

Pathogens in Manure – Strategies to Prevent Infections

John H. Kirk, DVM, MPVM
Extension Veterinarian
School of Veterinary Medicine
University of California Davis, Tulare

In recent times there has been a lot of attention paid to manure with respect to environmental stewardship, particularly in the California Dairy Quality Assurance Program nutrient management seminars. These programs have been of great benefit to dairymen. However, it is well to remember that the same manure that carries nitrogen, phosphorus and potassium may also be carrying potential pathogens. The focus of this article is on these pathogens and controlling the risk of exposure to dairy livestock.

The potential pathogens that may be found in the manure of cattle are the bacteria E coli O157, Listeria, salmonella, Mycobacterium paratuberculosis as well as the protozoan parasites Cryptosporidium and Giardia. Each of these pathogens can be found in livestock manure under fairly specific conditions as shown in Table 1. Knowing these shedding patterns allows for prevention and control of these diseases that might be carried in manure. It is well to keep in mind that these infections spread from one animal to another animal primarily by the fecal-oral route. Usually this means that manure containing the pathogen contaminates the feed of another animal in sufficient quantity to cause infection in the susceptible animal. Some pathogens like that which causes hairy heel warts merely have to come in contact with the feet of a susceptible animal to cause clinical disease.

Here are some strategies to break the fecal-oral cycle on your dairy.

1. Construct your manure flush alley system so that it carries the manure away from the most susceptible animals on your dairy. This means that the flush alley should slope downhill away from the young calves and towards the older, more immune cows. Fresh cow and hospital cow pen manure should not flow past the young stock on its way to the lagoon.
2. Flush systems under calf hutches should be controlled to prevent aerosols of pathogens up into the hutches as it cleans the manure below the calves.
3. The turbulence of the flush water should be controlled so that it does not enter the feed bunk either overtly by flooding or by aerosol.
4. Recycling flush water is the same as recycling the pathogens.
5. Calves are at high risk of infection for M. Paratuberculosis, Johne's Disease, at birth. Great care should be taken to provide clean, manure-free calving pens. All calves should be immediately removed from the calving pens as soon as they

are discovered to prevent them from suckling on dirty udders and teats. It is helpful to re-bed calving pens between calvings.

6. Feed bunks and water troughs should be constructed so as to prevent contamination by manure.
7. Shared feed bunks and water troughs should be avoided.
8. Boots worn by dairy workers should be thoroughly washed to remove all manure and then disinfected when moving from one location to another on the dairy. This is particularly important when moving from a high risk area (calf hutches or pen, calving pen, fresh cow pen or hospital pen) to another area.
9. Avoid using the same equipment to handle manure and feeds.

In summary, most of these bacteria and protozoan parasites spread from an infected animal through contaminated manure to another animal. Dairymen should use any strategy that will break this cycle of spread. Controlling these animal diseases will also help to reduce the hazard of market cows going to slaughter with potential human food-borne pathogens.

Table 1. Conditions when dairy livestock may be shedding potential pathogens in their manure.

Potential Pathogens	Fecal Shedding Patterns
E coli O157	Less than 1% of cattle; sporadic shedding in cluster of animals; highest in calves 1-2 months after weaning off milk
Listeria	Shedding induced by calving or transportation stress; often associated with poorly ensiled cattle feeds
Salmonella	Calves 1-3 months of age with diarrhea; some chronic cow shedders; probable increase in shedding at calving; hospital pens
M. Paratuberculosis	Mature cows with chronic diarrhea; sporadic with subclinical infections
Cryptosporidia	Milk-fed dairy calves 1-4 weeks of age are primary shedders
Giardia	Few calves with young calf diarrhea