# Dairy E-News

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## Recognizing and Preventing Grass Tetany on Spring Pasture

Heidi Ward, DVM, PhD, Assistant Professor and Veterinarian

Another mild winter and another early spring have come to Arkansas! The warm temperatures coupled with the ample rain can lead to an explosion of growth. Although the fresh greenery is pleasing to behold, the new grasses can become a problem for cows. Grass tetany (grass staggers) is a nutritional disease that mainly affects the metabolism of older lactating cows. However, it can affect any lactating cattle with lower body condition scores or that are off feed. The disease is caused by a low level of dietary magnesium in the blood. Low levels of magnesium in the blood leads to low levels of magnesium in the cerebral spinal fluid (CSF), which can cause neurological symptoms and death.

### Why spring?

Grass grows quickly during February through April in Arkansas. Forage grown in soils naturally high in potassium and those fertilized with potash and nitrogen are high risk areas for grass tetany. Cattle do not have the ability to store magnesium in their bodies, and magnesium absorption from the rumen is reduced when potassium and nitrogen intakes are high.

### What happens to the cows?

When affected, a cow may graze normally but walks stiffly and is hypersensitive to touch and sound. If not treated, the cow can progress to severe symptoms, which may include bellowing, running blindly, falling or having seizures. These neurological symptoms are due to the low magnesium in the CSF causing hyperexcitability of the nervous system. Once the cow starts to have seizures, there is very little time to intervene before death occurs.

### What must be done to stop the illness?

Animals showing clinical signs must be treated immediately to correct the low magnesium levels before they start having seizures. This is done by

slowly administering CMPK electrolyte solution intravenously while listening to the heart. The solution can only be purchased with a prescription, so plan ahead with your veterinarian for emergency situations. Once the initial injection of CMPK is given, magnesium levels can be maintained by giving oral CMPK gel or solution. Treatment should be done in a quiet area to prevent the triggering of seizures.

### How can this disease be prevented?

Test the soil prior to making any decisions on fertilization of your pasture. Research has shown that adding phosphorus fertilizer to low phosphorus soil can increase magnesium in the forage. Legumes such as clover and alfalfa tend to have higher magnesium content than ryegrass and can be planted for grazing on adapted sites. Also providing extra magnesium in the mineral mix can help prevent the problem during the spring flush of forage. Testing the feed ration for mineral content is important to balance the overall nutritional mineral intake, especially for heavy milking cows or those in early lactation. Consult a nutritionist for the best approach to balance rations. For more information or to obtain a fact sheet on grass tetany, visit www.uaex.edu.

# Normal Sources of Variation in Milk Composition of Lactating Cows

Michael Looper, Professor and Head, Animal Science

## Introduction

Many factors influence the composition of milk, the major components of which are water, fat, protein, lactose and minerals. Nutrition or dietary influences readily alter fat concentration and milk protein concentration. Fat concentration is the most sensitive to dietary changes and can vary over a range of nearly 3.0 percentage units. Dietary manipulation results in milk protein concentration changing approximately 0.60 percentage units. The concentrations of lactose and minerals, the other solids constituents of milk, do not respond predictably to adjustments in diet.

Milk composition and component yields also can be affected by genetics and environment, level of milk production, stage of lactation, disease (mastitis), season and age of cow. There are various feeding management practices that can enhance levels of milk fat and protein concentration in milk. Feeding strategies that optimize rumen function also maximize milk production and milk component percentages and yield.

## Genetics and Environment

Table 1 contains the breed averages for percentage of milk fat, total protein, true protein and total solids. A change in milk composition using traditional breeding techniques occurs slowly, although new techniques of genetic manipulation may allow faster progress in the future. Yields of milk, fat, protein and total solids are not easily impacted by genetics; heritability estimates for yield are relatively low at about 0.25.

Meanwhile, heritability estimates for milk composition are fairly high at 0.50. Conversely, environmental factors such as nutrition and feeding management will impact yield more than the actual percent composition of the major milk constituents.

The priority placed on each genetic trait depends upon its economic or profit impact. Milk yield per cow tends to receive the most attention by producers. However, component yields should not be overlooked. Genetic selection should be directed toward increasing fat, protein and nonfat solids yields. But, because component percentages tend to have negative genetic associations with yield traits, a change in these percentages is not likely to be achieved through genetic selection alone.

**Table 1. Breed averages for percentages of milk fat, total protein, true protein and total solids**

| Breed | Percent | | | |
|---|---|---|---|---|
| | Total Fat | Total Protein | True Protein | Total Solids |
| Ayrshire | 3.88 | 3.31 | 3.12 | 12.69 |
| Brown Swiss | 3.98 | 3.52 | 3.33 | 12.64 |
| Guernsey | 4.46 | 3.47 | 3.28 | 13.76 |
| Holstein | 3.64 | 3.16 | 2.97 | 12.24 |
| Jersey | 4.64 | 3.73 | 3.54 | 14.04 |
| Milking Shorthorn | 3.59 | 3.26 | 3.07 | 12.46 |

**Table 2. Change in milk constituents associated with elevated somatic cell counts**

| Constituent | Normal Milk, % | High SCC Milk, % | Percent of Normal |
|---|---|---|---|
| Milk nonfat solids | 8.9 | 8.8 | 99 |
| Fat | 3.5 | 3.2 | 91 |
| Lactose | 4.9 | 4.4 | 90 |
| Total protein | 3.61 | 3.56 | 99 |
| Total casein | 2.8 | 2.3 | 82 |
| Whey protein | 0.8 | 1.3 | 162 |
| Sodium | 0.057 | 0.105 | 184 |
| Chloride | 0.091 | 0.147 | 161 |
| Potassium | 0.173 | 0.157 | 91 |
| Calcium | 0.12 | 0.04 | 33 |

Adapted from Harmon, 1994. *J. Dairy Science* 77:2103.

## Level of Production

Yields of fat, protein, nonfat solids and total solids are highly and positively correlated with milk yield. Under selection programs that emphasize milk yield, fat and protein yields also increase. However, the percentages of fat and protein in the total composition decrease. The concept of milk component yield versus milk composition can be illustrated by comparing different bulk tank production averages with similar protein composition. If the tank average increases from 65 to 70 pounds while protein composition remains constant at 3.1 percent, an additional 0.16 pound of protein is produced per cow per day. However, if the percentage of protein increases from 3.1 to 3.2 percent while the bulk tank average production remains at 65 pounds, protein production (yield) increases by only 0.07 pound per cow per day.

## Stage of Lactation

The concentration of milk fat and protein is highest in early and late lactation and lowest during peak milk production through midlactation. Normally, an increase in milk yield is followed by a decrease in the percentages of milk fat and protein, while the yields of these constituents remain unchanged or increase.

## Disease

Although other diseases can affect milk component content and distribution, mastitis has been the predominant disease studied. Table 2 shows the compositional changes in milk constituents associated with elevated somatic cell counts (a measure of severity of the disease). Mastitis results in a reduction in

fat and casein content and an increase in whey content of milk. These changes in the milk proteins, in conjunction with alterations in lactose, mineral content and milk pH, result in lower cheese yields and altered manufacturing properties. Milk from cows with elevated somatic cell counts (greater than 500,000 somatic cells/ml) has longer coagulation time and forms weaker curds than milk from cows with lower somatic cell counts.

### Season

Milk fat and protein percentages are highest during the fall and winter and lowest during the spring and summer. This variation is related to changes in both the types of feed available and climatic conditions. Lush spring pastures low in fiber depress milk fat. Hot weather and high humidity decrease dry matter intake and increase feed sorting, resulting in lower forage and fiber intake.

### Age (Parity)

While milk fat content remains relatively constant, milk protein content gradually decreases with advancing age. A survey of Holstein Dairy Herd Improvement Association (DHIA) lactation records indicates that milk protein content typically decreases 0.10 to 0.15 unit over a period of five or more lactations or approximately 0.02 to 0.05 unit per lactation.

## Riparian Zone Management

Dirk Philipp, Associate Professor - Forages

Riparian areas are a haven for wildlife and fulfill crucial functions for maintaining the health of ecosystems. Winter and early spring is a good time to check on these areas. With no leaves present on trees and dormant vegetation, structural problems can be easily spotted and taken care off with a long-term plan.

By far the biggest problem in riparian buffer areas is the disintegration of streambanks. There are many telltale signs, such as trees that seem to get angled each year a bit more and appear to slowly fall in the water yet still try to grow upright. This is due to “bank creep,” a very slow but steady movement of the streambanks into the water. In many instances, this phenomenon is perfectly natural, as erosion is a natural process that has shaped entire landscapes over millions of years. However, man-made accelerated erosion is detrimental to the economic interests of farmers and landowners and needs to be addressed.

Fortunately, many of the problems stemming from erosion can be reversed over time. Nature is resilient, and there is a very good chance that vegetation will reinhabit streambanks if damage is moderate. In addition, it is not necessary to remove animals altogether as strategic, infrequent grazing will do the trick of reducing riparian area disturbance substantially.

As this has always been a point of contention, it is not necessarily required to permanently remove cattle from the area or install permanent fences. It is possible to plan grazing events in riparian areas, thereby stimulating vegetative growth but still being protective of the environment. Normally, a 50-feet undisturbed buffer is deemed sufficient by NRCS or soil conservation service offices, and the efficacy of these buffers can be greatly increased when grazing and buffer remediation go hand in hand.

Grazing can be accomplished within this 50-feet area during times when impact on streambanks is small. This is the case during relatively dry periods during the year, such as midsummer or fall in the southeastern U.S. The forage quality won’t be top-shelf during those times, but the idea is to keep the soil undisturbed as much as possible with grazing events kept short and intensive

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to take advantage of standing forage in buffer zones. While the health and nutritional requirements of cattle should always be kept in mind, of course, forage species that are less input-intensive are a good choice for areas adjacent to riparian zones vegetated with trees and brush species. A mix of native grasses is a good choice for midsummer as those should not be grazed before June and after August anyway, so the rest of the year these grass strips can fulfill their function as filter strips for potential runoff and nutrients.

Animals can be kept out from riparian areas with temporary fences only. This way, damage to costly permanent fencing structures will be avoided as those sometimes get flushed away in flood plains that are quite common in the southeastern U.S. Temporary polywire fences can be reinforced with metal T-posts to which the polywire can be attached as well. Those structures are longlasting, as a stream restoration project by the University of Arkansas at Monticello has shown. There, several treatments for streambank integrity were tested, including one-side fencing, two-side fencing and permanent fencing enclosing a tree-covered area. The second option has been shown to be sufficient for letting the vegetation reestablish itself and making peak water flows less damaging for streambanks. This project was successfully established around an intermittent creek, but with larger streams things are a bit more complicated.

On large streams or even rivers, access to streams by cattle can be managed with graveled areas that discourage animals from loafing around and damaging nearby banks. Good examples are crossings reinforced with concrete from which cattle can drink as well. If the stream is smaller and sometimes dry, geo-fabrics can be installed to secure the area around the crossing and prevent soil from settling.

Riparian areas are a vital part of the landscape with ecosystem functions that include those directly related to pasture productivity and animal health. By protecting them, landowners ensure long-term economic success of the farming operation.

# Choose Your Fat Source Wisely

Shane Gadberry, Associate Professor

Dr. Kristina Weld and Dr. Lou Armentano recently completed a meta-analysis (2017, *J. Dairy. Sci*., volume 100, pages 1766-1779) that included up to 98 studies examining the effect of fat supplement type on total tract fiber (neutral detergent fiber, NDF) digestibility and dry matter intake (DMI). For the analysis, studies evaluating response to oilseeds in the diet were excluded since oilseeds offer additional dietary alterations such as NDF that could confound interpretation. The researchers categorized fat supplement type as medium-chain fatty acids, oils, C16, animal-vegetable, tallow, calcium salts of palm, calcium salts of long-chain fatty acids and saturated fats.

The analysis revealed dietary medium-chain fatty acids can decrease both NDF digestibility and DMI. All other fat sources appeared to have a greater impact on DMI than NDF digestion. The authors indicated most of the studies analyzed were conducted with cows in mid-lactation; therefore, the DMI reduction may be more associated with positive energy balance and satiety than a reduction in NDF causing a correlated reduction in DMI. Irrespective of fat source, the overall effect size of rumen NDF digestibility was slight positive (0.4 kg increase), suggesting that fiber utilizing bacteria may not be as sensitive to fat as traditionally thought, and the authors suggest that any decrease in total tract NDF digestion may not be biologically significant. On the other hand, the effect of fat supplementation on DMI should be considered. Dietary fat inclusion can improve the caloric density of the diet (% dietary TDN); however, the researchers' model for change in total digestible nutrients (TDN) sends a warning that reductions in DMI due to fat can ultimately reduce TDN intake (total pounds of TDN consumed). The greatest net effect of TDN occurred with dietary inclusion of medium-chain fatty acids (primarily 12:0 and 14:0 fatty acids) since this fat source negatively affected both NDF digestibility and DMI.

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Since fats contain 2.5 times the caloric content of proteins and carbohydrates, fat inclusion offers a means of adding energy and possibly moderating starch in the diet when used to replace high starch grains. The effect of adding fat on milk production and components can vary with fat source. Responses may include a reduction in milk protein, an increase or decrease in milk fat and an increase in milk production. The improvement in milk production can often offset any change in milk value associated with change in components. Dr. Schroeder (NDSU Extension publication AS-1118) suggests a total maximum fat percentage of 7 to 8 percent dry matter basis with contributions of 3 percent of the ration dry matter from the basal diet, 2 to 4 percent from added natural fats, 1 pound oil seeds, 1 pound tallow and 2 percent (or 1 pound) protected fats. Accessibility and cost of including different sources of fat must also be taken into consideration.

Visit with a dairy nutritionist about feed rations before making changes to dietary fat. Be aware that certain byproduct feeds such as rice bran, distillers grains and hominy can alter fat content of the diet. When making changes specific to dietary fat, monitor the effect of that change on feed intake, milk yield, milk composition and body condition. Analyzing the diet for nutrient composition and fatty acid profile can help determine contribution of fat sources and total daily nutrient intake.