2018 Northeast Agribusiness and Feed Alliance Update: The McFadden Lab

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2/7/18

Core principles

- Mass spectrometry-based lipidomics is a technological advancement that provides breakthroughs in our understanding of dairy cattle biology.
- Metabolic disease afflicts domestic animals and humans, and the mechanisms may be similar.
- Actively challenging contemporary theory and industry practice with science is essential for progress.
- The translational application of discovery is of fundamental importance.

The team

- Eduardo Rico, Ph.D.; Postdoc

- Ananda Fontoura; PhD student

- Amanda Davis; NSF PhD Fellow

- William Myers; MS student

The sphingolipid ceramide: A target for nutritional therapies aimed at controlling nutrient partitioning

Our discovery: Ceramide is an associative and causative mediator of insulin antagonism, and ceramide accrual develops with hyperlipidemia and fatty liver.

- Does ceramide accumulation represent an intrinsic mechanism to support gestation and lactation?
- How can we modify fatty acid (FA) feeding regimens to control ceramide supply and nutrient partitioning?
- When is it optimum to feed supplemental palmitic acid (i.e., enhance ceramide) to maximize health and milk production?
- Does LDL-ceramide promote inflammation and impair insulin action?

The glycerophospholipid phosphatidylcholine (PC): Optimizing dietary approaches to mitigate fatty liver

Our discovery: The biochemical mapping of the bovine hepatic and plasma lipidome (1,400+ lipids) reveals limited PC as a key feature of fatty liver.

- How can I improve the scientific approach to study VLDL-TAG secretion?
- How can you optimize methyl donor and FA supplementation to maximize hepatic PC synthesis and TAG export?
- Does hepatic inflammation antagonize PC synthesis and VLDL export?
- Should we be concerned about sphingomyelin synthase?

In the pipeline…

- USDA-NIH Dual Purpose/Dual Benefit R01 – Submitted
- American Association for the Study of Liver Diseases Pilot Grant – Submitted
- NIH NINR R01 – Submitted
- USDA Hatch Preproposal – Submitted
- CAT grant in partnership with Balchem – Spring
- USDA NESARE Graduate Student grants – Spring
- Weill Cornell Medicine seed grant – Invited, Spring
- Foundation for Food and Agriculture Research – Spring
- NSF Career Award – Summer
- USDA NIFA AFRI Foundational Program – Summer
- NIH R21, Co-PD – Fall?
- NIH R01, Co-PD – Fall?

Fatty liver; Nutrient partitioning

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Thank you for your support!

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