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Nutrition, Metabolism and Experimental Approaches

Supplementation Of The Maternal Diet With C18:3N-3 Has Long Term Effect On Offspring Gut Immune Function In Pig.

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Objectives and Study: Consumption of n-3 polyunsaturated fatty acids (n-3PUFAs) is low and should be increased, especially in pregnant and lactating woman. Indeed, n-3PUFAs have many beneficial effects on newborn development, including systemic and mucosal immune function. Studies on the impact of n-3PUFA upon newborn immune function have mainly focused on long-chain n-3PUFAs. The objective of our study was to investigate the effect of the precursor C18:3n-3 in the maternal diet on gut barrier and immune function in a piglet model of human babies.
Methods: Two groups of sows were fed either a low (ALA3) or a high (ALA27) C18:3n-3 diet throughout gestation and lactation. Piglet jejunal barrier function was followed every week during the suckling period, using Ussing chambers (FD-4 flux across the mucosa). Immunoglobulin concentration was measured in sow colostrum and 36hr-old piglet plasma. Intestinal sensitivity to LPS was determined at the end of the suckling period (post-natal day (PND) 28), using jejunal explants cultures (IL-8 and TNF secretion response to different doses of LPS). Oral tolerance acquisition test to ovalbumin (OVA) was also performed at the end of the suckling period (PND24). Finally, proliferative response of mesenteric lymph nodes (MLN) cells to concavalin A and LPS was investigated 3 weeks after weaning (PND52).
Results: Jejunal permeability of ALA27 piglets was higher than that of ALA3 ones at birth (PND0: 456±91 vs 271±53 ng/cm^2/h, $P<0.05$) and at the end of the suckling period (PND21 746±110 vs 498±68 ng/cm^2/h, $P<0.05$ and PND28 584±98 vs 399±70 ng/cm^2/h, $P=0.07$). Colostrum immunoglobulin concentration was not modified by the maternal diet. Piglet plasma immunoglobulin concentration was not increased in ALA27 piglets despite the higher jejunal permeability at birth. At the end of the suckling period, jejunal sensitivity to LPS was lower in ALA27 piglets despite the higher intestinal permeability. Oral tolerance acquisition to OVA was not modified by the higher intestinal permeability in ALA27 piglets. Later in life, however, MLN cells proliferative response to concavalin A was reduced (proliferative index: 226±28 vs 412±54, $P<0.05$) while that to LPS was increased (proliferative index: 9.9±2.1 vs 4.1±0.5, $P<0.05$).
Conclusion: Supplementation of the maternal diet with C18:3n-3 modifies the post-natal development of jejunal barrier function with an enhanced permeability at key points of the neonatal period. This had, however, no immediate consequence on gut immune function and sensitivity during the neonatal period. Conversely, gut immune response to mitogen and inflammatory mediators was altered later in life.

Disclosure of Interest: None Declared