

# Fermentation Acid Absorption Influences the Severity of Subacute Ruminal Acidosis

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Subacute ruminal acidosis (SARA) is a common digestive disorder that negatively impacts the health and productivity of dairy cows. In research conditions, SARA is defined to occur when ruminal pH is below 5.8. The depression in ruminal pH is driven by fermentation acid production in excess of acid removal from the rumen. The severity of SARA varies markedly between individual cows fed a common diet suggesting that the capability for acid removal may differ among cows. To address this issue, we conducted a study to determine if differences in the absorptive capability of rumen tissue can explain differences observed for the severity of SARA.

Subacute ruminal acidosis was induced in 18 German Merino sheep, fed a hay diet, by administering an oral drench to supply 5 g of glucose/kg body weight. Ruminal pH was measured continuously pre- and post-drench using an orally dosed pH probe. Ruminal pH data were used to characterize SARA. Three hours after the oral glucose drench, sheep were euthanized and ruminal tissue was collected for mounting in Ussing Chambers. Ussing Chambers provided the capability to measure of the rates of absorption of two individual fermentation acids, namely acetate and butyrate, across the isolated epithelia.

The glucose drench successfully induced SARA with a mean pH of 5.77 for the 180 min following induction. However, even though animals received the same dose of glucose/unit of body weight, there was marked variation observed in the severity of SARA. For example, the time that ruminal pH was below 5.8 ranged from 0 min to 180 min/180 min. Likewise, there was marked variation for acetate and butyrate absorption with values ranging from 0.31 and 1.30 to 0.69 and 3.82  $\mu\text{mol/h/cm}^2$ , respectively. Correlation analysis revealed that as acetate and butyrate absorption increased, the severity of SARA decreased ( $P < 0.01$ ). Correlation coefficients for acetate and butyrate absorption and the severity of SARA were -0.66 and -0.60, respectively.

**Implications:** This study indicates that the absorption of fermentation acids across the rumen is highly related to the severity of ruminal acidosis. Thus, strategies to increase fermentation acid absorption may also reduce ruminal acidosis, and improve the health and productivity of dairy cattle.