

Digestive Capacity of the Small Intestinal Aminopeptidase N is Decreased in Early-Weaned Pigs

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Background

Early-weaned piglets are usually fed animal protein-based expensive starter diets. Corn and soybean meal-based diets are economical. However, gut mucosal atrophy occurs in early-weaned piglets fed soybean meal (SBM)-based weaning diets. The small intestinal aminopeptidase N (APN) plays a vital role in the final stage of protein digestion.

Objective: This study was conducted to examine changes in the digestive capacity of the small intestinal APN in responses to early weaning (EW) stress in weaned piglets fed a corn and SBM-based weaning diet.

Methods and Procedures: A total of 12 Yorkshire piglets, with an average BW of 3 kg, were weaned from sows at the age of d 10 and fed a weaner diet at *ad libitum* intake for 12 d. The weaner diet was corn and SBM-based and formulated to meet the NRC (1998) nutrient requirements. In comparison, 12 suckling (SU) piglets were selected, marked and continued their suckling for 12 d. The entire small intestine of all the piglets was harvested and divided into the segments of duodenum, proximal jejunum, distal jejunum (DIS) and the terminal ileum. Enzymatic kinetic experiments of APN activity were conducted with L-Alanine-*P*-nitroanilide hydrochloride (0-16 mM).

Results:

- Weaning reduced ($P < 0.05$) 27% of the gut maximal specific activity ($V_{\max}$: EW, 0.16 ± 0.01 vs. SU, 0.22 ± 0.01 , $\mu\text{mol/mg protein}\cdot\text{min}$, $n = 48$) and 29% of the whole gut digestive capacity (EW, 0.84 ± 0.04 vs. SU, 1.19 ± 0.08 , $\text{mol/kg BW}\cdot\text{d}$, $n = 12$) primarily in the DIS region.
- The weaning process enhanced ($P < 0.05$) the APN affinity by 38% (K_m : EW, 0.86 ± 0.03 vs. SU, 1.38 ± 0.07 , mM , $n = 48$) as an adaptation change to the weaning stress in the weaning pigs. However, the adaptation change in the improved enzyme affinity may be limited to provide sufficient digestible amino acids to the weanling pig.

Take Home Messages

- We conclude that early-weaned piglets fed corn SBM-based diets are associated with the reduced gut digestive capacity for proteins. Dietary strategies need to be developed for improving the digestive function of the weanling pig fed corn and SBM-based economical starter diets.

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