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**Sodium butyrate improves duodenal development even in calves with neonatal diarrhea.**

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The intestinal development in calves is known to be improved by oral supplementation of sodium butyrate. The present study aimed to evaluate the duodenal development of Holstein calves who received sodium butyrate in their diet during the first 15 and 30d of life and to investigate if episodes of diarrhea can affect the benefits of butyrate. For this, 24 male calves were randomly allocated after birth into 2 groups: Butyrate Group (BG, n = 12) received 4 g/day of Admix Easy (Adisseo, France) diluted in whole cow milk; and Control Group (CG, n = 12) with no supplementation. All the animals were housed in individual pens with water and concentrate ad libitum and fed with 6L milk/day. Using a score scale for feces, calves were classified “with diarrhea” (score 2 = smooth, 3 = watery or 4 = with blood) or “without diarrhea” (score 0 = well-formed or 1 = pasty). Euthanasia was performed at 15 (n = 12) and 30d (n = 12) and histological analyzes of villus length and depth of crypts were used to compare duodenal development. The expression of lactase (*LCT*), a marker of intestinal immaturity, and Glucagon-Like Peptide 2 (*GLP-2*), related to tissue repair was analyzed by qPCR. As results, there were 2 animals with and 4 without diarrhea in each group until 15d of life, and 3 animals with and 3 without diarrhea in each group until 30d of life. Duodenal morphometry at 15d did not differ between groups, but at 30d the length of the villi (BG = 488.14 ± 4.76 µm vs CG = 446.87 ± 4.76 µm) and the depth of the crypts were higher in BG ( $P < 0.05$ ) (BG = 254.96 ± 2.75 µm vs CG = 231.32 ± 2.75 µm). Gene expression of *LCT* and *GLP2* were highest in CG with diarrhea, compared with all the other groups at 30d, indicating a delay in duodenal development and an elevated repair rate in comparison to the other groups. The villus length (BG = 510.48 ± 4.16 µm vs CG = 448.77 ± 4.16 µm) and crypt depth (BG = 269.59 ± 2.37 µm vs CG = 233, 89 ± 2.37 µm) were higher ( $P < 0.05$ ) in calves with diarrhea from BG compared with calves with diarrhea from CG. Duodenal development attributed to butyrate occurred in the first 30 d of life, and those episodes of diarrhea during this period did not impar the effects of its supplementation.

**Keywords:** morphometry, scours, quantitative PCR.