Incidence of Subclinical Ketosis in Relation to Other Periparturient Conditions in Dairy Cattle

Minimizing the occurrence, severity, and consequences of negative energy balance in the early postpartal period has become an important issue for the dairy industry. (Geishauser et al, 2000; p 296) One of the consequences of negative energy balance is subclinical ketosis, defined as abnormal concentrations of circulating ketone bodies in the absence of clinical signs of ketosis.

In the literature, subclinical ketosis has been linked to a variety of periparturient conditions including udder disorders and mastitis. Listed below is a collection of literature references relating subclinical ketosis to these various conditions.

Subclinical Ketosis and Mastitis

- "Subclinical ketosis is highly associated with several periparturient diseases, including subclinical and clinical mastitis. There is growing evidence that the mechanisms of udder defence against mastitis are impaired in periods of negative energy balance and hyperketonemia." *(Leslie et al. p. 30)*
- In reference to a review of two studies of experimentally-induced mastitis in ketotic cows, *Leslie et al.* found the "Concentration of BHB showed a strong positive correlation to the severity of mastitis." *(Leslie et al. p. 28)*
- "Several epidemiological studies have shown that clinical ketosis is associated with an increased risk of clinical mastitis." *(Leslie et al. p. 28)*
- "*Jánosi et al. (2003)* found that elevated serum BHBA levels 1 to 3 days postpartum were associated with an increased risk for CM [clinical mastitis] caused by environmental pathogens." *(van Straten et al. p. 4387)*.
- A study by *Moyes et al.* found that clinical mastitis cows "had higher nonesterified fatty acid levels and a tendency toward higher β-hydroxybutyrate levels than H [healthy] cows before mastitis . . ." *(Moyes et al. p. 5419)*
- "Results from our study indicate that higher BHBA is also associated with the development of clinical mastitis at calving as well as during early lactation." *(Moyes et al. p. 5425)*
- "Greater concentrations of both NEFA and BHBA have been associated with impaired immune functions and mastitis in dairy cows." *(van Straten et al. p. 4393)*.
- A study by *van Straten et al.* showed that ". . . greater negative energy balance in early lactation predisposes dairy cows to udder inflammation". *(van Straten et al. p. 4386)*
- "Evidence also suggests a more positive relationship between BHBA concentrations and mastitis, although more studies are needed to resolve conflicting results, especially between parities." *(Moyes et al. p. 5427)*
- ". . . it is clear that leukocytes from hyperketonemic cows have impaired udder defence mechanisms against mastitis." *(Leslie et al. p. 27)*
- A study by *Suriyasathaporn et al.* states that "Among factors related to NEB [negative energy balance] (BHB, glucose, insulin, and NEFA), only the concentration of BHB shows a strong positive correlation to the severity of experimental mastitis, indicated by bacteria count." *(Suriyasathaporn et al. p. 403-404)*

Subclinical Ketosis and Other Periparturient Conditions

- "Several studies have shown an impairment of cellular immunity with increased concentrations of ketone bodies." *(Moyes et al. p. 5425)*
- "Approximately 75% of disease in dairy cows typically happens in the first month after calving. These problems are increasingly known to be rooted in immune function, and in turn, feed intake in the 2 to 3 weeks before calving." *(LeBlanc et al. p. 1272)*
- "There is an association between subclinical ketosis and metritis." *(Leslie et al. p. 26)*
- "The likelihood of abomasal displacement was significantly increased when BHB concentrations were elevated above 1400 µmol/L. In addition cows with BHB at or above 1400 µmol/L in the first two weeks post-calving were three times more likely to develop abomasal displacement." *(Leslie et al. p. 26)*
- In cows with subclinical ketosis, the interval from calving to first service was longer, and they needed more services to conceive. *(Geishauser et al. p. 296)*

By: David L. Lee; Professor, Rutgers University New Jersey Agricultural Experiment Station

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