Western Dairy News
for the West, about the West, from the West
November 2004
Volume 4, No. 9

Manure and antibiotic contamination

By Jessica G. Davis
Professor and Extension Soil Specialist
Colorado State University

Low levels of antibiotics have recently been detected in surface water bodies such as rivers and lakes, around the country. Is this going to become an environmental crisis for the American dairy industry? The answer will depend, in part, upon whether dairy antibiotic use contributes to this contamination. There are actions dairy producers can take to minimize this hazard. The purpose of this article is to inform producers about this area of concern and to provide some suggestions for how to avoid potential problems with antibiotic contamination of the environment.

At this point, the sources of the antibiotics detected in these studies have not been identified. They could have either human, urban sources and/or veterinary, agricultural sources. Could dairies be a source of antibiotics in surface water?

Sampling found residues

Colorado State University recently sampled seven dairy lagoons and seven dairy manure stockpiles and analyzed them for several antibiotic classes. The lagoon samples ranged from non-detectable levels to 17, 17, and 19 parts per billion for the tetracyclines, sulfonamides, and macrolides. The solid manure samples also ranged from non-detectable levels to 5,130, 46, and 5 parts per billion of tetracyclines, sulfonamides, and macrolides.

Although results demonstrate the presence of antibiotics in dairy manure and lagoons, these antibiotic levels are quite low, less than 50 parts per billion, with the exception of one high measurement of tetracyclines in solid manure.

Knowing that antibiotics have been found in water bodies and in dairy manure sources, the question remains: can antibiotics be transported from dairy manure and wastewater storage areas to water bodies?

We have begun transport studies to evaluate runoff and leaching of antibiotics, but at this point there are many unanswered questions. There are many potential sources including pharmaceutical production facilities, wastewater treatment plants, feed mills, seepage from wastewater lagoons, or runoff from livestock operations or manured fields.

In addition to identifying contamination sources, we need to know whether the antibiotic levels measured in water bodies are high enough to have negative environmental impacts. In general, most measured concentrations have been well below (10 times lower) the levels that have been shown to be toxic to standard testing organisms.

If dairies and other livestock operations are indeed a source of antibiotic contamination of water bodies, then it will be important to know what manure management decisions can be made to hasten the degradation of antibiotics and limit their potential negative impacts.

There are some exceptions to this general observation, but these are mostly related to antibiotics in manure itself and in soil where manure is applied, rather than in water sources.

In addition to direct toxicity effects, antibiotics in the environment could lead to the development of antibiotic resistance, a critical concern as it relates to the efficacy of antibiotics in the treatment of disease.

This is not a new issue; in 1989, the National Academy of Sciences concluded that the use of antibiotics in animal feeding operations was seriously undermining the ability of antibiotics to protect human health. The World Health Organization called for a ban on routine feeding of antibiotics to livestock in 1997.

Scientists are researching this area to determine whether antibiotic resistance develops in surface water bodies where antibiotic concentrations have been documented.

If dairies and other livestock operations are indeed a source of antibiotic contamination of water bodies, then it will be important to know what manure management decisions can be made to hasten the degradation of antibiotics and limit their potential negative impacts.

Scientists are currently evaluating treatments such as composting, lagoon aeration, and phytoremediation in order to be prepared to give producers solid recommendations about management options to limit the spread of antibiotics present in the environment.

Antibiotics that are commonly used in livestock production have been found in surface water bodies. What are the sources of contamination? Are the concentrations high enough to cause harm to humans or ecosystems? If the sources include dairies or other livestock operations, what can be done to prevent further contamination?

As scientists seek answers to these questions, there are things dairies can do in the meantime. Following Best Management Practices (BMPs) for manure nutrients will also reduce the potential for contamination of water bodies with antibiotics. Ask yourself these questions to be sure you are following BMPs:

- Is all of the runoff from your dairy (except for

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clean roof runoff) contained in your runoff storage pond? Or does some leave your property and enter ditches or creeks?

• Are your wastewater lagoons designed, built, and maintained properly?

• Are your lagoons lined to prevent seepage?

• Do you inspect the lagoon berms regularly to look for cracks, rodent burrows, bulges, or sink holes that may be signs of a damaged liner?

• Do you keep the lagoon water level below the marker (identified with a staff gauge) so that it can hold runoff from a 25-yr, 24-hr storm at all times?

• If you furrow irrigate with wastewater, do you collect the tailwater?

• If you sprinkle irrigate with wastewater, do you apply at a rate that the soil can soak in to avoid runoff?

By following these runoff and lagoon management practices, dairies can reduce the risk of antibiotic runoff into surface waters.

Benefits of rumen fluid after DA surgery

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

Displaced abomasums in dairy cows result in increased treatment costs, delayed or decreased peak milk production and increased culling risk.

There are a several methods utilized for the correction of a displaced abomasums in dairy cows such as rolling, roll and tack, and surgical repair. Each has advantages and disadvantages. However, the method of choice is often surgical correction, as it results in fewer relapses despite the cost.

Once the abomasums is replaced to its normal position, the metabolic upsets should also be corrected to ensure a rapid recovery. In addition to the commonly used medical treatments with fluids, calcium solutions, and propylene glycol, it has been suggested that rumen transfaunation – otherwise known as the administration of oral rumen fluid from one apparently well cow to the sick cow – may be of benefit in hastening the recovery in milk production.

A recent study in the *Journal of the American Veterinary Medical Association*[1] investigated the effect of giving rumen fluid after surgical correction of LDAs. In the study, naturally occurring LDAs in 20 older cows (2+ lactations) were surgically corrected by omentopexy in the veterinary teaching hospital at UC Davis.

Cows received 10 litres of fluid

Right after surgery and on the day after surgery, half of the cows got 10 liters of rumen fluid given by stomach tube. The rumen fluid had been collected from one of two donor cows that had rumen fistulae. The fluid was collected from five locations within the rumen of the donor cow and given to the surgical cows within 20 minutes of collection. Control cows received 10 liters of lukewarm tap water instead of rumen fluid.

Cows in both groups ate more dry matter on days two through five, compared to day one after surgery. However, cows that received rumen fluid had significantly greater daily dry matter intake each day following surgery compared to the control cows that received tap water. Cumulative dry matter intake at day five was also greater for the rumen fluid treated cows compared to controls.

The rumen fluid treated cows also produced more milk each day and cumulatively by day five compared to the control cows. The cumulative five-day total for the rumen fluid treated cows was 59 pounds greater compared to the control cows.

The benefits of administration of rumen fluid shortly after LDA surgery may be due to increased feed intake leading to improved milk production. There may also be benefits from changes in rumen pH and rumen fluid volatile fatty acids. The optimal amount of rumen fluid to administer and the frequency of administration was not determined in this study.

The take home message seems to be that giving rumen fluid from apparently healthy cows to those recovering from LDA surgery will speed up recovery and improved their milk production.

[1] *Rager KD, George L, House JK, DePeters EJ. Evaluation of rumen transfaunation after surgical correction of left-sided displacement of the abomasums in cows. JAVMA 225:915-920, 2004.*

Always be careful when inoculating livestock

By Helen Schledewitz
Department of Environmental and Radiological Health Sciences
Colorado State University

Medicating livestock is a common practice on dairies, farms and ranches. Accidental injection to you, a family member, or coworker can occur while performing this task.

Most vaccinations and medications given to livestock are not potentially harmful, but some are toxic to humans. Other potential health effects resulting from a needle stick include a localized infection caused by bacteria or other foreign material, or a reaction to a vaccine, active ingredient, or a carrier material.

Everyone must be knowledgeable about the substances being used and exercise caution during the inoculation process. By using precautions and common sense the potential for accidental injection can be minimized. The following precautions are recommended:

• Always read the enclosed label instructions, Material Safety Data Sheet (MSDS), or original label that comes with any medication BEFORE using it. If the medication does not have enclosed label instructions or a MSDS, call the company and ask for a copy of the either the enclosed label instructions, MSDS or original label.

The enclosed label instructions, MSDS and/or the original label will have warning information to advise you on what precautions you need to take. Dairy managers should supply the information contained in the label or MSDS to their workers in the appropriate language.

• Properly restrain livestock in a chute before vaccinating or injecting medications.

• Do not use automatic powered syringes when injecting "human toxic" medications.

• Do not carry "loaded" syringes in your pants or coat pockets.

• Do not leave "loaded" syringes on the seat of a vehicle.

Western Dairy News is published as a service to people interested in the health and welfare of the Western dairy industry. Archives of this publication may be found at:
http://animalscience-extension.tamu.edu/dairy/wdn.html

For further information contact:
Dr. Ragan Adams, Editor
ILM, CSU-VTH
300 W. Drake Road
Fort Collins, CO 80523
970-297-0371
radams@lamar.colostate.edu

• Always load the syringe in the work area.

• Cap the syringe if it is not going to be used immediately.

• Be aware of your surroundings; look for slip, trip, and fall hazards.

• Watch your livestock for signs of being "spooked" and never carry a "loaded" syringe around unrestrained livestock.

• Dispose of syringes or needles in a hard plastic container that has a tight lid and label the container "SHARPS". This will warn everyone what is in the container and help prevent children from accidentally handling the used syringes.

• If re-using needles and syringes, disinfect both the syringe and needles after each use.

• Wash your hands thoroughly after handling any medication or vaccine.

• Post the number to your local poison center by the house and barn telephone.

• If you do accidentally inject yourself, inform your supervisor or co-worker and call your local poison center IMMEDIATELY. Wash the area well with clean water.

• If you are using a medication that has a potential for "human toxicity" or does not have an antidote, talk with your veterinarian to see if there is a different medication you can use. If not, ask your veterinarian for tips on how to handle the medication.

• If using a medication with known "human toxicity", do not tent the skin with one hand while injecting with the other hand. Sudden animal movements can easily lead to accidental self-injection.