

Quantitative detection of bacteria associated with lung exacerbations in bronchiectasis

Project team:

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Quantitative assay for monitoring infection

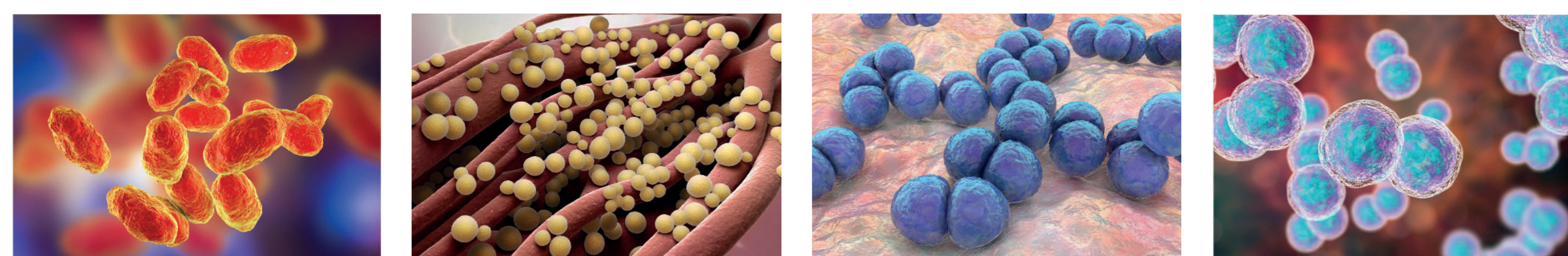
LifeArc is partnering with the University of Dundee and the European Multicentre Bronchiectasis Audit and Research Collaboration (EMBARC) to develop tests that quantify bacteria linked to lung flare-ups. These tests will first be used in research studies to provide knowledge to the community, enabling clinicians to make better informed treatment decisions. We also plan to develop our tests for *Pseudomonas aeruginosa* and non-tuberculosis mycobacteria (NTMs) as clinical monitoring tools to determine if an infection is responding to a given treatment.

Quantitative assay for monitoring infection



LifeArc scientists in our Integrated Diagnostics group in Edinburgh are developing tests that can quantify bacterial species, based on quantitative PCR detection of 16S ribosomal RNA. Assays were designed in-house and performance tested, prior to clinical sample testing.

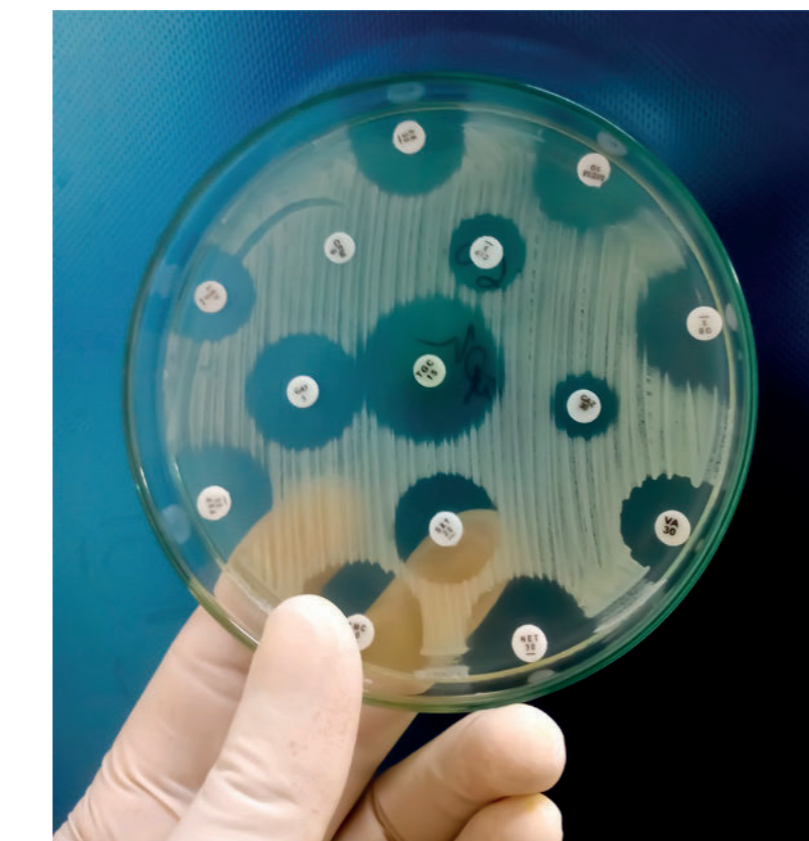
We are developing tests that can detect and distinguish *Pseudomonas aeruginosa*, *Haemophilus influenzae*, *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Moraxella catarrhalis*, Non-tuberculosis mycobacteria and others in human sputum.



The top picture depicts the design principle for the quantitative bacterial assay. Images above (left to right) show *Haemophilus influenzae*, *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Moraxella catarrhalis*.

Current care

- Antibiotics are given based on previous culture data, if available.
- Treatment decisions are made prior to return of microbiology results.



Clinical utility of quantitative tests

Virtual clinician round-table group (May 2021):

- Research studies are needed to understand the relationship between bacterial species identity, load and pulmonary exacerbations
- Top bacterial targets for assays were identified.

Clinician round-table at World Bronchiectasis and NTM Conference (July 2022):

- *Pseudomonas aeruginosa* assay would have clinical utility monitoring infections (e.g. in response to treatment) and in clinical trials for new anti-pseudomonas therapy.
- NTM assays would have clinical utility monitoring infections (e.g. in response to treatment) and assessing patients prior to commencing long-term macrolide therapy.
- Top bacterial targets agreed upon, extended list TBD.



Top image: antibiotic susceptibility testing
Bottom image: *Pseudomonas aeruginosa*

Project objectives

- Define the bacterial species associated with pulmonary exacerbations in bronchiectasis.
- Design quantitative assays targeting these species and demonstrate success in clinical samples.
- Perform research studies using appropriate samples to understand the relationship between bacterial species, load and pulmonary exacerbations.

Research studies

- When should we treat? Is there a load threshold associated with exacerbation?
- What should we treat? Are some species/combinations associated with exacerbations, and others that are not?
- How long should we treat? Upon treatment, is there a minimal load threshold associated with sustained recovery and can treatment time be reduced?



- Data from research studies should enable clinicians to make better-informed treatment decisions based on pre-existing diagnostics.
- Data from research studies will highlight what new diagnostic tests are needed

Research studies will be performed using samples available through EMBARC and will be carried out in collaboration with the Chalmers lab, University of Dundee.



Top image: bacterial culture plate
Bottom: University of Dundee, EMBARC and European Respiratory Society logos