Veterinary Research Scholars Program
University of Missouri

Equine Intestinal Microbiome
The Future of Enteric Disease Prognostics

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Introduction

- Colic is a common cause of morbidity and mortality in horses that often arises in the absence of a defined etiology.
- Perturbations of the gastrointestinal (GIT) microbiota are believed to play a role in many idiopathic colic cases.
- The equine GIT microbiota is critical for the sequestration of energy from the digesta, which is essential for health and for normal GIT maintenance.

Hypothesis

- Multi-factorial characteristics of the GIT microbiome will be associated with enteric disease using machine-learning techniques, e.g., “random forests” based on pre- and post-hospitalization fecal samples.

Methods

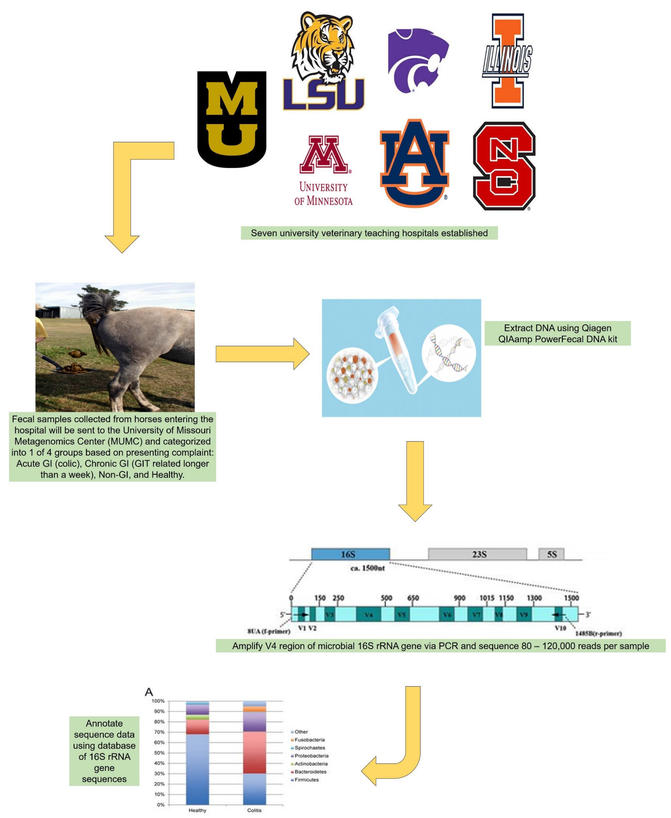

Figure 1. A multi-center consortium comprising seven veterinary teaching hospitals including those in Missouri, Kansas, Illinois, North Carolina, Alabama, Louisiana, and Minnesota has been established. Equine fecal samples will be collected and sent to MUMC for DNA extraction and sequencing.

Equine microbial composition for colic prognosis

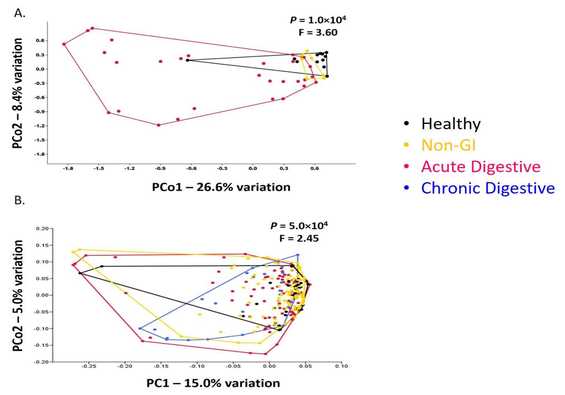

Figure 2. PERMANOVA and PCoA using Jaccard indices for horse fecal samples collected by LSU (A) and MU (B).

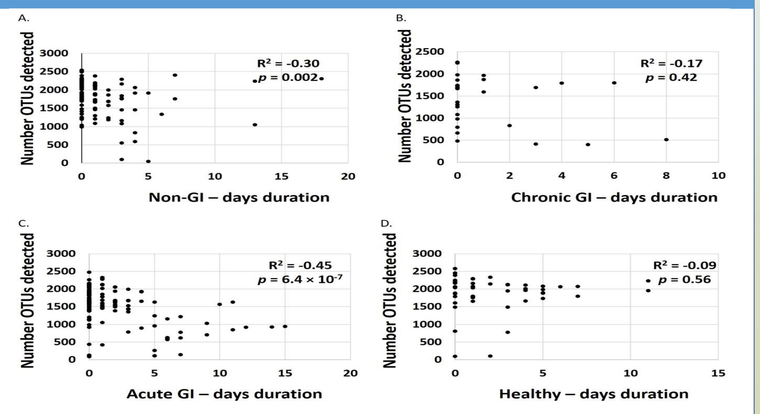

Figure 3. Graphs A, B, C, and D are separated into categories of patient presentation to the hospital. Each is plotted by richness of the sample against the number of days in the hospital. Acute-GI (C), suggests an overall decrease in richness the longer the patient is in hospital (p = 6.4×10^{-7}, R^2 = -0.45); however, Chronic GI (B) and Healthy (D) suggest no correlation between the richness and number of days in the hospital.

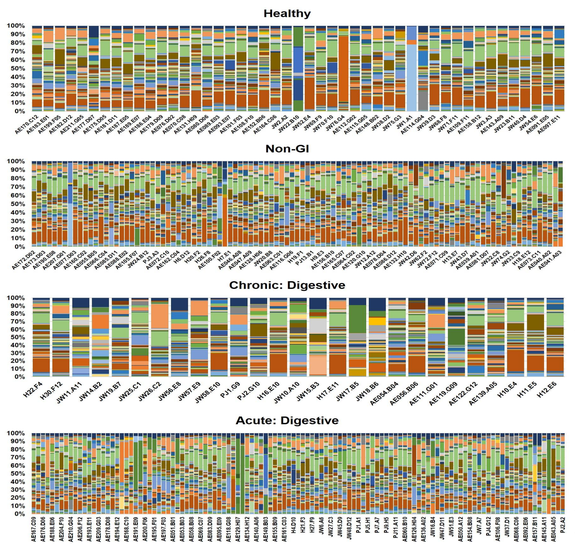

Figure 4. Bar charts showing the relative abundance of fecal microbiota samples from LSU and MU and separated into respective groups based upon reason for hospital visit.

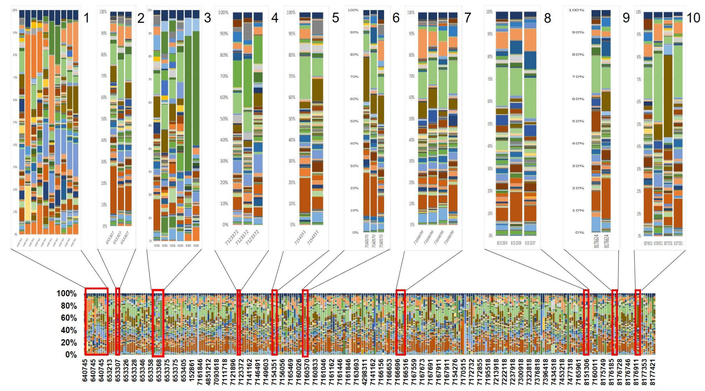

Figure 5. Overall abundance of pre- and post-hospitalization fecal samples. Of the samples selected, samples 1, 3, 4, 5, 7, and 10 are acute GI, colic patients. The more prominent bacteria present in the overall abundance seem to be *Bacteroidales* (light green), *Rikenellaceae* (brown), and *Kiritimatiellae* (burnt orange).

Conclusions

- Overall the composition among samples from both LSU and MU were similar with few extreme differences. Those differences within the healthy and acute GI groups that stray far from normal composition appear to be from mares that have recently foaled and are accompanying sick foals. The non-GI MU samples that stray far from normal are from 1 day-old foals.
- Richness of the intestinal microbiota decreased as the number of days in hospital increased, especially for acute GI presentations. Since the other presenting categories showed no correlation, it suggests that the hospital stay alone does not decrease the overall richness of the microbial composition.
- Overall abundance of microbial composition changes among varying presenting categories. Therefore, examining the pre and post samples will be used to decipher characteristics of composition to be used as prognostic indicators.

Acknowledgements

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