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Pseudomonas-Infected Dairy Cows

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Pseudomonas aeruginosa is a bacterium capable of causing mastitis (inflammation of the udder) in dairy cows. This bulletin will focus on the source of *Pseudomonas aeruginosa*, or "pseudomonad" infections within a dairy herd, and suggest useful control and prevention tips for dairy farmers.

Where can pseudomonads be found on the farm?

Pseudomonas bacteria are widespread in the environment because they require very few nutrients to grow and multiply. Water supplies, contaminated water hoses, and contaminated drugs and drug-treating equipment are major sources of *pseudomonas* bacteria on dairy farms. *P. aeruginosa* has been isolated from soil, animal feces, barnyards, and animal skin, so the presence of unsanitary housing and bedding conditions can also contribute to occasional outbreaks of *pseudomonas* infections.

How do pseudomonas infections develop and spread within my herd?

How these bacteria cause infections is not well understood. Most of the time, these organisms act as opportunists, attacking weak or injured tissues of teats or mammary glands. Cows that are unable to respond to attacks of the bacteria because of other diseases, or nutritional deficiencies or imbalances, are also susceptible to *pseudomonas* infections. Since *pseudomonas* bacteria do not usually infect glands that

are already infected with other bacteria, they may become a problem in well-managed herds that have a low prevalence of non-clinical infections from such organisms as *Streptococcus agalacticae* or *Staphylococcus aureus*.

The mammary gland is more likely to become non-clinically infected when it is repeatedly exposed to small numbers of these bacteria than to very large numbers. The number of *pseudomonads* in contaminated water is generally low, and non-clinical infections are likely to develop when contaminated water is used in udder wash. Clinical infections usually result from exposure to large quantities of organisms—potentially from a single exposure, such as from contaminated drugs or drug treatment equipment.

How widespread are *P. aeruginosa* infections, and what kind of problems can they cause?

The *pseudomonas* infection rate in dairy herds is usually less than 1 percent of the cows and rarely more than 3 percent. Clinical infections usually involve higher-producing cows in early lactation, although clinical outbreaks can occur across all stages of lactation. Infections range from sudden, very acute, life-threatening clinical cases to non-clinical infections. Remember, repeated exposures to small numbers of bacteria are more likely to cause chronic, non-clinical infections, whereas massive exposures usually result in short-lived, severe clinical infections.

Can pseudomonas bacteria survive in antibiotic solutions?

Pseudomonas organisms are very resistant to antibiotics. Multiple-dose vials of antibiotics can become contaminated by dirty needles that re-enter the vial, and the bacteria will survive within the antibiotic solution for a long time. Future doses of antibiotics taken from the vial will be contaminated, and the next gland to be infused with the drug will have a high likelihood of becoming infected.

What are some signs of a pseudomonas mastitis problem that I might recognize?

Exposure to large numbers of *pseudomonads* will result in an acute case of mastitis, with marked swelling of the udder, high body temperature (105 to 107 degrees F) and abnormal, watery milk that contains flakes or clots. An infected cow may show severe signs of toxemia, and many animals die, regardless of aggressive treatment. If saved, a cow that has had an acute infection is often left unfit for productive use.

Cows repeatedly exposed to small numbers of organisms may develop chronic clinical or chronic non-clinical cases that are very resistant to antibiotic therapy. In these cases, *pseudomonas* organisms would have to be identified through culture tests. In some cases, acute infections related to contaminated antibiotics or contaminated treatment equipment will follow treatment for mastitis.

What should I do if I recognize one or more of these situations within my herd?

Clinical signs won't necessarily pinpoint the exact form of mastitis, so the first thing you should do is determine whether a pseudomonas problem exists in your herd. Aseptically collect milk samples for culture tests from at least 10 to 20 lactating cows that have had somatic cell counts of 400,000 (DHIA linear score of 5 or higher) for two to three months; strong CMT (California Mastitis Test) reactions; and/or those cows with apparent symptoms of pseudomonas infections. (Try to collect samples immediately after a milking. For cows that you suspect to have clinical mastitis, be sure to collect milk samples before administering any type of therapy.)

Submit samples to a qualified microbiological laboratory, such as your state animal health diagnostic laboratory. Not all veterinary labs and milk cooperative labs can isolate pseudomonads, so before submitting milk samples, be sure to find out whether the lab is capable of running tests for *P. aeruginosa*.

If a *P. aeruginosa* problem is diagnosed, what management steps should I take to get rid of the problem?

Antibiotic treatment of either severe acute clinical or chronic non-clinical pseudomonas infections is often unsuccessful, even when antibiotic sensitivity testing indicates a particular treatment should be successful. Therefore, you may wish to cull or isolate chronically infected animals to decrease the risk of infecting other cows.

Water supplies on your farm should be checked through culture tests to determine whether they are sources of infection. Potential sources include well water, water hoses, water pipes and stagnant water ponds. The organisms may also survive and grow in water heaters or softeners. Your county's public health department, your state department of agriculture or your state animal health diagnostic laboratory should have the facilities and equipment to culture water sources. Be sure to ask specifically for a test

to indicate the presence of *P. aeruginosa* in the water. Water from sources that are known to be contaminated should not be used to wash udders before milking.

As for the use of dry cow treatments, they will not prevent pseudomonas or other gram-negative organism infections; however, since most dry cow treatment products are effective against other forms of mastitis that may develop within your herd, it may be in your best interest to stick with an already-established dry cow treatment program.

Is there any relationship between *P. aeruginosa* infections and the type of milking equipment used?

There are no studies to suggest any relationship between the two. As with other types of mastitis, however, excessive liner slippage at the end of milking, and pulsator failure—which can both potentially result in teat end damage—can certainly increase the risk of *P. aeruginosa* infections. Using common (dirty) wash rags or sponges, and wet milking of cows (the use of excessive water with no drying at prep time) can also increase the potential for infection.

Is there anything I can do to prevent pseudomonas infections on my farm?

Yes. In the case of *P. aeruginosa* infections, prevention is your best defense. Of course, a long-term prevention program should be part of any mastitis control program. Consider following these prevention tips:

- Fence off any ponds or drainage areas on your farm.
- Test the water supply used to wash udders periodically for bacterial contamination. If you have had a previous problem with pseudomonas, have water tested twice a year.
- Replace wash hoses and spray nozzles at least once a year.
- Use properly metered iodine udder wash.
- Avoid the use of common wash rags and/or sponges.
- Use commercially prepared antibiotics that are prepackaged in sterile, single-use syringes rather than multiple-dose antibiotics to

prevent injecting contaminated antibiotics into the mammary gland.

- Use single-use, disposable teat cannulas. If you use stainless steel cannulas for intramammary infusions or drainage of a quarter, sterilize them (by boiling). Store sterilized stainless steel cannulas in clean alcohol between uses.
- Monitor the mastitis infection level within the herd through routine somatic cell count programs such as the DHIA linear score report.
- Cooperate with your local veterinarian to establish pseudomonas mastitis control and prevention programs.

Will the use of teat dips on my herd help prevent pseudomonad mastitis?

It's not likely. Germicidal teat dips have not been shown to be effective against gram-negative organisms such as pseudomonads.

SOMATIC CELL COUNTS AND EQUIVALENT DHIA LINEAR SCORES

Average Somatic Cell Count	DHIA Linear Score
12,500	0
25,000	1
50,000	2
100,000	3
200,000	4
400,000	5
800,000	6
1,600,000	7
3,200,000	8
6,400,000	9

This is one in a series of bulletins on mastitis control in dairy herds. Contact your county Cooperative Extension Service office for information on other forms of mastitis and how to control them.

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