

Plenary Session 7: Microbiome: A New Window to Health and Allergic Diseases? Asthma.

Presenter: Homer Boushey, MD, University of California San Francisco.

Outline:

- I. **Definition of the Microbiome.**
- II. **Dimensions of the Microbial World** as revealed by application of culture-independent methods for microbial detection. Existence of distinct microbial communities on mucosal lined surfaces. Humans as “superorganisms.”
- III. **Studies of the bronchial microbiome in healthy and asthmatic subjects.** One study described the bronchial microbiome of asthma as “disordered” in comparison with that found in healthy subjects, with notable predominance of *Haemophilus influenza* in lower airway samples from patients with asthma or COPD. Another study has reported bronchial microbiome of asthma to be richer (greater bacterial burden), more diverse (greater number of different bacterial taxa) and more even (abundance of different bacterial taxa more similar), with certain bacterial classes, especially proteobacteria, being common and more abundant. A limitation of both studies are that all asthmatic subjects were taking an inhaled corticosteroid, so it cannot be known whether the demonstrated differences in bronchial microbiota are a function of disease (asthma) or its treatment (inhaled corticosteroid therapy). A second limitation is that a study using exquisite care to minimize and control for upper airway contamination of lower airway samples concluded that there is no distinct bronchial microbiome in healthy adults.
- IV. **Bacterial colonization of the airways in early infancy related to risk of development of asthma in childhood.** Strong epidemiologic association between presence of *Streptococcus pneumoniae*, *Moraxella catarrhalis*, or *Haemophilus* in oropharyngeal samples at one month of age and hazard ratios for later development of asthma, and also with increases in blood eosinophils and IgE antibody. Study of weaningly mice showed microbial introduction into the airways alters subsequent susceptibility to *S. pneumoniae* infection of the lungs.
- V. **Tentative Conclusions:**
 - a. In asthma, as in COPD and Cystic Fibrosis, a microbial community appears to populate the bronchial mucosa.
 - b. This community is polymicrobial and is richer and more diverse than is found in the airways of healthy adults.
 - c. Whether the differences so far shown in the microbiome of asthma is a function of disease or its treatment is unknown.
 - d. The relationship between bronchial microbial community composition and phenotypic features of asthma is unknown.
 - e. Microbial colonization of the airways in early life may shape susceptibility to later colonization or infection by pathogenic microbes or microbial communities.
- VI. **Relationship between gut microbiome and development of asthma,** Will be reviewed in subsequent symposium: University Training Program 3: Allergy Prevention: Do Cats and Dogs Feed Infants Microbes? Wednesday, 7 December 2011: 15:00 - 16:30
Gran Cancún 1 (Cancún Center)