

ON THE RANCH

Women in Agriculture Conference

February 20-21-2020
Holiday Inn Convention
Center in Kearney, NE

The Nebraska Women in Agriculture Conference is an annual two-day event designed to educate and uplift women involved in any aspect of Nebraska's agricultural industry. Through workshops and presentations, attendees will learn how to better manage risk, improve their farms and ranches and become more successful operators and business partners.

For event details visit:
<https://wia.unl.edu/conference>

“Burning Your Bottom Line: How Hot Hay Changes Forage Quality”

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Hay put up too wet can lead to a number of issues, most notably mold and heat. Moisture keep otherwise dormant microbes and fungi active, decreasing forage quality and creating heat. Too much heat can actually create a risk of combustion.

However, even heat that doesn't get to the level of combustion can start to cause issues with our hay. Since hay is not protected from oxygen like most of our anaerobic fermented feed stuffs (silage, haylage, etc.) high temperatures, moisture, and oxygen allow aerobic bacteria to grow, using plant protein and sugars for growth and producing carbon dioxide, water, and heat. Too much of this and temperatures can rise high enough to kick off a process called the Maillard reaction.

Even if you've never heard of the Maillard reaction before, you are probably familiar with it. First described in 1912 by the French chemist Louis-Camille Maillard, the Maillard reaction is the browning process that happens between amino acids (proteins) and sugars under heat. We use it all the time when cooking. From searing a steak to baking bread, the Maillard reaction is what produces that flavorful browned or golden outer portion of most cooked foods.

So what does this have to do with hay? While it's typical to have bales generate heat after harvest due to the curing process. Too much moisture has the dual issue of 1) helping trap heat already created instead of letting it dissipate quickly, and 2) acting as a catalyst for the Maillard reaction once it kicks off at around 170°F. The Maillard reaction takes normal proteins and sugars and changes them through a series of chemical reactions into something called the Maillard polymer. The resulting hay is sweet/tobacco smelling and golden/caramel in color. And cows love it! Just like I can't turn down a perfectly seared steak, the result of the Maillard reaction in hay is a treat for cows.

Why is this an issue? The problem is that the resulting Maillard polymer, while tasty to our animals, isn't great nutritionally. The chemical reactions actually have tied up proteins and lowered the forage's true crude protein content. A standard crude protein feed analysis won't be able to pick up this difference though and will report the number like nothing is wrong, causing us to overestimate the available protein in our forage and under feed our animals.

Luckily, the solution is fairly simple. If you suspect you have bales that have had some caramelization occur, add on a test for Heat Damaged Proteins (HDP) or Acid Detergent Insoluble Crude Protein (ADICP). While adding a bit more to the cost of the forage analysis, this additional test will show how much



unavailable protein content there is due to the Maillard reaction and rations can be adjusted accordingly. At some labs, this test will also be shown with the adjusted Crude Protein content after damage has been factored in.

While we are on the look-out for hay that could be heat damaged, it's also a great time to look bales over for excessive mold growth. The same wet conditions that allow the Maillard reaction to occur can also be great for mold. While not always toxic, mold can reduce hay quality and palatability, so allowing animals the freedom to pick through heavily molded bales is a great option. If you want more information on considerations to take when working with moldy hay, check out the Nov. 1 Beef Watch article "[What to Do with Wet Hay](https://beef.unl.edu/beefwatch/what-do-wet-hay)" (<https://beef.unl.edu/beefwatch/what-do-wet-hay>) by extension educator Hannah Greenwell and myself.

After last winter's cold and a wet summer, using every last bit of hay available to its fullest potential is going to be important. Testing forage quality of your hay, whether your own or purchased is a critical first step to optimizing hay use, but make sure to take a bit more critical look when taking those samples. Keep an eye out for signs a Maillard reaction could have occurred and if significant, running the additional HDP test is essential. With a true idea of available Crude Protein, making the right decisions on how much hay to feed this winter and when to start supplementing will be that much easier.

- High temperatures in bales (>170°F) can result in reactions between proteins and sugars called the Maillard reaction.
- Hay impacted by Maillard reactions will be sweet/tobacco smelling and brown/caramel colored
- While highly palatable, the reaction creating this hay ties up protein, making it unusable for animal digestion.
- If significant signs of Maillard reactions are seen in your hay, add a Head Damaged Protein (HDP) test to your forage analysis to get accurate Crude Protein contents for feeding decisions.
- Caramelized hay also has a high likelihood of containing larger than normal amounts of mold growth. Feeding free choice is a good option to minimize risk when feeding moldy hay. More information can be found in the Nov. 1 article "What to Do with Wet Hay".

50th Annual Nebraska Poultry Conference
February 19-20, 2020
River's Edge Conference Center
Columbus, Nebraska

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