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The effects of non-esterified fatty acids and β-hydroxybutyrate on the hepatic CYP2E1 in cows with clinical ketosis

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Abstract: Dairy cows with ketosis display severe oxidative stress as well as high blood concentrations of non-esterified fatty acids (NEFA) and β-hydroxybutyrate (BHB). Cytochrome P4502E1 (CYP2E1) plays an important role in the induction of oxidative stress. The aim of this study was to investigate the effects of NEFA and BHB on hepatic CYP2E1 expression and activity in cows with clinical ketosis. Liver tissue samples were collected using a liver puncture needle. The primary hepatocytes from calves were cultured and treated with different concentrations of NEFA and BHB, respectively. The CYP2E1 activity was detected using a biochemical kit and the CYP2E1 expression was detected using quantitative real-time polymerase chain reaction and Western blotting. Dairy cows with clinical ketosis exhibited a low blood concentration of glucose but high concentrations of NEFA and BHB. Hepatic mRNA, protein expression, and activity of CYP2E1 were significantly higher in cows with clinical ketosis than in control cows. *In vitro*, both NEFA and BHB treatment markedly up-regulated the mRNA, protein expression, and activity of CYP2E1 in cow hepatocytes. Taken together, these results indicate that high levels of NEFA and BHB significantly up-regulate the expression and activity of hepatic CYP2E1, which further involves the induction of oxidative stress in cows with clinical ketosis.