



Episode Twenty Seven - Biofilms

Welcome to episode 27 of Food Safety Bites, brought to you the University of Wisconsin Madison, and funded by the USDA Food Safety Outreach Program. This is your host Harriet Behar. This episode is **focused on understanding what is a biofilm, and how to prevent buildup of biofilms on your farm.** These podcasts are meant to help identify issues and aid you in developing food safety protocols that are adapted to your own farm.

What is a biofilm? Biofilms are composed of bacteria and other microorganisms that have congregated together to form a slime substance that sticks to surfaces. Much of what you might consider “slime” is a biofilm and calling it biofilm is just a nice word for slime. If there is water and a hard surface with the presence of bacteria, a biofilm could form. A biofilm that we are all familiar with is the formation of plaque on your teeth. If you don’t brush your teeth for a day or two, you know a sticky, slimy substance forms on the surface of your teeth. There is water, a hard surface and bacteria present, the perfect situation for biofilms to form.

Why are biofilms problematic? The cells in the biofilm secrete a carbohydrate that forms a slime or “matrix” that can trap bacteria, adhering it to the surface with a glue-like substance. Basically, it is a way for single-cell organisms like bacteria to protect themselves and persist and grow. However, water and nutrients can still pass through the slime, allowing for the microbes inside to thrive. The microbes can also break off from the biofilm and colonize new areas where there is an acceptable habitat of a hard surface and water. Yes, I know it sounds like a bad science fiction movie.

If you have ever worked in a health care setting, you know that biofilms are a huge concern for doctors and nurses as they form on medical equipment and cause illness when bacteria and viruses can be trapped, sickening patients. In the farm setting, biofilms are also a major concern on any surface where water is present. Biofilms can be present on sinks and sink drain boards, in water tanks used for washing and cooling produce, on vinyl strip curtains used in your cooler, around the drain and corners of the cooler, air conditioning units, at the ends of hoses that are not fully drained and on totes or buckets. Anyplace where water and bacteria sit undisturbed for hours or days, can be an area where biofilms form. And where you have biofilms, you have the potential for pathogenic bacteria to get stuck and reproduce. Different species of bacteria will coexist within this biofilm and they *will* reproduce and grow if the biofilm is not disturbed by cleaning. In the health care industry, there are times when the same type of bacteria within a biofilm is 200 times more difficult to kill when they are in the biofilm than when they are not. Once biofilms are present, pathogens are tenacious and difficult to remove.

There are many areas in both field and post-harvest handling where standing water or moisture can provide the environment for the growth of biofilms. Attention to developing systems and protocols that discourage the accumulation of biofilms is an important part of food safety. Fungi, algae and the products of equipment corrosion such as bits of rust are examples of what could be found in biofilms in addition to pathogenic bacteria such as listeria or salmonella. If biofilms



are present and then get washed onto your produce by moving water over that area, you have now contaminated your veggies.

How to clean and prevent biofilms. Since biofilms are sticky, slimy and adhere to the surface, the use of detergents and scrubbing will be necessary to remove them, with the use of a sanitizer after you did the cleaning to kill any residual bacteria. For areas where you know there may be standing water, like packshed drains, around faucets, wash tanks, and coolers, develop cleaning protocols to ensure these are regularly cleaned with a detergent and scrubbing action. The scrubbing action combined with the detergent is needed to break down the biofilm's matrix. Spray with a surface sanitizer and let air dry according to the label. Simply spraying with water is not enough. Make sure the areas dry out after cleaning as best as possible as well. Also important, have protocols in place that include drying the areas where water may accumulate to make sure the habitat for the biofilm to grow is not present in the first place.

Designing your equipment to lessen the formation of biofilms.

Let's look at a few examples where a few simple changes can prevent biofilm issues. How about hanging your water hoses used in the pack shed or post-harvest handling area, so they are not in contact with the floor or ground and drain completely. You have now taken away the habitat for the biofilm to grow. Irrigation pipes or water distribution areas should be checked regularly and maintained by cleaning and sanitizing where you have noticed that biofilms may accumulate. Tubs, sinks, counters, and floors should have protocols that discourage biofilms by regular cleaning and the removal of standing water and/or complete drying. Empty tubs so they fully drain out, which may mean turning them more than once to get all of the water out. Store them on their sides or upside down. Counters, spray wash areas and sinks should have periodic cleaning and sanitizing, and physically drying in areas with single use towels to prevent standing water. The vinyl strips on the cooler doors should not touch the floor, so they can completely drain, and squeegee out cooler floors that have continuous standing water. If you notice biofilm forming in any area, take the time to clean and sanitize right then. You don't want to push open tubs of freshly washed broccoli through slimy vinyl curtains, where the biofilms can easily fall onto your nice clean veggies.

It is important that workers are trained to follow protocols and to look for the presence of biofilms in sensitive areas, both easily seen and somewhat hidden, before they add water that will then be used for produce handling. Biofilms present inside of hoses, in sinks or other locations can break free when the water starts to flow and spread to other areas, without the knowledge of the workers.

In summary- Prevention and frequent cleaning are both important to address the problem of biofilms. Next time you are in your pack shed or looking at your irrigation system, take a few minutes to specifically address the areas where water might accumulate and not fully drain. Look for and feel for the slime that will tell you have an issue in that area with biofilms, so you can then improve your activities to prevent this breeding area of contamination.



So that's it for this episode of Food Safety Bites, the next episode is pack shed construction and layout. This is your host Harriet Behar brought to you by the University of Wisconsin Madison, talk to you next time!