



HAL
open science

Addition of dairy lipids and probiotic in infant formulas modulates gut microbiota and intestinal physiology with long-term consequences; a preclinical study in a minipig model

Marion Lemaire, Mahendra Mariadassou, Laurence Le Normand, Gwenaelle Randuineau, Véronique Rome, Cécile Canlet, Marie Tremblay-Franco, Amandine Ligneul, Mathilde Guerville, Gaëlle Boudry, et al.

► To cite this version:

Marion Lemaire, Mahendra Mariadassou, Laurence Le Normand, Gwenaelle Randuineau, Véronique Rome, et al.. Addition of dairy lipids and probiotic in infant formulas modulates gut microbiota and intestinal physiology with long-term consequences; a preclinical study in a minipig model. 15. Congress of the international society for the study of fatty acids and lipids (ISSFAL), Jul 2023, Nantes, France. hal-04155652

HAL Id: hal-04155652

<https://hal.inrae.fr/hal-04155652v1>

Submitted on 7 Jul 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Addition of dairy lipids and probiotic in infant formulas modulates gut microbiota and intestinal physiology with long-term consequences; a preclinical study in a minipig model

Marion Lemaire¹, Mahendra Mariadassou², Laurence Le Normand¹, Gwénaëlle Randuineau¹, Véronique Romé¹, Cécile Canlet³, Marie Tremblay-Franco³, Amandine Ligneul⁴, Mathilde Guerville⁴, Gaëlle Boudry¹, Sophie Blat¹, Isabelle Le Huërou-Luron¹

1 INRAE, INSERM, Univ Rennes, Nutrition Metabolisms and Cancer, NuMeCan, Rennes, France

2 MalAGE, INRA, Université Paris-Saclay, Jouy-en-Josas, France

3 INRA, PF MetaToul-AXIOM, Toxalim, Toulouse, France

4 Lactalis R&D, Retiers, France

Whereas breast milk is the gold standard, most infants are at least partly formula-fed. The aim of the present study was to investigate the short- and long-term effects of the addition of dairy lipids (DL) in infant formulas as an alternative to plant lipid-based infant formula, on gut microbiota composition and activity, and on intestinal immune and barrier functions, and of a probiotic, *Lactobacillus fermentum* (Lf), on the same parameters.

Piglets received from postnatal day (PND) 2 to 28 a balanced formula containing either: only plant lipids (PL), a half-half mixture of PL and DL (DL), or a half-half mixture of PL and DL supplemented with Lf (DL+Lf). Pigs were subsequently fed a standard diet for 1 month and then challenged with a high-fat, high-sucrose diet for 3 months until PND140. Dietary-induced changes in gut microbiota composition were observed at both PND28 and PND140, mainly within Firmicutes (*Lachnospiraceae*, *Ruminococcaceae* and *Lactobacillaceae* families) and Bacteroidetes (*Prevotellaceae*, *Bacteroidaceae* and *Bacteroidales* S24-7 group families) phyla. At PND28, twenty fecal metabolites (such as valerate, butyrate, amino acids, glucose) discriminated the three groups. DL and DL+Lf reinforced tight junction protein expressions in colon, with moderate changes in epithelial barrier permeability. At PND140, DL+Lf decreased the inflammation risk through decreased ileal pro-inflammatory cytokine secretion and increased ileal expression of genes encoding tight junction proteins. A slight but persisting and coherent effect of probiotic Lf on gut microbiota composition was observed between PND28 and PND140, even after discontinuation of its intake. Correlations between gut microbiota composition and intestinal physiology confirmed the involvement of gut microbiota in such processes.

In conclusion, the addition of DL in infant formula changed the microbial signature and gut physiology in infants. The addition of Lf enhanced the beneficial effects observed in the long term. The addition of DL±Lf appears to be safe.

Disclosure of interest: This project was funded by Lactalis Recherche et Développement .