

Within-day variation in milk and blood metrics for hyperketonemic and non-hypoketonemic dairy cows

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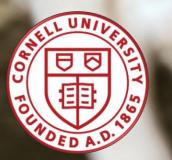
DEPARTMENT OF POPULATION MEDICINE & DIAGNOSTIC-SCIENCES DEPARTMENT OF FOOD SCIENCE CORNELL UNIVERSITY ITHACA, NY



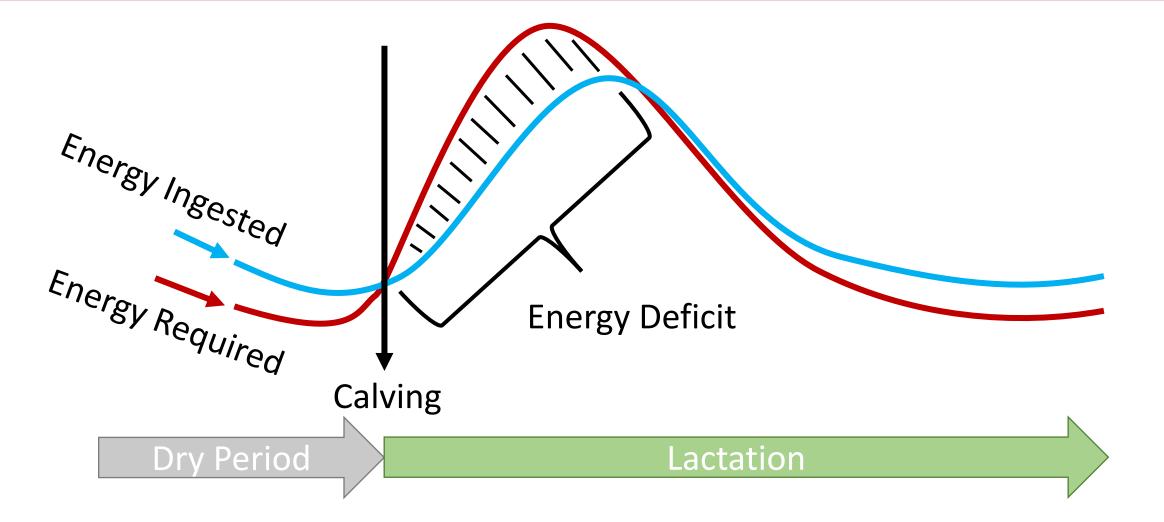
Photo: K. D. Bach



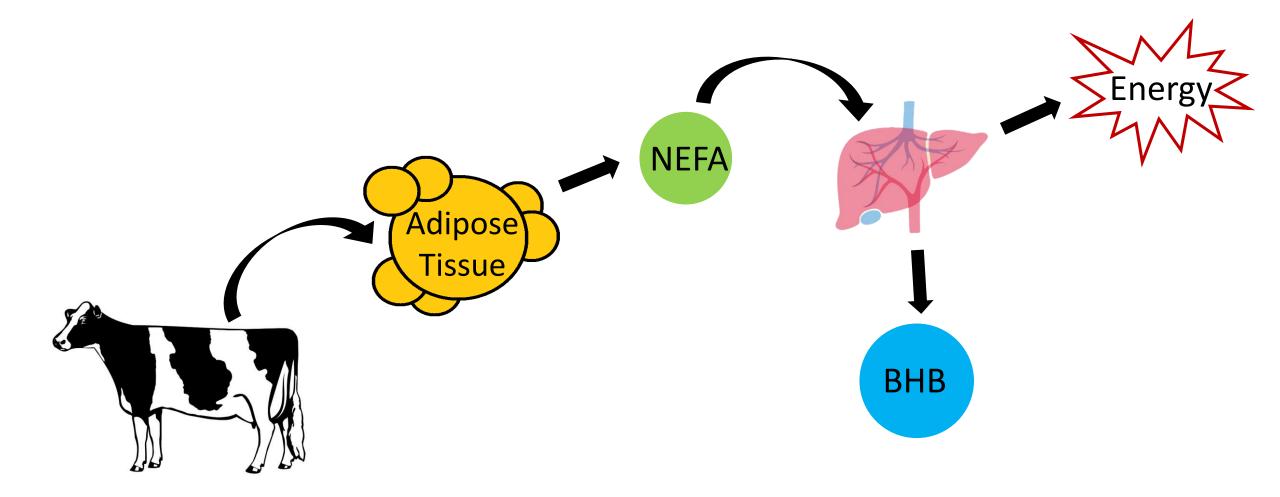
**Claira Seely** 



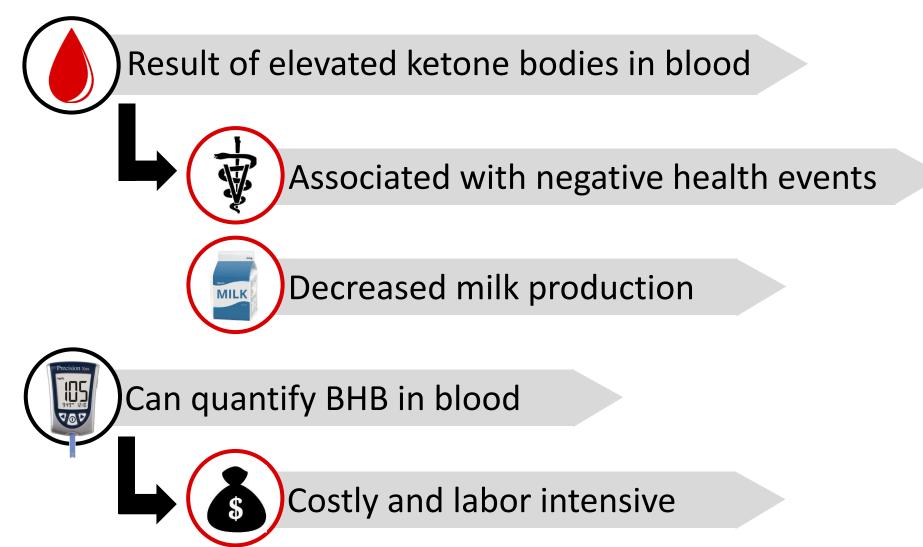
#### The Transition Period



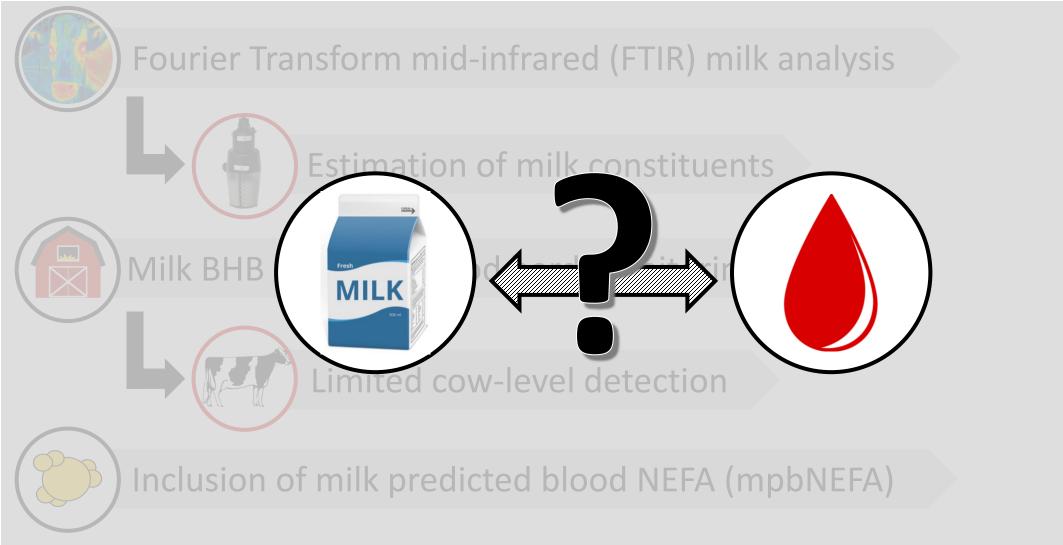
### Energy Deficit



#### Hyperketonemia (HYK)



### Monitoring HYK Through Milk



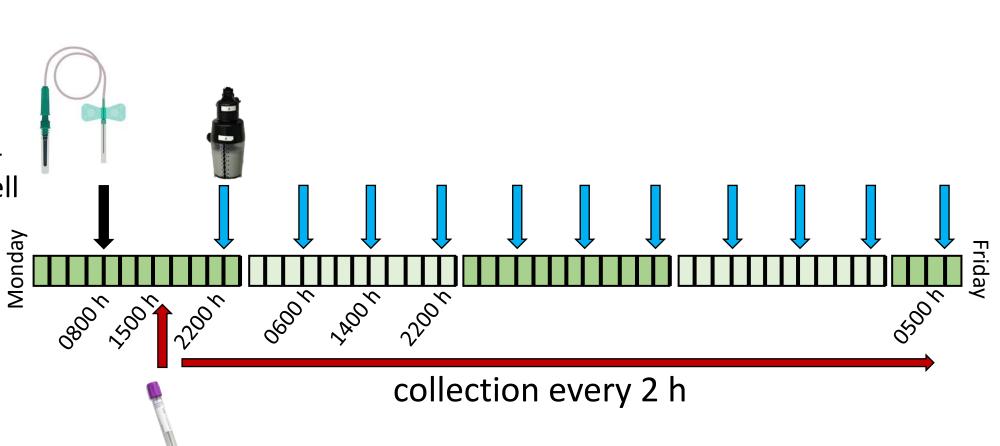
#### Objectives

1) Determine the diurnal variation in plasma BHB and NEFA, mBHB and mpbNEFA, and milk fatty acids

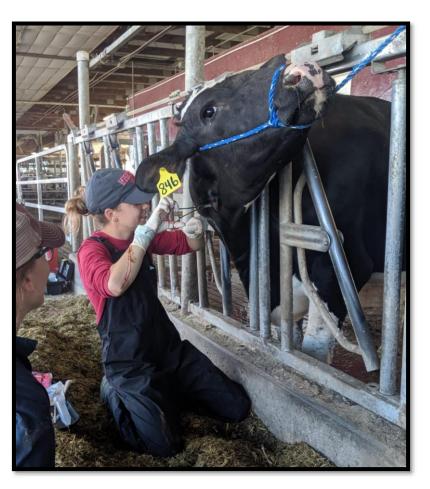
 Explore the effects of HYK on diurnal patterns of blood and milk constituents

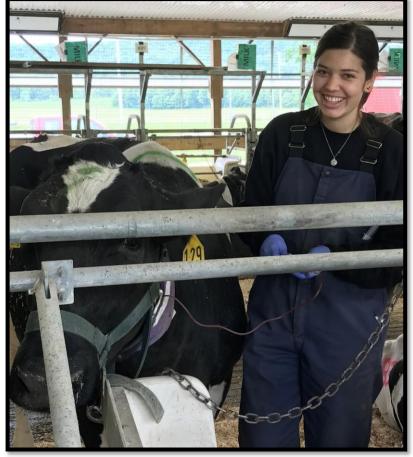
#### Materials & Methods: Study Timeline

- 28 multiparous Holstein cows
- Between 3 9
  DIM
- Housed in tiestalls at Cornell University Ruminant Center
- June & July 2019



#### Materials & Methods: Sample Collection





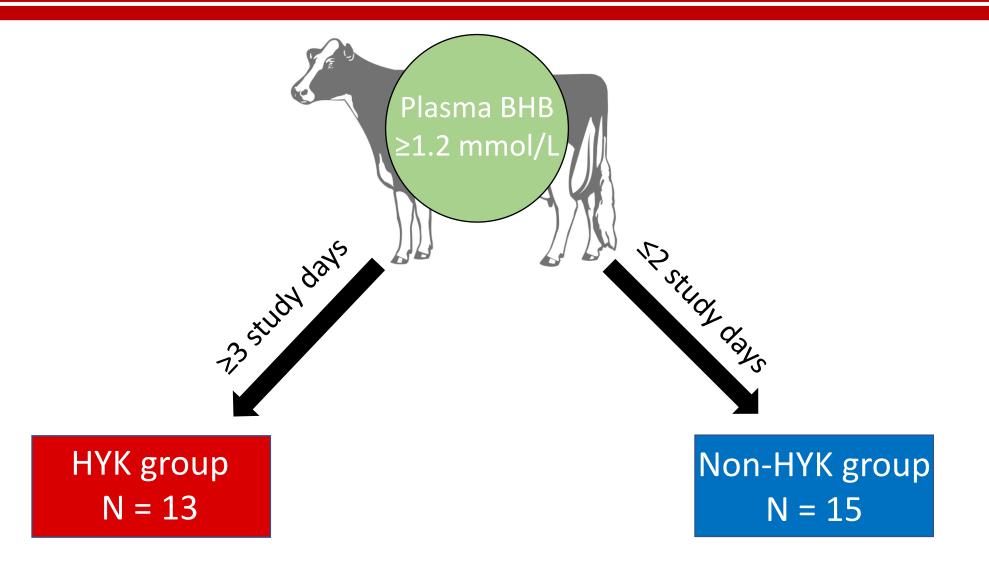


## Materials & Methods: Sample Analysis

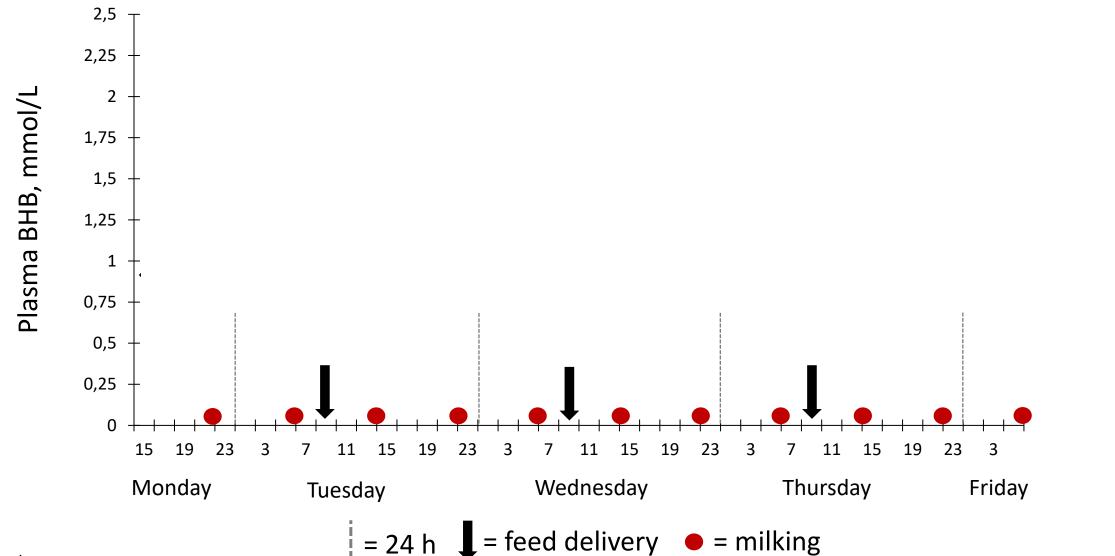
- Plasma samples analyzed for BHB and NEFA at NY State Animal Health and Diagnostic Center (Ithaca, NY)
- Milk samples (3X per day) analyzed for mBHB and mpbNEFA by FTIR at Barbano Lab (Cornell University)



#### Materials & Methods: Statistical Analysis

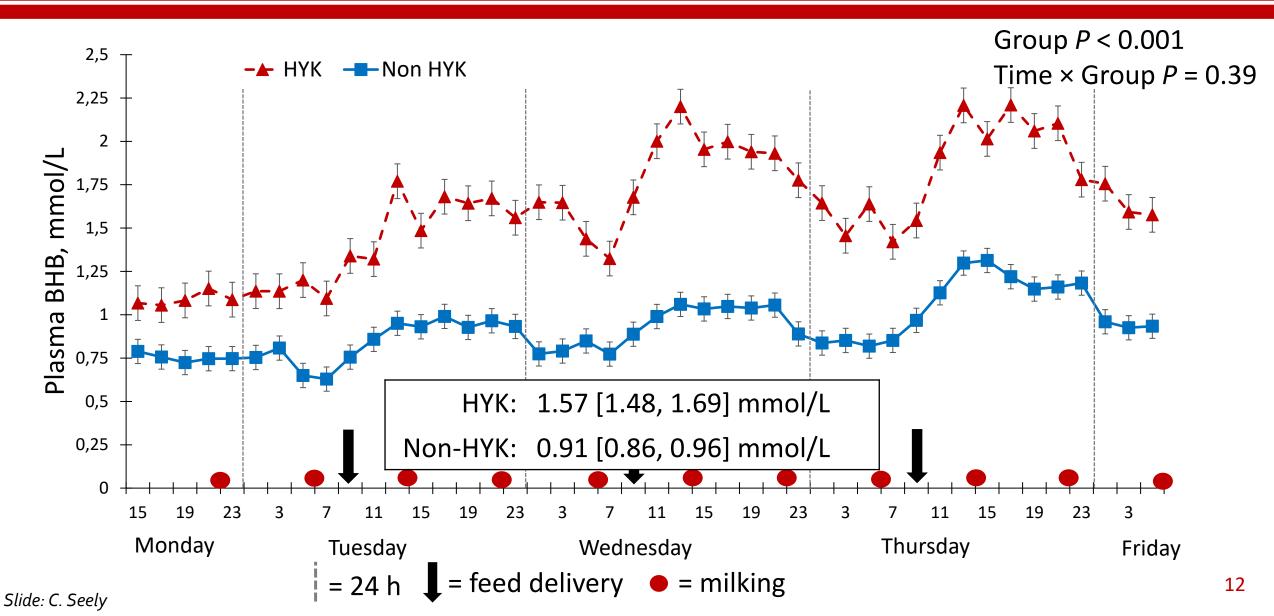


#### Results: Plasma BHB, all cows

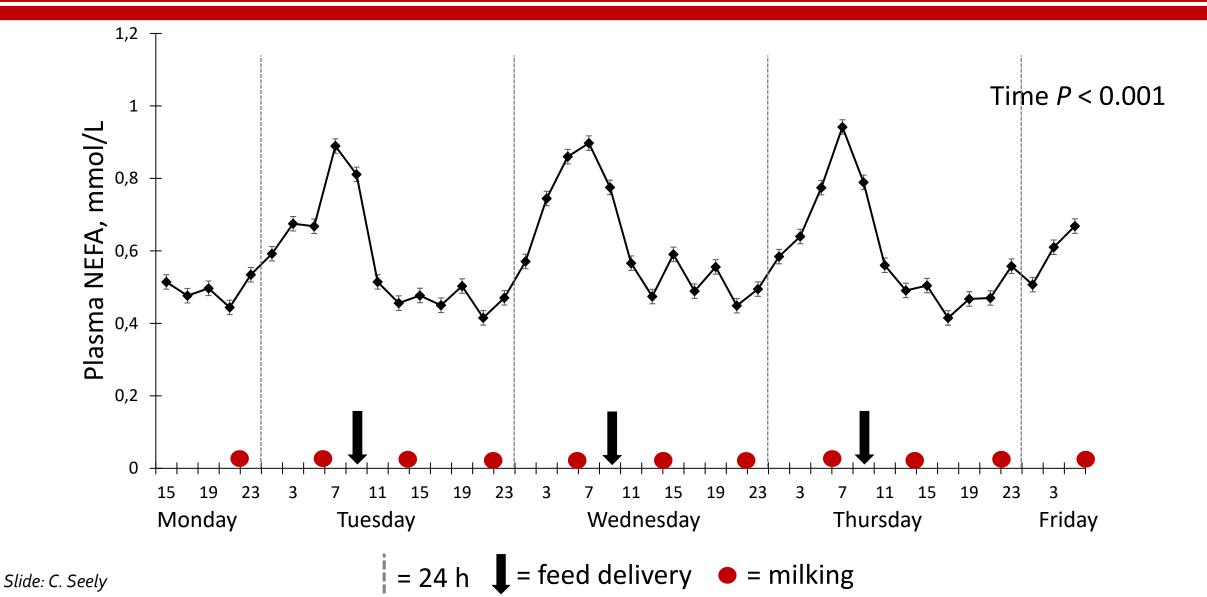


Slide: C. Seely

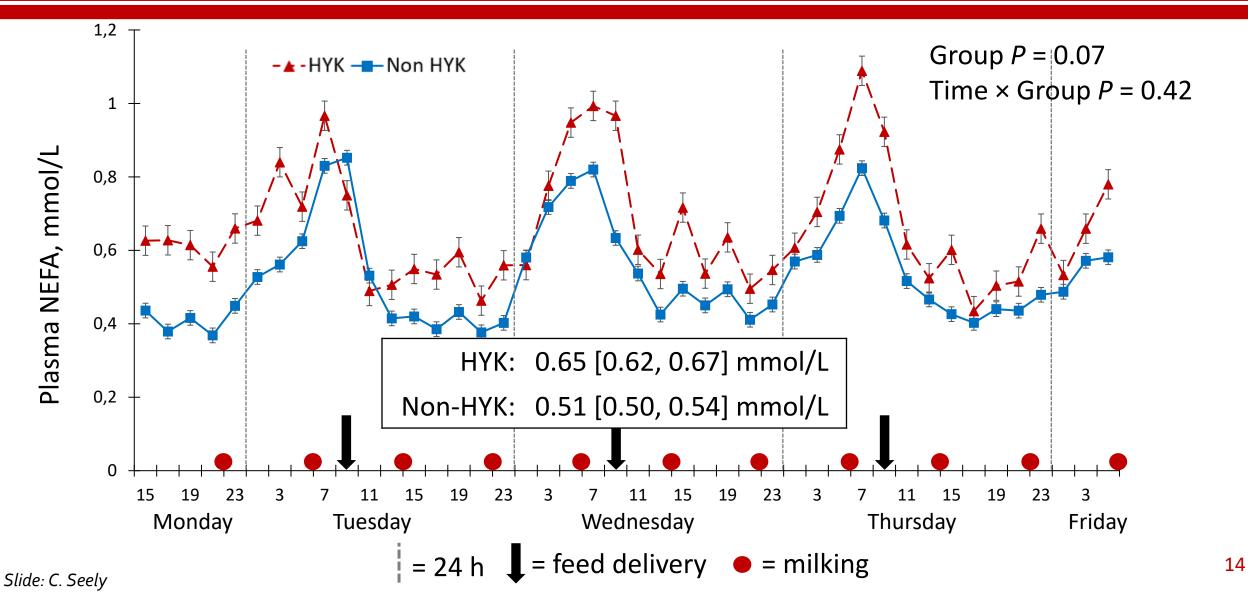
#### Results: Plasma BHB, by HYK group



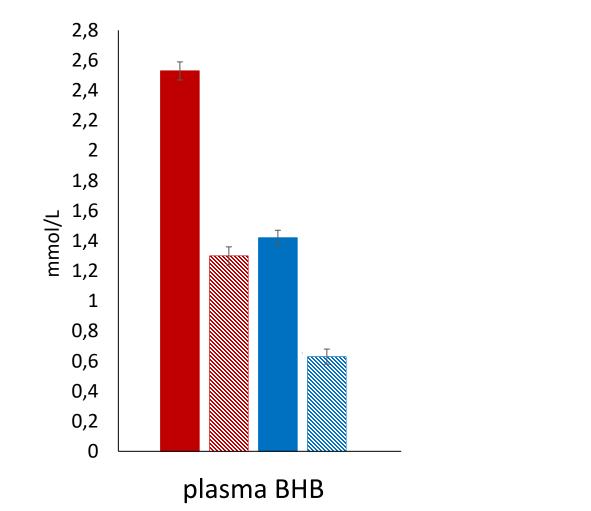
#### Results: Plasma NEFA, all cows



#### Results: Plasma NEFA, by HYK group



#### Results: Magnitude of Daily Change in Blood





🛯 HYK min

non-HYK Max

🔊 non-HYK Min

#### Conclusions - Blood

 Diurnal patterns of plasma metabolites

 HYK status affected daily amplitude of change for plasma metabolites

What happened in milk?

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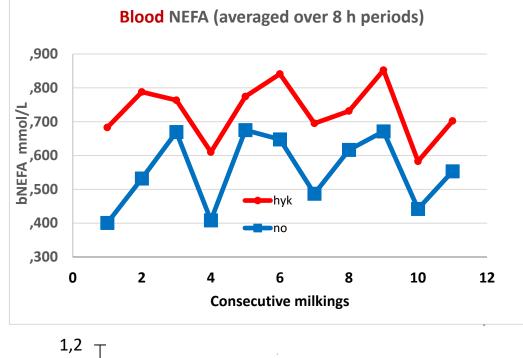
#### Results: Milk and Blood Metrics

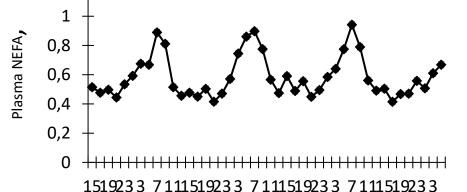
Blood samples were collected every 2 hours within each day, while milk samples were collected at 8 hour intervals within each day.

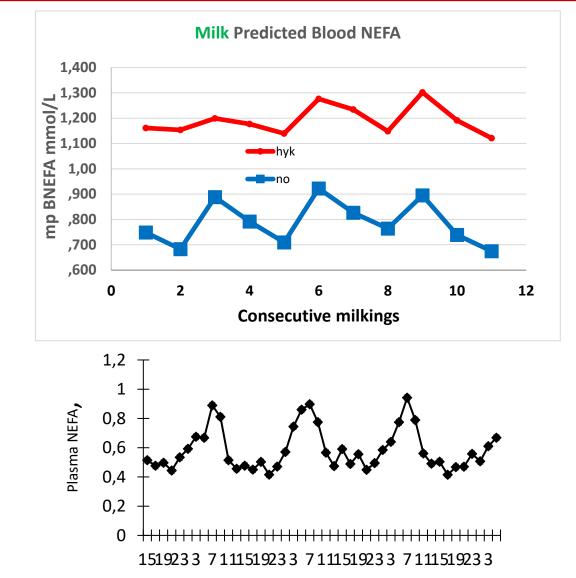
We hypothesize that the milk on an every 8 hour 3X milking system would reflect the characteristics of the blood for the 8 hour period prior to milking.

Thus, every two hour blood data was averaged to reflect the mean blood NEFA and BHB for the 8 hour period prior to each milking.

#### Results: Milk Predicted Blood NEFA and Blood NEFA

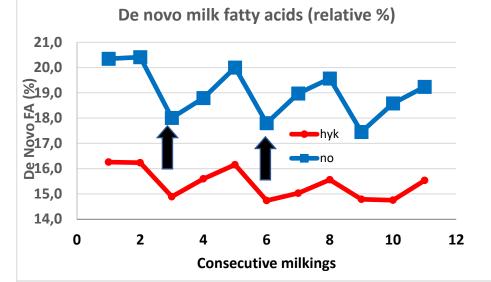




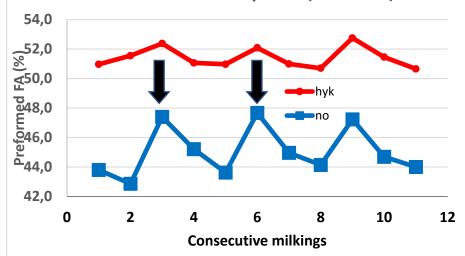


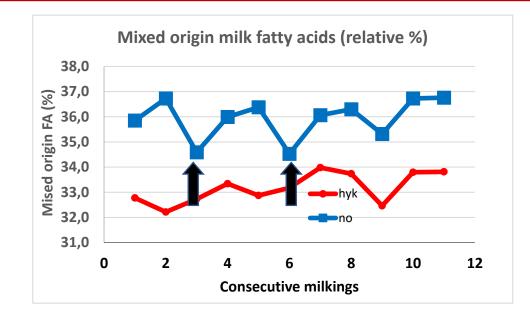
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#### Results: Milk De novo, mixed origin, and preformed FA

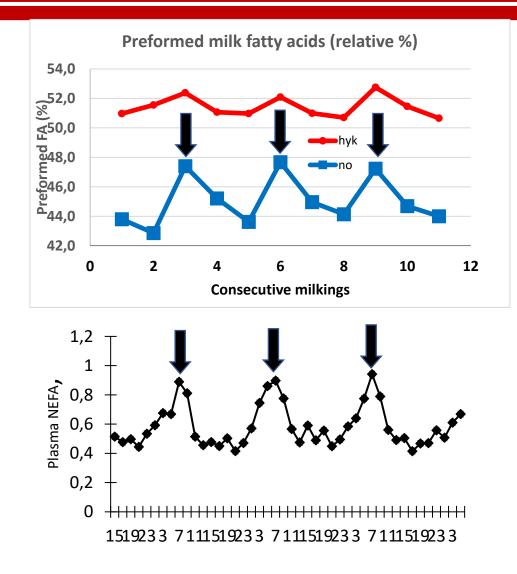


Preformed milk fatty acids (relative %)





#### Results: Milk De novo, mixed origin, and preformed FA



#### Conclusions - Milk

- Diurnal patterns of milk estimated blood NEFA and milk fatty acids were consistent with patterns in the blood.
- HYK status affected daily amplitude and overall relative percentage of milk fatty acid groups.

Slide: C. Seely



#### Implications & Future Directions

- FTIR estimates of mBHB and mpbNEFA as a tool to diagnose HYK
- Milk constituents provide more stable estimate during a 24 h period of energy status than a single blood sample.

# Acknowledgements



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#### McArt Dairy Cow Lab Caring for the well-being, health and production of dairy cattle Home Posts Research Lab Members ▼ Gallery Contact Us Links 🖆 Like 27 💓 Tweet 🖬 Share 0 Tweets by @mcart Welcome to the McArt Dairy Cow Lab! Jess McArt ent diseases in dairy cattle. As such, we are interested tifving methods that accurately and quantitatively measu netabolites, macromineral concentrations, ar portant biological markers cow-side in order to improve detection rders. Knowledge of a disease's incidence an ence during this period of lactation and its association with an important antecedent in determin nanagement factors and preventative measures that decrease impact of disease in a herd Our group has experience studying the epidemiology of hyperketonemia in early lactation, and we are interested exploring patterns of other parturient-related diseases in order to improve the well-being, health, and production iry cattle. In addition to the welfare of individual cows in a herd, diseases have an impact on the financial success dairy farms. Economic considerations regarding the cost of parturient-related diseases and the cost-benefit of differen esting and treatment strategies have a large impact on farm engagement and management practices. Usin feterministic and stochastic/iterative modeling, we hope to explore the economic impact of transition cow diseases an note management practices that optimize cow health and farm profit. Jess McArt

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