

Mastitis Control Program
for
Pseudomonas Mastitis
in Dairy Cows

by

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Pseudomonas aeruginosa (*P. aeruginosa*) is a bacterium capable of causing mastitis in dairy cows. This bacterium presents a difficult challenge, as it tends to protect itself from antibiotics and white blood cells in layers of slim. This bulletin will focus on the source of *P. aeruginosa* infections within a dairy herd and suggest useful control and prevention tips for dairy farmers.

Where can *Pseudomonas aeruginosa* be found on the dairy farm?

P. aeruginosa is widespread in the environment of dairy cows because it requires few nutrients to grow and multiply. Water supplies of all types (wells, troughs, ponds, parlor wash hoses, and sprinkler pens), contaminated teat dips and contaminated drugs and infusion equipment are the major sources of *P. aeruginosa* on dairy farms. *P. aeruginosa* has also been isolated from waste feed, soil, manure, and animal skin. The presence of unsanitary housing and bedding conditions can contribute to occasional outbreaks of *P. aeruginosa* infections.

How do *P. aeruginosa* infections develop and spread within a herd?

How these bacteria cause infections is not well understood. *P. aeruginosa* acts as an opportunist by attacking weak or injured tissues of teats or mammary gland.

Malfunctioning milking equipment would increase the risk on new *P. aeruginosa* infections and other bacteria due to teat end trauma. Cows that are immunologically compromised due to other infectious diseases or nutritional deficiencies are also more susceptible to *P. aeruginosa* infections. Since *P. aeruginosa* do not infect mammary 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 caused by *Strep. ag.* or *Staph. aureus*.

The mammary gland is more likely to become non-clinically infected with *P. aeruginosa* when it is repeatedly exposed to small numbers of the bacterium rather than to very large numbers. The number of *P. aeruginosa* bacteria in contaminated water is usually low.

Non-clinical infections are likely to develop when *P. aeruginosa*-contaminated water is used to wash teats, used in sprinkler pens and used to mix concentrated teat dip. Clinical infections usually result from a single exposure to large numbers of *P. aeruginosa*.

Examples of a major exposure would include the use of *P. aeruginosa*-contaminated drugs, teat dips or treatment equipment. Dry cows are susceptible to *P. aeruginosa* from contaminated antibiotics or from contaminated water used to warm dry cow antibiotic tubes on cold days.

How widespread are pseudomonas infections and what kind of problems do they cause?

The *P. aeruginosa* infection rate in dairy herds is usually less than 1 percent of 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 that repeated exposure to small numbers of bacteria are more likely to cause chronic, non-clinical infections characterized by an extended period of high somatic cell counts. Exposure to large numbers of *P. aeruginosa* may cause re-

occurring mild clinical cases. Exposure to massive numbers of *P. aeruginosa* is more prone to cause short-lived, severe clinical cases that can lead to death.

Can pseudomonas bacteria survive in antibiotics?

P. aeruginosa bacteria are very resistant to antibiotics. Multiple-dose bottles of antibiotics can easily become contaminated with *P. aeruginosa* when the same needle repeatedly is used to not only draw the antibiotic from the bottle but also to treat more than one cow. Once the bottle is contaminated, *P. aeruginosa* will survive within the antibiotic for an indefinite time. Cows treated with *P. aeruginosa*-contaminated drugs quickly become severe clinical cases. Cows should not be treated with “home-mixes” of antibiotics.

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

P. aeruginosa has a tendency to cause sudden outbreaks of clinical mastitis in several cows within a few days despite no apparent changes in weather or management techniques. Acute cases of mastitis with marked swelling of the udder; high body temperatures (105 –107 F) and abnormal, watery milk that contains flakes, clots or blood will be part of the outbreak. In addition, infected cows may show severe signs of toxemia and many animals die despite aggressive treatment. Many cows that are saved are left unfit for productive use. Note that these signs are consistent with infections caused by coliforms and other organisms and, therefore, are not a clear indication of *P. aeruginosa* infections.

Depending on the exposure dose, other suggestive signs might include:

- Infections that are totally resistant to antibiotic therapy.
- Recurring chronic clinical infections.
- Toxic mastitis as described above.
- Multiple quarter infections.
- High PI counts.
- An increase in the severity of quarter infections following intramammary treatment from multiple dose bottles of antibiotics.
- A major increase in non-clinical (increased BTSCC and DHI SCC) and clinical infections following the use of a new teat dip or a new mix of a concentrated dip.

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

Clinical signs will not pinpoint the exact bacteria causing mastitis. The first step is to determine what bacteria are responsible for the new infections. Working with your veterinarian, aseptically collect milk samples for culture tests from at least 10 to 20 lactating cows. Collect milk samples from cows that have somatic cell counts greater than 200,000 (DHIA linear score 4 or higher) with a CMT (California Mastitis Test) reading of a 1, 2 or 3 in one or more quarters or that may have symptoms of clinical mastitis. Since *P. aeruginosa* is resistant to therapy, cows that have been treated with antibiotics can be tested by milk culture. However, non-treated cows are preferred for culture purposes..

The milk samples should be submitted to a qualified laboratory that follows the National Mastitis Council Laboratory guidelines. Inform the laboratory that you suspect *P. aeruginosa* infections.

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

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

Water supplies on your dairy should be checked through culture tests for the presence of *P. aeruginosa*. Potential water sources to test include the well, water used to wash milking equipment water used in sprinkler pens and water used to mix concentrated teat dips. *P. aeruginosa* has been cultured from pre-heaters, hot water heaters and water softeners. Your county public health department, state department of agriculture, milk cooperative or your state animal health diagnostic laboratory should have facilities and equipment to culture water sources. Ask that the water sample specifically be tested for pseudomonas and, in particular, *P. aeruginosa*. Other environmental sites that harbor high numbers of *P. aeruginosa* are stagnant ponds, low wet areas, waste feed and dirt lots.

If well water or wash water are contaminated with *P. aeruginosa*, all water sources can be shock-treated with chlorine to eliminate the presence of *P. aeruginosa*. Depending on the level of pseudomonas present it may require several chlorine treatments to purge the well or wash water of pseudomonas. Any rubber hoses should be replaced as well as older hot water heaters or similar devices.

Water sources on your farm should be tested or cultured every 6 months (minimum) or more frequently to monitor the presence of pseudomonas. The farm water should not be used to wash teats and udders or used to mix concentrated dips unless tested pseudomonas-free. Pre-dipping can be used to wash or prep teats in place of water.

What effect will dry cow antibiotic treatment have on *P. aeruginosa* infections?

Dry cow antibiotic treatment should be continued in your herd using commercially prepared, single use dry cow tubes along with good infusion technique. However, do not expect any change in the *P. aeruginosa* situation within your herd due to the resistant nature of these bacteria. Discard any multiple dose bottles of antibiotics or drugs that you may have on hand. Dry cow antibiotic tubes should not be placed in a bucket of warm water to warm the tubes during very cold weather, especially on a dairy that is experiencing a *P. aeruginosa* problem. The water may be the contaminating source causing the problem.

Is there any relationship between pseudomonas infections and the type of milking equipment used?

There are no research studies indicating a casual relationship between *P. aeruginosa* infections and milking equipment. As with other types of mastitis, faulty milking machine function such as excessive liner slippage or pulsator failure can potentially result in teat end damage that can lead to an increased risk of infection. Using common (dirty) washrags or sponges and wet milking of cows can also increase the potential of infection.

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

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

- Fence off any ponds or water drainage areas on your dairy.
- Take steps to remove areas on the dairy where runoff water or waste feed tend to collect.
- Test the water supply periodically especially when sprinkler pens are used or dairy water is used to mix concentrated teat dips.
- Replace wash hoses and spray nozzles at least once a year.
- Insure that iodine concentration in udder wash or back flush units remains above 25 ppm.
- Don't use common washrags or sponges to prepare udders and teats for milking.

- Do not apply a milking unit to wet and dirty teats.
- Thoroughly wash teat dip applicators after each milking.
- Use commercially prepared antibiotics that are packaged in single use tubes.
- Use single use teat cannulas when administering intramammary antibiotics to cows. If stainless steel cannulas are used, sterilize them by boiling.
Store clean cannulas in clean alcohol.
- Monitor the level of mastitis within your herd through routine somatic cell count programs such as the DHIA linear score report.
- Seek the aid of your local veterinarian to set up a mastitis control program.
- Wash and sanitize teat plugs that used when milking cows with three or less functional quarters.

Will the use of teat dips in my herd prevent *P. aeruginosa* infections?

It is not likely. Germicidal teat dips are not effective against Gram-negative bacteria such as *P. aeruginosa*. However, the use of a good germicidal post-dip will prevent infections caused by Gram-positive bacteria.

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