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The airway microbiome in cystic fibrosis: Where are we now?

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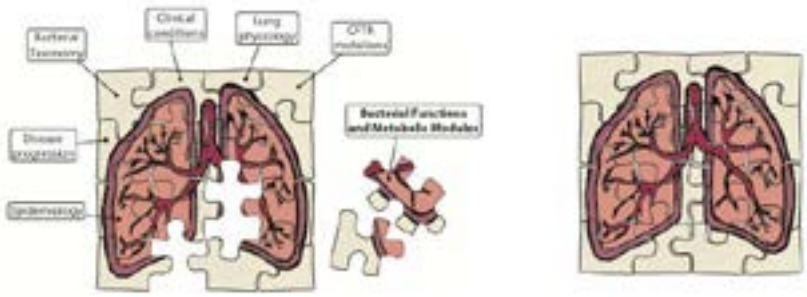
Patients with cystic fibrosis (CF) can experience periodic episodes of acute pulmonary exacerbation, which are associated with a poor health-related quality of life, disease progression, and survival. Only recently scientists began to appreciate the complexity of CF polymicrobial infection and the implications it may have for disease prognosis and response to therapy. New insight into the impact of antibiotic treatment, patient age increasing, and periodic pulmonary exacerbation on CF microbiology has been obtained. Anyway, the analysis of both taxonomic assessment of CF microbiome and its functional potential (ie which genes and pathways are present) have not been investigated yet. Understanding the role of the CF airway microbiota and detecting microbial species associated with the decline in lung function are key challenges for the delivery of new potential biomarkers for bacterial infections managements in CF patients and improving healthcare treatment. Here, I will present the state of the art on CF microbiome and describe the complex interaction networks underlying the host-lung microbiome interaction at taxonomic and functional level. Finally, data from a longitudinal study of the airway microbiome in CF will be presented, paying special attention to the episodes of exacerbation, by using shotgun metagenomic sequencing that permits targeting the entire genomic repertoire of the microbial community, down to the strain level. Overall, such results suggest the need for future development of personalized therapeutic approaches based on patient-specific airways microbiome. These new insights may alter future clinical management of CF. This work was supported by Grants from Italian Cystic Fibrosis Foundation (FFC#8/2012; FFC#10/2014; FFC#14/2015; FFC#19/2017).



Recent Publications:

1. Bacci et al. The personalized dynamics of microbiome in the airways of cystic fibrosis patients. Manuscript in preparation
2. Bacci G, Mengoni A, Fiscarelli E, Segata N, Taccetti G, Dolce D, Paganin P, Morelli P, Tuccio V, De Alessandri A, Lucidi V, Bevivino A. A Different Microbiome Gene Repertoire in the Airways of Cystic Fibrosis Patients with Severe Lung Disease. *Int. J. Mol. Sci.* 2017, *18*, 1654.
3. Bacci G, Paganin P, Lopez L, et al. Pyrosequencing Unveils Cystic Fibrosis Lung Microbiome Differences Associated with a Severe Lung Function Decline. Kormann MSD, ed. PLoS ONE. 2016;11(6):e0156807. doi:10.1371/journal.

pone.0156807.

4. Paganin P, Fiscarelli EV, Tuccio V, Chiancianesi M, Bacci G, et al. (2015) Changes in Cystic Fibrosis Airway Microbial Community Associated with a Severe Decline in Lung Function. PLOS ONE 10(4): e0124348. doi.org/10.1371/journal.pone.0124348.
5. Bevivino A*, Bragonzi A (2013) The evolving polymicrobial composition in the airways of patients with cystic fibrosis: implications for disease and clinical management. Currrent Medical Literature CML – Cystic Fibrosis 3(4): 93–104. ISN 2045–7138 (Online).

Biography

Annamaria Bevivino has her expertise in microbial diversity and microbial interactions in different environments. She is senior scientist at ENEA, Italian National Agency for New Technologies, Energy and Sustainable Development, and Professor at University Campus Bio-Medico, Rome, Italy. Actually, she is the Coordinator of a multicentric project funded by Italian Cystic Fibrosis Foundation (FFC#19/2017), entitled "A longitudinal metagenomic analysis to uncover microbial signatures of CF lung disease: unravelling host-microbial community interactions in humans and animal models". She is academic editor for PlosOne and Frontiers in Microbiology and member of Italian Society of General Microbiology and Microbial Biotechnology, Federation of European Microbiological societies, Italian Society of Agro-Food and Environmental Microbiology, International Union of Microbiological Societies, Italian Cystic Fibrosis Sociey and European Cystic Fibrosis Society. She is author of 44 peer-reviewed published papers in international journals, and more than 150 communications to national and international congresses. Scopus: ID: 6602516452 Citations: 1491. h index: 22.

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