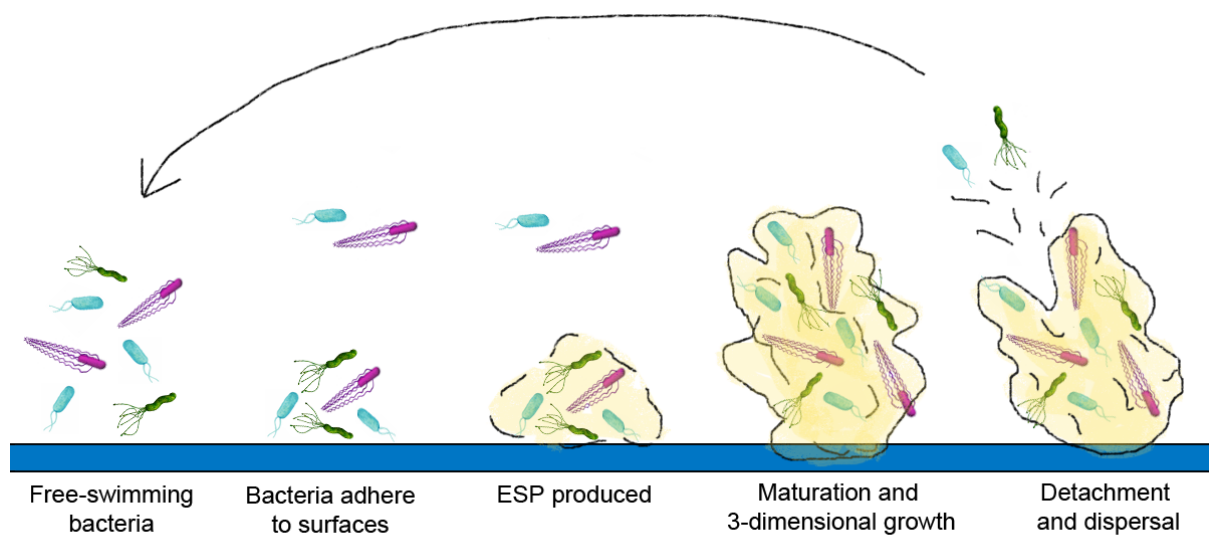


## Biofilms

Biofilms are communities of microbes that live on a variety of both natural and manmade surfaces. You have probably encountered biofilms before – the dental plaque that forms on your teeth and causes cavities is an example of one. So is the film that you scrub off your toilet bowl!

We have called biofilms ‘bacterial cities’ because it’s a good illustration of what a biofilm is – lots of different types of bacteria and other microbes growing together on a surface, cooperating and even communicating with one another in order to maximise their chances of survival.



## Why are biofilms important?

Biofilms give bacteria protection from outside elements; a biofilm forms when bacteria attach to a surface and then produce a sticky, sugary matrix known as "extracellular polymeric substances" (EPS). The EPS surrounds the bacteria and allows them to form three-dimensional colonies which are protected against things that would otherwise kill them, like antibiotics. It has been shown that biofilms are resistant to doses of antibiotics over 1000 times stronger than

those needed to kill free-floating bacteria! They also make it harder to remove the colonies with physical force, like with a toothbrush or toilet brush. Our hands-on '**Blast a Biofilm**' activity will model the differences between removing bacteria without EPS vs biofilm colonies with EPS matrix protecting them. One is much easier than the other!

Because biofilms make bacterial colonies so resilient, they can cause problems when they grow where they shouldn't be.



Where do biofilms grow? List three locations:

- 1) \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_



However, not all biofilms are harmful. People have learned how to use biofilms for beneficial purposes. Name one way people use biofilms to help:

- 1) \_\_\_\_\_
- 

## Health and Hygiene

The human body contains many different types of microbes, and most of these are beneficial – they help our bodies carry out the tasks it needs to in order to function well. Sometimes, however, bacteria and other microbes grow too much and cause infection or other negative results. Though we can treat infections with antibiotics biofilm formation makes the bacteria much harder to kill, which means infections can last longer and become more serious.

Name three human diseases or chronic infections caused by biofilms:

- 1) \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_



### Biodiversity



Although you can have biofilms of just one type of bacteria it is far more common to find biofilms made up of many different types of microbes living together! Dental plaque can be made up of hundreds of different species of bacteria, just like a city is made up of lots of different types of people.

What are competitive relationships among organisms called?

- 1) \_\_\_\_\_

What about helpful relationships?

- 1) \_\_\_\_\_

### Communication

Because the bacteria in biofilms are packed so closely together they are able to communicate by sending chemical signals which travel from microbe to microbe, like letters sent through the post. This is called quorum sensing and it only happens when bacteria are in close proximity, like in a biofilm.

What processes can be triggered by a quorum sensing signal?

- 1) \_\_\_\_\_