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Silage Day

University of California Cooperative Extension

Modesto, California

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Silage Day Agenda

9:15a – Registration begins

9:45a - Welcome & introductions

10a - UCCE Silage Update

Jennifer Heguy, UCCE Dairy Advisor

10:20a - Timing Harvest for Silage Quality

Dr. Heidi Rossow, UC Vet Med, Dairy Nutrition & Nutrient Management

10:45a – What's the Value of High Quality Corn Silage?

Dr. Noelia Silva-del-Rio, UC Dairy Production Medicine Specialist

Break – Visit with meeting sponsors

11:30a - Feeding Silage for Production & Animal Health

Dr. Peter Robinson, UC Dairy Nutrition Specialist

Lunch – Visit with meeting sponsors

2p –Adjourn

UCCE Silage Research Update

Jennifer Heguy,
UCCE Dairy Advisor
Stanislaus & San Joaquin Counties

Silage Survey

In summer 2009, a feed management survey was mailed to dairy producers in Tulare, Stanislaus, and San Joaquin Counties; the first, third and seventh largest dairy counties in California, respectively. The objective of this study was to describe current feed management practices, including silage management, on California's Central Valley dairies. Response rate was 16.9%; 120 of 710 dairy farms responded to the survey. Herd size ranged from 160 to 6,600 cows, with a median herd size of 950 lactating cows.

Responses suggest there are two key areas where improvements can be made with regard to silage management: 1) surface spoilage, and 2) sizing of silage structures.

Surface spoilage. Reported top layer spoiled forage ranged from 0 to 20 inches. Twenty-five percent of dairies reported less than 3 inches of spoiled feed, 53.9 % reported 3 to less than 6 inches, 15.7 % reported 6 to less than 9 inches, and 4.9% reported at least 9 inches of spoiled feed (**Figure 1**). Reducing surface spoilage of forage should be a priority, and ensuring adequate packing, prompt covering, and sufficient weighting of plastic are a good place to start. Of the 120 respondents, only one producer indicated that silage was not covered (20 inches of spoiled top layer forage).

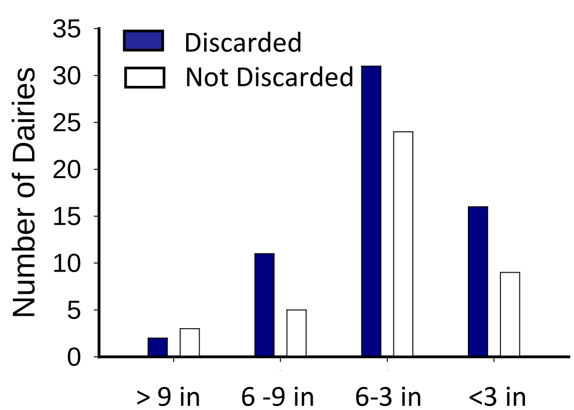

Figure 1. Inches of spoiled forage present, reported as discarded or fed.

Sizing of silage structures. Nineteen percent of dairies removed less than 6 inches (depth) daily from the silage face, which is the minimum amount recommended to be removed in cool weather. In hot weather, recommended removal is 18 inches or more, reported by 21.7% of respondents. The entire width of the silage face was removed daily in 36.1% of dairies, with the remaining respondents removing one-half or less of the silage face daily. **Figure 2** depicts the width and depth of silage face removed by survey respondents.

Width of Face Removed	Depth Removed (in) < 6	6 - 12	12 - 18	> 18	
Whole	9.6	12.0	7.2	7.2	**36.1**
Half	2.4	9.6	6.0	8.4	**26.5**
Third	4.8	10.8	10.8	3.6	**30.1**
Fourth	2.4	0.0	2.4	2.4	**7.2**
	19.3	**32.5**	**26.5**	**21.7**	

Figure 2. Width and depth of face removed (% of dairies).

Our study provides the first glance at understanding how silage is managed on farm. Additional surveys/audits will be conducted to address more detailed components of the silage preservation, storage, and feeding programs.

Estimating Dry Matter of Harvested Corn Silage

There are a number of reasons to obtain an accurate estimation of dry matter of silage coming out of the field and into the silage structure: buying/selling forages, tracking feed inventory, and regulatory compliance.

Our objective was to determine if differences exist in calculating dry matter (DM) removal based on various intensities of sub-sample and composite collection. We collected a representative sample and noted the forage weight from every truck unloaded from a single corn field on three dairies. Actual DM removed was calculated by summing truckload weight * DM for all collected samples. Field DM removal totals were calculated using two composite sampling methods (sequence and interval). Sequence values are the average of sample DM within an hour of harvest; for example, forages from trucks that unloaded between 9a and 10a. Interval values are the average of every 10th sample collected (harvest averaged 10 trucks/hour), for example, forage that was unloaded at 9a, 10a, 11a, etc.

We found that taking a single sample of forage to estimate DM removal of an entire field yielded results that varied greatly from the actual DM removed. Using any one individual sample to estimate DM removal could underestimate harvested forage by 21.5% or overestimate forage removal by 20.4%. Sequential composites were less varied, and interval samples were the least varied of all methods tested (**Table 1**).

	Individual	Sequential	Interval
% difference	-21.5 to + 20.4	-5.14% to + 5.15	-2.71% to + 2.40
DM difference (lbs)	± 135,000	± 33,000	± 16,500

Table 1. Differences between estimated field DM removal and actual field DM removal based on method of sampling on one cooperator dairy.

Through more intense sampling, it was found that under- and overestimations were reduced. Interval samples across all dairies were ± 3% of actual DM harvested.

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Feeding Silage for Production and Animal Health

P.H. Robinson
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High quality forages are the basis of all successful dairy farming enterprises. I'm not sure who said that first, but truer words were never spoken. And, in contrast to so many things that dairymen do, forage production (and its nutritional quality) is largely under your control. Making the highest quality forages possible, at the lowest possible cost, is critical to profitability in these times of very high feed prices.

Forage Preservation
Forage has historically been preserved as hay (by desiccation) or as silage (by acidification or sterilization). Hay works well in dry climates for crops with small stems, which dry quickly, and no seed heads, as seed head grain can be lost in the field. The key principle is rapid drying to <15% moisture in order to prevent mold growth and formation of heat from aerobic (oxygen using) bacteria. In situations where dry conditions are uncertain and/or crops have small stems or grain in the seed heads, then ensiling generally makes sense in order to preserve as much of the feed nutrient value as possible.

Ensiling Types
Silage can be made in one of three general ways:

- *Enhanced fermentation* is achieved by using crops with high levels of epiphytic (existing on the plant) bacteria and sugars in the crop to allow anaerobic (oxygen intolerant) bacteria to create acids which essentially pickles the crop to give it long term stability.
- *Restricted fermentation* is achieved by adding sufficient acid at chopping/packing to pickle the crop.
- *Sterilization* is achieved by adding bacteriostats at packing to kill all bacteria and create a stable forage mass which retains many of characteristics of the fresh crop.

For a number of reasons, enhanced fermentation is the predominant silage making technique worldwide, and essentially the only one used in California.

Why Ensile?
There are a number of reasons to ensile a crop:

- *Convenience:* it is often faster than hay making.
- *Cost:* it is often less expensive than haying due to fewer passes over the field.
- *Weather:* ensiling can occur in short harvest windows.

- *Lower dry matter (DM) loss at harvest:* less leaf shatter as the crop is moist at harvest.
- *Lower DM loss after harvest:* hay dry matter loss can be high without hay barns.
- *Crop characteristics:* some crops just don't hay (thick stems, seed heads).

What ensiling will not do is create a feed with a higher nutritional value than the chopped crop, or even if it were hayed under excellent drying conditions. Indeed, due to fermentation of sugars in the standing crop, the nutritional value of silage will generally be lower than that of the fresh crop, and it will be a very different feed overall.

The Three Key Principles of Ensiling

There are three key principles to successful ensiling:

- *Get the air out:* chop and compact the fresh crop to stop yeast and mold growth.
- *Keep air and water out:* seal the silo fast.
- *Get the pH down to 4 fast:* this may need addition of bacteria and/or sugars.

Poor ensiling may result from low epiphytic bacterial numbers on the crop, poor packing or covering or low sugar levels in the crop which results in the silage pH declining too slowly, thereby increasing fermentation losses as well as creating heat which can damage protein and fiber quality. The resultant mold growth can negatively impact animal health, especially if the molds create toxins.

Most California silage is put up in bunkers, bags, rollover piles or stack piles. While the key principles of ensiling apply to each silo type, the differences in them lead to slightly different ideal ensiling procedures. For example, the quality of silage from concrete walled bunkers will be improved if plastic is placed against the inner walls as concrete is not impervious to oxygen, silo bags should be on hard surfaces to minimize losses under wet winter feedout conditions, rollover piles should have about a 1 to 6 max height to max width ratio, and stack piles should not exceed the maximum 'reach' of the loadout apparatus.

How to Meet the Key Principles of Ensiling

The devil is in the detail.

1) Chopping and packing

Successful chopping and packing requires delivery of chopped crop to the silo at a rate which is balanced to its size. This means that as the silo structure size increases then the number of choppers, trucks and packers all have to increase proportionally.

2) Sealing the silo

The faster that the silo is covered the better. In general, thicker plastic is better, white plastic on the exterior is best, 2 plastic layers (the inner being an oxygen barrier plastic) is critical, allowing a minimum seam of at least 1 yard and use of lots of weights to keep the plastic down. Several of these issues are regulated by Rule 4570.

3) Getting the pH down fast.

If steps 1 and 2 are successful then nothing else may be required. However crops suspected of having low epiphytic bacterial numbers (such as after a rainfall) or having low levels of sugars due to prolonged overcast may benefit from additives applied at ensiling.

Silage additives used in California can be divided into three main groups, although all are designed to enhance fermentation in some way:

1) Inoculants

These are generally lactic acid bacterial strains (they create lactic acid), or mixtures of strains, which are designed to augment the action of the epiphytic bacteria on the crop.

2) Enzymes

These are generally mixtures of amylases (degrade starch), cellulases (degrade cellulose), pectinases (degrade pectins) to create the sugars which are then to be used by silo bacteria.

3) Sugars

Sugars are occasionally added as direct energy sources for silo bacteria.

Several of these issues and additives are regulated by Rule 4570.

Nutritional Value of Silages in Dairy Rations

Silages have a number of desirable attributes which have combined to make them a key part of the California dairy industry. In general, they:

- are a relatively low cost nutrient source
- are an excellent source of dietary fiber, especially physically effective fiber
- have a low transport requirement relative to out-of-state feeds
- are a flexible feed source as feeding levels can be rapidly changed
- can be combined easily with other silages and feeds to create effective TMR
- are a source of many nutrients required by cows, including minerals.

However our main California silages (winter cereals, corn, sorghum) are relatively low in crude protein (7 to 12% of DM) and a lot of that is ruminally soluble. They also have high neutral detergent fiber (NDF) levels (45 to 55%) which leads to relatively low net energy (NE) values of 0.5 to 0.7 Mcal/lb of DM. Keep in mind that the NE values of our main California silages are heavily influenced by its NDF level and rate of fermentation in the rumen. While lignin is a good indicator of NDF fermentability <u>within</u> a crop, it is a poor predictor <u>among</u> crops. The most powerful tool available to you to determine NDF fermentability is *in situ* (in the rumen) measures of fermentation, which are offered by many analytical labs, and can be used to assess the potential NE level, and overall feeding value, of the silages.

Environmental Impacts of Silages

Silage making and silages are impacted by current San Joaquin Air Pollution Control District compliance requirements in two ways. For example, the process of chopping, transporting and packing fresh crops in silos creates dust and uses fossil fuels, both of which degrade air quality and are regulated by the District. However an issue of more recent concern is the potential release of volatile organic compounds (VOC) from silages during storage, during load-out, during TMR mixing, during feeding and while TMR are sitting on the bunkline. While it has been known for a very long time that silages are sources of volatile compounds such as organic acids and alcohols, especially ethanol in silages based upon crops with starch in seed heads (such as corn and winter cereals), there is concern that the quantity of these compounds released from silages is large enough to have a substantive impact on air quality within the Great Central Valley of California. While these concerns are not universally agreed upon, they have resulted in Rule 4570 to implement mitigations which may include:

- finer field chopping of forage
- tighter packing of silo masses
- covering of piles within 72 hours
- use of lactic acid bacterial inoculants (optional by rule)
- restricting exposed surface area
- maintenance of ‘flat’ silo faces between load-outs
- no ‘loose’ silo piles between load-outs

As most of these suggested mitigations can be classed as good silage management practices, it is unlikely that they will actually reduce cash flow for most dairy producers. Indeed for producers with poor practices they might even increase cash flow. However other mitigations under consideration, including feeding silages more frequently during the day and use of compounds which inhibit the bacteria which create the VOC in the silage mass, are another story. This is a fast moving area – stay tuned.

Finally

Tough times in the dairy industry suggest that all ensiling practices need be re-evaluated and, where sensible, modified to maximize farm profitability (or minimize farm losses) while meeting current environmental regulations. While we all hope that 2009 conditions will not re-visit the California dairy industry, we all know that it could happen again.

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Understanding the Ensiling Process Can Help You Reach Your Silage Feeding Goals

Jennifer Heguy, UCCE Dairy Advisor &
Noelia Silva-del-Rio, UCCE Dairy Production Medicine Specialist

With high feed costs, now is the time to evaluate your current ensiling techniques in order to make improvements to the process before corn starts coming off the field. To do this, let's take a look at the different phases of the ensiling process, what pit-falls exist, and what steps you can take to reach your silage feeding goals.

Phase 1 – Initial Aerobic Phase. Oxygen is entrapped within the fresh forage delivered to the silage structure and this oxygen maintains the respiration of plants and microorganisms. During this phase, heat, water and are produced and lost.

Best Management Practices to Minimize Losses in Phase 1:

- Exhaust oxygen rapidly through adequate compaction of the forage in order to limit time in phase one. Factors affecting compaction are:
    - Tractor time and weight – heavier tractors packing for longer amounts of time will do a better job of packing material and removing oxygen.
    - Packing layer thickness – the forage should be packed in layers no greater than 6 inches to allow for adequate packing of the material.
    - Forage particle length - shorter is easier to compact, but too short has rumen health consequences. Your nutritionist will be able to help you pinpoint the particle length that best meets your feeding needs.
    - Dry Matter (DM) of forage – wetter is easier to pack, but too wet leads to leachate and fermentation issues. Recommended DM at harvest is in the 30 - 35% range.
- Cover silage as soon as possible with plastic to prevent oxygen exposure of the forage mass.

Phase 2 – Main Fermentation Phase. Oxygen has been depleted, but pH is still relatively high allowing spoilage microorganisms to grow. As lactic acid bacteria proliferate and consume plant carbohydrates to produce lactic acid (strong acid), the forage mass pH decreases below the critical point thus inhibiting or killing spoilage microorganisms. During the fermentation phase we observe effluents, silage gas production and shrinkage of the forage mass. A rapid decline in pH will minimize dry matter (DM) losses.

Best Management Practices to Minimize Losses in Phase 2:

- Harvest forage at adequate DM. If forage is too wet (DM is too low), there will be important effluent losses in this phase. Furthermore, low DM forages have lower carbohydrate content and there will be lower acid production, creating a longer period to reach the stable phase (Phase 3).
- Bacterial inoculants can be utilized to aid in the rapid decrease in forage mass pH. Cost and efficacy of additives need to be determined as additives are not a solution to poor management in other phases of silage production (poor packing and harvesting at improper DM, for example).

<u>Phase 3 – Stable Phase.</u> Lactic acid bacteria are dominant and lactic acid becomes the predominant end-product formed. Acid tolerant enzymes are active but little microbial activity will take place during this phase. However, if air ingresses into the silage mass, spoilage microorganisms will grow. Poor covering, inadequate weighting of covers, tears in the cover material, etc. are potential sources of oxygen exposure. Losses in phase three should be minimal.

Best Management Practices to Minimize Losses in Phase 3:

- Cover the silage structure properly with plastic, and place weight on the plastic cover to prevent oxygen exposure.
- Periodically evaluate the condition of the cover and repair any flaws (holes, tears) that allow oxygen to enter the silage structure.

<u>Phase 4 – Feedout.</u> At feedout, the ensiled forage face is exposed to oxygen, which supports yeast growth. Yeast metabolizes lactic acid to produce heat and volatile organic compounds (VOC). Silage pH increases, allowing previously inhibited fungi and bacteria to grow and further reduce silage quality.

Best Management Practices to Minimize Losses in Phase 4:

- Size the silage structure according to feed out needs to minimize the surface area exposed to oxygen and to rapidly progress through the silage face (depth removed).
- Minimize the time between removal of silage from the structure and feeding to animals in order to limit exposure to oxygen.
- Maintain a straight, smooth face to reduce exposed surface area and to prevent oxygen from penetrating the forage mass.

Poor silage management practices in all phases have been associated with DM losses as high as 40%. Storing forage as silage results in dry matter losses to the environment, and these losses can be categorized as avoidable or unavoidable losses.

1. Unavoidable losses:
    - Residual respiration: exhaustion of oxygen in phase one (1-4% losses).
    - Fermentation: the conversion of plant sugars to acids in the absence of oxygen (2-6% losses).
2. Avoidable losses (the target of best management practices):
    - Effluent from harvesting forages that are too wet (0-5% losses).
    - Secondary fermentation (0-5% losses).

Aerobic spoilage is categorized as both avoidable and unavoidable, because some spoilage is expected, but the extent of spoilage is within the silage team's control (proper uncovering and face management, for example).

- Aerobic spoilage during storage (1-10% losses)
- Aerobic spoilage during feedout (1-10% losses).

Silage is a high value commodity, with large potential losses. It is worth your time to sit down with your silage team (PCA, nutritionist, feeder, etc.) to ensure quantity and quality expectations are met. In times of high feed costs, high quality, home grown forages are imperative to your bottom line.

Harvesting Corn Silage: Kernel Processing and Theoretical Length of Cut

Noelia Silva del Rio, UCCE Dairy Production Medicine Specialist

Kernel processing improves whole plant feeding value by breaking all the corn kernels and reducing the presence of large cob pieces. This has a positive impact on handling and packing, reduces feed sorting, and increases rumen availability and total tract digestibility of starch, fiber utilization and feed intake. However, excessive processing may negatively impact rumen health by decreasing effective fiber and favoring rapid fermentation and ruminal acidosis. On the other hand, if kernel processing is inadequate, sorting will increase, kernels will be lost in feces, and the silage will be more difficult to pack. In California, most corn harvested for silage is processed. But, 5- 15% of dairy producers do not choose to kernel process at harvest in order to reduce harvesting costs (Collar and Silva-del-Río, 2010).

Several factors affect kernel fragmentation during processing: processor roll clearance, length-of-cut, machine throughput and corn maturity at harvest. Adequate processing will result in most kernels cracked (at least 95%) with 70% of the kernel particles smaller than ¼ of a kernel. The extent of kernel fragmentation should be evaluated at the silage structure during harvest. This can be easily done using a bucket of water. The kernels sink and can be separated from the fodder for evaluation.

Some commercial labs offer corn silage processing evaluation using a score system developed by Dr. Mertens (USDA Forage Center). The forage sample is dried and shaken vigorously through a series of sieves. Particles are separated into three categories: coarse, medium, and fine.

- **Coarse fraction**: particles larger than 4.75 mm. Fiber in this fraction will stimulate chewing, but starch will be poorly digested and may escape the rumen.
- **Fine fraction:** particles smaller than 1.18 mm. Fiber from this fraction does not contribute to chewing activity or physical effectiveness. Thus, NDF from this fraction can be subtracted from peNDF.

Kernel processing is **excellent** when the proportion of starch that passes through the coarse sieve is more than 70%, **average** when it is 50-70%, and **inadequate** when it is less than 50%. Data from a commercial lab (Cumberland) indicates that 42% of the corn silage samples evaluated (n=1131) were inadequately processed.

Theoretical Length of Cut (TLC) of corn silage should be set so particle length is long enough to supply effective fiber for optimal rumen function and adequately short to favor packing and fermentation. Based on the DM of the harvested crop, TLC should be adjusted. If the corn crop is too dry, it should be chopped finely to improve packing. However, if ensiled corn is the only roughage source at the dairy, it is recommended to chop long to ensure enough effective fiber in the ration.

Dr. Mike Hutjens, the Dairy Extension Specialist from the University of Illinois, has developed some guidelines on the theoretical length of cut and the roll clearance based on whole plant maturity (://www.livestocktrail.uiuc.edu/dairynet/paperDisplay.cfm?ContentID=):

- DM < 33%: TLC should be 0.75 – 0.90 in. and the rollers open.
- DM 33-38%: TLC should be 0.75-0.90 in. and rollers with 0.12 clearance inches.
- DM 38%: TLC should be 0.5 in. and the rollers should be closed.

Measuring forage particle length using the NASCO Penn State Particle Separator continues to be a popular way to objectively evaluate on the farm if forages have optimal particle length. The recommendations are different for processed and unprocessed corn silage (see table).

	3 / 4 TLC Processed	3 / 8 TLC Unprocessed
Top	5-15	3-8
Second	>50	45-60
Third	<30	30-40
Bottom	<5	<5

Furthermore, if corn silage represents the major forage source in the ration, the target is to have more material in the middle two sieves and less in the top sieve and bottom pan. Penn State Separator guidelines can be found at: ://www.das.psu.edu/research-extension/dairy/nutrition/pdf/evaluating-particle-size-of-forages..

Results of a recent custom harvester survey (Collar and Silva-del-Río, 2010), indicates that the settings of the roll clearance opening ranged from 0.5 to 3.0 mm (0.02 to 0.12 inches) and TLC from 10 to 21 mm (0.4 to 0.8 inches). Research needs to be conducted to evaluate if the particle length and kernel processing of corn silage in California falls within the desired target.

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Mycotoxin Levels of Your Silage

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What are mycotoxins?
Mycotoxins are toxins produced by some molds (fungi) on plants in order to reduce the activity of other molds or bacteria which are on the same crop. There are hundreds of known mycotoxins, all of which are complex chemical structures, although only a few are thought to impact mammals if they are eaten. In addition, as most molds do not produce mycotoxins the visual presence of molds in a silage, or even high assayed levels of mold spores, should not be presumed to mean that mycotoxins are present – although they might be present.

However molds will always, at least to some extent, reduce silage palatability and, as they use the most fermentable parts of the crop, reduce its energy value.

Why be concerned about mycotoxins in silage?
Keep in mind that low levels of mycotoxins are present in most silages under most conditions and cattle frequently consume them in their diets. This is generally not a problem as rumen bacteria are effective in detoxifying mycotoxins in the rumen. However if a diet is very high in mycotoxins, the ability of the bacterial population to effectively detoxify them may be overwhelmed. If this happens, then mycotoxins escape the rumen, are absorbed from the small intestine and exert their toxic effects on the animal. If this happens, common symptoms include:

- reduced feed intake and milk production
    - off feeds, ketosis and DA's may increase as a result
- diarrhea will occur in many impacted animals
- swollen vulvas and nipples and vaginal or rectal prolapse
- reduced fertility
- increased incidence of early term abortion

What are the most common mycotoxins?
The mycotoxins found most frequently, and of greatest concern, are aflatoxin (produced by *Aspergillus* molds), zearalenone, T-2 toxin, deoxynivalenol (DON; a.k.a vomitoxin) and fumonison (produced by *Fusarium* molds) and ochratoxin (produced by *Penicillium* molds). While many others are known to exist their impacts on animals are largely unknown but not considered to be a problem under most situations. Deoxynivalenol (DON; a.k.a vomitoxin) has been considered to be a key mycotoxin as other mycotoxins are seldom found in silages if DON is absent.

These mycotoxin producing molds are always present on crops in the field (which is where they are produced) and so some level of mycotoxins are always in crops which are ensiled. However as mold growth is spurred by wet field conditions, this year may be a bad year for mycotoxins in corn silage.

Which animals are most susceptible to mycotoxins?

Because of the ability of the rumen bacterial population to detoxify most mycotoxins, cattle are in general less susceptible to mycotoxin toxicity than non-ruminants such as swine, poultry and humans. However 'at risk' cattle classes are pre-ruminant calves with limited rumen function, cows with sub-optimal rumen bacterial populations (such as fresh cows with low intakes) and cows with high ruminal passage rates (such as high producing cows with high intakes because the mycotoxins stay in the rumen for a short time). In addition, breeding (and recently bred) cows are more susceptible to mycotoxin toxicity.

How do I know if my silage has unsafe levels of mycotoxins?

Visible molds on silages are an indication that mycotoxins may be present. Thus if you see molds you should inform your consulting nutritionist who will take a sample of the suspect silage and send it for analysis. This sample should be from the mixed silage which is actually being added to rations and should be transported to the laboratory quickly since mycotoxins can be produced after sampling in the presence of oxygen. While most of the main mycotoxins listed above can be chemically analyzed, their assay costs are high, although they seldom approach the costs of animal losses if mycotoxin toxicosis occurs.

What are safe dietary levels of mycotoxins?

Keep in mind that there are no totally safe dietary levels of mycotoxins, but there are levels which are generally considered to be safe. In addition, not all mycotoxins have been investigated sufficiently to create 'safe' levels. Nevertheless, some guidelines are:

Aflatoxin	
At risk cattle	100 ppb
Other cattle	200 ppb
Deoxynivalenol (DON; a.k.a vomitoxin)	
At risk cattle	3 ppm
Other cattle	5 ppm
Fumonisin	
At risk cattle	30 ppm
Other cattle	50 ppm
T-2	
At risk cattle	50 ppb
Other cattle	100 ppb
Zearalenone	
At risk cattle	15 ppm
Other cattle	25 ppm

What can I do if I have an unsafe level of a mycotoxin in my silage?
The silage process itself will not detoxify mycotoxins, which are largely produced in the field, as these are very stable compounds. However ensiling will dramatically reduce the activity of the molds, at least if oxygen is unavailable. Thus this would be a good year to practice good silo unloading practices (flat faces, 4 - 6 inch face removal daily, no leftover silage at the end of the day) to prevent molds from growing again once oxygen is available at load out.

Recognize also that the levels listed above are in the total diet dry matter. Thus if you have a corn silage with 500 ppb aflatoxin which is fed at 20% of diet DM, then its contribution to dietary aflatoxin levels is 100 ppb. This leads to the first, and most common, strategy to limit mycotoxin toxicosis, which is to dilute (feed less of) the infected silage in the diet in order to get the calculated mycotoxin level of the diet down to a safe level. If this is impractical or impossible, many dairies in the Northeast have claimed success by feeding 100 to 200 g/cow/day of sodium bentonite (commonly called bentonite, which is a form of clay), which acts by binding the mycotoxins so that they are inactivated and pass harmlessly through the gastrointestinal tract to be expelled in feces. However, as bentonites originate from many sources, and differ in unknown ways, all bentonites are unlikely to be equally effective in general, and may also not be equally effective against all mycotoxins (which may explain why some Northeast dairies have had success with bentonite and some have not). There are also companies which market mycotoxin binders which likely act similar to bentonite but, as commercially produced products, will be more consistent.

What can I do if I have unsafe levels of several mycotoxins in my silage?
If you have high levels of more than one mycotoxin in a silage, then you have entered uncharted waters and the guidelines listed above may, or may not, be valid. However, in general, it is recommended that you be conservative with the guidelines when you have significant levels of more than one mycotoxin, and very conservative indeed if you have several. Keep in mind that deoxynivalenol (DON; a.k.a vomitoxin) has been considered to be a key mycotoxin to assay as other mycotoxins are seldom found in silages if DON is absent.

Notes: