# The changes in oral flora after oral hygiene

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## Introduction

The oral cavity is a small but very complex system that plays a huge role in the human body. It is a diverse ecosystem that is filled with many different microbes such as bacteria, fungi and viruses (Alghamdi 2022). There are billions of different oral microbes that reside in the mouth. Some of the common oral microbes are various species of the genus *Streptococcus*, *Lactobacillus*, *Lactococcus*, *Enterococcus*, *Staphylococcus*, *Corynebacterium*, *Veillonella and Bacteroids* (Alghamdi 2022). These microorganisms are essential to the maintenance of the oral space and what it brings into the body.

The importance of oral microbes may not be as common as one might think. There are good and bad oral microbes that play separate roles in the human body. The good oral microbes can work together or separately to help aid the human body in fighting against unwanted infections from the outside. However, an imbalance of these microbes can have harmful effects on the body such as diseases (Gao et al. 2018).

These oral florae can take place on many different surfaces in the oral cavity. Such places include the superior and inferior surfaces of the tongue, surfaces of the teeth, gingival sulcus, hard and soft palates, tonsils, interior surface of cheeks, and lips (Gao et al. 2018) and (Santonocito and Polizzi 2022). Since there is an abundance of oral microbes and spaces where they reside, it is important to understand how they can be affected by everyday practices like oral cleaning.


**Figure 1.** This chart displays the different bacterial families that were isolated from the oral cavity (Alghamdi 2022).

## Effects of oral cleaning

Oral cleaning can impact the oral composition of oral flora. There are many different methods for keeping up with oral hygiene. The everyday basics are brushing teeth, flossing, and using mouthwash. Oral hygiene is also a good preventative measure for dental caries. Dental caries, or cavities, are a disease that is caused by the interaction of host, host habits, like det, and the oral flora which result in demineralization of the tooth enamel. One way to prevent dental caries is the practice of everyday brushing and the removal of plaque build-up.

The type of toothbrush can also impact the effectiveness of oral cleaning. There are manual toothbrushes and then electric toothbrushes. A recent study showed that electric toothbrushes, specifically sonic/ ultrasonic, may have the most effect on oral health. When compared to manual toothbrushes, the electric toothbrushes reduced more dental biofilm and used more efficient brushing motions (Digel et al. 2020).

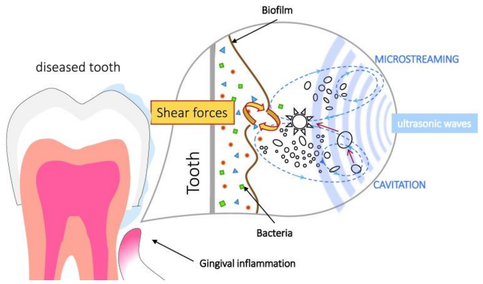


**Figure 2.** The graphic displays the use of an ultrasonic toothbrush on the surface of the tooth (Digel et al. 2020).

There are other methods like the use of mouthwash, toothpastes, and tongue cleaning. In another study, the effects of a 0.3% cetylpyridinium chloride-containing (CPC) mouth spray on the oral flora showed an increase in the overall amount of *Haemophilis* in the mouth (Fujimoto et al. 2023). It is also recommended that toothpastes and mouthwashes containing fluoride be used to prevent dental caries and to protect existing enamel (Naumova et al 2019). Another method of oral hygiene is tongue cleaning/scraping. The tongue can harbor many different microorganisms that live in the mouth. The method of tongue scraping can act to remove some of those bacteria present in the mouth. In another study, the use of tongue scraping was shown to reduce oral bacteria count and when used with tooth brushing, can promote good oral health (Matsui et al. 2014).

## Professional vs self-oral hygiene

Oral hygiene is important and can be done professionally and at-home. Professional dental cleanings can help make up for lack of self-oral care but should not be the only form of oral hygiene. It is important to practice self-oral care like brushing teeth and flossing to remove any dental plaque and keep a healthy oral environment (Wang et al. 2022). Dental professionals like dentists and dental hygienists use more extensive oral hygiene products than those available for patients at home. These professionals use tools like polishing brushes and rubber caps to provide professional cleanings (Fujimoto et al. 2023).

Being consistent with self-oral hygiene can help prevent potential diseases that can occur in the oral cavity. The focus of self-oral hygiene is to remove plaque and biofilm from the areas of the teeth, gums, and tongue. The way to do this is by brushing the teeth, either with manual or electric toothbrushes. It is also important how long the brushing of the teeth occurs and the brushing motions (Digel et al. 2020). Brushing of the teeth is a simple form of self-oral hygiene but if done incorrectly, will not give the best results (Wang et al. 2022). The state of the toothbrush is also important. An old, dirty and worn toothbrush cannot clean the teeth as effectively as a new and clean toothbrush. This is why it is important to replace old toothbrushes (Van Leeuwen et al. 2017).

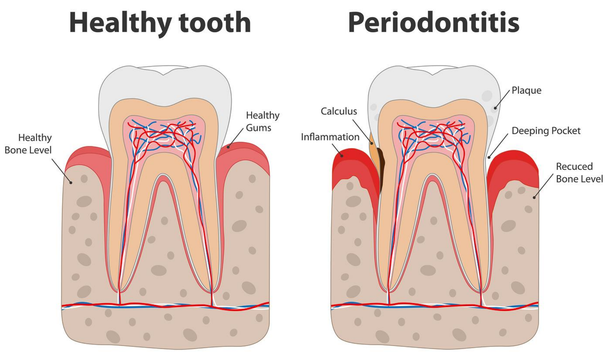


**Figure 3.** This image compares a healthy tooth and a tooth associated with periodontitis (Center 2023).

By being consistent with self-oral hygiene and regularly seeing a dental professional, the chance of developing oral diseases like dental caries and periodontitis are lowered. Periodontitis is a chronic gum disease that affects many individuals. This disease damages soft tissue around the teeth and can lead to tooth loss (Zhang et al. 2022). This is only one example of an oral disease that can be prevented by good oral hygiene practices.


**Figure 4.** This image displays the differences between a set of healthy gums and a set of gums affected with periodontal disease (Dental Center 2021).

## Planned experiment

The goal of this experiment is to examine the changes in oral flora of an individual's mouth pre-cleaning versus post-cleaning due to everyday brushing. Under IRB supervision, a handful of individuals will be asked to participate in this study and will sign consent forms. The participants will offer a few saliva samples pre-cleaning and post-cleaning of their teeth. The saliva samples will then be examined in the lab and used to indicate if there are any changes in the oral flora. The bacterial populations will be characterized using commercially available laboratory kits to examine the changes in population diversity following brushing. One of the kits to be utilized will be the EcoPlate that will test for genetic and metabolic diversity and allow for population wide characterization. Further microbial metabolic tests will allow for isolation and species characterization.

## Literature cited

Alghamdi, S. 2022. Isolation and identification of the oral bacteria and their characterization for bacteriocin production in the oral cavity. Saudi journal of biological sciences, 29 (1): 318–323. DOI: https://doi.org/10.1016/j.sjbs.2021.08.096
Center, Dental Health. "What Are Some Secondary Effects of Periodontitis? Dental Health Centers." *Dental Health Centers*, 22 Dec. 2023, www.dhc.dental/periodontists-in-miami/.
Dental Center, Hudson. "Periodontics : Periodontal / Gum Disease - Hudson Dental Center: Dentist in West New York, NJ." *Hudson Dental Center West New York*, 1 Nov. 2021, www.hudsondentalcenter.com/services/periodontics/.
Digel, I., Kern, I., Geenen, E. M., & Akimbekov, N. (2020). Dental Plaque Removal by Ultrasonic Toothbrushes. *Dentistry journal*, *8*(1), 28. https://doi.org/10.3390/dj8010028
Fujimoto, A., Fujii, K., Suido, H., Fukuike, H., Miyake, N., Suzuki, H., Eguchi, T., & Tobata, H. 2023. Changes in oral microflora following 0.3% cetylpyridinium chloride-containing mouth spray intervention in adult volunteers after professional oral care: Randomized clinical study. Clinical and Experimental Dental Research, 9(6): 1034–1043. DOI: https://doi.org/10.1002/cre2.810
Gao, Lu, et al. "Oral Microbiomes: More and More Importance in Oral Cavity and Whole Body." *Protein & Cell*, U.S. National Library of Medicine, May 2018, www.ncbi.nlm.nih.gov/pmc/articles/PMC5960472/.
Matsui, M., Chosa, N., Shimoyama, Y., Minami, K., Kimura, S., Kishi, M. 2014. Effects of tongue cleaning on bacterial flora in tongue coating and dental plaque: a crossover study. BMC Oral Health. 14(4). DOI: https://doi.org/10.1186/1472-6831-14-4
Naumova, E. A., et al. "Bacterial Viability in Oral Biofilm after Tooth Brushing with Amine Fluoride or Sodium Fluoride." *Archives of Oral Biology*, Pergamon, 17 Oct. 2018, www.sciencedirect.com/science/article/pii/S0003996918303042#:~:text=Conclusions,not%20longer%20than%20120%20min.
Santonocito, S., & Polizzi, A. (2022). Oral Microbiota Changes during Orthodontic Treatment. *Frontiers in bioscience (Elite edition)*, *14*(3), 19. https://doi.org/10.31083/j.fbe14030319
Van Leeuwen, M. P. C., Van der Weijden, F. A., Slot, D. E., & Rosema, M. A. M. (2019). Toothbrush wear in relation to toothbrushing effectiveness. *International journal of dental hygiene*, *17*(1), 77–84. https://doi.org/10.1111/idh.12370
Wang, Q., Chen, H. & Jiang, L. Assessment of the professional dental cleaning knowledge, behavior and medical compliance among dentists, medical doctors and non-medical staffs: a cross sectional study in Chongqing, China. *BMC Oral Health* **22**, 188 (2022). https://doi.org/10.1186/s12903-022-02226-x
Zhang, D., Liu, W., Peng, L., Wang, H., Liu, M., Li, Y., Wang, Z. 2022. Difference in oral microbial composition between chronic periodontitis patients with and without diabetic nephropathy. BMC Oral Health. 22(12). DOI: https://doi.org/10.1186/s12903-021-01985-3