

## **Rapid High-Resolution Electrophoresis for Phenotyping Lipoproteins and as Novel Diagnostic Targets in the Dairy Cow**

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### **The Need**

The transition from pregnancy through birth to lactation is one of the most dangerous times for a dairy cow's health. Because cows must invest so much energy into gestation, labor and milk production, it leaves them more susceptible to infectious diseases. One particularly dangerous disease for cows during this period is hyperketonemia, which occurs when a cow is directing so much glucose and fat to milk that they begin metabolizing nutrients incorrectly, and in response, their livers produce excess ketones. Not only do excess ketones make cows more vulnerable to disease, acidic ketones can change the acid/base balance of a cow's blood. Accumulation of fats in the liver, called hepatic lipidosis, as a result of altered metabolism can also have negative health impacts on the cow.

### **The Approach**

Hyperketonemia is currently diagnosed via liver serum and milk analysis, but these changes don't appear until rather late in the disease progression. Hepatic lipidosis is also a challenge to recognize in its early stages. This project aimed to discover more sensitive markers of changes in fat metabolism and the liver, with the goal of being able to catch disease much earlier, benefiting cow health and farmer livelihoods. Lipoproteins, which transport fat through the body, may be able to serve as a surrogate marker of liver function and provide early warning signs of cow distress. Complicating this effort is the fact that many diagnostic tests used in veterinary medicine are not species-specific for cows. While there is extensive research on lipoprotein function in humans, much of it is not applicable to cows. This project also sought to understand more fundamental questions about lipoprotein functioning and diagnostics specific to dairy cattle. Blood samples from New York dairy cows, collected as part of regular herd health checks, were used for analysis.

### **The Impacts**

The researchers successfully identified lipoproteins that showed changes between healthy cows and animals with hyperketonemia; however, it is unclear whether those changes would have appeared before the disease progressed to that point. Future research will explore that question now that target lipoproteins have been identified. Researchers also validated precise, cow-specific diagnostic tests for changes in lipoproteins. The validated method will be available to external stakeholders through Cornell's Animal Health Diagnostic Center, enabling researchers and practitioners to access the analysis and expertise gained through this study.