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Effects of boron supplementation on peripartum dairy cows' health: A metabolomics and transcriptomics approach

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Although many different dietary studies on the prevention of negative energy balance related diseases are often encountered, this is the first study investigating the effects of boron supplementations on peripartum dairy cows' health in the light of an omics approach. Twenty-eight (28) healthy cows (1 control and 3 experimental groups) were enrolled from 2 months before predicted calving until 2 months after calving. Experimental groups were assigned to receive boron at increasing doses as an oral bolus. Production parameters, biochemical profile, nuclear magnetic resonance based metabolomics profile and mRNA abundance of gluconeogenic enzymes and lipid oxidation genes were determined. Pivotal knowledge was obtained on boron distribution in the body. Production parameters and mRNA abundance of the genes were not affected by the treatments. Postpartum non-esterified fatty acids, β-hydroxybutyrate and triglyceride concentrations were significantly decreased in experimental. The primary differences among groups were in lipid-soluble metabolites. There were significant differences in metabolites including postpartum valine, β-hydroxybutyrate, polyunsaturated fatty acid and citrate, propionate, isobutyrate, choline metabolites (betaine, phosphatidylcholine and sphingomyelin) and some types of fatty acids and cholesterol in experimental. Boron appears to be effective in minimizing negative energy balance and improving health of postpartum dairy cows.

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