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Effect of low-protein diet supplemented with short- and medium chain fatty acids on immune responses of *E. coli* challenged weaned piglets

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To maintain a healthy intestine and support the immunity of young pigs, nutritional strategies have been formulated by means of lowering dietary protein⁽¹⁾ or supplementing the diets with selected fatty acids⁽²⁾. However, little is known about the impact of these combined strategies on the immune responses of piglets. Using 24 newly weaned piglets (28 days of age, 7.68 [SD 1.72] kg body weight, tested susceptible to *E. coli* F4), a 2 × 2 factorial study was carried out in two consecutive trials to determine the effect of low-protein diet supplemented with short- and medium chain fatty acids on immune responses of weaned piglets challenged with *E. coli*. Twelve piglets received low-crude protein (CP, 20%) diet supplemented with butyric (4: 0, 0.29%), caproic (6: 0, 0.15%) and lauric acid (12: 0, 0.26%), and the other piglets received standard weaner diet (CP, 22.5%; 4: 0, 6: 0 and 12: 0 were not detected in the diet). Within diets, six pigs were inoculated with *E. coli* O149:F4 and the rest of six pigs received saline buffer. At the day prior to challenge and 4 days thereafter, faeces was collected, scored for its consistency, and analyzed for dry matter and bacterial counts. Blood was sampled at the day prior to and 4 days post inoculation (PI), and just before killing. Four pigs (1 per treatment) were killed per day at 6, 7, 8 and 9 days PI. Bile was obtained and mucosa was collected from 10%, 50% and 90% site of small intestine (SI). Mucosal IgA concentration was lower ($P = 0.01$) in piglets provided with treatment diet, and numerically increased ($P = 0.20$) in *E. coli* challenged piglets. Concentration of IgA decreased distally ($P = 0.01$) from site 10% length to 50% and 90% of SI. Metabolomics profile of the plasma differed between *E. coli* challenged and control pigs, as well as among piglets originated from different litters, but no difference between diets. Challenge with *E. coli* affected faecal and clinical score ($P < 0.0001$, only in the first trial) and reduced feed intake ($P = 0.02$) and gain ($P = 0.06$), but the effect of diets was not observed. Neither diets nor inoculation with *E. coli* influenced lymphocyte subset counts in the blood and concentration of immunoglobulins in the bile (IgA) and plasma (IgA, IgM and IgG) at any time of measurements. Our results suggest that low-protein diet supplemented with short- and medium chain fatty acids may impair mucosal immune responses of weaned piglets.

1. De Lange CFM, Pluske J, Gong J *et al.* (2010) *Livest Sci* **134**, 124–134.

2. Rossi R, Pastorelli G, Cannata S *et al.* (2010) *Anim Feed Sci Tech* **162**, 1–11.