**2008F079R Relationship between gut bacterial**

**establishment and immunity development in dairy calves**

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Background: The composition of the cow gut microflora is affected by the host genotype as well as the acquisition of microflora from the mother. This suggests that the establishment of the gut microflora in the early stage of the life plays an essential role in the development of the immune system and the maintenance of health. However, there have been few attempts to apply this knowledge to ruminants and determine how gut microflora may influence the development of the gut immune system in calves. Whether cattle genetics may influence the host-microbial interactions and how this may be used to help select animals with a better immune system and increase disease resistance remains unexplored.

Objectives:

1. To investigate the bacterial diversity difference along the GIT and in tissue and content early in dairy calves
2. To study lactic acid bacteria in the gut of dairy calves
3. To study TLRs expression along the GIT of dairy calves
4. To explore the relationship between gut bacterial establishment and host immunity development

Methods:

* Study 1: The ruminal absorption mechanisms in claves were evaluated using ten claves fed milk and starter. At 8 weeks mucosal tissue and cut content was sampled.
* Study 2: Calves were fed whole milk and starter before weaning and hay/straw with rolled oats after weaning. At 3 weeks (8 calves) and 6 months (8 calves) mucosal tissue and gut content were sampled.

Outcome: Results from this study showed that the bacteria inhabiting the epithelium was different than those inhabiting the GIT content. This suggests the commensal bacterial community associated with mucosal tissue is more stable than the bacterial flora in GIT contents and some bacteria are restricted in their distribution by gut location. Localized bacterial populations are established early in life and may contribute to the normal development and function of the GIT of dairy calves. Additionally, bovine TLR expression (detect pathogens and initiate immune response) GIT varies significantly throughout the GIT and mucosal TLR expression is age-dependent, with down-regulation occurring after weaning. The observed down regulation in TLRs expression in weaned calves may reflect host mechanisms to control inflammatory responses to commensal microflora and pathogens as well as development of other immune populations which alter TLRs signaling.

Recommendations: No recommendations possible for on-farm at this time

Benefits to industry: Animal health is a key factor in animal production. Infectious diseases cause billions of dollars in direct and indirect losses in both the dairy and beef industries. Thus, selecting healthier animals with better maintenance and disease control capabilities is urgent and necessary. Knowledge from this study may lead to future work in identifying phenotypes for disease resistance and new applications such as oral vaccines or immunotherapeutic agents, to improve mucosal immune system function, especially during the neonatal period, which is the time of greatest risk for infectious disease in cattle

KTT:

* 3 published scientific papers
* 6 presentations at conferences