Early life solid food ingestion remodels the gut microbiota composition and increases the production of protective bacterial metabolites

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EARLY LIFE SOLID FOOD INGESTION REMODELS THE GUT MICROBIOTA COMPOSITION AND INCREASES THE PRODUCTION OF PROTECTIVE BACTERIAL METABOLITES

Background

Maternal milk → Solid food
Microbial colonization → Microbiota maturation → Susceptibility to inflammatory diseases → Age

Aim: DETERMINE HOW THE ONSET OF SOLID FOOD INGESTION SHAPES THE MICROBIOTA COMPOSITION AND ITS METABOLIC ACTIVITY IN RELATION WITH THE EPITHELIAL BARRIER MATURATION

1- Microbiota composition

α-diversity (Observed OTUs)
β-diversity (Bray-Curtis)

The microbiota composition shifted after the onset of solid food ingestion

The relative abundance of families including pathobionts decreased after the onset of solid food ingestion while the abundance of a butyrate producing family increased

2- Bacterial metabolites

Short chain fatty acids
Nitrogenous compounds derived metabolites

3- Epithelial barrier in vitro

Maternal milk → Solid food
18 days → 25 days
Sterile caecal content supernatant (Mixture of metabolites)
Caco-2 cells

Transepithelial electric resistance (TEER) measurement (48 hours)

The mixture of metabolites produced by the microbiota after the onset of solid food promoted epithelial barrier formation

3-phenylpropionate and trimethylamine concentration increased after the onset of solid food while trimethylamine concentration decreased

Conclusion

• The microbiota composition and its metabolic activity shifted after the onset of solid food ingestion
• Since milk intake ingestion was still predominant at 25 days, our results suggest that the introduction of solid food (versus weaning) is sufficient to induce microbiota maturation
• Metabolites produced by the gut microbiota after the onset of solid food ingestion might contribute to the postnatal maturation of the epithelial barrier