Specific synbiotics in early life protect against diet-induced obesity in adult mice

CONCLUSION

The findings show the potential and importance of timing of synbiotic interventions in early life during crucial microbiota development as a preventive measure to lower the risk of obesity and improve metabolic health throughout life.

STUDY BACKGROUND

The metabolic state of human adults is associated with their gut microbiome. The symbiosis between host and microbiome is initiated at birth, and early life microbiome perturbation can disturb health throughout life.

STUDY OBJECTIVES

To determine how beneficial microbiome interventions in early life affect metabolic health in adulthood.

STUDY DESIGN

Litters were culled at postnatal day (PN) 2 and were randomly divided into 4 diet groups until postnatal (PN) day 42:

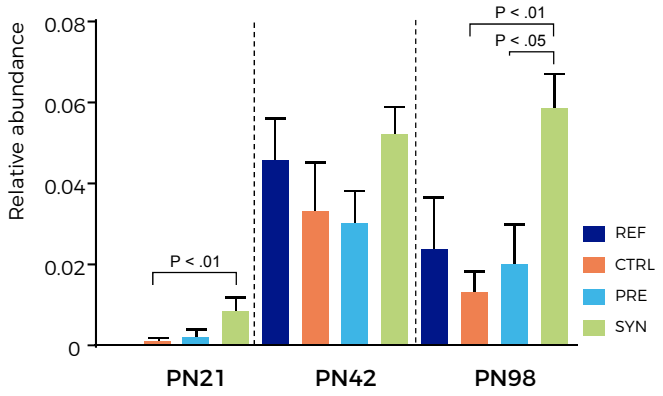
- Reference (REF) and Control (CTRL) groups receiving AIN-G (standard semi-synthetic diet appropriate for breeding) plus control component (maltodextrin)
- PRE group receiving AIN-G supplemented with prebiotics (scGOS/lcFOS, 9:1)
- SYN group receiving AIN-G, supplemented with synbiotics (scGOS/lcFOS, 9:1 + *Bifidobacterium breve* M-16V)

CTRL, PRE and SYN groups were subsequently challenged with a high-fat Western-style diet (WSD) for 8 weeks.

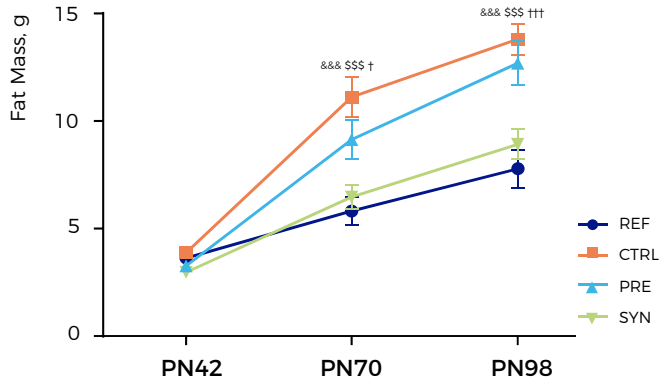
Food intake did not differ between groups.

To test the robustness of the findings, the study was repeated in a second animal facility.

Key results



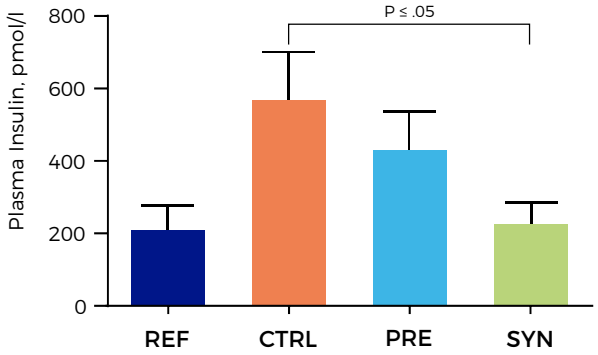
&&&P ≤ .001 indicates significance for REF vs CTRL.
††P ≤ .01, †††P ≤ .001 indicate significance for PRE vs SYN.
$P ≤ .05, $$P ≤ .01, $$$P ≤ .001 indicate significance for CTRL vs SYN.

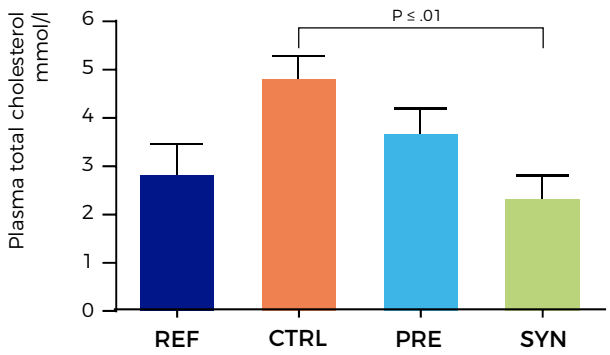


Microbiota transplantation using samples collected from synbiotics-supplemented adolescent mice at PN42 to age-matched germ-free recipients did not transfer the beneficial phenotype, indicating that synbiotics-modified microbiota at PN42 is not sufficient to transfer long-lasting protection of metabolic health status (data not shown).

Early life synbiotic supplementation increased the abundance of *Bifidobacterium*.

Early life synbiotic supplementation provided long-term protection against diet-induced excessive fat accumulation





SYN group showed a trend towards reduced HOMA-IR (P = .067) compared with the CTRL group (data not shown), suggesting improved insulin sensitivity. This effect was driven mainly by reduced insulin levels (P = .039) in the SYN group compared with the CTRL group.

Total plasma cholesterol was significantly reduced in the SYN group compared with the CTRL group (P = .003), resembling REF group levels.

Increased plasma levels of beta-hydroxybutyrate (P = .047) in the SYN group compared with the CTRL group (data not shown) indicated higher fatty acid oxidation, which might contribute to protection against obesity and improved glucose metabolism.

Early life synbiotic supplementation improved insulin sensitivity and dyslipidaemia in adulthood

synbiotics = scGOS/lcFOS and B. breve M-16V

Reference

Mischke M, Arora T, Tims S, Engels E, Sommer N, van Limpt K, Baars A, Oozeer R, Oosting A, Bäckhed F, Knol J. Specific synbiotics in early life protect against diet-induced obesity in adult mice. Diabetes Obes Metab. 2018 Feb 20. doi: 10.1111/dom.13240.