Rumen wall morphology in low- and high-RFI beef cattle

Leme, P.R.[1], Oliveira, L.S.[1], Mazon, M.R.[1], Souza, J.L.F.[1], Silva Neto, P.Z.[1], Sarti, L.M.N.[2], Barducci, R.S.[2], Martins, C.L.[2], Gomes, R.C.[1], Silva, S.L.[1]

1 – Faculdade de Zootecnia e Engenharia de Alimentos, University of Sao Paulo, Av. Duque Caxias Norte 225 13635-900 Pirassununga , SP Brazil. ✉: prleme@usp.br. 2 – Faculdade de Medicina Veterinária e Zootecnia, São Paulo State University, Botucatu, SP, Brazil

Objectives

The aim was to evaluate the rumen wall morphology of beef cattle with low and high residual feed intake (RFI), to test the hypothesis that differences in the papillary profile exist across feed efficiency classes. This study was conducted as part of a broader project investigating the biological mechanisms affecting RFI in Nellore (Bos indicus) cattle.

Introduction

Variation in beef cattle feed efficiency arise among individuals due to differences in biological processes influencing metabolism. High efficiency cattle present lower feed intakes when compared to low efficiency cattle so that we can hypothesize that differences in the rumen metabolism may also exist. Because papillae in the rumen wall are sensitive to changes in diet composition and feed intake, differences in the rumen wall morphology may occur between high and low efficiency cattle.

Methods

Nellore steers (n=30) and bulls (n=30) with 20 months and 355±26 kg BW, were fed in individual pens a diet containing 2.6 Mcal ME/kg DM and 14.6%CP for 62 days. Daily dry matter intake (DMI) and average daily gain (ADG) were recorded individually and RFI was calculated within each sex group. Cattle with RFI > 0.5 standard deviation (SD) above and RFI < 0.5 SD below the mean were classified into high (H-RFI, less efficient) and low (L-RFI, most efficient) RFI cattle, respectively.

Five L-RFI and five H-RFI cattle within each sex group was randomly chosen and harvested.

Upon evisceration, tissue samples were obtained from the ventral sac of the rumen for assessment of papillary profile. Data was analyzed by one-way analysis of variance for a randomized block design (block=sex).

Results

Table 1. Performance and rumen papillary profile of Nellore bulls and steers with high and low RFI

| | RFI group | | SEM[1] | P value |
	High RFI	Low RFI		
Initial liveweight, kg	371	372	4.85	0.94
Final liveweight, kg	508	503	7.48	0.60
Daily weight gain, kg	1.69	1.61	0.06	0.48
Dry matter intake, kg	11.7	9.58	0.30	<0.0001
Feed conversion, kg/kg	7.07	6.02	0.23	0.02
Residual feed intake, kg/d	1.18	-0.79	0.25	<0.0001
Absorption surface, cm^2/cm^2 of rumen wall	22.5	26.4	2.05	0.53
Papilae, n/cm^2 rumen wall	46.8	54.0	3.43	0.39
Papilae area, % surface area	95.4	96.2	0.37	0.33

[1]Standart error of the mean

L-RFI steers had similar final BW and ADG, lower DMI, RFI, and feed:gain than H-RFI cattle.

There were no differences between L-RFI and H-RFI cattle on absorption surface, papilla number and papillary area.

Conclusions

Although great differences exist in feed consumption, rumen wall morphology and absorption surface are similar across feed efficiency classes in Nellore cattle, suggesting no differences in the metabolism of short chain fatty acids in the rumen .