

Does Weaning Influence The Barrier Function of The Gastrointestinal Tract in Holstein Calves?

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Weaning represents a dramatic shift in the digestion and absorption of nutrients for calves. Weaning strategies have been designed to promote development of the rumen; however, it is clear that other regions of the gastrointestinal tract (GIT) are also affected. The objective of this study was to assess the permeability of the GIT as the calf ages to the point of weaning.

Fourteen Holstein bulls calves were randomly assigned to 1 of 2 dietary treatments: WEAN ($n = 7$), where calves were weaned by gradually reducing the amount of milk replacer fed beginning at 35 d of age, or CONTROL ($n = 7$), where calves remained on milk for the duration of the experiment. On d 14, 28, and 42 calves were housed in a metabolism crate to enable total urine collection and orally dosed with a 179 mM Cr-EDTA solution to evaluate total tract barrier function. On d 44 calves were killed and tissues from the rumen, omasum, duodenum, jejunum, ileum, cecum, and proximal and distal colon were collected. Tissues were mounted on Ussing chambers to measure flux of ¹⁴C-mannitol and ³H-inulin as indicators for barrier function.

Although bodyweight and starter intake had significant treatment \times period interactions ($P \leq 0.005$), dietary treatments did not differ within a week. Overall duration ruminal pH was < 5.5 was lower ($P = 0.032$) prior to weaning compared with post weaning. Urinary Cr appearance decreased from d 14 to 28 and continued to decrease for CONTROL but increased for WEAN on d 42 (treatment \times age, $P = 0.04$). The flux of mannitol and inulin did not differ ($P \geq 0.51$) between treatments, however flux differed with region of the GIT; Greatest flux rates observed in the rumen, duodenum, and jejunum.

Implications: This study indicates that barrier of the GIT increases as the calf ages, however weaning may negatively impact the barrier function of the GIT. The regions of the GIT, which appear to be the most impacted are the rumen, duodenum, and jejunum.