The Human Lung Microbiome
- A Hidden Link for Human Health and Diseases

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The Human Lung Microbiome

Lung Microbiome - Summary

Sampling and sequencing
- Sputum/BAL/Brushings
- Lung tissue
- Amplicon-based/Metagenomics
- Multi-omics

Disease applications
- Chronic lung diseases
- Acute lung diseases
- Lung cancer
- Other lung diseases

The lung microbiome

Current challenges
- Low microbial-host ratio
- Disease heterogeneity
- Microbiome manipulation
- Culturability

Future promises
- Diagnosis
- Spatial dynamics
- Microbe-host interaction
- Lung-distal organ axis

Lung Microbiome - Methodologies

Sputum
Bronchoalveolar lavage
Bronchial brushings
Tracheal aspirate
Lung tissue

Sampling

Amplicon-based
Metagenome
Virome
Metatranscriptome
Metaproteome
Metabolome

Sequencing

DNA
RNA
Protein

Host
Metabolites
Metabolites
Immune cells and mediators

Profiling

Virus
Fungi
Bacteria

Lung Microbiome - Applications

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<thead>
<tr>
<th>Disease</th>
<th>COPD</th>
<th>Asthma</th>
<th>Bronchiectasis</th>
<th>Cystic fibrosis</th>
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### Challenges

- Oral contamination
- Low microbial-to-host ratio
- Disease heterogeneity
- Microbiome-host interaction
- Microbiome manipulation
- Culturability

### Possible solutions

- Sample quality control
- Oral sample cross-comparison
- Pre-sequencing host cell depletion
- High depth ‘Holo-biome’ sequencing
- Microbiome-pheno/endotype relations
- ‘Microbial-host’ multi-omic landscape
- Standard procedure for respiratory microbiome manipulation
- Culturomics

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