

University Training Program 3: Allergy Prevention: Do Cats and Dogs Feed Infants Microbes?

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Outline:

I. Hypotheses:

- a. That the content of house dust shapes microbial community composition in the intestinal tract of infants growing up in the household.
- b. That microbial communities in the intestinal tract shape the development of immune function.
- c. That differences in immune function shape the broncho-pulmonary response to exposure to allergens, viruses, bacteria, and/or fungi.

II. Tool for Culture-independent analysis of microbial community composition: Description of the principles and application of the 16S rRNA Phylochip.

III. Studies of dust and stool samples from households and infants exposed or not exposed to pet dogs or cats: Microbial content of dust from pet-keeping households significantly richer, more diverse, and more even than microbial content of dust from no-pet households. Driven by effects of pets that spend time out of doors. 900 bacterial taxa significantly more common in pet house dust, most Proteobacteria. Non-Heirachical cluster analysis of small number of stool samples from infants in pet keeping households suggest clustering driven by dog exposure. Review of study of feeding *Lactobacillus rhamnosus* shows stool microbial community composition is modified by oral ingestion of microbes.

IV. Animal and Human data showing immune function altered by gut microbiota. Presence of Segmented filamentous bacteria in small intestine necessary and sufficient for induction of Th17 cells in C57BL/6 mice. Daily ingestion of *L. acidophilus* and *B. animalis* or of lyophilized bacterial extracts reported to reduce severity of respiratory viral infections in children.

V. Challenges to testing the hypothesis: possible importance of selection of microbe (fungal, viral, bacterial?) and outcome (disease, disease marker, test of immune function?)

VI. Tentative Conclusions:

- a. Pet keeping, especially of pets allowed indoors and outdoors, shapes microbial community composition of house dust to be richer and more diverse and to differ in proportion of distinct bacterial taxa.
- b. Oral intake of microbes can shape gut microbial community composition.
- c. Animal studies show gut microbial community composition, especially in early life, to shape immune function and the response to viral and bacterial infection.
- d. Some studies of children suggest that oral feeding of microbial preparations can alter response to community acquired viral respiratory infections..