HOARD'S DAIRYMAN

by John Goeser

Store for cleaner feed

THE Food Safety Modernization Act is a government oversight effort meant to identify risks in the food chain, alleviate these with a transparent plan, and ensure safe and clean purchased feeds from feed manufacturers. Purchased feed typically makes up about 50 percent of what is fed to dairy cattle, and the clean feed concept should carry through to the other half — fermented forages and grains.

Goeser

To be clear, farm-grown feeds do not pose any considerable risk to the human food chain with the exception being aflatoxin, a potent carcinogen that is already monitored in milk and regulated. I am not suggesting the government should step in (on farm). Yet, your farm can take a leadership role by committing to farm-level clean feed efforts by keeping fungal and bacterial populations in check within farm-grown forages and grains.

Feed contamination risks at the soil and feed level were discussed in a prior article titled "The lowdown on dirty feed." Bacterial and fungal pathogens were identified and control steps suggested at the soil and field level.

Successful fermentation can combat pathogenic mold and bacterial load coming from the field. Hence, this article discusses the next logical control point, identifying and controlling contamination within the silo, during ensiling and feed preservation. The objective here is to offer tips to control microbial contamination due to prolonged fermentation and/or poor oxygen exclusion — two common situations we find on farm all too frequently.

As discussed previously, harmful bacteria (such as *Clostridium spp., Listeria spp., E. coli spp.*, and *Salmonella spp.*) and molds (such as *Aspergillus spp. or Fusarium spp.*) are present throughout the soil and environment. These pathogenic species are problematic for cattle health if feed or forage load is overwhelming or dairy cattle are stressed and immune systems compromised. Both mycotoxins and calving are stressors, among others, known to suppress the immune system. Under immune suppression and stress, pathogens can take hold and cause varying health challenges and even death.

Bad bacteria need time

Let's separate good from bad bacteria: Good bacteria (lactic acid producers) grow in feed and acidify the forage. This should happen within days after the forage is sealed. However, rained-on and/or poor-quality forage, soil contamination, excessive moisture content, or high mineral content make it harder to acidify forage. For every day that the forage is above 4.5 to 5.0 pH, "bad" bacteria can grow.

Good bacteria need fuel to grow. Rained-on and poor-quality forage are harder to preserve because the feed is missing a critical component, sugar (fuel), for lactic acid producing bacteria. Excessive moisture (greater than 65 percent) in grass and legume silages also makes the forage more difficult to preserve. Under extended fermentation situations, clostridia and other negative organisms can contaminate feed by breaking down protein into butyric acid, biogenic amines, and some alcohols. These odorous compounds are problematic for transition cow health, affecting the liver.

Biogenic amines and alcohols are also thought to suppress feed intake, according to research at the University of Bonn in Germany. With some inefficient fermenting situations, feed never stabilizes and even continues to get worse over time. One case is where legume silage is stored at 65 percent or greater moisture. If this situation is unavoidable, let this feed ferment for several weeks only and feed forage sooner rather than later because quality will deteriorate over time as negative bacteria take over.

Greater forage mineral content will also lead to prolonged fermentation. Even where sugar is adequate for lactic acid producing bacterial growth, positively charged minerals such as calcium, potassium, and magnesium make it harder for the forage pH to drop. Soil minerals are readily taken up (depending on soil pH and other factors) by most plants.

Legumes and grasses are particularly good at absorbing minerals, leading to high mineral content forages that are more difficult to ferment. This phenomenon is due to buffering capacity. Buffering capacity is the reason high potassium feeds make a negative DCAD balance in a prefresh diet less effective. Just as baking soda (sodium) can neutralize vinegar (acetic acid) and create a reaction, like in your child's volcano science project, the minerals offset the acid's impact on pH.

Check your forage pH. If forage pH is greater than 5, there is an opportunity for improvement. Consult with your forage management team to more aggressively ferment, acidify, or preserve feed.

Soil contamination, either from the field or at the bunker, pit or pile, will also create challenges for clean feed. Soil minerals bring greater buffering capacity to the forage and soil also harbors fungi and bacteria, potentially increasing contaminant load.

Check your forage ash content. If ash content is greater than 5 for corn silage or greater than 12 for grass and legume silages, work with your agronomy and nutrition consulting team to determine where the ash is coming from. Avoid tracking dirt into feed around the feed center and during forage packing. Ash can also be higher during drought conditions due to dust blowing or with heavy rains, flooding, or rained on forage due to mud.

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A NICELY COVERED SILO excludes wild yeast and limits bacteria's reign, making for better feed and more milk.

If your forage has been rained on, is extremely low quality (both low sugar situations) or has greater buffering capacity or soil contamination, applying a sugar-rich substrate (molasses) can help drive fermentation. The addition gives fermenting bacteria more fuel to grow and produce acid.

Adding sugar to forage is uncommon due to application challenges, but directly applied acid or other anti-microbial food-grade preservatives (for example, potassium sorbate or benzoate) can also help quickly stabilize feed in these situations. The other option is to avoid ensiling and allow the forage to dry to 15 percent moisture or less, another point where bacteria can no longer grow.

Wild yeast want oxygen

It's critical to exclude air from the silo to prevent excessive wild yeast and mold growth as negative yeast and fungi typically need oxygen to grow. Air in the silo, as a result of poor packing, too dry of forage, a poor seal, or holes within the cover or bag, means more oxygen is present and fungi will grow, sometimes even at a low pH.

Yeast are particularly challenging because they will use both sugar and fermentation acid as fuel. This creates two feed health challenges — less sugar (energy) available for dairy cattle and less stable feed because the silage pH goes up. Further, yeast produce ethanol and other alcohols, causing feed energy losses. Wild yeast can also disrupt the rumen, according to University of Delaware and Michigan State University researchers. On top of all that, there is still much to learn regarding wild yeast. Unfortunately, yeast and mold kick start a downward feed health spiral because less sugar and greater forage pH lead to the bacterial challenges discussed above.

Pack the forage to greater than 50 pounds as-fed forage per cubic foot. Ask your consulting team to check this using a density measure. Achieving this density in an upright silo or a bag is more difficult so work to keep these silos sealed. If using bags, check for holes weekly as rodents and birds can wreak havoc on bag silo integrity and let air in.

If feed is found to be contaminated or heated, also discard 50 percent more feed than is visibly deteriorated. Yeast, mold, and bacteria will be growing beyond where the naked eye can see. Avoid this contamination in the ration to be mixed.

In summary, consult with your harvest and nutrition advisory team to understand contamination points within the silo. Interpret fermentation product measures (pH, lactic and acetic acids along with ethanol), understand bacterial and yeast levels, and consider ash content and buffering capacity as they relate to clean feed.

Well before harvest, create a harvest plan. Discuss how to minimize ash impact and ensure harvest does not outpace packing. Managing the silo control points discussed here will keep fungal and bacterial growth at bay and yield greater energy and cleaner feed up until feedout.

Goeser is the director of nutritional research and innovation with Rock River Lab Inc., Watertown, Wis., and adjunct assistant professor, dairy science department, University of Wisconsin-Madison.

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