

Evaluating the impact of marketing strategies on host response

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Introduction

Although there are differences in how cattle are weaned and marketed in the U.S., the impact of these commonly employed strategies on host response in terms of inflammation, immunity and metabolism remains unclear. Recent advances in genomic sequencing allows for unparalleled evaluation of how cattle marketing strategies influence host gene expression. Our objective is to evaluate the impact of marketing cattle directly to a backgrounding operation versus traditional auction market and order buyer system prior to arrival at a backgrounding operation on host gene expression.

Materials and methods

Whole blood was collected from twelve clinically healthy beef crossbred steers at weaning and at arrival at a backgrounding operation 3 days later. Calves were either weaned at the farm in Mississippi for 3 days prior to shipment directly to the backgrounding operation in Texas (n = 6; Direct) or were weaned and shipped to an auction market, then an order-buyer for 3 days prior to shipment to Texas (n = 6; Auction); within each marketing group, half of the calves were previously vaccinated with a commercial modified-live viral vaccine or not. Isolated mRNA from each time point was sequenced (NovaSeq 6000; ~35M reads/sample), and reads were processed through ARS-UCD1.2 reference-guided assembly (HISAT2/Stringtie). Differentially expressed genes (DEGs) between the two groups were identified with edgeR (FDR<0.10). Functional enrichment analyses for biological functions were performed with KOBAS-i (FDR < 0.05).

Results

A total of 367 unique DEGs were identified across marketing systems. Direct cattle demonstrated decreased adaptive immune response gene expression upon arrival, with Direct cattle having been vaccinated possessing increased gene expression related to phagocytosis and muscle contraction. Auction cattle demonstrated an increase in type I interferon and antiviral-related gene expression at backgrounding arrival, with non-vaccinated Auction cattle demonstrating a decrease in gene expression related to inflammatory resolution.

Significance

Auction market systems profoundly influence host gene expression at facility arrival, compared to direct marketing, with increased antiviral host response and inflammatory cytokine production. Vaccination may be beneficial in reducing ongoing inflammation in cattle placed into auction market systems.

