Metabolomics Profile in Calves with Acute Bronchopneumonia

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Abstract

Background: Bovine respiratory disease (BRD) is one of the main health issues in dairy calves. Inflammatory lung diseases are highly complex in respect of pathogenesis and relationships between inflammation, clinical disease and response to treatment. Metabolomics may offer the potential to identify biomarkers that define calf bronchopneumonia in terms of combined clinical, physiological and pathobiological abnormalities. There is no knowledge related to metabolomics approach to calf pneumonia as in human medicine and childhood pneumonia. Objective The aim of this first study was to reveal the new potential biomarkers for acute calf bronchopneumonia by single proton (1H) Nuclear magnetic resonance (NMR) based quantitative metabolomics. Methods Fifty dairy calves with acute bronchopneumonia presented for treatment to the teaching hospital, and ten healthy dairy calves belonging the teaching farm were used. Laboratory (hematological: complete blood count and blood gas analysis), and biochemical analysis related to health profile were performed. NMR spectra of the all samples (50 diseased +10 healthy water soluble extracts, 50 diseased +10 healthy lipid extracts) were acquired using a standard Nuclear Overhauser Effect Spectroscopy pulse sequence. Results NMR based metabolomics analysis showed that calves suffering from bronchopneumonia...
and healthy calves have two different and distinguishable metabolic fingerprints using both water soluble and lipid extracts. Alterations in metabolites (increases in 2-methyl glutarate, phenylalanine, phosphatidylcholine, and decreases in ethanol, dimethylsulfone, propionate, acetate, allantoin, free cholesterol, cholesterol (-C18), were meaningful for pathogenic mechanisms of calf bronchopneumonia. Conclusion The NMR based metabolomic profile may contribute to better understanding bronchopneumonia in calves.

**Keywords:** Metabolomics, NMR, Calf, Bronchopneumonia.