

What is Biofilm?



Biofilm (a bacterial film) is a mixture of different microorganisms that are held together and protected by glue-like materials (carbohydrates). The glue-like material that microorganisms secrete allows them to attach themselves to surfaces. Biofilm formation in food production areas is a sign that sanitation procedures are inadequate and can become the potential root cause for reduction of shelf life and pathogenic contamination of food products.

Bacteria in Biofilm

Biofilms on food contact surfaces are usually multispecies; both disease causing and non-disease causing bacteria. Common organisms in biofilms include:

- *Listeria*
- *Pseudomonas*
- *Bacillus*
- *Salmonella*
- *Campylobacter*
- *Escherichia coli*

Conditions that Create Biofilm

- Food processing equipment that is not easily cleaned due to its unsanitary design and/or food particles being left behind after sanitation creates a nutrient rich environment for biofilm formation and adhesion. Biofilms can form on different surfaces, including:
 - stainless steel
 - polystyrene
 - polyester
 - rubber
 - copper

- Environmental conditions that play a big role in biofilm formation in food processing are:
 - nutrients
 - acidity
 - temperature
 - moisture
 - oxygen
 - time
- Biofilms can form anywhere. With time and nutrients from the environment, biofilms can grow and become strongly attached to surfaces. The advantages of forming a biofilm is protection from:
 - heat
 - light
 - drying
 - chemicals
 - sanitation
- Biofilm formation has been associated with environmental surfaces, for instance:
 - floors
 - walls
 - pipes
 - drains
 - joints
 - valves

- conveyor belts
- gaskets
- hollow areas (e.g., frames and rollers)
- dead ends

Removal of Biofilms

Biofilm removal requires proper, frequent cleaning, followed by proper sanitization.

Removal of biofilms is achieved by a combination of four factors:

- formulations and concentrations of cleaning and sanitizing agents
- exposure time
- temperature
- mechanical activity

Biofilm microorganisms have a higher resistance to chemicals, which can limit their effectiveness. If biofilms are a concern, work with a chemical supplier to select and evaluate a system to eliminate the problem. The best defense against biofilms in a food production facility is a good offense developed as part of the sanitation program.

Testing for Biofilm

There are two approaches to biofilm testing:

Outside experts: Food processors can choose to use an outside, accredited [laboratory](#) to do regular microbial testing. **In house:** A common way to monitor general sanitation in house is with plating microbial swabs. Depending on the size of your facility, you may choose to set up a microbiological laboratory to perform your

analysis. Rapid methods using [Petrifilm®](#) is approved by Health Canada and easy to use in a small to medium laboratory setting.

Adenosine triphosphate (ATP) bioluminescence is another in house method that uses test swabs and a luminometer. Results are fast, which means corrective actions can begin immediately. Over time, this method shows the general sanitation level in the food production areas.

The appearance of sporadic bacterial colonies on agar plates from sanitized equipment swabs may also indicate the presence of biofilm.

Proper training and sampling techniques must be followed to prevent errors.