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Peri-partum scFOS supplementation improves intestinal immune system development and vaccine response of the offspring.

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Introduction: Diet supplementation with short-chain fructo-oligosaccharides (scFOS) is known to improve intestinal defence mechanisms and to modify local immune system development, notably by improving beneficial bacteria growth. Objectives of our study were to determine impact of scFOS maternal supplementation on passive immunity transfer and consequences on development of intestinal immunity and vaccine response of the offspring.

Material & Methods: 24 sows received during the last month of their gestation and lactation a diet supplemented with scFOS (SUPP group) or not (CTRL group). Systemic immunity has been evaluated by serum immunoglobulin dosage (IgG and IgA) from sows (28 and 7 days before farrowing) and 7 (n=105/group) and 21 days old (n=90/group) suckling piglets. IgG, IgA as well as TGFβ1 have been analysed on colostrums collected within 15h of farrowing and mature milks from 7 and 21 days. One piglet per litter was sacrificed at 21 days old (n=10/group). Mononuclear cells have been isolated from ileal Peyer's patches (iIPP) and mesenteric lymph nodes (MLN) and cultured *in vitro*. Secretory activity (sIgA) and cytokine pattern (IFNγ and IL-10) of iIPP cells have been studied following respectively, 7 day (basal condition) and 3 day (concanavalin A stimulation) cultures. Cytokine pattern of MLN cells has also been evaluated. From weaning onwards, piglets also received diet supplemented or not with scFOS. We studied their response to influenza vaccination by evaluating serum levels of specific IgG 3 weeks after boost stimulation.

Results: scFOS supplementation did not affect sow IgG and IgA serum concentrations before parturition. IgA concentration similarly increased between 28 and 7 days before parturition in both groups (p<0.001). Contrarily, colostrum IgA concentration (p<0.04) as well as TGFβ1 one (p=0.1) were greater in SUPP sows (signs of cellular recruitment and/or higher production in mammary glands of SUPP sows at the end of gestation). However, there was a rapid decrease of the immune quality between colostrum and mature milks in both groups. The decrease of serum IgG and IgA observed between 7 and 21 days old piglets was not modified by mother supplementation. At the mucosal level, secretion of IFNγ, but not sIgA and IL-10, by iIPP cells (p<0.02) and MLN cells (p=0.1) was higher in piglets whose mothers received the supplemented diet. Challenge with influenza vaccine triggered higher specific IgG level following supplementation after weaning (p<0.03).

Conclusion: Diet supplementation with scFOS during the last month of gestation and lactation reinforces sow colostrum immune quality and improves intestinal immune system development as well as vaccine response of the offspring. Microbiota role in these modifications is worth to be evaluated.