

Effects of a moderate and aggressive implant strategy on the ruminal microbial communities in steers



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INTRODUCTION

- Implant strategies are one of the most efficient management practices to increase live carcass weight¹
- These hormones can interact with other physiological systems in cattle
- Feed efficiency metrics have been linked to rumen microbial communities²
- Few studies involving how hormones can interact with the gut microbiome to cause shifts in communities

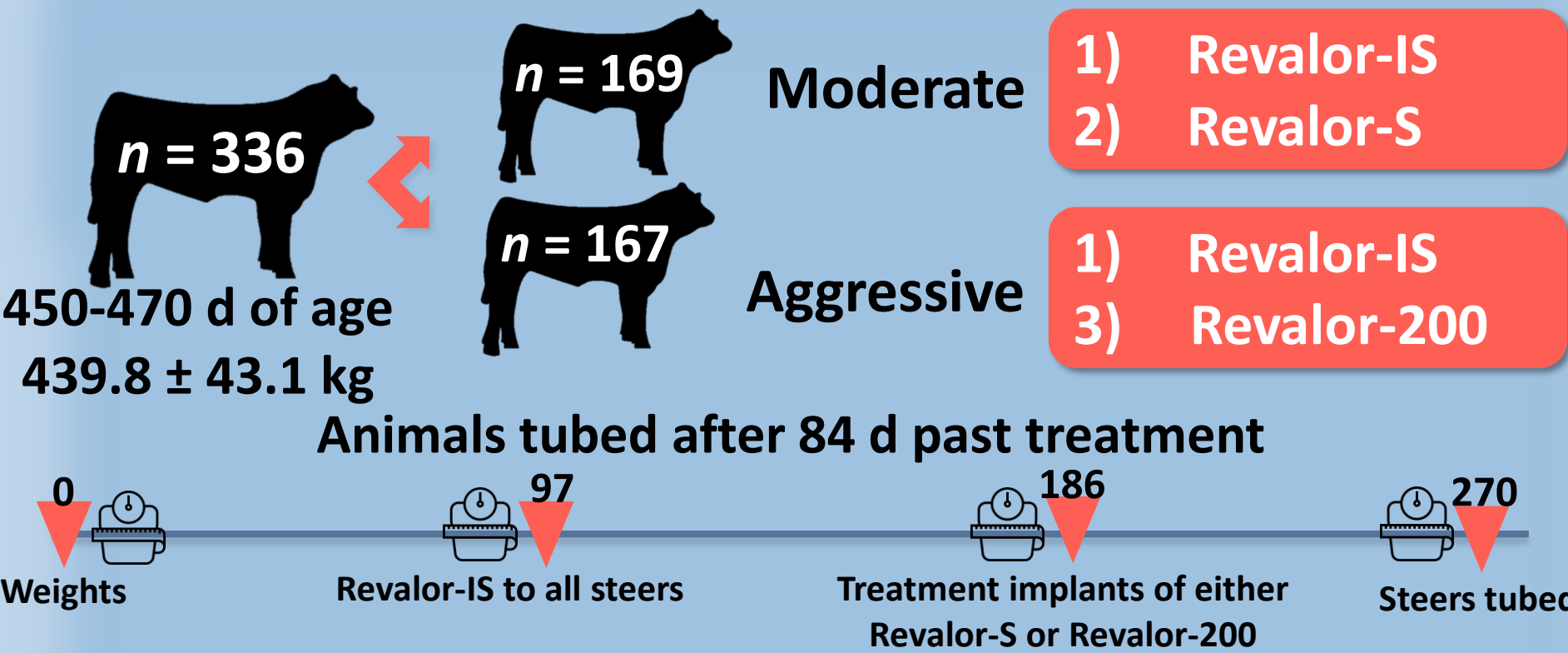
HYPOTHESIS

There will be shifts in ruminant microbial communities associated with a moderate or aggressive implant strategy.

METHODS

Germplasm evaluation steers from US MARC

Received same high-concentrate diet



Microbial Sequences

- Processed in R with packages 'phyloseq' and 'DADA2'
- Filtered for Q₂5
- DADA2 used to identify amplicon sequence variants (ASVs)
- Taxonomic assignment with SILVA v132
- *Cyanobacteria* removed
- α- and β- diversity calculated
- Differential abundances analyzed with DESeq2

Weight Data

- Analyzed in SAS v9.4

RESULTS

1. Bacteria

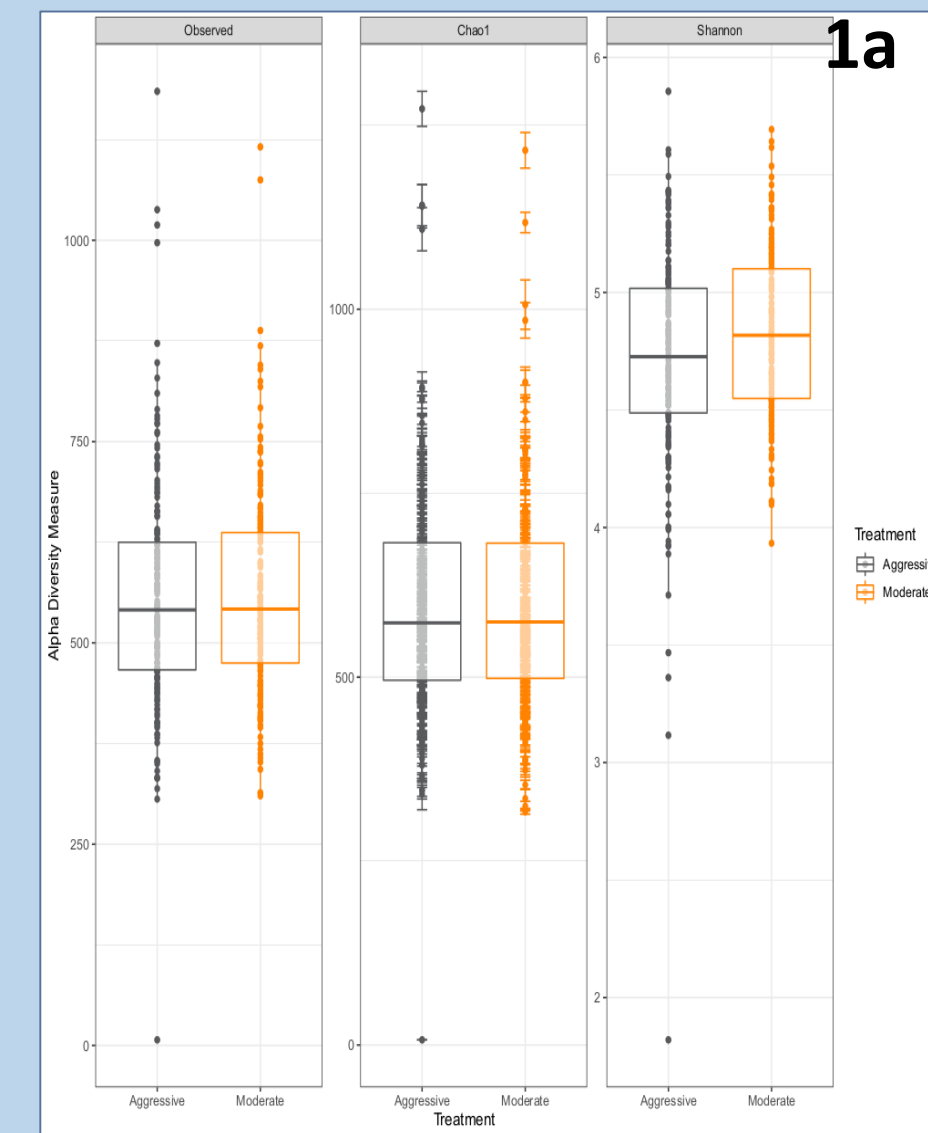


Figure 1a. Alpha-diversity metrics of observed, Chao1 (expected), and Shannon (richness and diversity) for bacterial communities. Shannon metrics were significantly different between treatments (P < 0.05)

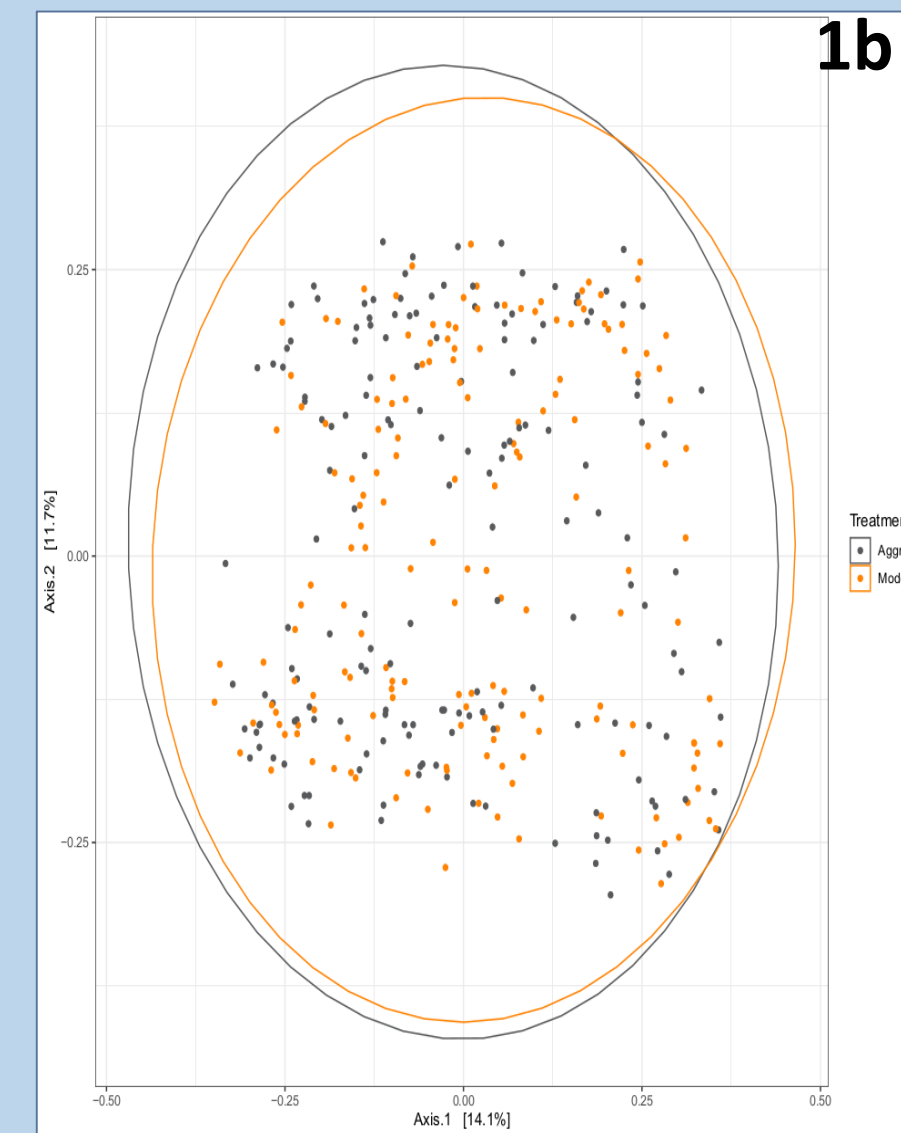


Figure 1b. Bray-Curtis PCoA showing beta diversity of bacterial communities, with ellipses representing a 95% confidence interval. There were no significant differences between the treatments (P > 0.05).

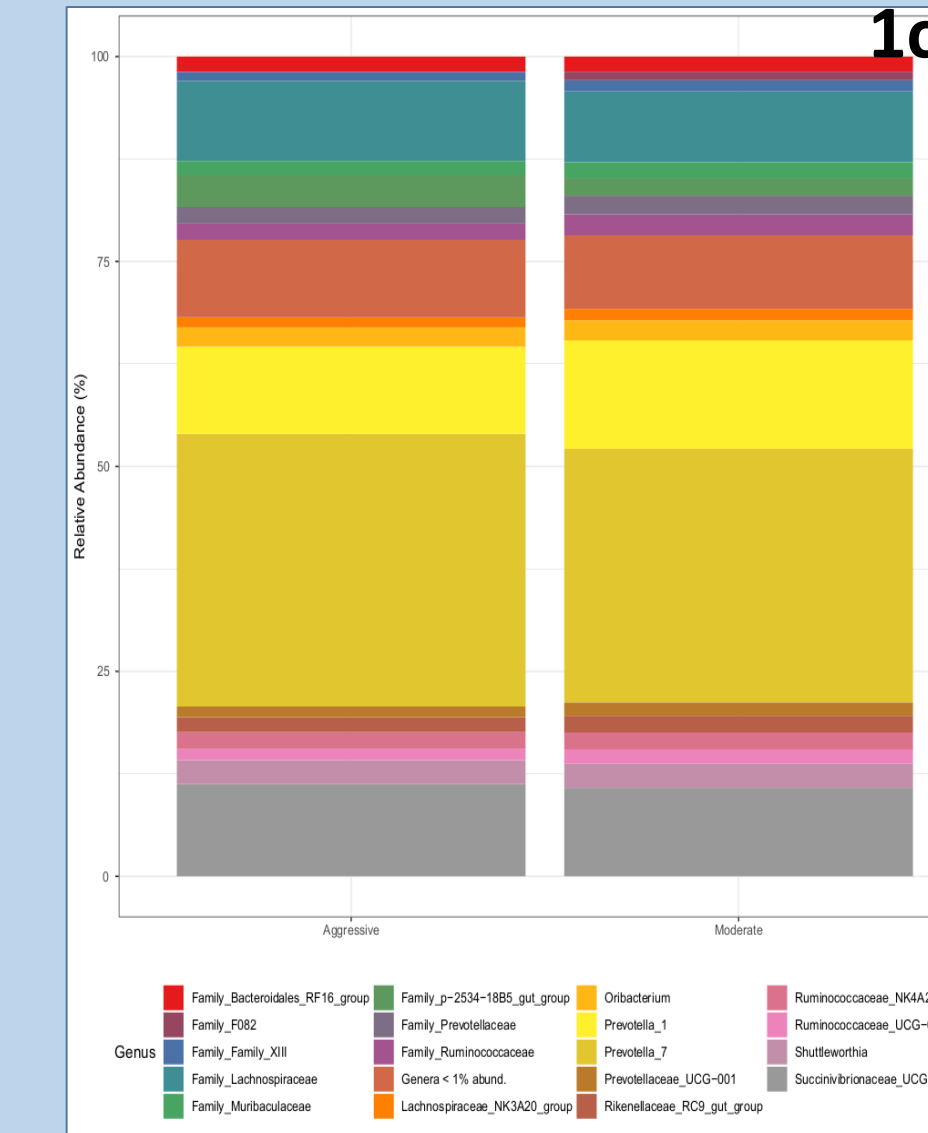


Figure 1c. Genus-level relative abundance chart for bacterial communities. There were no significant differences between bacterial communities and treatments (P > 0.05).

2. Archaea

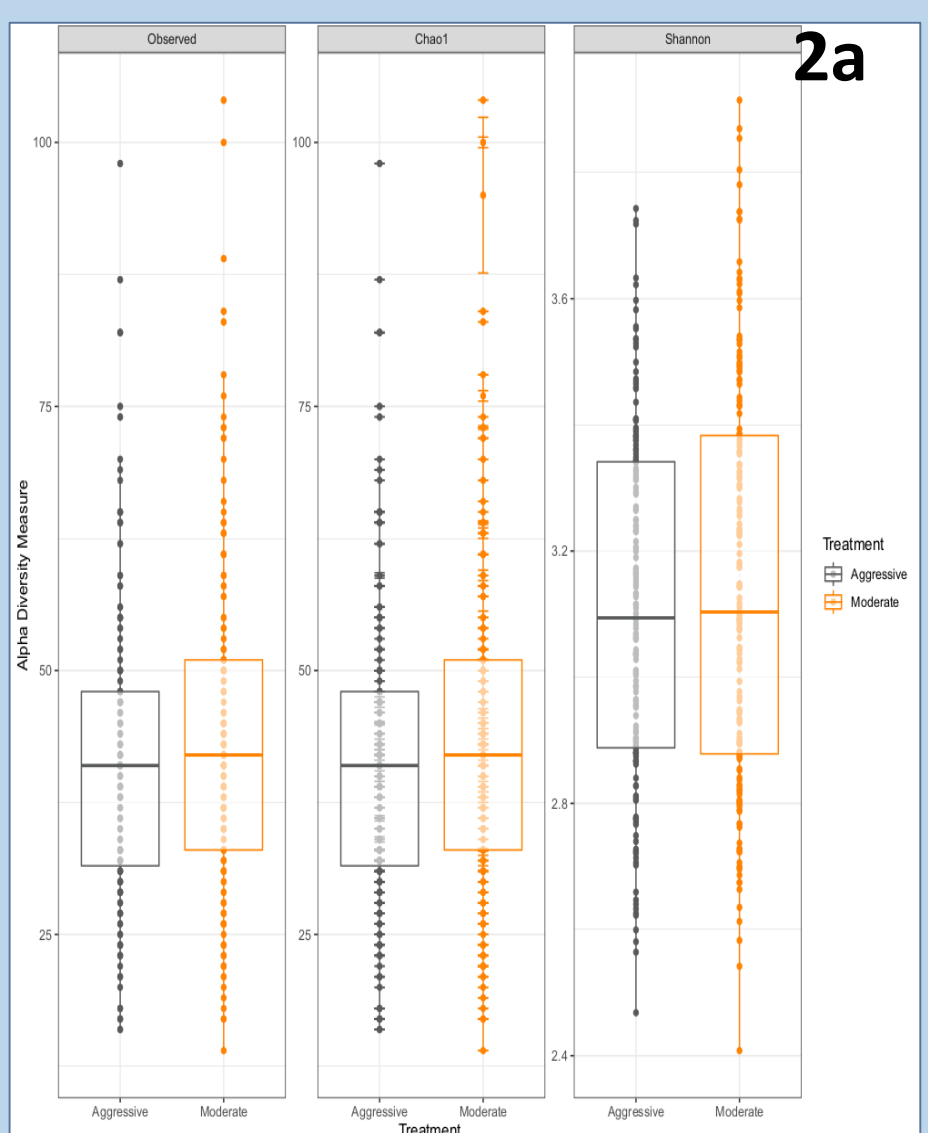


Figure 2a. Alpha-diversity metrics of observed, Chao1 (expected), and Shannon (richness and diversity) for archaeal communities. There were no differences between treatments (P > 0.05)

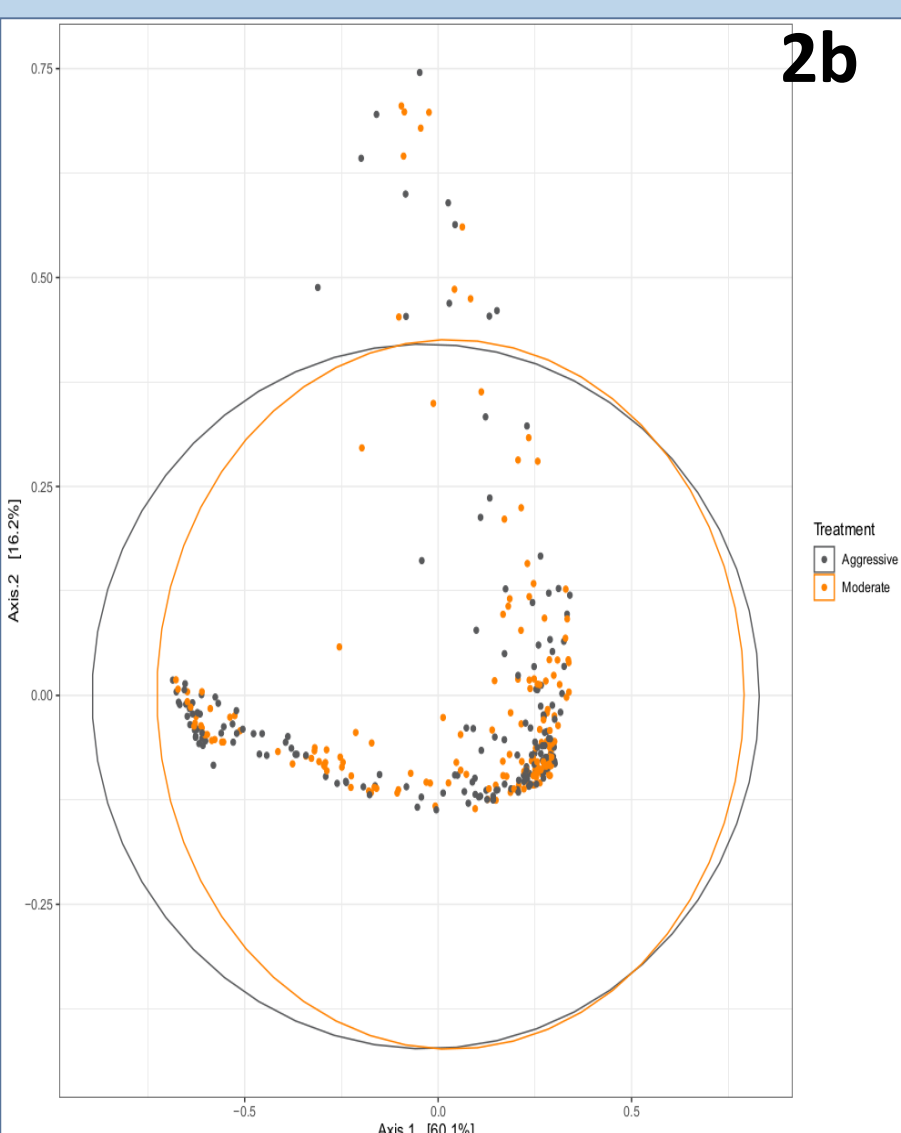


Figure 2b. Bray-Curtis PCoA showing beta diversity of archaeal communities, with ellipses representing a 95% confidence interval. There were no significant differences between the treatments (P > 0.05).

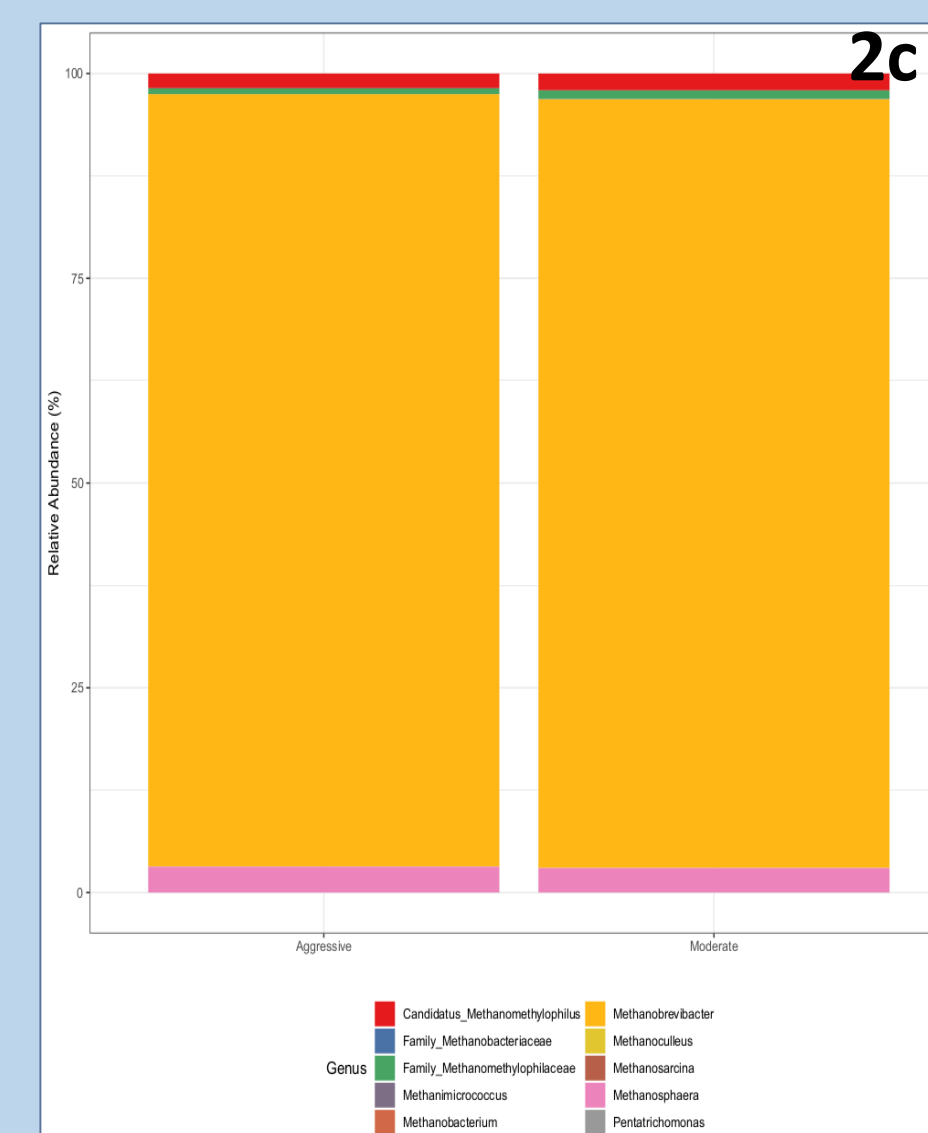


Figure 2c. Genus-level relative abundance chart for archaeal communities. There were no significant differences between archaeal communities and treatments (P > 0.05).

3. Protozoa

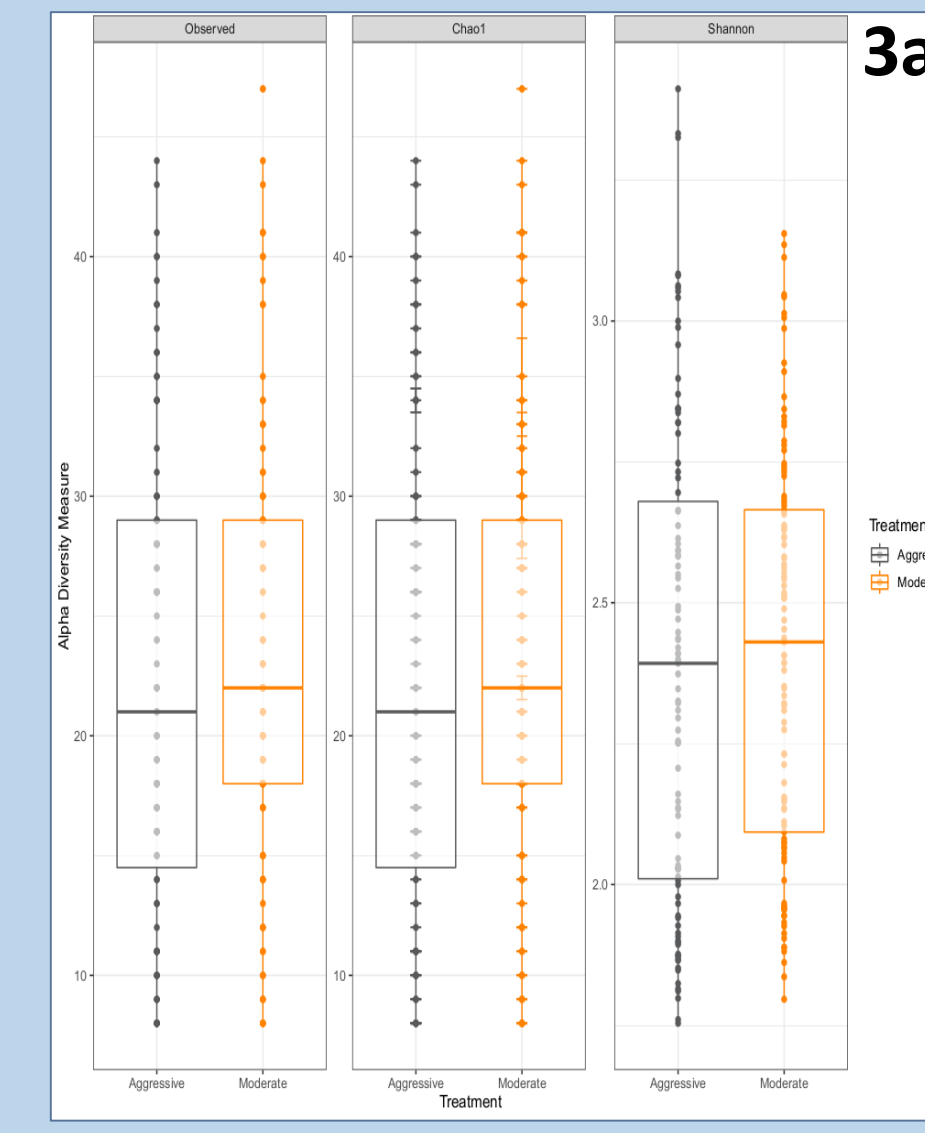


Figure 3a. Alpha-diversity metrics of observed, Chao1 (expected), and Shannon (richness and diversity) for protozoal communities. There were no differences between treatments (P > 0.05)

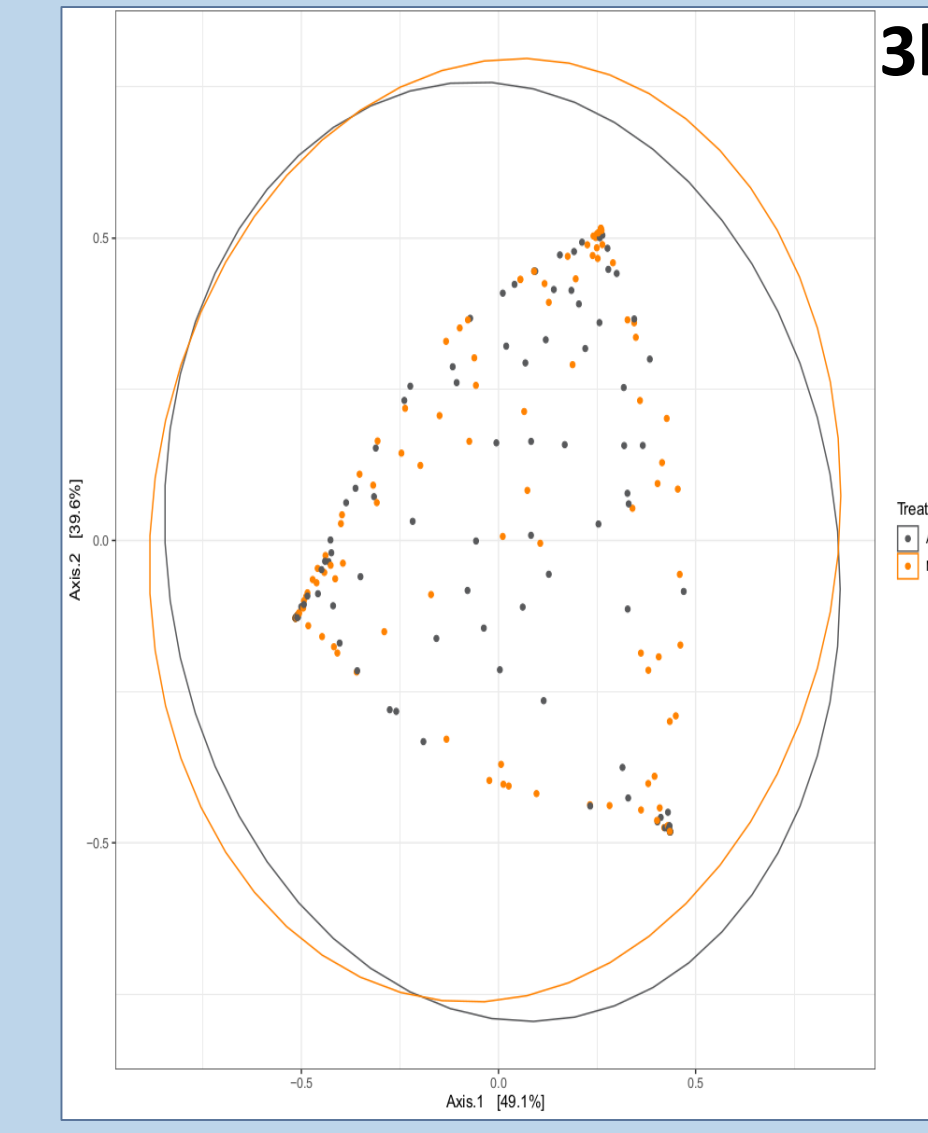


Figure 3b. Bray-Curtis PCoA showing beta diversity of protozoal communities, with ellipses representing a 95% confidence interval. There were no significant differences between the treatments (P > 0.05).

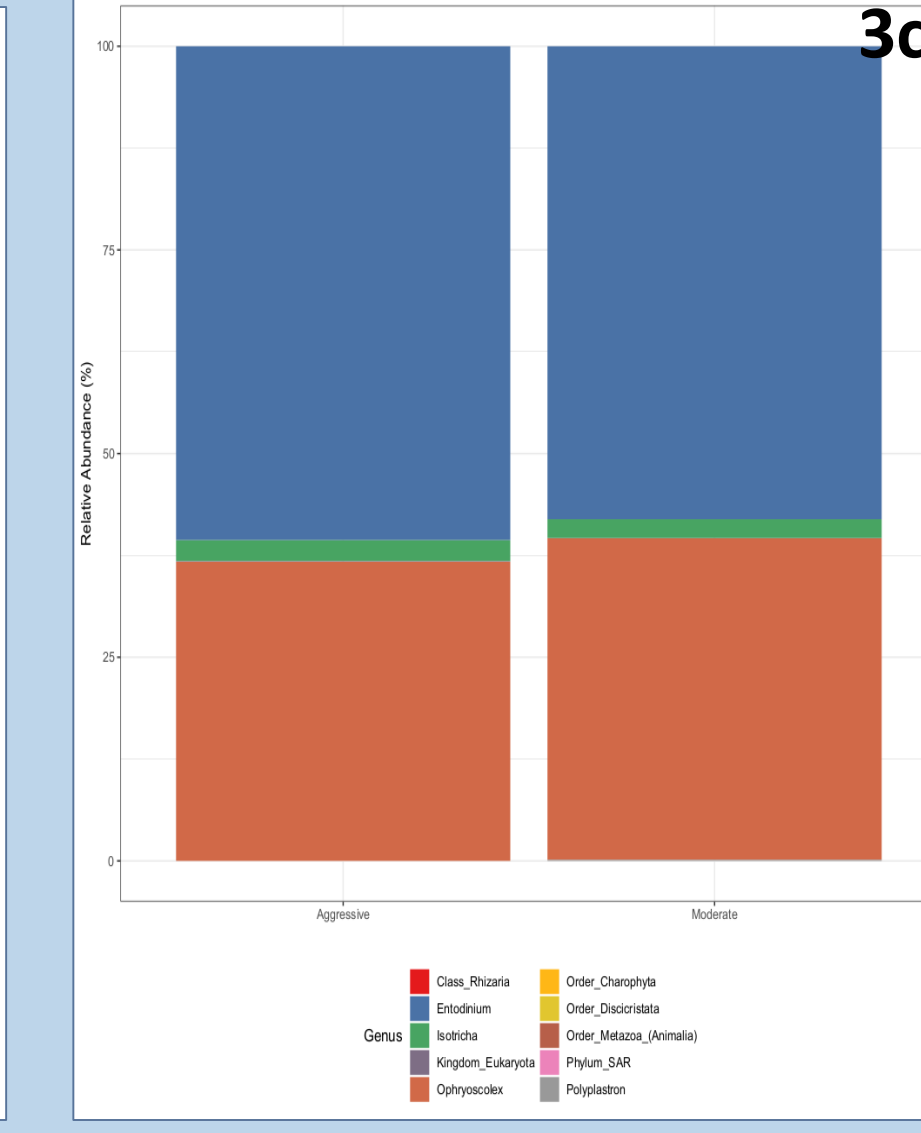


Figure 3c. Genus-level relative abundance chart for protozoal communities. There were significant differences in the *Isotricha* communities between treatments (P < 0.01).

RESULTS CONT.

Table 1. Average daily gain between implant strategies

	Aggressive	Moderate	SEM
ADG (kg)	1.72	1.66	0.02

P < 0.02

CONCLUSIONS

- The high-potency implant strategy resulted in greater gain, however may not be influential to producer choice of implant strategy
- Differences in Shannon index for bacteria are likely not biologically relevant due to no significant differences in bacterial communities between treatments
- Protozoal genus *Isotricha* significantly differed between moderate and aggressive implant strategies but likely have little biological impact
- Beef cattle operations should consider whether an aggressive implant strategy fits their herd

REFERENCES

1. Preston, R. L. (1999). Hormone containing growth promoting implants in farmed livestock. *Advanced drug delivery reviews*, 38(2), 123-138.
2. Myer, P. R., Smith, T. P., Wells, J. E., Kuehn, L. A., & Freetly, H. C. (2015). Rumen microbiome from steers differing in feed efficiency. *PLoS one*, 10(6), e0129174.