Milk yield and gene expression in the udder of beef heifers depending on pre and post- weaning diets.

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Raising female calves and heifers on high energy planes of nutrition during the pre-pubertal period has been proposed to lower the age at first calving, reducing their "unproductive" period. However, high energy planes of nutrition during pre-pubertal period have been shown to have a negative effect on milk yield and may compromise mammary development, decrease the potential of subsequent milk yield and health and immune status of the animal.

**Objective**

Evaluate early nutrition-induced changes on first-lactation milk yield and composition and gene expression in the mammary gland in Parda de Montaña primiparous cows.

**Material and methods**

- **Animal design and diets**
  - 2x2 factorial experiment
  - **Birth**
    - 0 mo
  - **Weaning**
    - 6 mo
  - **1st AI**
    - 15 mo
  - **Calving**
    - 27 mo
  - **PRE-W**
    - Mountain pasture: All animals
  - **POST-W**
    - High: 91.7 MJ/d (n=8)
    - Moderate: 79.3 MJ/d (n=8)

- **Traits**
  - **Measurements**: BW, and ADG
  - **Blood**: glucose, IGF-I and leptin
  - **MILK**: yield; protein, fat, casein, lactose and non fat solids content; and SCC

- **RNA extraction and microarray hybridization**
  - Mammary gland biopsy: RNA extraction (RIN>8)
  - Bovine gene 1.1 st array strip (Affimetric)
  - GEO_GSE78173

- **Data processing**
  - Babelomics: Limma test; p<0.001
  - MetaboAnalyst: SAM; FDR<0.005
  - PCA, PLS-DA and Hierarchical clustering
  - DAVID: Functional Annotation Clustering
  - KEGG: Visualization of metabolic pathways
  - Validation by qPCR

**Results**

- **Effect of PRE-W and POST-W feeding treatments on milk yield and quality**
  - Significant differences were found only in PRE-W treatment
  - PRE-W: 307 genes
  - POST-W: 7 genes

- **Significant genes after SAM**
  - Fifteen miRNAs related to mastitis, and adipose tissue were identified

- **Hierarchical Clustering and Functional Annotation Clustering in PRE-W**
  - Immune response and chemokine activity
  - Gene expression, ribonucleoprotein and ribosome
  - Proline biosynthesis process

**Conclusions**

Creep feeding during PRE-W period resulted in up--regulation of genes related with immune response and chemokine activity and down-regulation of ribosome and spliceosome genes. The data confirmed the lack of clinical mastitis, however, the possibility that the animals might be at greater risk to develop subclinical mastitis cannot be excluded. Therefore, increasing the energy level during the POST-W period would be advisable to reduce the age at first calving of heifers, without impairing milk yield or immune status.

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