Kraig Peel, Ph.D.
Butyric Acid

How many times have we opened a new trit pile or a bag of haylage and the smell was overwhelming? When this happens we are disappointed because now we know we have a problem with butyric acid. I had an undergraduate intern that asked me how I was sure there was a problem. I told him to handle the haylage then tell me tomorrow if the smell is still on his hands? Butyric acid is hard to get away from. But why is it a problem if the microbes in the rumen synthesize it during normal fermentation? How do we avoid high levels of butyric acid and if we have it, how do we manage our way out of it? We can't just throw away a pile of silage.

We encounter high levels of butyric acid in forages that are harvested at a moisture rate that is over 60%. The butyric acid producing chlostridia bacteria become attached to the plant in the field. The bacterium originally comes from the soil. Irrigation or rain causes splashing from the soil that allows the bacteria to get from the soil to the plant. When the plant is harvested, chopped, hauled, mixed and packed, the bacteria become well distributed in the pile. The excessive moisture in the forages allow these chlostridia organisms to flourish faster than the much needed lactic acid producing bacteria which are ideal to preserve the forage in the bunk. When the pH does not drop from the lactic acid, then the chlostridia organisms continue to increase in number and the result is extremely high levels of butyric acid in the forage and very little fermentation/preservation. Once the problem has been established in a pile, the problem will get worse over time as the butyric acid producing bacteria will continue to grow over time and produce higher levels of butyric acid in the silage.

The most common ingredient in silage inoculants is lactic acid producing bacteria. The effort is to increase the good bacteria and give them a head start on the bad bacteria. It does not take a lot of inoculant to go a long way as these lactic acid producing bacteria can proliferate at a very high rate in the correct conditions. If forages must be harvested at high moisture rates, then inoculants are a good insurance policy against high levels of butyric acid. Silage can be tested to determine the volatile fatty acid profile. The standard benchmark for butyric acid is: 50 grams per head per day for lactating cows and 20 grams per day on dry cows. This calculation will require some math, as the lab will send results in the number of grams in a given volume of the silage. The nutritionist or dairyman will then have to calculate the grams per day based on intake and the amount of the forage in the ration.

Silages that are found to be high in butyric acid can be spread out and some of the butyric acid will volatize meaning it will leave the silage in favor of the atmosphere. However, this is just a management tool to reduce the amount, it will not by any means eliminate the problem and the dairy or feedlot will need to have a lot of space to spread the silage into a large enough area to effectively realize the benefit. This process often leads to contamination with soil as the silage is spread and then returned to the pile that can lead to other problems. Often, the only manageable course of action is to blend the high butyric acid pile with a very low

butyric acid pile to keep levels below the threshold that will cause metabolic issues in dairy cows.

Why is butyric acid so bad for cows? First, ows do not like the smell of the butyric acid in the ration so it is common to see lowered DMI across lactating and dry cows. The olfactory response from the cows is significant when they put their nose into the ration at the bunk. The cow's reaction is not dissimilar from our reaction when we inhale a large enough volume when examining the silage. Lactation creates an extremely high nutritional demand so the hunger response takes over and the cows do eat the silage that is included in the overall ration. When cows ingest high levels of butyric acid it is volatized in the rumen and passes through the rumen wall and into the bloodstream where it is immediately carried to the liver. In the liver, the cow converts the butyric acid to BHBA through one reaction. The result is ketosis. If this silage is being fed to dry cows then ketosis is often realized at freshening. If the silage is fed to lactating cows then ketosis may be realized at any time in the lactation must most often in early lactation.

If the dairyman can utilize good management strategies to minimize or eliminate a butyric acid problem in silages, there will always be a positive effect on the bottom line.