Effects of lipopolysaccharide on the metabolic function of ruminal epithelial cells

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Ruminal acidosis has been reported to induce inflammation and increase risk for non-desired molecules, such as lipopolysaccharide (**LPS**), to cross rumen wall and enter circulation. Such inflammation has been reported to increase glucose requirements and decrease milk yield, but it is not clear whether cells within the rumen wall (rumen epithelial cells) are implicated in this response. The objective of this study was to investigate the effects of LPS on rumen epithelial cell metabolism. Ruminal papillae from nine yearling beef heifers were used to isolate and culture REC. Cells were grown for 12 d before use and then exposed to normal media or media containing SCFA (2 m*M* butyrate and 5 m*M* propionate) with (50,000 EU/mL) or without LPS for 24 h. Incubation media samples were collected for analysis of glucose and SCFA use. Cells were also collected to measure expression of genes associated with inflammation (tumor necrosis factor [*TNF*] and interleukin 1β [*IL1B]*), nutrient transport (*GLUT1* and monocarboxylate transporters [*MCT1*, *MCT4*]), and nutrient metabolism (*ACAT1*, *MCU*, *IGFBP3* and *IGFBP5*). Protein expression of ketogenic enzymes (BDH1 and HMGCS1) were also analyzed using flow cytometry. Cells tended to consume more glucose when exposed to LPS compared to without (31.8 vs 28.7 ± 2.7 %; P = 0.072). Expression of inflammatory genes (*TNF* and *IL1B*) were upregulated when exposed to LPS (P < 0.001). In cells exposed to LPS, there was a downregulation of ketogenic genes (*ACAT* and *IGFBP5*) and an upregulation of genes involved in nutrient transport (*GLUT1*, *MCT4*) and nutrient metabolism (*MCU* and *IGFBP3*) (P < 0.05). Media with SCFA led to greater expression of *MCU*. *MCT1* was upregulated in cells grown with SCFA compared to REG and those exposed to LPS (P = 0.001). Ketogenic enzyme expression was not affected, however BDH1 tended to be less in cells exposed to LPS (P = 0.076). **Take Home Messages:** Exposure of the rumen epithelial cells to LPS increases glucose uptake and metabolism suggesting that the rumen epithelium may contribute to the greater glucose requirement due to inflammation.