Monitoring NEFA and BHBA serum levels in transition cows to predict peri-parturient disease
Peri-parturient Disease

- Dairy cattle are at risk for disease around parturition primarily due to entering a state of negative energy balance. Such diseases include Ketosis, Displaced Abomasum, Metritis and Retained Placenta.
- Negative energy balance requires the animal to mobilize adipose tissue in an attempt to meet increasing energy demands.
- Negative energy balance is also related to immunosuppression, further predisposing animals to other peri-parturient diseases.
Negative Energy Balance

• Negative energy balance occurs due to:
  – A decrease in DMI prior to calving
  – An increase in energy demands due to milk production
  – A lagging increase in DMI after parturition
Monitoring for Peri-parturient Diseases

• To identify and manage disease at a herd level, constant monitoring is necessary.
• Common methods of transition cow monitoring include:
  – Disease and culling records
  – Feed intake
  – Milk production
  – Body condition scores
Monitoring NEFA and BHBA values

- Non Esterified Fatty Acids (NEFA) and β-hydroxybutyrate (BHBA) serum levels are other means to predict peri-parturient diseases.

- Screening helps producers predict which animals are predisposed to peri-parturient disease.

- Screening also helps determine whether the management and nutrition practices are effective.
Why NEFAs?

• Circulating NEFA levels are a good indicator of Negative Energy Balance because their presence represents active fat mobilization.
• During Negative Energy Balance, adipose is mobilized as NEFA and transported to the liver to be oxidized or reesterified into triglycerides.
• Lower levels of NEFA indicate normal adjustments to the new energy demands, however higher levels of NEFA may indicate excessive negative energy balance and therefore the animal may be at higher risk for disease.
BHBA

- Adipose is mobilized as NEFA and transported to the liver to be oxidized or reesterified into triglycerides. When reesterification of triglycerides is decreased, production of ketone bodies is increased.

- Ketone bodies include:
  - $\beta$-hydroxybutyrate (predominant)
  - Acetoacetate
  - Acetone

- Lower levels of BHBA likely indicate normal adjustment to the new energy demands, however higher levels of BHBA may indicate peri-parturient disease.
Methods for Testing

• Blood is collected from peri-parturient cows (<14 days prepartum to <14 days postpartum) via the coccygeal vein or artery and stored in a red-top tube.

• Cows should be selected at random with a minimum of 10-12 samples per group for interpretation of results.

• Samples should be taken at the same time of day each time to avoid conflicting results due to diurnal and postprandial variations. For example, NEFA concentrations peak just prior to first feeding.
Methods for testing

- Serum should be separated within 12-24 hours of blood collection or kept in a cooler to avoid incorrect results.
- Samples should be frozen or shipped chilled as soon as possible. Transport should be arranged so that they arrive at the laboratory within 1 to 2 days.
Critical Thresholds

- Animals reported to have blood values of NEFA and BHBA greater than or equal to these thresholds are considered at higher risk for periparturient disease.
  - Prepartum:
    » NEFA: 0.27 mEq/L
  - Postpartum:
    » NEFA: 0.70 mEq/L
    » BHBA: 12 mg/dL
Herd Alarm Level

• The herd alarm level is the proportion of sampled cows per herd in the prepartum or postpartum group with levels of NEFA and BHBA above the critical threshold.
• It was designed to allow interpretation of results to determine when management and nutritional strategies need to be reevaluated.

• Prepartum
  - NEFA: greater than 15% of sampled animals had NEFA concentrations greater than or equal to the critical threshold

• Postpartum
  - NEFA: greater than 15% of sampled animals had NEFA concentrations greater than or equal to the critical threshold
  - BHBA: greater than 15% of sampled animals had NEFA concentrations greater than or equal to the critical threshold.
Prevention of Peri-parturient Disease

• Begin feeding higher energy diet to close up cows before parturition to supply more propionate and decrease circulating levels of NEFA
• Avoid stressing cattle as increases in epinephrine will increase circulating levels of NEFA
• Maintain dry matter intake of cows
• Elect to feed propionate or propylene glycol to cattle to increase glucose production
  – unpalatable, too much can be toxic to rumen microbial populations
References

