

# **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.<sup>1</sup> 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 mouth<sup>2</sup> increasing their risk of dental decay (cavities) and damage to their gums and supporting tissue in their mouth (gingivitis and periodontitis). 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.<sup>3</sup>

#### 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).<sup>4</sup>

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.

## **Eleven dentist approved measures for oral home health care**

1. **Brush long enough:** The American Dental Association recommends brushing a minimum of two minutes each time to remove dental plaque. For those who have devices in their mouth, like braces, a bridge, or implants, add extra time to clean around areas where food may get trapped on the device.
2. **Brush often enough:** Ideally, teeth should be brushed after each meal and before bedtime to remove bacteria and plaque. At a minimum they should be brushed twice daily.
3. **Brush the right way:** After placing the toothbrush in the mouth, tilt the toothbrush up so that it's at a 45° angle to the gums. Move the brush head from tooth to tooth using a small circular motion. This goes for the outer surfaces of teeth, the inner surfaces of teeth, and the tops or chewing surfaces of teeth.
4. **Use the right kind of toothbrush:** Most dental professionals will agree that a rotating, oscillating, electronic toothbrush or sonic driven toothbrush is better at removing plaque from the teeth than a manual bristle toothbrush. Oscillating toothbrushes may rotate at up to 8800 strokes per minute. Sonic toothbrushes may vibrate at up to 40,000 strokes per minute. A popular brand name oscillating toothbrush is marketed under the brand name of Oral-B®. A popular sonic toothbrush is marketed under the name of Sonicare.®
5. **Floss after meals and at bedtime:** Flossing is important. Failure to floss results in missing half the surfaces of the teeth where plaque can form causing cavities and gum disease.

6. **Brush the tongue:** The tongue forms the floor of the mouth. It is critical for speech and swallowing. It can, however, act as a trap for bacteria causing bad breath, dental decay, and gum disease. Use the toothbrush to gently brush back and forth several times with each brushing. Special tongue brushes may be purchased on the Internet that cost only a few dollars
7. **Don't brush too hard:** Whether using a manual or a powered toothbrush, the most effective way to clean the teeth is by repetition, not force. Exert the same amount of pressure as the amount one might use to ring a doorbell. Too much pressure may wear down the enamel surface and cause the gums to shrink and recede from the teeth forming pockets at the base of the teeth in which microbes can hide.
8. **Don't use too much toothpaste:** Adults need only to express a pea-sized amount of toothpaste on the brush, or one half the length of the standard toothbrush.
9. **Store the toothbrush properly:** Keep the toothbrush as clean as possible. Rinse thoroughly after using it to make sure toothpaste and any debris is removed from the bristles. Store the brush in the upright position where it can air dry. If stored with other toothbrushes, make sure they do not come in contact with each other. Don't store the toothbrush in a closed container since microorganisms that grow best in warm, dark, and moist environments may proliferate on the brush.
10. **Change the toothbrush or the toothbrush tip on an electronic powered toothbrush frequently.** The lifespan of a manual bristle toothbrush is about 3 to 4 months. After that, the bristles become frayed and do not clean the teeth well. Replace the brush. For powered toothbrushes change the toothbrush tip every 90 days.

**11. Prevent dry mouth.** Saliva provides a major source of defense for the oral cavity against dental infections, gum disease, and dental decay. Conditions that can lead to a decrease in the formation of saliva in the mouth include drugs, radiation treatments, diseases like Sjogren's syndrome, and failure to hydrate. Drinking water ensures optimal salivary flow. The water of choice should be distilled water.

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

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

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

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