Biofilms Threaten Calf Health

Look for these topics in this resource:

- **What are biofilms?**
- **Why are they a threat to calf health**
- **How do biofilms get started**
- **How do biofilms grow**
- **What can we do prevent/remove biofilms**

What are biofilms?

Biofilms are an organic layer (think of a protein/fat scum) that sticks to any surface. As calf rearers, our most important concern is biofilms on non-biological surfaces.

Biofilms build up on our stainless steel milker and plastic equipment. They are composed of:

- Initial contaminants - most common are milk proteins and fats that are not washed off properly, and
- Organic compounds produced by the bacteria that bind to the initial contaminants.

These films may be so thin that we can neither see nor feel them. If allowed to grow, eventually we may see a yellowish film. Alternatively, a surface may be excessively rough or slimy. We may even scrape some tan-colored film off with our fingernails.

Why are they a threat to calf health?

The biofilms act as housing for bacteria. Each time we use a piece of equipment, these resident bacteria contaminate colostrum, milk and/or milk replacer.

For example, stainless steel milk dump buckets used to collect colostrum often have biofilm buildup. Resident coliform bacteria immediately contaminate freshly harvested colostrum. The warm colostrum is an ideal growth medium for coliforms. If the colostrum remains warm, the coliform bacteria will double in number every 20 minutes. Contaminated colostrum collection equipment often leads to coliform bacteria counts of over one million/ml. High colostrum bacteria counts are often the cause of persistent calf scours among one to three week-old calves.

Similar health issues come from mixing and feeding equipment for milk and milk replacer. Biofilms act as the reservoir for bacteria. The bacteria may be swept out of the film into the milk. When calves are exposed repeatedly to even low levels of bacteria,

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they have scours problems. Excessively high scours rates among preweaned calves are frequently connected to high respiratory treatment rates, too.

How do biofilms get started?

Biofilms usually develop because of poor cleaning of equipment. For example, the prewash rinse may be excessively hot. This causes particles of whey protein to bond to the surfaces.

The wash water may be too cool [less than 120° (49°C)]. This causes particles of fat and/or protein to fall out of suspension and stick to surfaces.

During the wash step, thorough brushing may not reach all surfaces. Alternatively, we might run out of either soap or chlorine and wash without them. Even worse, we may just "rinse" the equipment while planning to wash it more carefully after the next use.

Bacteria recognize these residues on the equipment. Using a biological connector, the bacteria attach to the protein, fat or lactose particles. Biologists call this "adhesion behavior." Bacteria literally cement themselves to equipment surfaces using the milk residues.

Once the bacteria are cemented onto the surfaces, they produce organic compounds designed to protect themselves. Bacteriologists call these exopolysaccharides. These compounds stick together in forms called matrices. Think of them as biological apartment developments.

How do biofilms grow?

After the initial layer of bacteria colonizes the surface, other bacteria recognize this as "a desirable neighborhood." They attach to the original matrices, produce more of their own exopolysaccharides, and add to the housing development.

Once the matrices have developed, then it is even easier for more milk residues to stick to these areas. They provide an abundant source of food for bacterial growth.

Exposure to common disinfectants has little effect on these housing developments. Even long-time, high concentration soaking in bleach (sodium hypochlorite) will fail to reduce the bacteria populations enough to reduce calf scour rates.

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What can we do to prevent and/or remove biofilms?

First, every time a piece of equipment is used for colostrum or milk, clean it. Use at least a prewash rinse and wash protocol. For resources, click HERE and scroll down to "Washing Milk Containers Protocol" and "Washing Milk Containers Checklist."

Second, regularly monitor washing protocol compliance. For a procedure to follow "Monitoring Compliance with Sanitation Protocols" click HERE.

Third, regularly sample and culture colostrum and milk or milk replacer as it is fed. If standard plate counts are more than 10,000 cfu/ml, then send frozen samples to a lab that can both identify and quantify the bacteria. Ask your vet to help you interpret these results. High values may require not only changes in cleaning procedures, but also other measures designed to reduce bacterial contamination. For colostrum management, see Colostrum: Reducing Coliform Counts Checklist, click HERE.

Fourth, recognize that after long usage plastic equipment cannot be kept clean. The only remedy is to replace it. This is especially true for plastic esophageal tube feeders. Prolonged soaking in a strong bleach solution will neither remove a biofilm nor kill the bacteria embedded within it.

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