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Effects of Dietary Amylose–Amylopectin Ratio on Growth Performance and Intestinal Digestive and Absorptive Function in Weaned Piglet Response to Lipopolysaccharide

Can Yang

Hengyang Normal University, China

Simple Summary: As one of the most important components, starch has made great contributions to feed but was wasted numerously during pig feeding. This paper is designed to explore the optimal ratio of dietary amylose to amylopectin for gut health and absorption, thereby improving starch utilization. Our results indicated that the dietary amylose/amylopectin ratio (AAR) of 0.60 could reduce feed conversion rate of piglets, having a certain positive significance for saving feed. In addition, under lipopolysaccharide (LPS) stress, a diet with an AAR of 0.40 to 0.60 significantly improved the intestinal health of piglets, which would provide data to support for the formulation of feed in weaned piglets during bacterial infection.

Abstract: This study investigated the effects of diet with different amylose–amylopectin ratios (AAR) on the growth performance, intestinal morphology, digestive enzyme activities and mRNA expression of nutrients transporters in piglets with short-term lipopolysaccharide (LPS) intraperitoneal injections. Sixty 21 days-old piglets (Landrace × Yorkshire; 6.504 ± 0.079) were randomly assigned based on their body weight (BW) and litters of origins to five groups with experimental diets with an AAR of 0.00, 0.20, 0.40, 0.60, or 0.80 (namely, the 0.00, 0.20, 0.40, and 0.80 groups), respectively. Each treatment included 12 piglets (one piglet per pen). This experiment lasted for 28 days. On the 28th day, six piglets in each treatment were randomly selected for an LPS intraperitoneal injection (100 μg/kg BW), and other piglets were injected with normal saline. Twelve hours after LPS injection, all piglets were sacrificed to collect small intestinal mucosa for analysis. Although different AAR did not influence the final BW in piglets, the piglets in the 0.40 group represented the poorest feed-to-gain ratio (F/G) in the first, second and fourth week ($p < 0.05$) and the lowest average daily gain (ADG) in the fourth week ($p < 0.05$) compared with other groups. In terms of the small intestinal morphology, piglets in the 0.20 and 0.60 groups showed better ideal villous width ($p < 0.05$). Piglets in the 0.60 group presented greater activities of jejuna maltase, sucrose and alkaline phosphatase ($p < 0.05$) than those of 0.20 and 0.40. However, a low amylose diet increased the mRNA expression of jejunal glucose and amino acid transporters ($p < 0.05$). In addition, compared to saline injection, the LPS challenge significantly lessened jejunal digestive enzyme activities ($p < 0.01$) and, ideal villous width and down regulated the gene expression of glucose and amino acid transporters ($p < 0.05$) in piglets. Interestingly, certain diet -LPS interactions on duodenal VH/CD, jejunal maltase activity ($p < 0.05$) and the expression of glucose transporters ($p < 0.05$) were observed.

Biography

Can Yang is associate professor of Hengyang Normal University, Hengyang, Hunan, China. In her 19 years of professional experience, she have expertise in animal nutrition especially pigs and poultry. She worked as post doctor in Hunan Normal University. She was visiting scholar in animal science department, Purdue University.