DAIRY VETERINARY NEWSLETTER

September 2012

Drought Year Issues Include Aflatoxin Testing and Nitrate Testing of Feed

Aflatoxins in corn and other feed crops during drought conditions

2012 is shaping up to be one of the very worst droughts in the recorded history of rainfall in North America. One of the many problems that can result from drought is aflatoxin in corn or sometimes in other feeds fed to dairy cattle. Beginning on August 31, 2012, the state of Iowa ordered all milk processors to screen all tanker loads of milk for aflatoxin, with testing to "continue indefinitely". There are no reports yet that aflatoxin has been found in any loads of Iowa milk. Aflatoxin is a concern this year across the U.S., including in many Midwestern and Great Plains states where many Utah dairy farms purchase some of their feed from.

According to the Ohio State C.O.R.N. Newsletter 2012-26, "Drought-stressed corn is more susceptible to infection by *Aspergillus flavus* [note: sometimes the cause is *Aspergillus parasiticus*], an ear rot fungus that produces a very potent group of carcinogenic toxins called aflatoxins. However, the fungus can infect grain and produce aflatoxin under a wide range of conditions: temperature between 54 and 108° F; kernel moisture between 15-25% and relative humidity above 80%. But it should be noted that although *Aspergillus* ear rot is a good indicator of potential aflatoxin contamination, there are no guarantees that: **1)** moldy ears will be contaminated with aflatoxins; **2)** ears without visual signs of fungal infection will be free of aflatoxins, and **3)** the amount of *Aspergillus* ear rot will provide an accurate measure of the levels of aflatoxin contamination. In addition to weather conditions, the levels of ear rot development and toxin contamination depend of the strain of the fungus, with some members of the *Aspergillus flavus* group being capable of producing more or less toxins than others.

Producers should start checking for *Aspergillus* ear rots by stripping back the husks and examining the ears of 80-100 plants sampled from across the entire field for a yellow-green or gray-green mold. Since not all ear rots are associated with mycotoxin contamination, it is important to properly identify ear rots before harvest in order to determine if mycotoxin will be a concern and to make adequate marketing and storage decisions. *Aspergillus* ear rot tends to be more severe in insect- or bird-damaged fields or sections of a field and is much easier to identify in the field than in harvested grain. Samples from suspect fields should be sent to an approved laboratory for testing to determine whether aflatoxins are present and whether they exceed thresholds established by the U.S. Food and Drug Administration."

USDA regulates aflatoxin levels allowed in finished livestock feed and in corn for human consumption. Regulations vary by species but the lowest concentration allowed is in food for humans and dairy cattle, at 20 parts per billion.

Aflatoxicosis in dairy cows and calves

Aflatoxin can affect other types of feed besides corn, and can affect calves more readily than cows fed any kind of feed contaminated with aflatoxin. Ensiling does not destroy aflatoxins; corn silage can therefore be contaminated with them. Clinical signs of aflatoxicosis are generally more pronounced in younger animals than in mature cows. However, dairy animals of any age consuming excessive aflatoxins can exhibit:

- Reduced feed intake
- Reduced growth rate
- Depression
- Weight loss
- Rough hair coat
- Diarrhea (usually mild)
- Bruises (may only be evident post-mortem under the hide)
- Subcutaneous hemorrhage (only evident post-mortem under the hide)
- Abnormal estrous cycles (too short or long)
- Abortions
- Rectal prolapse

Definitive diagnosis of aflatoxicosis in animals is difficult. The key to avoiding it is testing feed levels, and ideally feeding aflatoxin-free feed. However, in drought conditions like this year, feeding some aflatoxin can be virtually impossible to avoid.

As noted earlier, lactating dairy cows should not be fed more than 20 ppb of any aflatoxin (most common types are B1, B2, G1 and G2), and calves should not drink any milk from cows fed more than 20 ppb. If a farm has aflatoxin detected as a reason to suspend milk shipment, the temptation to use that discard milk to feed dairy replacement or veal calves should be resisted.

Nitrate poisoning in drought conditions

Drought conditions are well known to increase risk of nitrate poisoning in corn, oats and barley. However, according to North Dakota State University's "Nitrate Poisoning of Livestock", http://www.ag.ndsu.edu/pubs/ansci/livestoc/v839w.htm, a much longer list of plants can accumulate nitrate:

Table 1. Common plants known to accumulate nitrate. (N. Dakota St. Univ.)

Crops	Weeds
Barley	Canada Thistle
Corn	Dock
Flax	Jimsonweed
Millet	Johnson Grass
Oats	Kochia
Rape	Lambsquarter
Rye	Nightshade
Soybean	Pigweed
Sorghum	Russian Thistle
Sudangrass	Smartweed
Sugar beets	Wild Sunflower
Sweetclover	
Wheat	

Clinical signs of nitrate poisoning in livestock

Some signs of nitrate poisoning are relatively distinctive, appearing 30 min to 4 hours after consuming toxic levels of nitrate. According to multiple sources, they include:

- chocolate brown mucous membranes, sometimes bluish/cyanotic instead of brown
- rapid/difficult breathing
- noisy breathing
- rapid pulse (150+/min)
- abdominal pain, including tucked abdomen
- frequent urination
- salivation, bloat, tremors, staggering
- weakness, coma, death
- dark "chocolate-colored" blood
- abortion 10-14 days after first consumption of toxic nitrate levels if cows survive

Treatment of nitrate poisoning in ruminants

Methylene blue given slowly I.V. is the classic treatment for nitrate poisoning. The concentration of methylene blue is described between 1% and 4% in isotonic saline, with the dose ranging between 1 to 4 mg/lb (2 to 8 mg/kg) of body weight. However, there are occasional references to much higher doses. Methylene blue is not approved for use in food producing animals, but remains the major therapy described. I do not know of a practical alternative treatment for food animals.

Nitrates in feed crops

Laboratory samples for nitrate poisoning should be submitted with cold packs or other means of keeping them cold, according to Dr. Jeff Hall, Veterinary Toxicologist at the Utah Veterinary Diagnostic Laboratory (UVDL). This inhibits bacterial breakdown of nitrates which leads to falsely low nitrate values. The UVDL has indeed found some of the feed samples submitted this year to have very high nitrate concentrations, well above what are considered lethal levels if fed.

For the most up to date information regarding nitrate testing in Utah, contact the UVDL, http://www.usu.edu/uvdl/

When feedstuffs are high in nitrate, the most common and practical solution is to dilute them with other feeds low in nitrate. The goal is to have the ration less than 2000 ppm (0.2%) nitrate.

New FSIS Testing for More Drugs in Meat of Dairy Cattle

This was a subject of considerable discussion at the recent Milk Quality and Udder Health Committee meeting at the American Association of Bovine Practitioners conference. The USDA FSIS is now testing 52 analytes, "including NSAIDS, pesticides, and growth implants" as well as antibiotics, in meat from cull dairy cows. The longstanding practice of targeting cull cows of dairy appearance, especially Holsteins, for a higher percentage of meat residue carcass testing continues.

The table on the next page is from the Federal Register Vol. 77, No. 130. The "Bovine kidney" column was explained as the tolerance level (µg/g or ppm). If there is no tolerance in the table, finding any detectable residue

Analytes and Applicability Level
[([mu] g/g) for MRM](Multiple Residue Method)

Analyte	Bovine kidney	Porcine kidney	7-plate bioassay(ppm)
Ampicillin	0.02	0.02	0.05
Beta-dexamethasone	0.05	0.05	.....
Cefazolin	0.2	0.2	.....
Chloramphenicol	0.006	0.006	20
Chlortetracycline	1	1	0.05
Cimaterol	0.012	0.003	.....
Ciprofloxacin	0.025	0.025	.....
Clindamycin	0.05	0.05	.....
Cloxacillin	0.02	0.02	1.6
Danofloxacin	0.025	0.025	.....
DCCD (marker for Ceftiofur)	0.2	0.2	.....
Desthylene Ciprofloxacin	0.025	0.025	.....
Dicloxacillin	0.2	0.2	.....
Difloxacin	0.025	0.025	.....
Enrofloxacin	0.025	0.025	.....
Erythromycin A	0.05	0.05	0.25
Florfenicol	0.1	0.1	.....
Florfenicol Amine *	.....	0.15	.....
Flunixin	0.0125	0.0125	.....
Gamithromycin	0.05	0.05	.....
Lincomycin	0.05	0.05	1.5
Nafcillin	0.2	0.2	.....
Norfloxacin	0.025	0.025	.....
Oxacillin	0.2	0.2	.....
Oxyphenylbutazone *	0.05	.....	
Oxytetracycline	0.5	0.5	0.4
Penicillin G	0.1	0.1	0.05
Phenylbutazone *	.....	0.05	.....
Pirlimycin	0.25	0.25	.....
Prednisone	0.05	0.05	.....
Ractopamine	0.003	0.003	.....
Salbutamol	0.006	0.003	.....
Sarafloxacin	0.025	0.025	.....
Sulfachloropyridizine	0.05	0.05	.....
Sulfadiazine	0.05	0.05	.....
Sulfadimethoxine	0.05	0.05	.....
Sulfadoxine	0.05	0.05	.....
Sulfaethoxypyridazine	0.05	0.05	.....
Sulfamerazine	0.05	0.05	.....
Sulamethazine	0.05	0.05	150
Sulfamethizole	0.05	0.05	.....
Sulfamethoxazole	0.05	0.05	.....
Sulfamethoxypyridazine	0.05	0.05	.....
Sulfanilamide *	0.1	.....	
Sulfanitran	0.05	0.05	.....
Sulfapyridine	0.05	0.05	.....
Sulfaquinoxaline	0.05	0.05	.....
Sulfathiazole	0.05	0.05	.....
Tetracycline	0.5	0.5	0.4
Tilmicosin	0.12	0.24	0.5
Tylosin	0.1	0.2	1
Zearalanol *	.....	0.012	.....

* This analyte is not applicable for bovine kidney in the MRM.

is a violation. A prominent example of this that was obviously of interest to many practitioners there was dexamethasone (as opposed to beta-dexamethasone); it was said that any residue is a violation. I thought it was interesting that some drugs banned for food animal use have tolerances in the table.

Looking through the table, oxyphenylbutazone and sulfanilamide have the notation, "This analyte is not applicable for bovine kidney in the MRM" (Multi-Residue Method). Why this is so when they do have a bovine kidney tolerance in the table is not clear.

According to the Federal Register, "The new multi-residue method (MRM) being implemented by FSIS provides significant improvements: (1) It can screen for a variety of analytes, not just antibiotics; (2) the method can be validated at levels appropriate in relation to tolerances; (3) because of the power of mass spectrometry, it can clearly distinguish individual analytes, even if multiple drugs are present in the same sample; (4) unknown microbial inhibition responses would be mitigated; and (5) the time and personnel needed to obtain results is reduced."

How can dairy veterinarians recommend new meat (or milk) withdrawal times with the new testing?

The consensus including from veterinarians who have used the service was that the answer is the Food Animal Residue Avoidance Databank (FARAD). Threatened by budget cuts with extinction several years ago, FARAD appears to be indispensable as far as new residue time recommendations. However, it again faces possible complete elimination in the 2013 proposed federal budget. FARAD's website is: http://www.farad.org/

Again, the example drug discussed for some time was dexamethasone. According to FARAD, one dose of dexamethasone at 0.1 – 0.4 mg/kg IM has a meat withdrawal time of 10 days. Several examples on the FARAD website of dexamethasone administered IV or IM, multiple doses, resulted in recommended meat withdrawal time of 10 days after final dose. A practicing veterinarian stated at AABP that in response to a specific question to FARAD, one dose of IM dexamethasone (dose was not specified) resulted in a recommended milk withholding time of 1 day. Veterinarians should submit their specific dosage information on a case-by-case basis to FARAD for recommendations regarding withdrawal times.

Flunixin meglumine withdrawal information on the FARAD website says that for a single dose of up to 1 mg/lb (2.2 mg/kg) of flunixin meglumine, meat withdrawal time is 30 days, milk withholding time is 72 hours. There is also a cautionary statement that before milk is shipped or the cow is sold for meat, testing is strongly advised.

There was also considerable discussion in two committee meetings that there is still a mentality among many dairy producers that if a drug is not tested for in milk or meat, or is perceived to not be tested for on most days at the milk plant, then it is okay to use it because one is not likely to have a residue violation. Considering human health, consumer attitudes, and increased regulatory testing for more classes of drugs, this attitude must change but the change likely will not come easily (I can say that it has not come easily since I began riding on dairy calls with a veterinarian 36 years ago). Failure to change will likely eventually result in even more regulation and/or banning of drugs for use in food animals. Frustrating as the pace of change can be, the dairy veterinarian is still the single most highly regarded source of animal health and disease information. Veterinarians will be an important influence in continuing to change producers' attitudes regarding drug use in dairy animals.

5600 Old Main Hill
Logan UT 84322-5600

Please let us know your comments and also suggestions for future topics. I can be reached at (435) 760-3731 (Cell), (435) 797-1899 M-W, (435) 797-7120 Th-F or David.Wilson@usu.edu.

David Wilson, DVM
Extension Veterinarian