Why Is It Important to Look at NDF Digestibility in Dairy Nutrition?

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In recent years, commercial forage testing laboratories have begun to evaluate the neutral detergent fiber digestibility (NDFD) as well as NDF with acid detergent fiber (ADF). Although ADF and NDF are good indicators of fiber contents in forages, they do not measure how digestible that fiber is. In vitro NDF digestibility gives us more accurate estimates of total digestible nutrients (TDN), net energy (NE), and feed intake potential. In general, increased NDF digestibility will result in higher digestible energy and forage intakes. By including NDF digestibility parameter, ration balancing can be more precise with more predictable dairy milk production. Here is a very simple comparison of two different NDF digestibility numbers for the same NDF content in two different forage samples. If you have two haylage samples that both analyze 21% CP, 32% ADF, and 43% NDF, then would they be considered equal in terms of affecting animal performance? If forage sample #1 has 45% of NDF digestibility and forage #2 has 60% NDF digestibility, it is obvious that feeding forage #2 will result in a lot more milk or gain than forage #1. There is a report indicating that one unit increase of NDF digestibility is associated with 0.37 lb increase in dry matter intake and 0.51 lb increase in milk yield. Thus, it's worth looking at the NDF digestibility in forage quality analysis when forage samples are sent to the commercial lab. When the in vitro NDF digestibility is low (i.e., 44 % NDFD for alfalfa hay), there are three possible options; 1) Substitute forage with another forage that is higher in NDF digestibility, 2) Add highly digestible fiber commodities (i.e., soy hulls, beet pulp, cottonseeds, corn gluten feed, and distiller's grain), and 3) Change the ratio of forages in favor of the higher NDFD forages.

How does stage of maturity affect forage NDF digestibility?

Maturity at harvest has the greatest influence on NDF digestibility. As forage matures, NDF digestibility can decline more than 40 percentage units (% of NDF). The decline in NDF digestibility in grasses and small grain silages is particularly dramatic with advancing maturity. In general, when grasses and small grain forages are in the vegetative stage, NDF digestibility is very high (>70 % of NDF). However, when stem elongation occurs in grasses and small grain forage, NDF digestibility declines at a relatively fast rate. In legumes, NDF digestibility is less than the grasses or small grains during early vegetative stage of growth (alfalfa hay : grass hay = 60 : 75 % NDF digestibility) but declines slower and in a more linear fashion with advancing maturity. NDF digestibility in corn silage declines approximately 10.0 percentage units between the ½ milk-line to advanced black layer stages of maturity. Harvesting at optimum stage of maturity (i.e., grasses at boot, legumes at bud, and corn silage at ½ milk line) is important to maximize both yield and quality including NDF digestibility.

Why does NDF digestibility decline with advancing maturity?

With advancing maturity, plants develop xylem tissue for water transport, accumulate cellulose and other complex carbohydrates, and these tissues become bound together by a process known as lignification. In particular, lignin in plant cell walls is more difficult for rumen bacteria to digest than cellulose or hemicellulose. As maturity proceeds, leaf-to stem ratio declines (more stems, fewer leaves) and as a result NDF digestibility declines because a greater portion of the total NDF is NDF associated with stem tissue.

In general, more digestible fiber is less filling because it is retained in the rumen for a shorter period of time. Since it is less filling in the rumen, diets containing **highly digestible fiber** allow greater dry matter intake for animals with intake limited by physical fill. High producing herds, herds that maximize forage feeding, and high-group cows will benefit most from forages with high NDF digestibility.