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## Effects of *peri-partum* dietary short-chain fructo-oligosaccharides supplementation on immune status, vaccine response and growth performance of piglets

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**Introduction:** In pigs, dietary supplementation of short-chain fructo-oligosaccharides (scFOS) modifies intestinal microbiota improving intestinal protection against pathogens and favouring development of the associated local immune system. There is an imprinting of maternal nutrition on digestive physiology of offspring; we then hypothesised that maternal like piglet supplementation with scFOS could play a role in the development of immune system of piglet. The aim of this study was to investigate the effects of maternal and piglet dietary supplementation of scFOS, respectively, on immune transfer, development of intestinal immunity and on immune response of piglets to a vaccine challenge.

**Animals, material and methods:** 30 sows in 3 replicates received a control diet or a diet supplemented with scFOS (3.3 g/kg of maltodextrin or scFOS, Profeed P95, Beghin-Meiji, respectively) for the last 4 weeks of their gestation and also during lactation (1.5 g/kg feed). After weaning (day 28), piglets of each litter (n=10) were divided into two groups and fed either the control or the scFOS diet (1.5 g/kg of maltodextrin or scFOS) from day 29 to 77. At day 35 and 56, piglets were challenged by *influenza* vaccination (Gripovac 3<sup>®</sup>, Laboratoires Merial, Lyon, France). Growth performance of sows (weight, back fat thickness, food intake) and piglets (weight and food intake) were recorded. Immune quality of the colostrum was assessed using immunoglobulin and cytokine concentrations. Intestinal immune development of piglets was measured after slaughtering at day 21 (n = 13/group) or day 42 (n = 6/group). The gut was weighed and Peyer's patches as well as mesenteric lymph nodes were sampled. Mucosal and cellular immune activity was evaluated after cell culture. Plasma haptoglobin, insulin, cortisol and GLP-1 concentrations of piglets were determined. Data were subjected to ANOVA using the General Linear Model procedure of Statistical Analysis Systems software (SAS Institute, Cary, NC).

**Results and discussion:** Maternal supplementation with scFOS increased concentrations of IgA and TGFβ in colostrum (+ 29.6 mg/ml,  $P < 0.005$ ; + 66863 pg/ml,  $P < 0.05$ ). It promoted the development of cellular immunity in suckling piglets, as suggested by the increase of secretory activity of IFNγ by lymphocytes of the ileal Peyer's patches ( $P < 0.01$ ) and a tendency to a better production of sIgA ( $P < 0.1$ ). Besides, plasma concentration of haptoglobin increased which has been described as associated with stimulation of Th1 cellular response. Contrarily, cortisol (stress hormone) concentration decreased ( $P < 0.05$ ) as well as GLP-1 and insulin ( $P < 0.05$ ) suggesting a better tolerance to glucose. In weaning piglets, a maternal supplementation of scFOS increased growth performance by 5% ( $P < 0.05$ ). Direct scFOS supplementation not only increased cell proliferation in mesenteric lymph nodes ( $P < 0.05$ ) but also tended to improve specific anti-flu IgG concentration in serum of weaning piglets ( $P < 0.1$ ) at day 77 (3 weeks after boost).

**Conclusion:** In conclusion, scFOS supplementation in diets of gestating and lactating sows improves the immune quality of the colostrum and the development of local immune system of suckling piglets. A scFOS supplementation in diets of weaning piglets tends to enhance immune response to environmental challenge, illustrated here by the *influenza* vaccine.