UK UNIVERSITY OF KENTUCKY College of Agriculture

Kentucky Dairy Notes

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Common Questions Regarding Aflatoxin in Corn Grain and Silage

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Question #1: I have heard that aflatoxin could be a concern in this year's corn crop. What is aflatoxin and why is it a concern for dairy producers?

Answer #1: Aflatoxin is a mycotoxin produced primarily by the fungus or mold, *Aspergillus flavus.* Alflatoxin is a family of compounds that are considered very toxic and carcinogenic. The FDA limits the amount of aflatoxin that can be found in lactating dairy cow feed to 20 parts per billion (ppb) and to 0.5 ppb in milk as aflatoxin M1. Generally, 1 to 3% of the aflatoxin found in the diet of lactating dairy cows will come through in the milk. The amount of aflatoxin allowed in feeds for lactating dairy cows and young dairy or beef cattle (action level of 20 ppb) is lower than non-lactating, breeding beef cattle (action level of 100 ppb).

Question #2: I have seen mold growing on ears of corn in the field. Should I be concerned?

Answer #2: Many different molds can grow on ears of corn. Some of these molds can produce mycotoxins, others do not. Aflatoxin is only one of hundreds of mycotoxins produced by molds.

Aspergillus ear rot is a fungal disease resulting in an olive-green, powdery mold generally growing on the tip of the ear, but it may be located all the way to the base. This fungal disease is caused mainly by *Aspergillus flavus* and it can produce aflatoxin. The presence of the *A. flavus* does not necessarily mean that the kernels will contain aflatoxin. *A. flavus* tends to attach kernels when temperatures are 80 to 100°F, in high humidity and with high nighttime temperatures during grain fill and pollination. These conditions fit our weather pattern this past July and August. This does not mean that Kentucky grown corn does or does not contain aflatoxin, just that it is possible that it could contain aflatoxin.

Aspergillus flavus grows under the husks by growing on the yellow-brown silks. Researchers who study Aspergillus ear rot report that kernel development is needed for the growth of Aspergillus mold. Thus, in corn plants which did not pollinate (those harvested as corn silage without ears), the risk for aflatoxin appears to be low. Fields should be scouted for this disease prior to harvest as grain or silage to assess the possibility of potential aflatoxin problems. For more information on detecting this mold, please refer to University of Kentucky Grain Crops Update, "Scouting Corn for Aspergillus Ear Rot". (http://graincrops.blogspot.com/2012/09/scouting-corn-for-aspergillus-ear-rot.html)

Question #3: Is milk tested for aflatoxin? Will I be shut off if my milk tests positive?

Answer #3: Yes, milk is routinely spot checked to make sure the amount of aflatoxin M1 is below 0.5 ppb. Milk testing above this level will not be sold for human consumption. The farm with the violation will not be able to sell milk until the milk tests under 0.5 ppb. In a research trial, aflatoxin appeared in the milk within hours of consumption and returned to baseline within 2-3 days after removal. At a farm level when aflatoxin is detected in the milk supply, the difficulty often is locating the feed source of aflatoxin in the diet, removing it, and waiting to be retested. Other factors, such as amount of aflatoxin in the diet, may impact clearance rates in milk.

Question #4: I have heard that a load of corn can be rejected by an elevator for possible aflatoxin, but if the farmer gets in line again with the same load, it may test negative. How can that be?

Answer #4: Great variation exists in sampling even when proper sampling procedures are followed. Contaminated kernels are not uniformly distributed throughout the load. One sample may contain kernels of corn grain from a hotspot in the load, whereas the next sample does not. In addition, the amount of aflatoxin is measured at very low amounts at the level of parts per billion (this would be equivalent to one second in 32 years). Both of these factors lead to great variation in testing for aflatoxin.

For example, the table below shows the results for 10 different samples for 3 different lots of peanuts. Each sample within each lot consisted of 10 probefuls of peanuts with at least 10 lbs of peanuts collected, the entire sample was then ground, 2 lbs sample collected from the 10 lb original sample, reground and tested. If the sample collected at the collection facility was above 20 ppb, the load would have been rejected. One can quickly see how different samples could give different action results of whether the loads was accepted or rejected. For more information on proper sampling procedures, please refer to University of Kentucky publication ID-59, "Aflatoxins in Corn". (http://www.ca.uky.edu/agc/pubs/id/id59/id59.pdf)

Table: Aflatoxin test results (parts-per-billion, ppb) in ten samples collected from each of three lots of peanuts. (Similar results could be expected if corn grain had been sampled.)

Sample	Lot A	Lot B	Lot C
1	0 ppb	0	0
2	0	0	3
3	0	0	5
4	0	0	9
5	2	0	32
6	4	3	49
7	8	8	87
8	14	26	91
9	28	52	127
10	43	70	168
Average	9.9	15.9	58.1

Source: University of Kentucky publication ID-59, "Aflatoxins in Corn". (http://www.ca.uky.edu/agc/pubs/id/id59/id59.pdf)

Question #5: Can I have my feeds tested for aflatoxin?

Answer #5: Aflatoxin can be found in not only corn grain but also cottonseed and peanuts. Various commercial and diagnostic laboratories are able to run laboratory tests on feed to measure the amount of aflatoxin and other mycotoxins , such as DON (also known as vomitoxin), T-2, zearalenone, or fumonisin. The cost for this analysis is generally greater than $25 for aflatoxin alone and more than $45 for a panel of mycotoxins. Proper sampling of the grain or forage in question is critical. However, also realize that molds tend to grow in pockets or on certain plants in the field and the sampling procedure may or may not detect the amount of aflatoxin at various locations, kernels, or pockets in stored feeds.

Question #6: Should I have my corn silage tested for aflatoxin?

Answer #6: Corn silage with corn grain potentially could be a source of aflatoxin and might be a factor in contributing greater than 20 ppb in the total diets for dairy cows. Corn silage harvested from plants without ears carry a low risk. Scouting fields ahead of harvest, if possible, is recommended. For fields already harvested, testing for aflatoxin in well-eared silage may be necessary. However, realize you are testing for very low quantities of aflatoxin, aflatoxin produced in the field is not be uniform across the field, and when sampling you may or may not sample the location where the aflatoxin is present. Unfortunately, there are no good solutions here.

Question #7: Will distiller's grains or corn gluten feed also contain aflatoxin if they were produced from corn with aflatoxin?

Answer #7: Yes, these feeds will actually be 3-fold or higher in aflatoxins and other mycotoxins than the corn grain they originated from. Removal of the starch tends to concentrate nutrients and mycotoxins.
Question #8: If I think I might have a problem, can I just add a mycotoxin binder to my cow's feed and not worry about the problem?
Answer #8: FDA considers the use of a product in this manner as a feed additive and as such they must have data submitted by the company regarding this purpose, review these data, and then approve this product for this intended use. To our knowledge, FDA has not approved any feed additives for use as binders of mycotoxins.

Revisiting Culling Decisions with Changing Market Conditions

Jeffrey Bewley

Culling decisions are one of the more difficult and complex decisions dairy producers make. Deciding when to cull a cow involves many economic and non-economic factors. Choosing when less productive cows should be culled is difficult. Too often, this decision is made solely on barn capacity or restrictions on how many cows we want to milk. Certainly, maintaining a minimum herd size is a valid reason for keeping cows when the bank dictates that barns should be kept full or for cash flow reasons. However, cows are often retained much longer than they should be. Keeping cows in the herd after production levels drop below feed costs results in significant losses and reduced profitability.

A simple way to examine culling decisions is to calculate the breakeven production level necessary to cover feed costs. At a minimum, a cow should cover the costs of the feed she is eating to remain in the milking string. A chart depicting breakeven milk production levels for varying feed cost and milk prices is provided below. As feed prices increase or milk prices decrease, the breakeven production level increases. For example, when milk prices are high ($25 per cwt.) and feed prices are low ($4 per cow per day), breakeven milk production level to cover just feed costs is only 16 pounds per cow per day. On the other hand, when feed costs are high ($10 per cow per day) and milk prices are low ($12 per cwt.), breakeven milk production level is 83 pounds per cow per day. With today's feed costs for many herds in the $8 to 10 per cow range with milk prices around $20 per cwt., breakeven milk production levels range from 40 to 50 pounds. As feed and milk prices change, dairy producers need to re-evaluate when cows should be culled. Although difficult to consider, if the majority of the herd produces less than the breakeven milk production level, it may be time to consider exiting the dairy business.

This method for calculating when to cull dairy cows only accounts for feed costs. Feed costs account for the largest percent of total costs (50 to 75%) but do not account for all costs. Thus, the true breakeven milk production level will be a few pounds higher than the levels in the table below and will vary considerably from farm to farm. Nevertheless, this serves as a quick reference guide for thinking about culling decisions because if a cow cannot even cover her daily feed costs, she may need to be culled or dried off early.

In practice, culling decisions also consider other factors. Probably the most important factor is whether the cow is pregnant. Another option for pregnant cows in late lactation producing below the breakeven milk production level is to dry them off early. One must also consider the costs of feeding her during the dry period, particularly if she will be dry for a long time. Another way of looking at when to cull a cow is something called a retention pay-off. With retention pay-off, the future income potential of a cow is calculated and compared to that of her potential replacement. The actual calculations for retention pay-off are fairly complex. Although Dr. David Galligan from the University of Pennsylvania has an excellent dashboard to calculate the retention pay-off for an individual cow in your herd (http://cahpwww.vet.upenn.edu/node/142). But, the concept is useful when thinking about culling a cow. For each cow, you should ask yourself "What is the future income potential of this cow compared to the next replacement heifer that will be brought into the herd." If the future income potential of the heifer is higher, the cow in question should be culled. This concept helps us see that culling decisions should be different for older cows than for younger cows as their future income potential is limited. The future

income potential of a pregnant cow in late gestation is much higher than that of an open cow. The future income potential of a non-lame, low SCC cow is higher than a lame, chronically high SCC cow.

The list of factors could go on and on. But, the important point to remember are: (1) milking cows should at least cover the costs of the feed they consume to be retained in the herd and (2) additional cow factors may help determine when to cull a cow accounting for her future income potential compared to that of her potential replacement.

Table 1. Breakeven milk production levels (pounds per cow) needed to cover daily feed costs for varying daily feed costs and milk prices.

Milk Price ($/cwt.)	Feed Costs ($ per cow per day)								
	$4	$5	$6	$7	$8	$9	$10	$11	$12
$10	40	50	60	70	80	90	100	110	120
$11	36	45	55	64	73	82	91	100	109
$12	33	42	50	58	67	75	83	92	100
$13	31	38	46	54	62	69	77	85	92
$14	29	36	43	50	57	64	71	79	86
$15	27	33	40	47	53	60	67	73	80
$16	25	31	38	44	50	56	63	69	75
$17	24	29	35	41	47	53	59	65	71
$18	22	28	33	39	44	50	56	61	67
$19	21	26	32	37	42	47	53	58	63
$20	20	25	30	35	40	45	50	55	60
$21	19	24	29	33	38	43	48	52	57
$22	18	23	27	32	36	41	45	50	55
$23	17	22	26	30	35	39	43	48	52
$24	17	21	25	29	33	38	42	46	50
$25	16	20	24	28	32	36	40	44	48

What is a “zero detectable level” of a drug and why is it important?

Michelle Arnold

The FDA has recently passed and enacted new regulations regarding illegal residues in meat and more stringent guidelines for certain classes of antibiotics. Included in these regulations is a new method for testing tissue samples called the multi-residue method or MRM. It is extremely accurate; it can distinguish individual chemicals even if multiple drugs are present in the same sample and boasts of faster turn-around times for results with fewer personnel requirements. It can also be validated (certified true) for specific levels of drugs called “tolerances”. This is important because the FDA establishes “tolerances” for drug residues in food animals which are the very smallest levels of a drug that will be considered acceptable if found in the meat. Tolerances are established by performing drug residue depletion studies on tissues after administering the drug or antibiotic exactly as described on the product label. This includes dose (how many cc’s), frequency (how many times administered per day), duration (how many days of therapy), route of administration (intramuscular, subcutaneous, intravenous, intramammary), and production class (bob veal, beef, dairy, steers, heifers, non-lactating dairy cattle). Many products are approved for beef and non-lactating (<20 months old) dairy cattle and, consequently, the FDA has established tolerance levels in these classes of animals. However, with a drug approved only for beef or non-lactating cattle, there is no established or acceptable tolerance level for that drug in dairy cattle, springing heifers, or dry cows. Therefore the “zero detectable level” must be reached to avoid a violative residue, no matter how tiny the amount of drug present.

What does this mean for dairy producers? It means if you are using a medication in a dairy cow that is only labeled for beef or non-lactating dairy cattle (for example: Nuflor, Micotil, Draxxin), you are using that drug in an extra-label manner. Because of this, you cannot use the meat withdrawal time printed on the label or the box as this meat withdrawal time only applies to the approved production class. The amount of time required for the detection level to reach “zero” is considerably longer and has not been measured. While the Food Animal Residue Avoidance Databank (FARAD) can give withdrawal recommendations to your veterinarian regarding extra-label use, they do not have the ability to project the “zero detectable level”. The new recommendations from FARAD generally range from a

60-90 day withholding period or more after administration of a drug that only requires 28 days to be acceptable for slaughter in a beef animal. Compounding the risk for dairy producers and veterinarians is the new methodology for drug residue screening which is far more accurate to a lower level than previously used methods.

What should you do to prevent residues?

1. Exercise extreme caution using drugs not approved for lactating cattle and consider avoiding their use altogether due to the unknown withdrawal times.
2. Only use drugs extra-label within a valid veterinary-client-patient-relationship and under the written direction of your veterinarian. Make sure withdrawal times are written and understood by all parties involved. Use a product approved for lactating dairy cows as your first treatment option.
3. Keep accurate treatment records and use an official animal identification method that is unique to the individual animal and cannot legally be tampered with or changed. Your written records are your best defense if accused of a residue violation. The more complete and accurate the records, the better.
4. Don't use prohibited drugs or aminoglycosides such as gentamicin in cattle. Extra-label use of the fluoroquinolones (Baytril or Advocin) is strictly forbidden. The cephalosporin class of antibiotics can only be used extra-label for a disease condition not listed on the package.
5. Do not cull recently treated cattle. Either hold the animal until she is healthy and free of drug residues or have her humanely euthanized. Remember at the slaughter facility, inspectors can order a test based on a suspicion that an animal or carcass contains residues.
6. If you are caught with a residue violation, get with your veterinarian and review the best management practices to help prevent a reoccurrence.
7. Veal producers should only use products that are approved in pre-ruminant calves. Avoid any products with the statement "not for use in calves to be processed for veal".

In summary, to prevent any type of illegal residue, the best practice is to follow label directions for all medications, vaccines, dewormers, and pesticides used on any animal intended for food (meat or milk). Work with your veterinarian when the need arises to go outside the established boundaries of approved label procedures. Keep the most accurate written records possible and use official animal identification as your best weapons to guard against false accusations of residues. Finally, do not cull recently treated animals if they do not return quickly to the productive state you were working towards. Instead, allow them time to return to a reasonable level of health and completely drug-free before culling or exercise the option to humanely euthanize her on the farm. Scrutiny of our products sent to market is only going to increase so we must have appropriate management practices in place to prevent illegal residues.

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Webinar: Can I Really Prevent My Cows from Becoming Lame?
Date: October 8, 2012, 12:00-1:00 PM Central Time **Speaker:** Dr. Ernest Hovingh

Lameness is a painful, costly, common and complex problem - a problem with which too many dairies struggle. Dealing with a lameness problem not only involves identifying and dealing with lame cows in the herd, but trying to prevent new cases from occurring in the first place. This webinar will focus on a number of best management practices that farms can utilize to try to minimize the number of cows that become lame - even when milk prices and profit margins are low.

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North American International Livestock Exposition
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UK Precision Dairy Showcase
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