

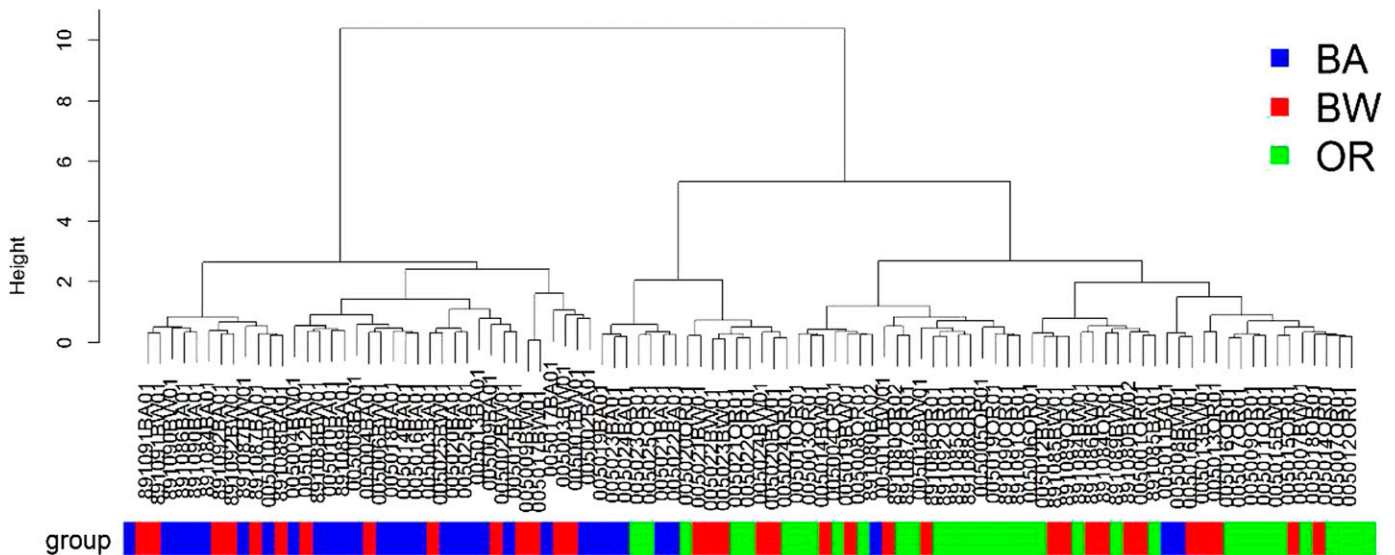


Figure 1. Dendrogram showing clustering using bray-curtis dissimilarity at the genus level. *Blue* = acellular bronchoalveolar lavage (BAL); *red* = whole BAL; *green* = oral wash.

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The Gut Microbiome and the Hygiene Hypothesis of Allergic Disease Impact of Pets and Siblings on Infant Gut Microbiota

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Rationale: Early-life exposure to pets or siblings is protective against allergic disease, including asthma. These associations are commonly attributed to the “hygiene hypothesis”; however, few studies have empirically tested this proposed biological pathway.

Objective: We investigated the impact of household pets and siblings on the developing gut microbiome.

Methods: The study included a subset of 24 healthy term infants from the Canadian Healthy Infant Longitudinal Development (CHILD)

birth cohort. Mothers reported on household pets and siblings.

Stool samples were collected at 4 months of age, and the fecal microbiome was characterized via high-throughput 16S rRNA gene sequencing.

Measurements and Main Results: Microbiome richness and diversity tended to be increased in infants living with pets, whereas these measures were decreased in infants with older siblings. Infants living with pets exhibited underrepresentation of *Bifidobacteriaceae* and overrepresentation of *Clostridium*, *Coprococcus*, and *Peptostreptococcaceae*. Infants with older siblings exhibited underrepresentation of *Peptostreptococcaceae*. In this cohort, high pet ownership was observed among single-child families.

Conclusions: This study provides new evidence that exposure to pets or siblings may influence the early development of the gut microbiome, with potential implications for allergic disease. These two traditionally protective “hygiene hypothesis” factors appear to differentially affect microbiome composition and diversity, calling into question the clinical significance of these measures. Ongoing studies in the larger CHILD cohort will investigate the independent role of these and other exposures and will address long-term respiratory health outcomes.

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