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► To cite this version:

Stefano Messori, Laurence Le Normand, Gérard Savary, Paolo Bosi, Jean Paul Lalles. Perinatal antibiotic treatment of the mother affects the development of intestinal alkaline phosphatase in her offspring. 44. Annual Meeting of The European Society of Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN), May 2011, Sorrento, Italy. hal-02746729

HAL Id: hal-02746729

<https://hal.inrae.fr/hal-02746729>

Submitted on 3 Jun 2020

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**The 44th Annual Meeting of The European
Society of Paediatric Gastroenterology,
Hepatology and Nutrition**

**25 – 28 May 2011
Sorrento, Italy**

PO-N-0204/PD-N-0144

Nutrition, Metabolism and Experimental Approaches

Perinatal Antibiotic Treatment Of The Mother Affects The Development Of Intestinal Alkaline Phosphatase In Her Offspring

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Objectives and Study: The microbiota influences host gut function throughout life. It is more and more incriminated in various diseases, including gut inflammation and obesity. Intestinal alkaline phosphatase (IAP) has been recently shown to be modulated by the microbiota and to play major roles in gut homeostasis, including bacterial lipopolysaccharide endotoxin detoxification and control of gut and systemic inflammation (Lallès, 2010). We hypothesized that disturbances in gut bacterial colonisation shortly after birth affect offspring gut IAP development.

Methods: This hypothesis was tested in the swine model by treating pregnant sows (11 antibiotic treated-ATBQ, vs. 12 untreated controls-C) with the large spectrum antibiotic amoxicillin (40 mg/kg BW/d) orally around parturition (day -10 to day 21) in order to disturb sows' microbiota and offspring bacterial gut colonisation. Offspring (1/sow/time) were slaughtered at day 14, 28 (weaning) and 42 and gut tissues and caecal and rectal contents were collected for IAP activity measurements and ileal tissue for mRNA determination. Data were analysed by SAS with a MIXED model for testing effects of treatment, age and interaction.

Results: IAP activity in offspring jejunal and ileal mucosa decreased with age ($P < 0.01$). Ileal tissue IAP activity was threefold lower in ATBQ than in C group at d14, with no differences at d28 and d42 (treatment by time interaction, $P < 0.01$). Antibiotic treatment of sows did not influence offspring jejunal and colonic tissue IAP activities which were low. IAP activity in offspring digesta contents decreased with time in the rectum ($P < 0.05$) but not in the caecum, with no significant effect of ATBQ treatment on digesta IAP activity. Ileal tissue IAP mRNA levels tended to be lower at d28 than at d14 or d42 ($P = 0.06$) with no significant effect of ATBQ treatment. Ileal tissue IAP mRNA and IAP activity were positively and linearly correlated ($P < 0.01$).

Conclusion: Perinatal antibiotic treatment of the mother affects the development of gut IAP in her offspring, with more pronounced effects in the ileum than in the jejunum or the colon. The drastic reduction in IAP tissue activity in offspring ileum at d14 with antibiotic treatment of the mother suggests differential patterns of gut microbial colonisation between groups. Reduced IAP activity may lead to reduced bacterial lipopolysaccharide detoxification and increased risk of gut inflammation in offspring. Future work will investigate the involvement of the microbiota in these IAP changes and long-term effects on offspring gut physiology.

References: Lallès JP, 2010. *Nutr Rev* 68:323-32.

Acknowledgment: This work was supported financially by the European Union (Interplay project No 227549).

Disclosure of Interest: None Declared