

ABSTRACT

Activity of bacterial flora in the large intestine and its influence on the organism may be modified by polysaccharides, being substrate for fermentation. One of such carbohydrates is inulin, a linear fructose polymer with health-promoting properties, among which the stimulation of bacteria growth, mainly *Bifidobacterium*, is the most important. Results of the previous studies do not confirm unequivocally its beneficial effect on piglets, which may depend on: its dietary level, degree of polymerisation and probiotic addition. Therefore, the aim of these studies was to determine the effect of different types of inulin and dried Jerusalem artichoke tubers, used separately or in combination with probiotic, on bacterial flora activity and the state of mucosal protective barrier in the large intestine of young pigs.

Experiment I was performed on 56 castrated male piglets, PIC x Penarlan P76, divided into 7 groups fed diets with 1, 2 or 3% addition of inulin from chicory root, with an average degree of polymerisation (DP) ≥ 10 (IN10) or ≥ 23 (IN23), or diet without inulin addition. Experiment II was performed on 48 castrated male piglets, Danbred x Duroc, divided into 6 groups fed diets with 2% addition of IN23, 4% addition of dried Jerusalem artichoke tubers (ST) or control one. Diets were fed without or with 0.05% addition of probiotic. In both experiments, animals were fed from the 10th until 50th day of life, and then they were sacrificed. In the caecum and three parts of the colon, the following parameters were determined: digesta pH, fructan content (only in experiment I), short-chain fatty acids (SCFA) concentration, activity of bacterial enzymes and relative amount of bacterial populations. Intraepithelial lymphocytes (IEL) count in the mucosa as well as secretory immunoglobulin A (SIgA) concentration in the mucosal scrapings were also analysed.

In experiment I, feeding IN10 diets increased fructan content in all parts of the large intestine compared to IN23 diets but did not affect SCFA concentration. Piglets fed diet with 2% addition of IN23 had a higher concentration of butyric acid in the caecum and proximal colon as well as higher concentrations of isobutyric and isovaleric acids in the middle and distal colon. There was no effect of DP and dietary inulin level on the amount of *Bifidobacterium* and *Lactobacillus*, or β -glucosidase and β -glucuronidase activity. Feeding diets with the 2% and 3% IN10 addition decreased mucinase activity in the middle colon as compared to the 1% addition. IN10 level did not affect IEL count, whereas in the caecum it was greater at the 1% addition of IN23 than in the control group. Feeding the 1% IN10 diet decreased SIgA concentration in the middle colon, compared to the control group, whereas IN23 level had no effect on SIgA concentration.

In experiment II, pigs fed diets with IN23 had a lower digesta pH and higher propionic, and valeric acid concentrations in the caecum than pigs fed the control diets. IN23 and ST decreased isobutyric and isovaleric acid concentrations in the colon, whereas feeding diets with probiotic increased acetic acid and total SCFA concentration. IN23 and ST reduced caecal β -glucosidase activity, whereas in the middle colon β -glucosidase and β -glucuronidase activity was lower only in piglets fed ST diets. Interaction between probiotic and fructan addition also affected activity of these enzymes. ST increased *Bifidobacterium* populations in the proximal and distal colon, compared to the control diets, whereas probiotic supplementation increased *Clostridium* populations in the distal colon. There was no effect of the experimental factors on SIgA concentration but interaction between them affected IEL count in the proximal colon.

IN23 exerts a greater impact on bacterial flora activity than IN10, but smaller than ST, which reduces intensity of proteolytic fermentation and activity of detrimental bacterial enzymes and may stimulate *Bifidobacterium* growth. Neither inulin, in pure forms, nor ST, as its source, improve mucosal protective barrier in the large intestine of piglets nor the applied probiotic does not support IN23 and ST effects.

Key words: inulin, piglets, large intestine, intestinal microorganisms, fermentation, immunity