head and neck
- Nerve damage from surgery to the head and neck
- Alcohol consumption
- Tobacco usage
- Vaping
- Use of Methamphetamine
- Use of Marijuana

Acid protection by stomach acid

Most of the 1 billion microbes coming from the mouth never go any further than the stomach since the stomach secretes large amounts of concentrated hydrochloric acid and pepsin, a protein dissolving enzyme. The combination of acid and pepsin destroy over 99.9% of microbes that enter the stomach from the mouth.

The microbe count may fall from 5 million per teaspoon upon entry into the stomach to less than 5000 per teaspoon upon exit from the stomach testifying to the antimicrobial effect of stomach acid and pepsin.

Individuals, however, with impaired production of stomach acid may have billions of mouth microbes that pass unimpeded into their intestines.³

Causes for low levels of stomach acid

Conditions with impaired production of stomach acid include, but are not limited to, the following:

- Ingestion of acid reducing medications, most particularly, proton pump inhibitors
- Pernicious anemia

- Aging
- Atrophic gastritis
- Bile reflux from small bowel retrograde into the stomach
- Autoimmune gastritis
- Stomach infections, most particularly *Helicobacter pylori* infection
- Weight reduction surgery

Small intestinal bacterial overgrowth (SIBO)

Excessive amounts of microbes that are delivered from the stomach into the small intestine can result in a condition known as small intestinal bacterial overgrowth (SIBO).⁴

SIBO may cause multiple intestinal symptoms including, but not limited to, loss of appetite, abdominal bloating, abdominal distention, nausea, abdominal pain, diarrhea, malabsorption, vitamin deficiencies, and osteoporosis.

Recommended measures

- Maintain good oral health—brushing and flossing—with frequent visits to the dentist and dental hygienist.
- Institute measures to reduce dry mouth such as increasing fluid intake, chewing non-sugar containing gums, using recommended mouth rinses or sprays suggested by the dentist, and keeping the humidity at an increased level in sleeping areas with a humidifier particularly for those who are mouth breathers.
- Avoid frequent use of steroid containing nasal and lung inhalers that may result in suppressing protective immune mechanisms that allow proliferation of microbes in the eyes, nose, throat, sinuses and lungs
- Only use acid reducing medications for brief periods and then only on the recommendation and supervision of a healthcare provider.
- Pay particular attention to the side effects of medications and over-the-counter supplements, and recreational drugs that may be responsible for dry mouth.

¹ Maracas, C., “Quantifying live microbial load in human saliva samples over time reveals stable composition and dynamic load,” *Msystems*, (Jan 2021):6:1-16.

² Dawes, C., "Circadian rhythms in human saliva composition," *J. Physiol* (1972), Feb 220 (3) 529-545.

³ Tennant, S., "Influence of gastric acid on susceptibility to infection with ingested pathogens," *Infection and Immunity*, (639-645), Feb 2008.

⁴ Dukowicz, A., "Small intestinal bacterial overgrowth," *Gastroenterology and Hepatology* (3) Issue 2, Feb 2007.