Should You Measure Urine pH When Feeding Anionic Diets to Dry Cows?

I get asked a lot of questions about dairy cow nutrition, and I think the askers would usually like short, simple, concrete answers - ones that they could “hang their hat on” so to speak. But, when it comes to dairy nutrition, many questions deserve more of a discussion than a simple answer. Whether or not to check urine pH of prepartum cows when they are fed anionic supplements (low DCAD diets) is a good example. Opinions differ among the recognized experts in that field; some say “yes” and some say “no”.

A logical start to a practical answer is to point out the relationships between metabolic acid-base balance, urine pH and calculated DCAD level. Research and on-farm experience have consistently shown that if a sufficiently low DCAD diet is fed, acid-base balance can be altered and urine pH can be reduced. Intake of diets with excessively low DCAD can lead to metabolic acidosis that is severe enough to negatively impact the animal, with one possible result being reduced feed intake. But this relationship between DCAD, acid-base balance and urine pH is not linear over the entire range of possible DCAD values. In recommendations for Australian dairymen, Lean and DeGaris (2010) depicted this over a wide DCAD range, from +150 down to -20 meq/100 g diet DM. Based on a weak R2 value, they concluded that “urine pH is therefore no longer recommended as a tool to monitor efficacy of dietary acidification”.

In recent research, Grünberg et al. (2010) evaluated the metabolic status of cows when diets with DCAD of either -15 or -13 meq/100 g DM were fed. Just that small difference in DCAD (which is a realistic DCAD range for U.S. prepartum diets) yielded differences in urine pH. It also impacted other variables such as calcium flux, calcium excretion, and plasma calcium concentration on day of calving. Urine pH was slightly above 8 for control cows and around 7 (still fairly safe, but how would one know it was a 7 without checking it?) on the -13 DCAD diet. From a practical perspective, cows could become much more acidic with just a slight further reduction of DCAD. In a dairy farm setting, could some unforeseen variation in the mineral profile of forages affect acid-base balance enough to reduce feed intake? If you think that is a possibility, check the pH!

Most experts agree that at some point, reducing DCAD improves calcium status in prepartum dairy cows, resulting in less milk fever. As with many things in management, the necessity to measure and monitor depends to some degree on how much you push the limit. Diets with DCAD of -20, 0, and +10 are all lower than +40, but practically, that overall range is huge, and each will have different effects on the animal. It’s all relative! Is your goal “full DCAD” for maximum benefits, or some degree of “partial DCAD” for partial benefits? So, when I am asked if checking urine pH is essential when feeding anionic supplements, my answer is always definitely yes – maybe – it depends!

References
Grünberg et al. 2010. J. Dairy Sci. 94:727-745