



Risks of inadequate fiber in the diet

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Fiber in the diet provides an important role in rumen function and digestive health. The varying levels of digestibility of fiber are due, in part, to differences in the amount of lignin, the part of the plant cell wall that provides the plant rigidity. Fiber is important for microbial fermentation, which in turn supplies energy to the cow. The primary products of the microbial fermentation of fiber are precursors of fat in milk.

Low fiber and how it leads to disorders & diseases

Dairy cows require certain amounts of *effective* fiber to properly function. Effective fiber needs to be of adequate length / size to stimulate rumen function without being so long as to be easily sorted out of the ration. Without adequate levels, there isn't enough fiber to stimulate chewing, promote rumen buffering, properly digest feed, and maintain proper rumen pH levels.

Feeding cows a low fiber diet can cause a handful of metabolic disorders that can affect milk production and the welfare of the animal. Typically, a low fiber diet is considered below 26-28% neutral detergent fiber (NDF). Other factors influencing this minimum NDF value include dry matter intake, forage chop length, starch content & degradability, inclusion of by-product feeds, and feed bunk management. For these reasons, the minimum is a range, rather than a set number. There are many health implications that dairy cows face due to nutritional disorders linked with acidosis.



The pH level in the rumen is a critical indicator of if an animal is getting adequate fiber or getting fiber that is chopped too fine. Feeding forage that is chopped too fine or lacking adequate fiber creates a chain reaction that reduces the chewing time, reducing the amount of saliva that is produced, and in turn causing the rumen pH to drop. As rumen pH drops below 6.2, the microbes that are responsible for fiber digestion decrease activity and fiber digestion decreases while the microbes responsible for digesting starches and sugars increase activity, which drops pH further. If the pH falls below 5.9, digestion of fiber essentially stops.

There are two types of acidosis. Acute acidosis is when the rumen pH drops below 5.0. Subacute rumen acidosis (SARA) is when the pH falls between 5.0 to 5.5 for more than 3 hours. The more common and less severe type is SARA. Maintaining a rumen pH of 6.0 or above is usually beneficial for cow health.

Other disorders associated with low fiber diets

Laminitis - is the inflammation of the laminae and corium of the hoof. Laminitis effects can be manifested by a variety of foot disorders. These disorders include: ridges along the foot wall, swelling of the coronary band, flaking and waxy solar horn tissue, false soles, hemorrhage in the sole, white line abscesses, and sole ulcers. These issues have a cost of \$90 to \$300 per case.



Sole ulcer on a hoof.
Photo from UW-Madison
School of Veterinary
Medicine.

Displaced Abomasum - occurs when the abomasum, which typically lies on the floor of the abdomen, becomes filled with gas and rises to either the left or right side of the abomasum. Even though this disorder is more commonly observed during the transition period, it could occur in mid- and late- lactation cows when diets are not adequate. (\$700 per case)

Low butterfat - depressed milkfat varies between breeds of cows. Depressed fat content is at least 0.2% less than breed average. Milk protein butterfat inversions also indicate a depressed fat content.

Liver abscesses - are sites of bacterial infection within the liver. Most cattle will not show visible signs, although they do not gain weight as well as a healthy animal. The abscesses are typically found during slaughter.

Off-feed - when cattle lack the want to eat the feed in front of them which causes decreased rumen fermentation.

Ration considerations for feeding low fiber diets

Fermentable corn products - Dry corn is not as fermentable in the rumen as high moisture corn, flaked corn, or other processed corn sources. We want to avoid highly fermentable corn sources when feeding a low fiber diet. A finer grind on corn products is more acceptable in TMR situations while a coarser grind in component feeding would help with potential overfeeding of starch. Many forage labs can run a grain particle size report on corn products which might be beneficial for your operation.

Particle size / length & mixing consistency - It is important to have a consistent diet being delivered from one end of the feed bunk to the opposite end. It is also important to not overmix your feed as overmixing will break up particle length. On the flip side, it is also important to make sure you do not have too much long particle length in the ration. This can also lead to sorting. Utilizing the Penn State Shaker Box can help determine if you have adequate particle size distribution in the TMR. Proper moisture content is key to help prevent sorting components of the diet. Utilizing liquid products like molasses, whey, or water can help create a less sortable ration.

Chart adapted from Penn State Extension Particle Separator Guidelines for Particle Size.				
Screen	Particle Size inches	Corn Silage %	Haylage %	TMR %
Upper	> 0.75	3 to 8	10 to 20	2 to 8
Middle	0.31 to 0.75	45 to 65	45 to 75	30 to 50
Lower	0.16 to 0.31	20 to 30	30 to 40	10 to 20
Bottom Pan	< 0.16	< 10	< 10	30 to 40

Visual signs of stress from low fiber diets

- reduction in cud chewing
- reduction in intake or off-feed
- decreased rumination time
- sore or tender feet, stiff gait
- decreased milk production
- loose and variable manure

Rumen buffers - It is recommended to add a buffer to 0.8% of dry matter when feeding low fiber diets. Rumen buffers help to stabilize the rumen pH.

Feed testing - Frequent testing of forages and byproducts being fed to dairy cows will help know what the fiber levels are in the ration being fed.

Feed bunk management - Feed pushups are critical to making sure cows have access to appropriate amounts of fiber. The goal is to avoid long periods without feed in front of the cows because if cows go for long periods without feed in front of them, the next feeding the cows will seek out certain portions of the diet, which can create other management issues. Considerations should also be made on availability of bunk space and how long cows have access to the available bunk space. Producers can utilize the shaker box to check the consistency of the TMR being fed at the beginning, middle and end of feed out.

While low fiber diets can function if designed correctly, there are risks associated with feeding them without good management practices. Consistent feed testing, paying close attention to cows as they are laying down or walking, watching feed intakes, checking ration particle size, and manure consistency can help detect changes before cows experience a higher risk of metabolic diseases or negative animal performance.

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References available upon request.

