J Prob Health 2017, 5:3(Suppl)
DOI: 10.4172/2329-8901-C1-024

Probiotic Supplements: Impacts on transcription and expression of genes involved in immunity and homeostasis for health and welfare

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Statement of the Problem: Molecular definition of the mechanism of action of probiotic supplements is needed to determine their effectiveness as a non-chemical approach to promote health and welfare. Our studies focus on the assessment of the molecular impact of probiotic administration on genes involved in homeostasis and immunity. Transcriptional profiling of the impact of probiotic supplements in dairy cows and meat goats was conducted using microarray analysis and real time PCR. Animals received the recommended doses of FASTtrak microbial pack (containing *Lactobacillus* acidophilus, Saccharomyces cerevisae, *Enterococcus faecium*, Aspergillus oryza and fructooligosacharide). Control groups were given sterile water. Blood samples were collected weekly. Cow blood was stimulated with LPS. Total RNA was isolated from blood collected at the beginning of the study (week 0) and at the end of the study (week 8) using Tri-reagent and then reverse-transcribed to cDNA using the Ambion-Retroscript kit. The cow Wingless signaling pathway, Cow Cytokine and Human Innate & Adaptive Immune Responses RT² Profiler™ PCR Arrays (SABiosciences) were used to profile the expression of 84 genes involved in each pathway. In cows pathway analysis of microarray data identified 87 bovine pathways impacted by probiotic treatment. These pathways included the Toll-like receptor (TLR), inflammation response and Wingless signaling pathways. In goats treatment had no effect on body weight, body condition, fecal egg count and RNA concentration ($p>0.05$). Treatment had an effect on packed cell volume and FAMACHA scores ($p<0.05$). Treatment increased the expression of innate and adaptive immune response, cytokine and Wingless pathway genes. This study provides evidence for a pleiotropic effect of probiotics administration impacting immunity and homeostasis. Oral administration of probiotics to dairy cows and goats had a systemic effect on gene transcription. The results of this study show that the utilization of probiotics impacts genes important to health and welfare at the molecular level.

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