

Diagnosis and Management of Subacute Ruminal Acidosis in Dairy Herds

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KEYWORDS

• Dairy cows • Subacute ruminal acidosis • Subclinical acidosis • Chronic acidosis

KEY POINTS

- Subacute ruminal acidosis is diagnosed and prevented at the herd level. Individual cows do not exhibit clinical signs while their ruminal pH is low.
- The pathophysiology of subacute ruminal acidosis is complex, involving both local ruminal effects and systemic inflammation.
- It is difficult to diagnose subacute ruminal acidosis in dairy herds. There is no definitive herd test; instead, information about herd performance, clinical signs, and measured ruminal pH must be integrated.
- Prevention of subacute ruminal acidosis requires excellent feeding management and proper diet formulation.
- Feed additives may reduce (but not eliminate) the risk for subacute ruminal acidosis in dairy herds.

INTRODUCTION

Ruminant animals are adapted to digest and metabolize predominantly forages. Ruminal acidosis may occur when dairy cattle consume diets that provide too much grain. Feeding diets that are progressively higher in grain to dairy cattle tends to increase milk production, even in diets containing up to 75% concentrates.¹ However, short-term gains in milk production may be substantially or completely negated by long-term compromises in cow health when high-grain diets are fed.²

Although excessive grain feeding is the main cause of ruminal acidosis in dairy cattle, cows grazing pasture alone are susceptible to ruminal acidosis.³ Lush grass

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from intensively managed pastures can apparently be high enough in rapidly fermentable carbohydrates and low enough in effective fiber to cause ruminal acidosis.⁴

There are 2 major types of ruminal acidosis in dairy cattle: subacute ruminal acidosis (SARA) and acute ruminal acidosis. The definitions for these 2 types of ruminal acidosis come from the beef feedlot industry⁵ and have been applied to dairy cattle.^{6,7}

SARA is the most common form of ruminal acidosis encountered in dairy herds. It consists of intermittent periods of low ruminal pH that are between acute and chronic in duration. Depressed ruminal pH during SARA self-corrects within a few hours. Affected cows typically exhibit no overt clinical signs when ruminal pH is depressed. However, chronic health problems secondary to rumenitis may appear weeks to months later.

In contrast to SARA, cows with acute ruminal acidosis experience a sudden and uncompensated drop in ruminal pH. They exhibit acute clinical signs and may die.

It is difficult to estimate the prevalence of SARA in dairy herds. The pH of ruminal fluid can be measured; however, spot samples of ruminal pH cannot fully assess the prevalence of SARA because ruminal pH varies considerably with meal patterns.⁷ Nonetheless, spot samples are the only practical measure available for estimating the prevalence of SARA in dairy herds. The proportion of cows with ruminal pH ≤ 5.5 using ruminal fluid collected by rumenocentesis has been reported to be 14% in Danish cows, 20% in German cows,⁸ and 20% in US cows.⁹

Recognizing the limitations of determining the exact prevalence of SARA, it is apparent that it affects a large number of dairy cattle and causes major economic losses. In addition to the economic losses, SARA also directly impairs cow welfare by increasing the risk for lameness and other chronic health conditions.

PATHOPHYSIOLOGY OF SUBACUTE RUMINAL ACIDOSIS IN DAIRY CATTLE

Low Ruminal pH

Low ruminal pH is the de facto definition of SARA; however, the clinical manifestations of SARA may not be dependent on ruminal pH alone.¹⁰ Harmful metabolites (other than hydrogen ions alone) may be produced by the rumen microbial population depending on the diet fed.¹⁰ Such harmful metabolites may include total ruminal volatile fatty acids (VFA), lactic acid, or ammonia.^{11,12} However, alternatives to ruminal pH for defining SARA have not been clearly defined or rigorously evaluated. It is likely safe to assume that low ruminal pH is the major instigator in the pathophysiology of SARA.

Ruminal pH becomes too low because organic acids from ruminal fermentation of carbohydrates accumulate in the rumen. Ruminal pH can be lowered can happen by one (or a combination) of 3 pathways:

- Increased production of organic acids due to overconsumption of ruminally fermentable carbohydrates.
- Insufficient buffering of organic acids in the rumen, which is largely related to effective fiber intake.
- Impaired absorption of organic acids out of the rumen, which is most likely due to rumenitis.

Most of the basic research done on SARA involves the use of cannulated cows with continuous ruminal pH monitoring. By using this system, SARA has been defined as a decline in ruminal pH < 5.6 for more than 3 hours per day.^{13,14} Other approaches to defining the risk for SARA in research settings include the rate of ruminal pH decrease

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