Patient Page

Guide to oral biofilms

- **What are oral biofilms?**
- **What problems can biofilms cause?**
- **How can biofilm formation be prevented?**

What are oral biofilms?

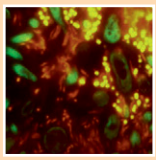
Biofilms are layers of germs/microbes/micro-organisms growing on moist surfaces. They are found throughout the environment: inside pipes, in medical tubing during long-term use, on rocks, and probably on surfaces in your bathroom and kitchen. In the mouth, biofilms can form on the teeth (**dental plaque**), tongue, gums, tooth restorations, and appliances worn to straighten teeth. These **oral biofilms** can consist of one or more types or subtypes of microbes (see **Box**) and commonly contain millions of bacteria. In just a few minutes after cleaning your teeth, free-floating bacteria in the mouth will stick to all surfaces of the mouth and quickly multiply, secreting sticky substances that attract more bacteria to join the complex, expanding community.

What problems can biofilms cause?

Biofilms are invisible but can cause these problems:

- Biofilms on teeth turn food into acids, which attack the tooth surface (**enamel**) and lead to tooth decay and cavities (**caries**)
- Biofilms on teeth and gums produce substances that cause gum irritation and bleeding or swelling (**gingivitis**), eventually leading to severe gum disease (**periodontitis**), and bone and tooth loss. More than 90% of people in Hong Kong have some form of gum disease!
- Without regular removal, biofilms on teeth harden and become **calculus/tartar**, which traps stains and plaque, and can be removed only by dental professionals
- Oral biofilms can cause bad breath (**halitosis**) by rotting food particles that collect between teeth, around gums, and on the tongue

What microbes live in biofilms?



Microbes, each about 1/50th the diameter of a human hair, can double their number every 20 minutes, and can grow together and protect each other in oral biofilm communities. Many species have still not yet been identified.

Bacteria: These are simple single-cell organisms (singular, *bacterium*). Their genetic material is surrounded by a gel (cytoplasm) contained within a fatty wrapping (cell membrane). *(Bacteria are stained yellow and red in the illustration.)*

Fungi: Sometimes called yeasts, fungi (singular, *fungus*) are usually spherical; some form filaments on surfaces. They are more complex than bacteria and belong to the same family as mushrooms and moulds. Their genetic material is enclosed in a nucleus, and the whole cell has a reinforced wall. *(Fungi are stained green in the illustration.)*

Archaea: Archaea (singular, *archaeon*), also called archae(o)-bacteria, are similar to but more complex than bacteria.

How can biofilm formation be prevented?

Visit your dentist regularly; he or she may recommend professional cleaning. After a professional clean, you can maintain oral hygiene by the following:

- Brush your teeth and tongue twice a day with a **fluoride toothpaste**; brush gently at an angle of 45° to the gums to reach below the gum line (remember to change your toothbrush every few months or when you see frayed bristles)
- Use **dental floss** to clean between teeth (remember to floss the back of your back teeth; see <www.toothclub.gov.hk> for recommended brushing and flossing technique); ask your dentist whether you need interdental brushes or special flossing products to clean between teeth, how to clean false teeth and oral appliances, and for the right oral care products for you, including disclosing solution/tablets that show up plaque (see top photos)
- **Add** the use of an antimicrobial mouthrinse/mouthwash that has been clinically proven to fight plaque bacteria; always follow product directions
- Have a **balanced diet** and **reduce snacking**; rinse your mouth with water after meals/snacks or chew sugar-free gum
- **Give up smoking** because gum disease is made worse by smoking; *Hong Kong Department of Health Smoking Cessation Hotline: 1833 183; HKU Smoking Reduction Hotline: 2819 2697; HKU Female Smoking Cessation Hotline: 2819 2692; Hong Kong Council on Smoking and Health website: <http://smokefree.hk> (Chinese) or <http://smokefree.hk/en/home> (English)*

Sources: Center for Biofilm Engineering, Montana State University, <www.erc.montana.edu>; Hong Kong Government Tooth Club, <www.toothclub.gov.hk>; American Dental Association, <www.ada.org>; microscope image of stained dental biofilm from Zijnge V, van Leeuwen MBM, Degener JE, Abbas F, Thurnheer T, Gmür R, Harmsen HJM. Oral biofilm architecture on natural teeth. PLoS ONE 2010;5:e9321. doi:10.1371/journal.pone.0009321.

Written by Trevor Lane, DPhil; edited by Lakshman Samaranayake, DDS, FRCPath. *This Patient Page is for general informational use and is not a substitute for diagnosis; for specific advice, please consult a dentist.*