Association of SNPs of NPY, leptin and IGF-1 genes with residual feed intake under grazing condition in Angus cattle

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Feed efficiency in beef cattle

Beef cattle selection has been focused on higher BW

Consequences of selection for higher BW
- Higher production cost
- Increased environmental contamination
- Lower overall efficiency under restrictive grazing environment
Residual feed intake

RFI = Actual DMI - Expected DMI

- RFI → more efficient
+ RFI → less efficient

- Scarce data for RFI evaluation under grazing conditions

- Development of predictive genetic markers is an attractive way to genetically improve by this trait (Moore et al., 2009)

- NPY, leptin and IGF-1 have been proposed as candidate genes because of their physiological role (Sherman et al., 2008)
Hypothesis

Animals with “favorable” allelic variants of NPY, leptin and IGF-1 genes present lower RFI than animals lacking such alleles under grazing conditions

Objective

Study association between allelic variants of NPY, leptin and IGF-1 and RFI under grazing conditions
Research timeline

- Spring - Summer 2009: Genotyping
- Fall - Winter 2010: RFI under high energy diet in confinement
- Spring - Summer 2010: RFI under grazing conditions

Adaptation period:
- 40 d
- 56 d
- 42 d
- 60 d

Location: Uruguay (32° S, 58° W)
Experimental approach

- Genotyping by PCR-HRM 1700 pure Aberdeen Angus female calves
- NPY (A/G, intron 2), leptin (C/T, exon 2) and IGF-1(C/T, promoter region)

- Calves carrying simultaneously 3 putative “favorable” alleles (V group, n= 19)
- Calves not carrying simultaneously 3 putative “favorable” alleles (C group, n= 19)

RFI determined under high energy diet in confinement

Heifers V group, n= 12

Heifers C group, n= 12

RFI determined under grazing conditions
Experimental approach

- 60 d grazing trial continuous stocking
- Initial BW: 294 kg
- 4 paddocks/group (3 heifers/paddock, 1.2 ha)
- BW registered every 14 days
- DMI estimated by n-alkanes technique

- Temperate pasture (fescue 44%, white clover 29%, birdsfoot trefoil 27%)
- Composition: 15% CP, 45% NDF, 25% ADF
- 4300 kg DM/ha
RFI calculation and statistical analysis

RFI: residual from regressing actual DMI on expected DMI

Actual DMI = $\beta_0 + \beta_1(\text{mid-test BW}^{.75}) + \beta_2(\text{ADG}) + \text{residual}$

Expected DMI RFI

Data were analyzed using PROC MIXED of SAS (SAS. Inst.)

The model included group (V or C) as fixed effect and paddock as a random effect
Results

[Graph showing DMI (kg/a/d) with bars for V and C groups. V group favorable alleles with 20% increase, P = 0.005. C group non-favorable alleles.]

[Graph showing ADG (kg/a/d) with bars for V and C groups. P = 0.78.]

[Graph showing RFI (kg/a/d) with bars for V and C groups. P = 0.002.]

N = 12/group
Tukey test
Results

- The group of heifers with favorable allelic variants had lower RFI

- First evidence for an association between RFI and SNPs in NYP, leptin and IGF-1 under grazing conditions
The presence of the three favorable alleles NPY, leptin and IGF-1 is associated with higher efficiency under non-restrictive grazing conditions.

These genetic markers could be used as a tool to better select efficient animals under non-restrictive grazing conditions.
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Thanks for your attention!