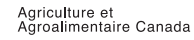
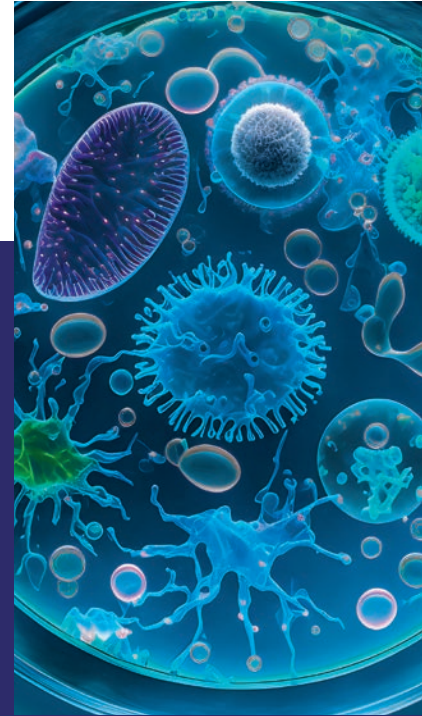


Biofilms in the dairy industry



The dairy industry invests in microbiology research to expand our understanding of the complex world of microorganisms and the role they play in our lives.

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What are biofilms?

Biofilms are communities of microorganisms multiplying and living together. Microorganisms within a biofilm secrete a matrix that is made up of polysaccharides and other very large molecules that surround and protect them. These microbial ecosystems can be made up of single or multiple species of bacteria, as well as other microorganisms such as yeast and molds.

Biofilms can be found everywhere! They only need water, nutrients, and a surface to grow on to thrive. You may have seen biofilms before, such as the slippery slime covering your shower curtain. This is a common biofilm made up of bacteria and other microorganisms. Due to their sticky nature and excellent protection, surfaces with biofilms can be hard to clean and disinfect.

Why do biofilms matter to the dairy industry?

Milk has a high nutrient content, which provides a rich environment for microorganisms to grow.

In the presence of milk residue, biofilms can form on milk-processing surfaces, including stainless steel, and become a concern on dairy farms and in cheese plants. Due to the difficulty in removing biofilms, some microorganisms can be transferred to milk and dairy products. This can increase food spoilage and reduce the shelf life of dairy products.

Time-intensive cleaning procedures are required on dairy farms and in cheese plants to ensure food safety and quality.



Key Points

Biofilms can present a challenge for cleaning and disinfecting on dairy farms and in milk processing facilities.

New research is exploring the origin, structure and formation of biofilms to help inform management practices.

The research also aims to identify protective bacteria that can prevent biofilms from forming as a natural way to reduce milk spoilage.

Identifying and controlling biofilms is critical to producing high quality milk and cheese.



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What did researchers investigate?

A recent study investigated the presence of biofilms in dairy facilities. Researchers swabbed surfaces at dairy farms and cheese plants in Ontario and Quebec to better understand the formation, structure, and type of biofilms that were present.

Of particular interest were hard-to-kill bacteria, for example, bacteria that form spores, or are resistant to heat. Spore-forming bacteria can become dormant to protect themselves from death and heat-resistant bacteria may be able to survive pasteurization. These types

of bacteria were a focus because they have the potential to survive in dairy and processing facilities, despite measures taken to destroy them. As biofilms are often made up of multiple species of bacteria and fungi, researchers investigated how multispecies biofilms interact.

The research also aimed to identify protective bacteria that can prevent biofilms from forming as a natural way to reduce milk spoilage.

Researchers swabbed surfaces at 58 dairy farms and 4 cheese plants in Ontario and Quebec



The natural antimicrobials produced by lactic acid bacteria were found to be promising molecules to fight harmful biofilms. Dairy biofilms can contain beneficial microbes such as lactic acid bacteria that, when transferred to milk, improve its microbial quality. It may be possible to utilize these “good” lactic acid bacteria to reduce the growth of spoilage microorganisms.



What have we learned about biofilms?

- ➔ **Biofilms found on dairy farms were dominated by families of microorganisms** including the phyla of proteobacteria, actinobacteria, lactic acid bacteria, and fungi (e.g., *Candida*, *Diutina*, and *Wickerhamiella*).
- ➔ **Heat-resistant bacteria were commonly found in biofilms** from cheese plants. At the dairy farms, the bacterial load of biofilms was highest on hard-to-reach surfaces.
- ➔ **The structure of multispecies biofilms** was found to vary significantly between farms and between pieces of the milking equipment within a farm.
- ➔ **The biofilms also differed based on the season of sampling** and were overall highly diverse. Milk residues seem to help biofilms form on surfaces.

A better understanding of biofilm formation, composition, and persistence will help improve on-farm management practices. Innovation in cleaning and sanitizing will help dairy farms and cheese plants to continue to produce high quality milk products.

Researchers continue to pursue characterizing the origin, structure and formation of both harmful and beneficial biofilms on dairy farms and in cheese plants.

Funding Partners