Faecal microbiota transplantation from children to mice mediates the transfer of cognitive, cardiac, intestinal and metabolic phenotype

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Background:

The involvement of the gut microbiota in the pathophysiology of metabolic syndrome and type 2 diabetes is supported by studies of faecal microbiota transplantation (FMT). In the JPI-HDHLINTIMIC GUTMOM project, we asked whether the phenotype of children donors predicts the organ-specific phenotype of mice recipients in the long-term.

Methods and Results:

We performed FMT from five-years old children into young, sex-matched mice. Recipients were monitored (food intake, body weight, Y-maze test) until adult age, when they underwent echocardiography, PET-CT imaging, ex vivo tissue histology, and fecal microbiota and metabolite characterization. So far, we have examined brain, heart, caecum and adipose tissue. Between donors and recipients, we observed significant correlations ($p<0.05$) in cognitive and cardiac parameters; children's BMI or waist circumference were related to recipient food intake, body weight, glucose levels, brown- and white-fat lipid accumulation, fat radiodensity, white-fat glucose uptake and inflammation, caecum crypt and goblet cell morphology.

Conclusions and Significance:

The results support a potent cause-effect role of the microbiota affecting the phenotype of recipients in a donor-consistent and durable manner. FMT in mice seems to be a valid translational model.

Keywords:

faecal microbiota transplantation, phenotype transfer, cognitive function, cardio-metabolic phenotype, PET-CT-US imaging

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Thematic Area:

- Frontiers in Microbiome Research
- Microbiome: from Research to Clinics

Infrastructures:

N.A.