SYNERGIA : Symbiotic microbiome interactions in pneumonia treatment: gateways to immune homeostasis - Ana Motos Galera, CR2TI

Background: Nosocomial pneumonia is the second most prevalent hospital-acquired infection and carries the highest fatality rate among them. Conventional understanding of lung health has historically constrained the microbial status into a dichotomy (sterile or infected), resulting in a "one-size-fits-all" therapeutic approach that exclusively targets pathogens while neglect the intricate host-microbiome interaction.
Hypothesis: SYNERGIA's hypothesis is that the reconstruction of the healthy respiratory microbiome core by a probiotic of lung-specific commensal bacteria and/or their derived metabolites can mitigate pneumonia severity via pathogens modulation. Our main objectives are: 1) test their in vitro impacts on pathogens and commensal bacteria; and 2) evaluate their impacts on pathogens multiplication and microbiome composition.
Description of work: We will assess the interaction of the bacterial consortium and its effects on pathogens by growth and transcriptional response analysis. Then, we will investigate their therapeutic potential in pneumonia mice models by examining pathogen burden, microbiome composition, transcriptomic activity, and immune modulation using single-cell RNA sequencing and flow cytometry.
Impacts: SYNERGIA is a novel approach to modulate the lung microbiome with non-antibiotic, lung-targeted therapies, addressing pneumonia pathophysiology beyond pathogen clearance. Through the multidisciplinary application of state-of-the-art techniques, this project has the potential to transform the treatment of pneumonia and, perhaps, other respiratory tract infections.