



## *How fast can the rumen adapt to concentrate?*

Brittney L. Schurmann, Matthew E. Walpole, Pawel Górká and Gregory B. Penner

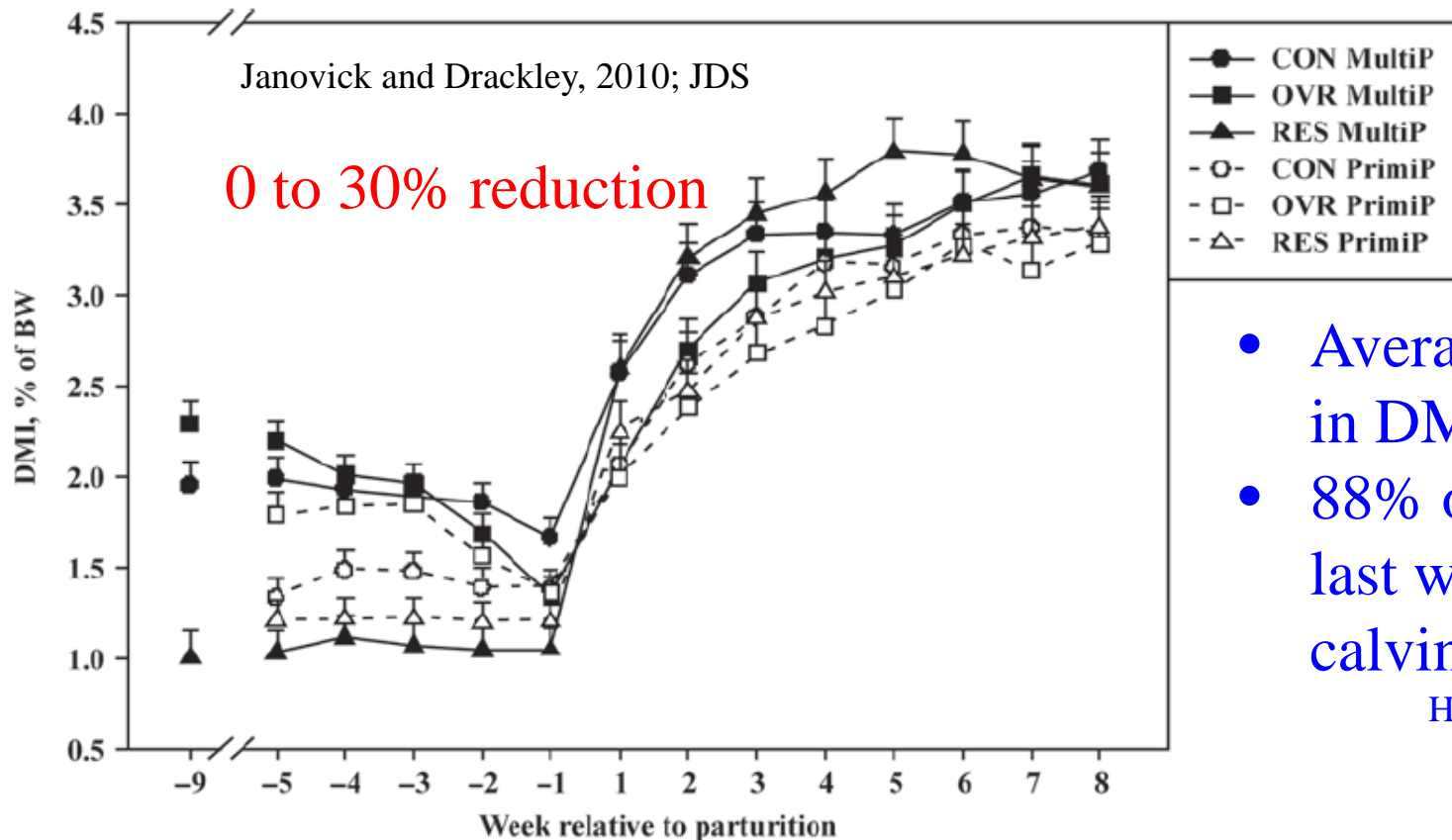
# Challenges with Transition Dairy Cows

- High risk for infectious, metabolic, and digestive disorders
- Energy demand
- Social structure
- Diet
- Feed intake



Courtesy of Jared De Jong

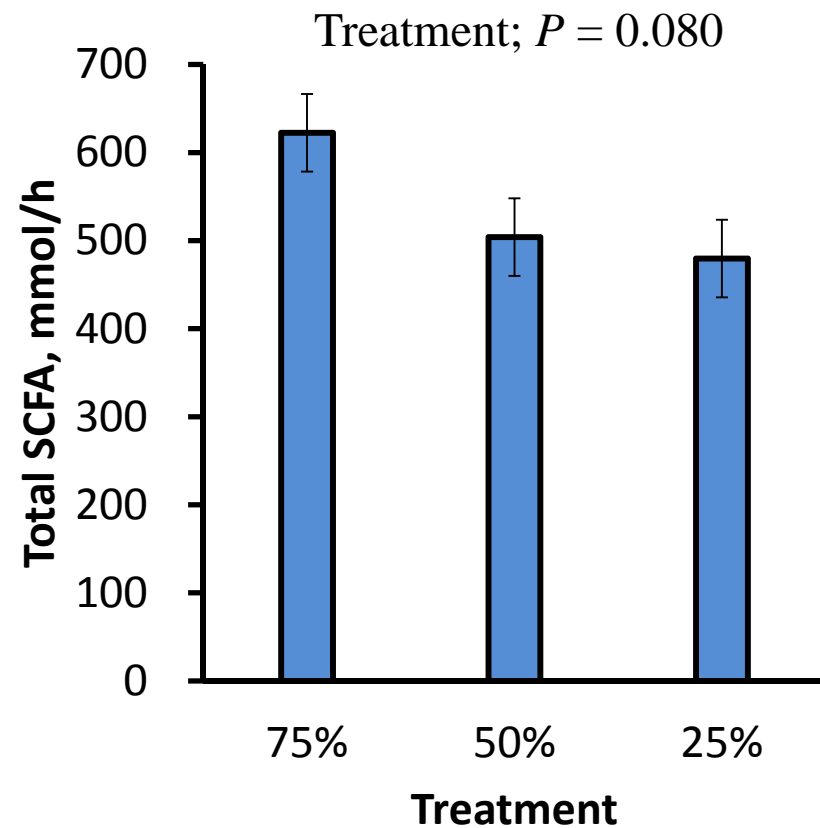
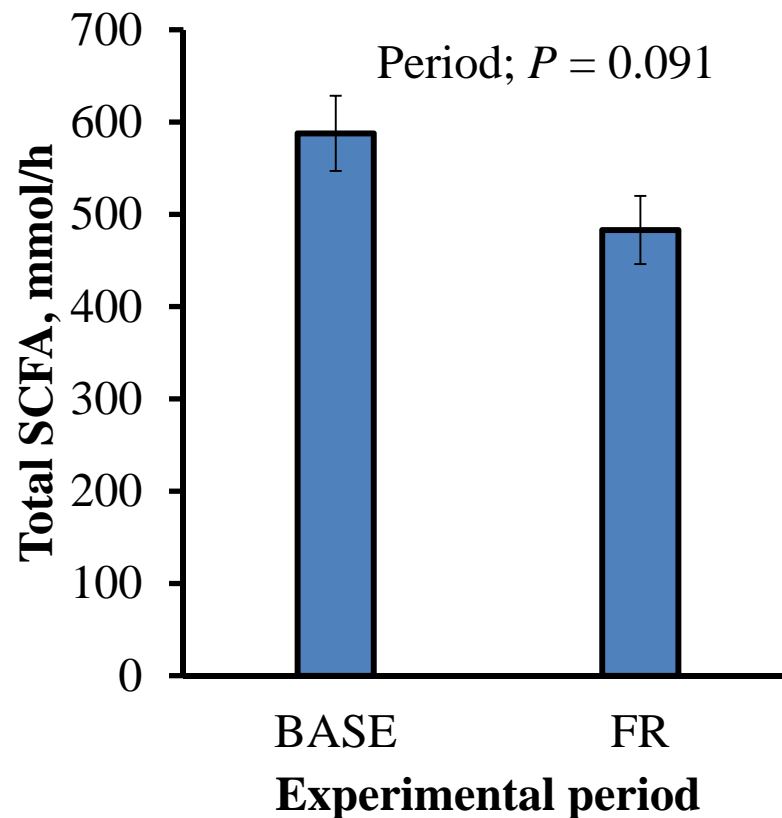
# Voluntary Feed Withdrawal in Transition Dairy Cattle



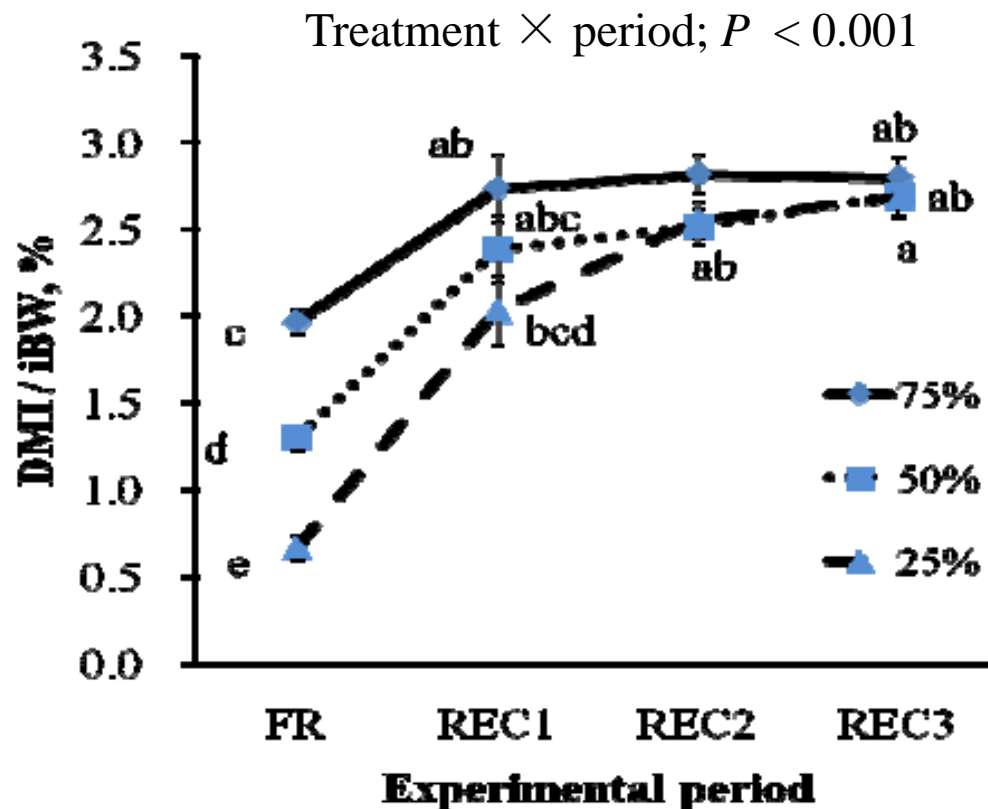
- Average depression in DMI = 33%
- 88% of reduction in last week before calving

Hayirli et al., 2002; JDS

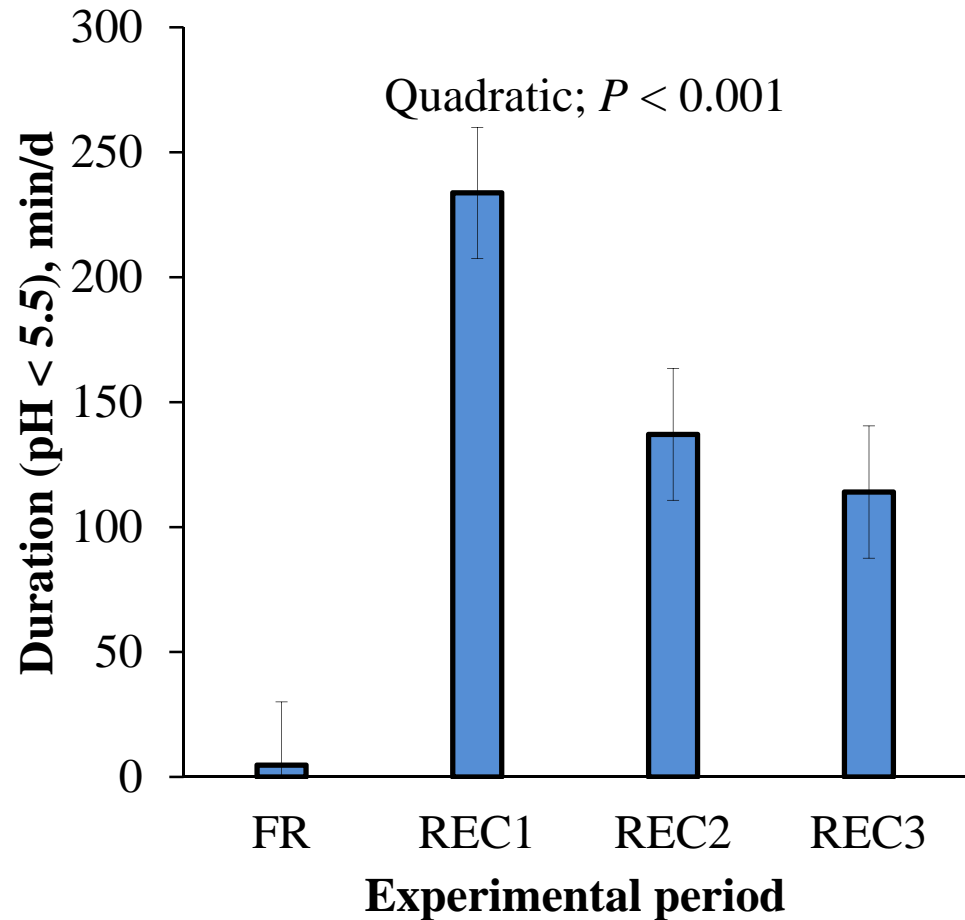
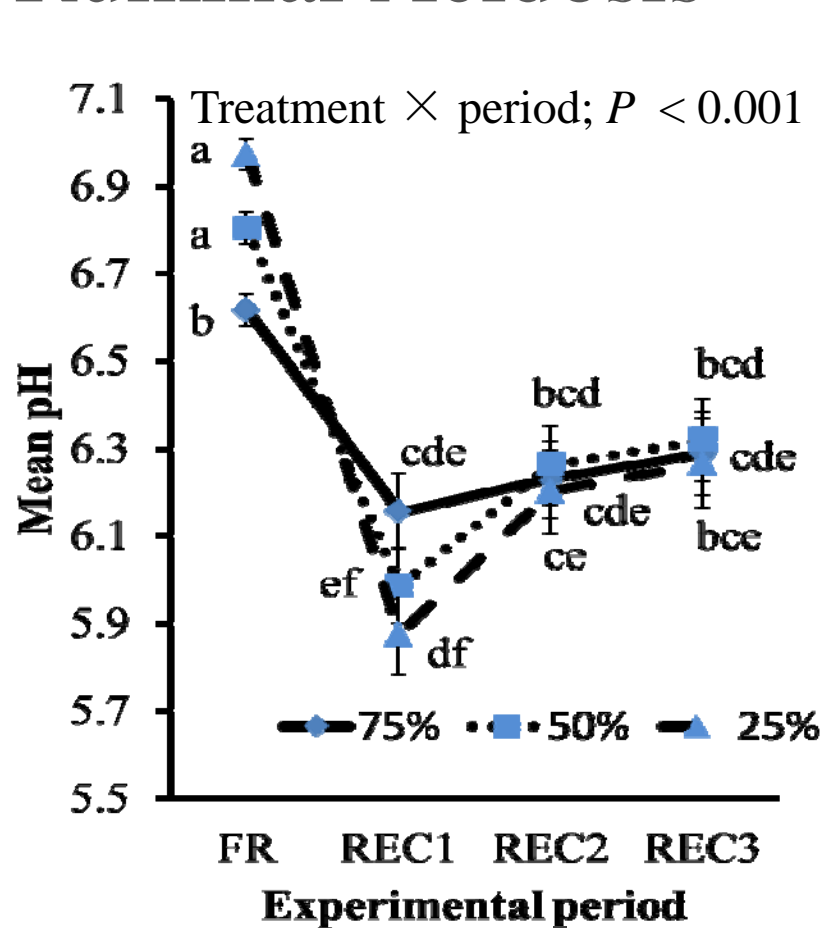
# FR Tends to Decrease SCFA Absorption



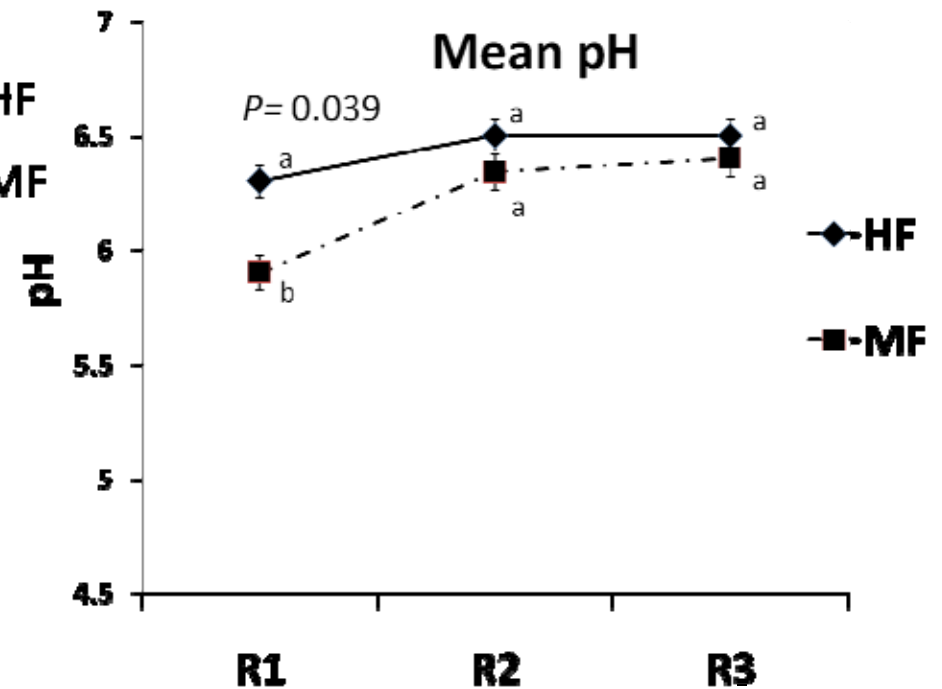
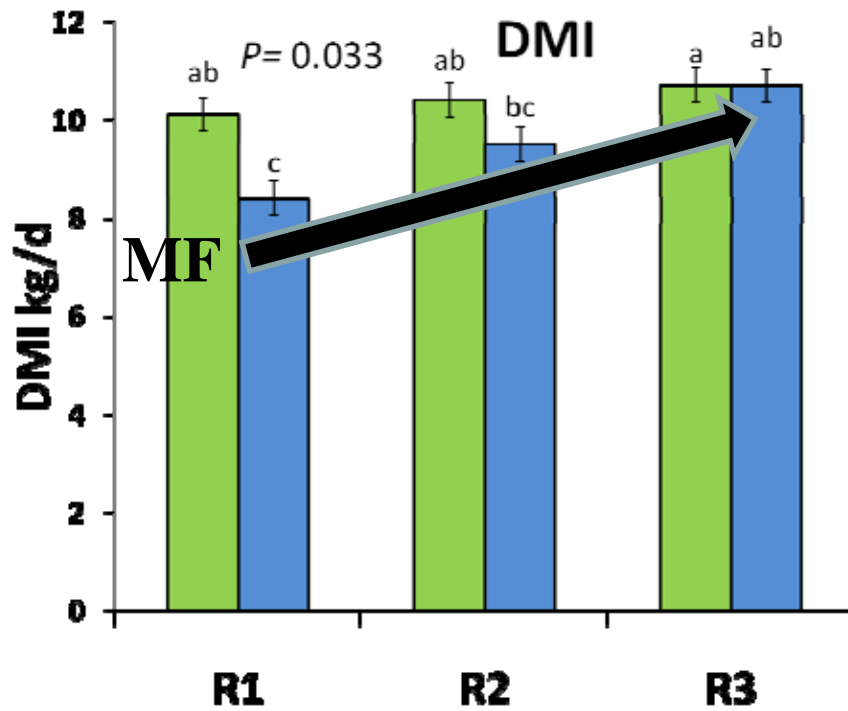
# Greater Severity of Feed Restriction Delays the Recovery for DMI



# Return to ad libitum Feeding Induced Ruminant Acidosis



# Effect of the Diet Fed POST on the Recovery Response



# Application to the Dairy Industry

- Several gaps remain
  - Practicality of feeding a high-forage diet immediately post-partum?
  - What are the production impacts, both short- and long-term?
  - Diet change will still be required; did we defer risk for acidosis to a time when DMI is greater?



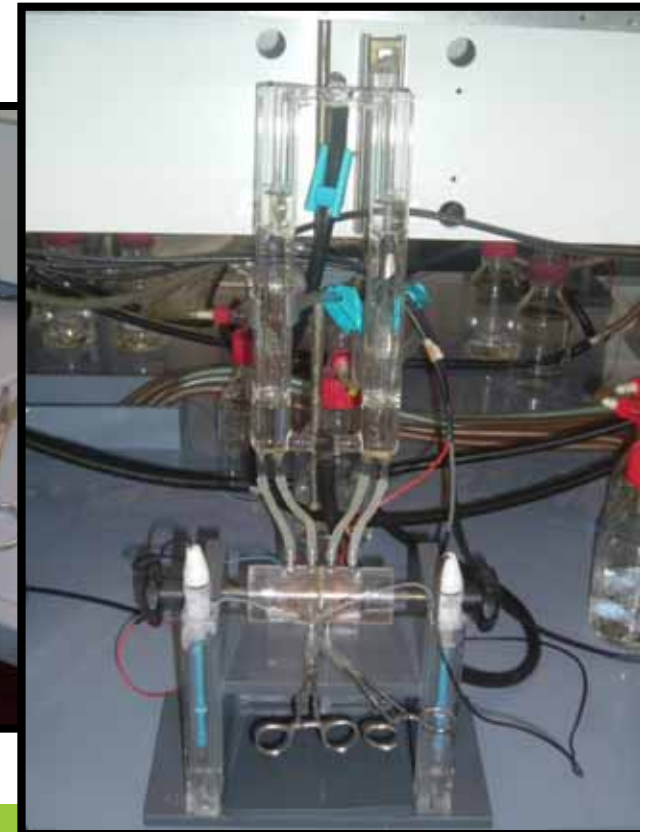
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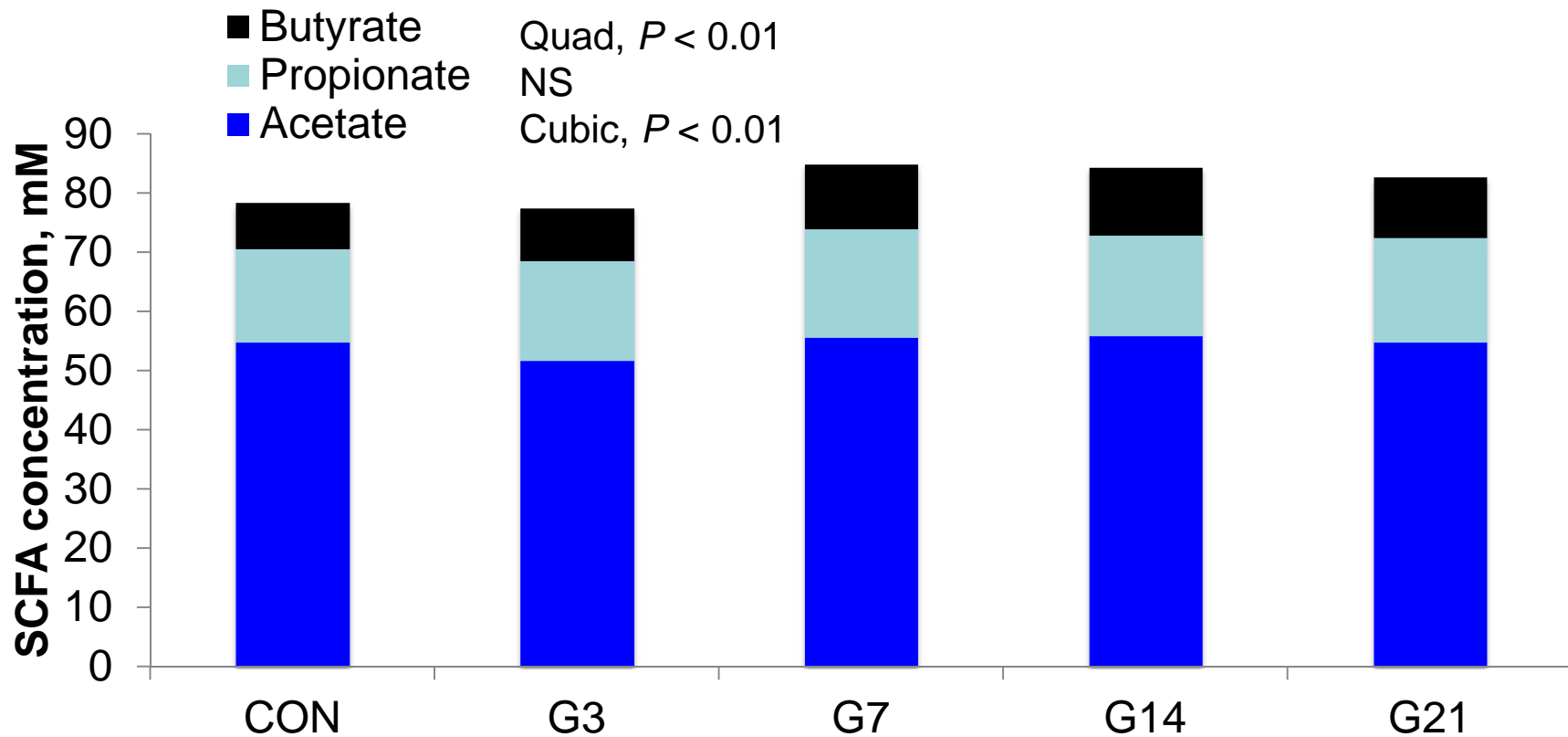
## How Fast does the Ruminal Epithelium Adapt?

- 25 Holstein bull calves
- 5 treatments: DMI restricted to 2.5% BW
  - Control  
(91.5% grass hay + 8.5% mineral/vitamin supplement)
  - 3 (G3), 7 (G7), 14 (G14), or 21 d (G21)  
(50% grass hay + 41.5% barley grain + 8.5% mineral and vitamin supplement)

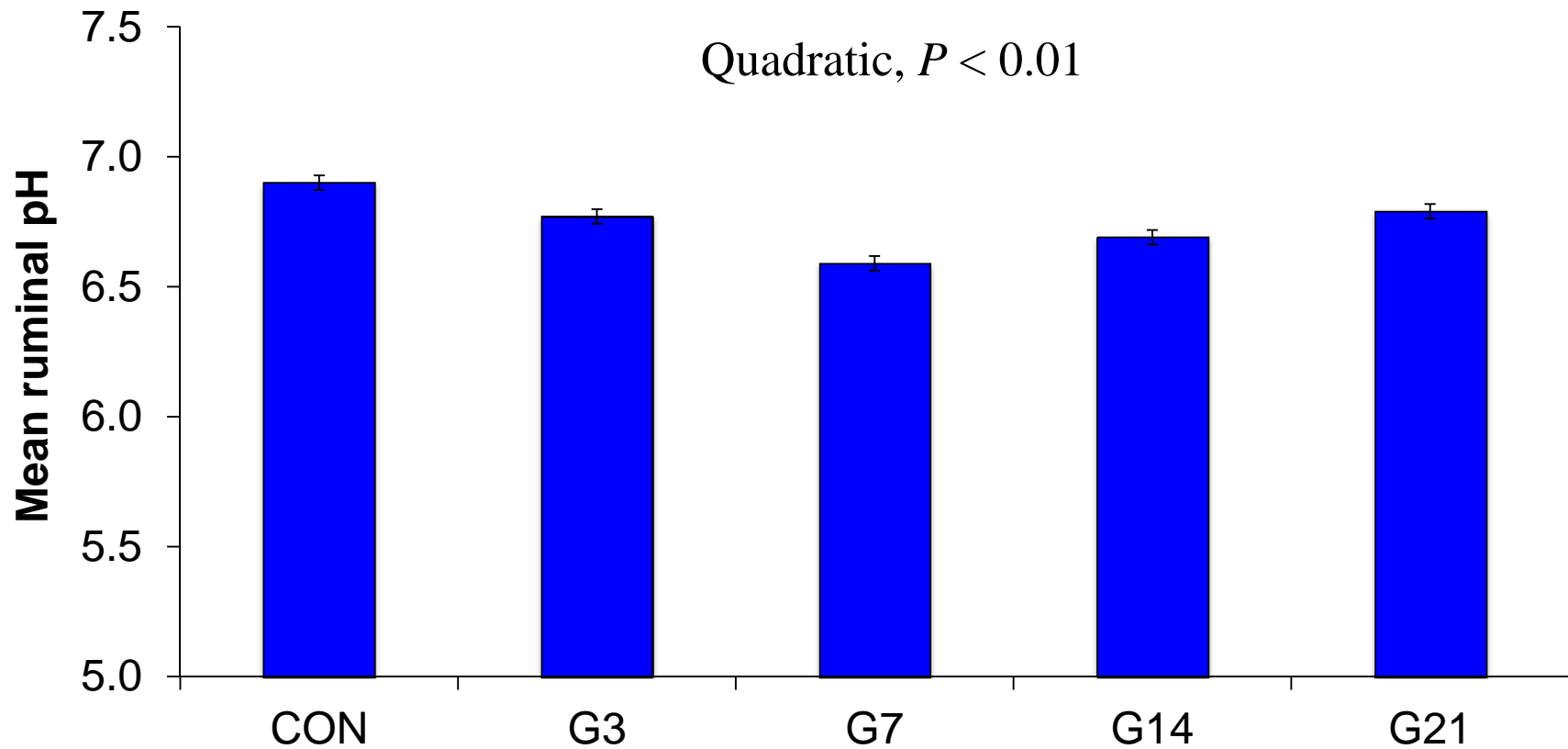
# Ussing Chambers



# Time on Feed and Ruminal Fermentation



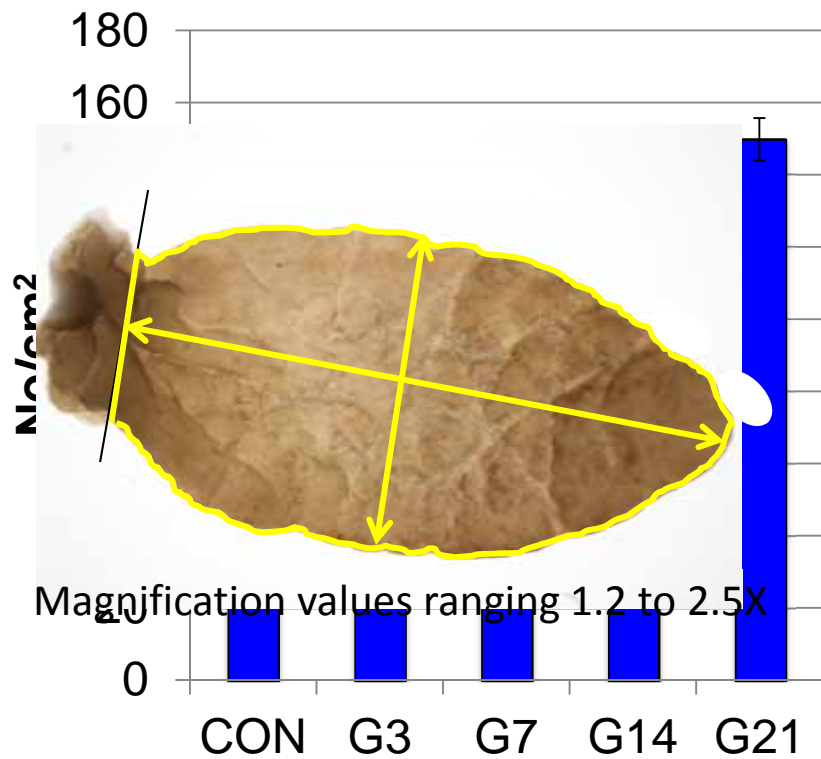
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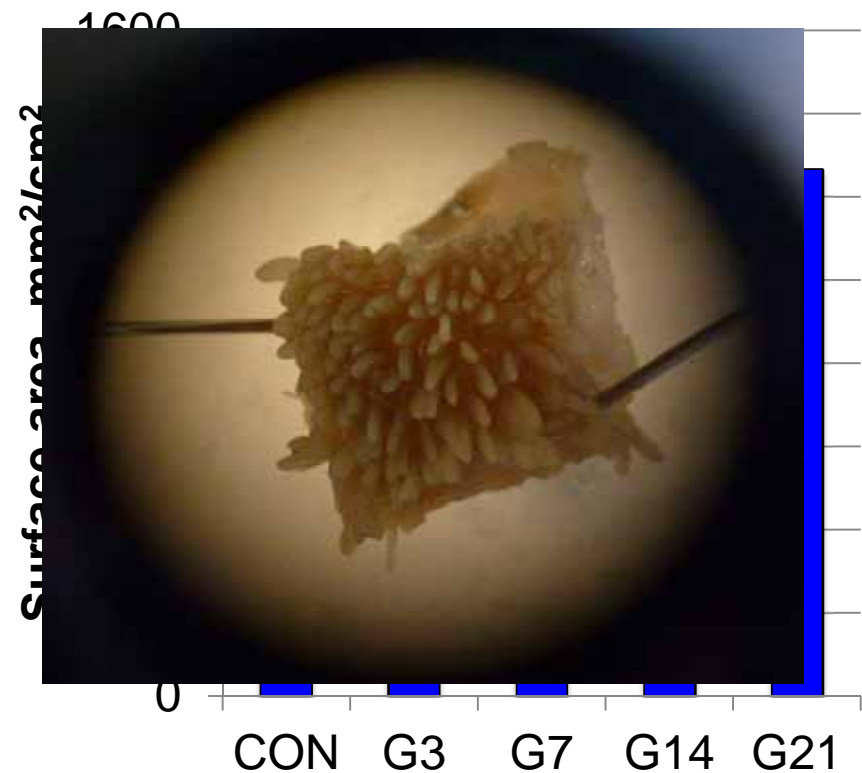
# Rate of Adaptation: Epithelial Responses

Not affected,  $P > 0.10$

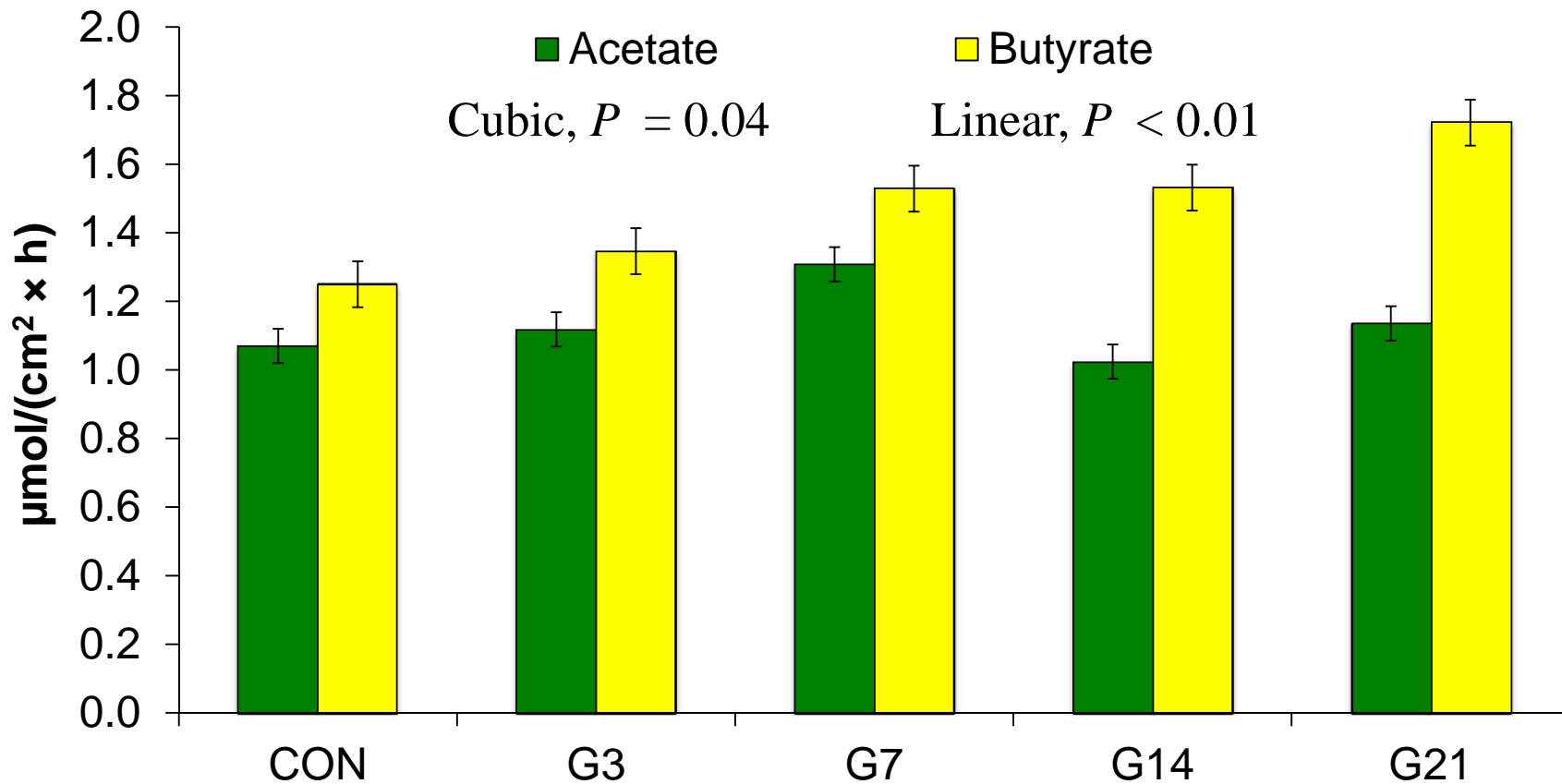
### Papillae density



### Effective surface area



# Rate of Adaptation: SCFA transport



# What Have We Learned?

- Short-term FR negatively affects nutrient absorption and barrier function of the gut
- Induces ruminal acidosis – even with diets that have a moderate fermentability
- Feeding a high forage diet following FR improved recovery
- Under ‘non-challenged’ situations the rumen adapts rapidly



# Where do we go now?

- What is the impact of the post-partum dietary energy density on;
  - DMI
  - Rumen fermentation and nutrient absorption
  - Milk and milk component yield
- Controlled metabolism and production study (U of S)
- On-farm validation with collaborating producers

# Funding Sources



Natural Sciences and Engineering  
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# Comments/Questions?

