Breaking Down By-Product Fiber Digestion

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One of the important niches beef and dairy production fill in our economy is the conversion of byproduct fiber into valuable beef and dairy products. While the marketing of byproducts is commonly focused on their fat or protein characteristics, they also bring significant amounts of fiber to diets. Perhaps alarmingly, we find more variation in fiber digestibility across byproduct ingredients than we do across the major forage types that are routinely analyzed for NDFD. As we've found in the major forage types, single time points and digestibility indexes struggle to tell the whole story about what happens between the time fiber enters the rumen and when it exits as VFA, microbial protein, gas, or undigested material.

To paint a clearer picture of how fiber digestion varies across byproducts, we'll look at the extent of digestion as well as the full digestion curves.

Indigestible fiber, depicted in figure 1, is the portion of the feed that is not digestible to any cow. While formulation programs may require different time points depending on the mathematical approach they are using, any time point beyond 72 hours will rank feeds similarly. Byproduct feeds display more variation in indigestible fiber than forages. Soybean hulls, corn gluten feed, and beet pulp contain less than half as much indigestible fiber as corn silage, while brewers' grains often contain more than alfalfa.

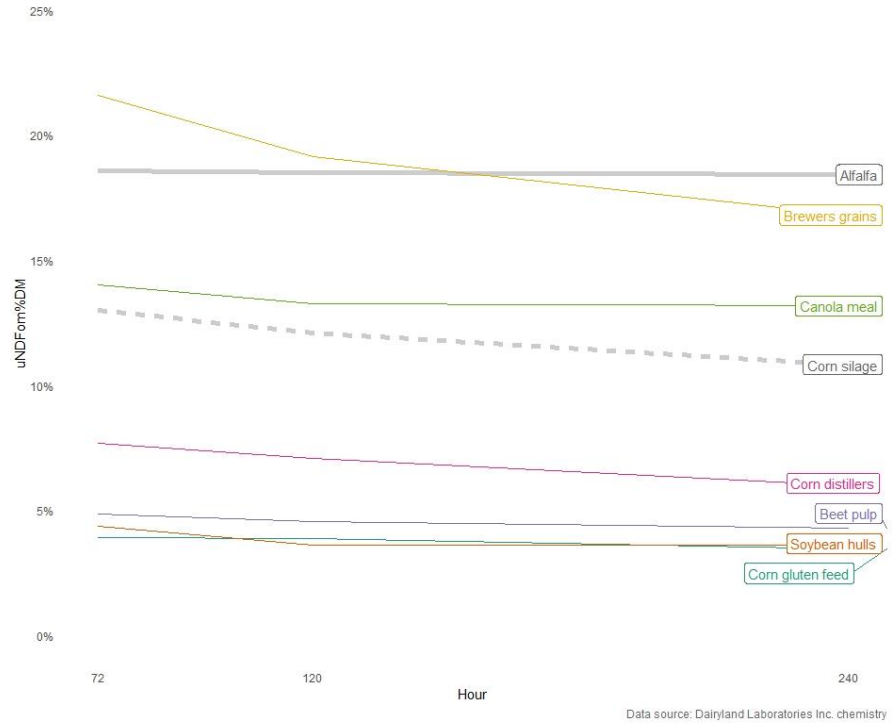

Figure 1. Median extent of digestion (uNDFom%DM) by feed type. Any timepoint beyond 72hr will rank feeds similarly.

Within the laboratory, we have mixed feelings about analyzing NDFD at multiple time points. On one hand, all the time points within an individual feed are highly correlated. Digestibility time points are also expensive to measure. Creating a reliable calibration for a single time point costs more than creating the full set of calibrations for CP, NDF, fat, and ash, but, we cannot get a full understanding of differences between feed types by looking at any individual time point (Figure 2). For example, at 12 hours, canola meal, alfalfa, and

corn silage are nearly identical, but by 30 hours they look like completely different feeds. Similarly, beet pulp and soybean hulls are only 6 points different at 72 hours but 33 points different at 12 hours. Feeds vary in both rate and extent of digestion, neither of which can be fully captured at a single time point or index.

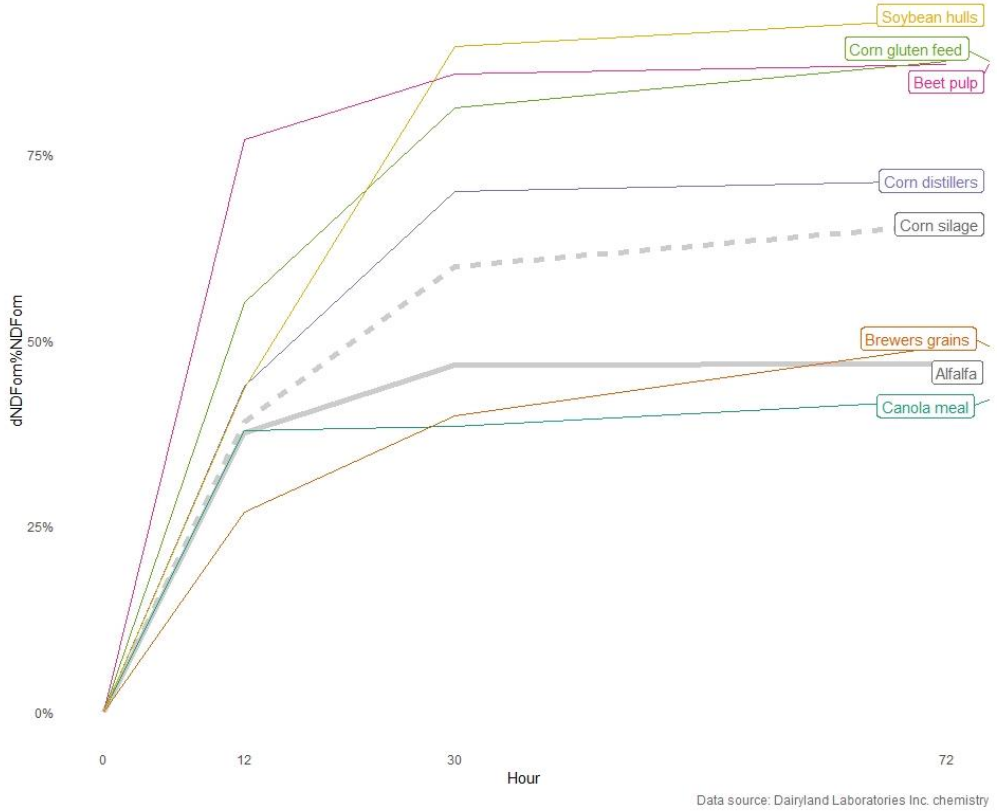

Figure 2. Median NDFD by feed type. Feeds vary in both rate (kd) and extent of digestion. Neither of these can be captured with a single time point or index.

		NDFD			
	aNDFom%DM	12h	30h	72h	120h
Beet pulp	37.5%	77.0%	85.8%	87.1%	87.9%
Brewers grains	42.6%	26.9%	39.8%	49.3%	55.1%
Canola meal	24.2%	37.8%	38.4%	42.0%	45.0%
Corn distillers	26.9%	43.8%	70.0%	71.5%	73.6%
Corn gluten feed	31.6%	55.0%	81.3%	87.6%	87.8%
Soybean hulls	64.7%	43.6%	89.6%	93.2%	94.4%

Table 1. Median values by feed type. Source: Dairyland Laboratories Inc chemistry

Today, Dairyland offers all the CNCPS time point inputs for the major forage and byproduct feed categories (12,30,120,240 for forages, and 12,72,120 for non-forages). Other time points are available on a chemistry basis.