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## Veterinarni Medicina

### Postnatal morphological development and production of short-chain fatty acids in the digestive tract of gnotobiotic piglets

Gancarcikova S., Buleca V., Zitnan R., Nemcova R., Scirankova L., Koscova J., Mudronova D., Hluchy M., Huska M.:

Veterinarni Medicina, 54 (2009): 156-168

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The present study examined the impact of *Enterococcus faecium* on morphological development and production of short-chain fatty acids in the digestive tract of gnotobiotic piglets during milk nutrition and weaning. The experiment was carried out on (18) gnotobiotic piglets. The piglets were non-colostral and the feeding ration consisted of autoclaved milk substitute (Sanolac Ferkel, Germany). From the first day of life a probiotic strain of *Enterococcus faecium* was administered continually at a dose of 2 ml of inoculum (1 ml contained  $1 \times 10^8$  CFU). The animals were weaned on Day 28. Gastrointestinal tract was collected from 18 gnotobiotic piglets slaughtered at

three hours after birth and at the age of 2, 7, 14, 21, 28 and 35 days. The level of short-chain fatty acids was determined in the contents of jejunum, ileum and colon. Samples of intestinal mucosa (from duodenum, jejunum and ileum) were subjected to morphological analysis. We characterized regional variations in morphological and functional responses of the small intestine. The jejunal part of the intestinal tract of gnotobiotic piglets was characterized by relatively short crypts, extremely long villi and narrow *lamina propria* which contained only few cells up to Day 14 of life. Morphological examination showed that jejunal and ileal villi were significantly lower at 21 days of age ( $P < 0.05$  and  $P < 0.001$ , resp.). Depending on age, the concentration of both acetoacetic acid and acetic acid was higher in the jejunal contents. The difference was significant on Day 7 of age ( $P < 0.05$ ) for acetoacetic acid and on Day 28 of age ( $P < 0.01$ ) for acetic acid. The concentration of acetic acid in the colonic content of gnotobiotic piglets was significantly higher on Day 7 ( $P < 0.05$ ) and 21 of age ( $PP < 0.01$ ). The study demonstrated that the respective bacterial

species affected differently the intestinal morphology and concentration of short-chain fatty acids and suggested that postnatal bacterial colonization patterns may have long-term effects on intestinal health and development.

**Keywords:**

gnotobiotic piglets; intestinal morphology; short-chain fatty acids; *Enterococcus faecium*; development; weaning

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