



Using Manure Evaluation to Enhance Dairy Cattle Nutrition

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INTRODUCTION

There are many tools that a nutritionist may use to evaluate and monitor the nutritional status of high producing dairy cows. Evaluating the feces or manure can provide information about general health, rumen fermentation, and digestive function of cows. Mature cattle provide ample opportunities for manure observation, as they pass feces approximately once every 1.5 to 2 hours and excrete a total of 100 or more pounds every day. The amount of manure produced may vary due to feed and water intake, and may be greatly reduced by an unusual disruption in passage of digesta through the digestive tract.

Manure evaluation may provide valuable information regarding the site and extent of both digestion and fermentation of consumed feeds. Normally a majority of the feed consumed by the dairy cow is digested in the rumen, and a majority of the nutrient absorption occurs in the rumen or small intestine. When feed is not properly fermented in the rumen, some undigested nutrients may reach the small intestine. Normally, these nutrients may be digested and absorbed, but if the amount is too excessive or the rate of passage is too fast, nutrients may escape both digestion and absorption in the small intestine. The last opportunity for nutrient digestion and absorption occurs in the large intestine.

Hindgut or large intestinal fermentation is part of the normal digestive process in the rabbit and horse; however, this process usually plays a small role in the dairy cow. When cows consume rations severely lacking in fiber or too high in non-structural carbohydrates (NSC), hindgut fermentation may be extensive, resulting in negative effects on cow health and production. Any feed particles or nutrients that are not digested and absorbed are excreted in feces and urine.

Manure evaluation is not a precise science; it cannot provide definitive answers to nutritional questions. Manure evaluation may be a useful diagnostic tool for some health-related issues, but it merely gives the nutritionist or farm manager a hint of what might be happening during the digestive process.

It is important to understand that there are no published scientific publications that demonstrate specific effects of nutrition on manure color, consistency or nutrient content. However, since manure evaluation has some potential as a nutrition and health observation tool we have put together some, of the known facts related to manure evaluation to aid in interpreting the results.

THE THREE C'S OF MANURE OBSERVATIONS

Color

Manure evaluation can be described by three C's: color, consistency, and content. Fecal *color* is influenced by feed type, bile concentration, and the passage rate of feedstuffs and digesta. Typically, manure is dark green when cattle graze fresh forage and darkens to a brown-olive if animals receive a hay ration. When cows consume a

ration containing large amounts of grain, a typical TMR for example, feces are usually a yellow-olive color. This color results from the combination of grain and forage and will vary by the amount of grain and processing of that grain. If an animal experiences diarrhea, feces may change to a gray color. Animals undergoing medical treatment may excrete abnormal colored feces as a result

of drugs that are administered. Dark or bloody manure may indicate hemorrhaging in the GI tract from watery dysentery, mycotoxins, or coccidiosis. Light-green or yellowish manure combined with watery diarrhea can result from bacterial infections such as salmonella.

Consistency

The *consistency* of feces largely depends on water content and is a function of feed moisture content and the amount time feed remains in the animal. Normal fecal material has a medium porridge-like consistency and forms a dome-shaped pile 1 to 2 inches high. Diarrhea may be caused by poisoning, infection, or parasites but also may result from extensive hindgut fermentation of carbohydrates and increased acid production. Loose feces also may result from excessive protein intake or high levels of rumen degradable protein. This is likely a result of increased water consumption in an attempt to excrete excess nitrogen via the urine. In addition, manure may be loose during periods of heat stress. Restricted water or protein intake often results in firmer feces. Severe dehydration results in firm balls of manure. Cows with left-sided displaced abomasums often excrete feces with a pasty appearance.

Content

Ideally, fecal samples should indicate uniform digestion and utilization of the majority of feeds and nutrients offered to the animal. If you notice large proportions of undigested grain or long forage particles (pieces greater than 0.5 inch), it may be an indication of poor rumen fermentation and possibly extensive hindgut or large intestine fermentation. Hindgut fermentation is much less valuable to the cow than rumen fermentation. This is due to the fact that little absorption of digested nutrients can occur in the large intestine. Therefore, though digestion and fermentation do occur in the

large intestine, little nutritional value is gained for the cow.

The presence of large forage particles or undigested grains may indicate that cows are not ruminating properly or that rumen passage rate is accelerated. This may be due to inadequate intake of fiber that is effective in stimulating rumination or maintaining normal rumen pH.

Observation of a substantial amount of large undigested grain particles may indicate grain engorgement or improper grain processing (including hard kernels from corn silage). Nutrients from these large particles are not available to the animals or to rumen microbes. Be aware that finely ground grain particles, which are not easily seen, may be present. Look closely for a yellow color that may indicate their presence, or observe dried manure. A pale white color on the surface of dried manure indicates undigested starch is present and the amount of white color depends on the amount of starch present.

The presence of excessive amounts of mucus indicates chronic inflammation of or injury to gut tissue. Mucin casts also may be observed. These indicate damage to the large intestine, possibly caused by extensive hindgut fermentation and low pH. The mucin is produced by cells lining the intestine in an attempt to heal the affected area.

Manure that appears foamy or bubbly may indicate lactic acidosis or excessive hindgut fermentation resulting in gas production.

PHYSICAL ANALYSIS

To evaluate manure particle size, walk through the barn and casually observe the manure of the whole pen or barn. Look at manure which has been passed very recently. Check for consistency of manure piles within animal groups. It is normal to have some variation in manure, and distinct diurnal variation in fecal excretion is normal for lactating dairy cows. This diurnal variation is due to feed intake variation throughout the day and in part due to daily animal management and movement. Many aspects of manure, including its nutrient content, have this diurnal variation pattern. Large variation within a group of cows during a similar time period of the day is a clear indication of ration sorting by the cows or some other health or management problem that is not affecting cows equally. This kind of variability indicates that the ration and/or feeding management may need adjustment.

Collect at least five manure samples that appear to be representative of the group of animals. Mix the collected samples and place a pint-sized sample on a .05-.08-inch mesh sieve or in a strainer. Using a hose, wash a gentle, steady stream of water over the sieve, passing across the sample continuously until the water running from the bottom of the sieve is clear. Then gently use running water to roll or float the particles to one corner of the sieve and remove all material from the sieve.

Place the washed sample on a flat dark surface and examine it for the following things:

Long fiber particles — It is inevitable that some long forage particles will appear, but if most are greater than 0.5 inch there may be cause for concern. Poor digestion of forages may be due to the makeup of the fiber component of the diet (low quality forages)

or to the ability of the animal to digest the forage being fed (poorly balanced rations).

Grain particles — The small intestine is capable of digesting starch, allowing the cow to utilize this nutrient. However, the amount of starch digested is limited by the rate of digesta passage through the small intestine.

Some grain will be observed in the manure of nearly all high producing cows. This is inevitable because high producers have a high rate of feed intake and a rapid passage rate of feeds out of the rumen. In addition, these cows require higher ration energy density, and in turn high grain diets, to try to meet their energy needs. This often creates a situation where starch is fed in excess of the amount that can be utilized in the rumen. The feeding of excess grain should be minimized and must be monitored constantly by the herd nutritionist. It is possible for the starch in corn kernels to be partially or fully digested, while the kernel remains intact. Corn silage often produces such kernels with the starch digested from the outer shell, so inspect kernels carefully, especially when corn silage is fed.

Finding the optimum amount of grain and extent of grain processing to optimize digestion in a high producing cow is part of the challenge of dairy nutrition, and may vary between cows and groups. Ruminal starch digestion is optimized when other dietary requirements are being met in the rumen. It is recommended to attempt to minimize the grain level in the manure while understanding that some grain will always be present if the cows are being fed adequate amounts of concentrates.

FINAL THOUGHTS

Examining general herd health and nutrition involves the collection of information from all areas of the farm, and fecal evaluation is one of several valuable sources of information. Paired with a close examination of feeding and management practices, fecal evaluation may help explain whole animal nutrient utilization problems associated with animal health. Combining

fecal evaluation information with cow health, performance, and behavior may be a valuable link to understanding the interaction between the ration and the animal. Manure evaluation is subjective, yet it is one tool the nutritionist can use to determine the best overall feeding program for a dairy farm.

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