Abstract Preview - Step 3/4

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Topic: 16.2. Microbiomes: epithelial, respiratory and gastrointestinal

Case Report: NO

Title: Decreased microbial conversion of lactic acid into butyrate in infants developing eczema.

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Text: **Background:** The development of the early gut microbiome is a dynamic process significantly influencing health throughout life. Aberration in its early development has been associated with the development of allergic diseases, but the exact patterns remain unclear. In this study the temporal dynamics of the infant gut microbiota were investigated and associated with the development of eczema in the first 18 months of life.
Method: This arises from a parent registered study (ISRCTN65195597) investigating the effects of a partially hydrolysed formula containing specific oligosaccharides (pHF-OS) on the prevention of eczema in infants at risk for atopy. Gut microbial composition was investigated in a set of vaginally born infants (n=138). Faecal bacterial compositions were analysed by 16S rRNA gene sequencing of DNA extracted from stool samples in the first 6 months of life. In addition major microbial metabolites (lactate and SCFAs) and stool pH were determined. Statistical analyses involved multivariate explorative data analysis using Canoco 5 software and differential abundance testing using the R-package MetagenomeSeq. All comparisons between infants developing and not developing eczema were corrected for the type of feeding, ethnicity and having siblings.
Results: Infants developing eczema in the first 18 months of life showed aberrant gut microbiome development in the first 6 months of life with significant temporal differences of *Parabacteroides* and genera of Enterobacteriaceae. These genera decreased in time in subsequently healthy infants, but the decrease was less pronounced for infants that developed eczema. Furthermore over time, eczematous infants showed decreased acquisition of lactate-utilising bacteria known to produce butyrate, namely *Eubacterium* and *Anaerostipes* spp., which was supported with significantly increased faecal concentrations of lactic acid and decreased concentrations of butyrate at 6 months of age.
Conclusion: The differential temporal dynamics and development of key bacterial species and metabolites in the gut of infants developing eczema may reflect a suboptimal implementation of the intestinal microbiome already early in life. The aberrances identified may prove to be useful as biomarkers for later atopic diseases and could aid the development of optimal nutritional strategies to support timely gut colonisation of key species, such as lactate-utilising and butyrate producing bacteria, in the gradually diversifying infant gut.

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