

# Cystic Fibrosis Research News

**Title:**

PHENOTYPIC CHARACTERISTICS OF INCIDENT AND CHRONIC MRSA ISOLATES IN CYSTIC FIBROSIS

**Lay Title:**

Appearance and behaviour of methicillin resistant *Staphylococcus aureus* (MRSA) from early and chronic infection in cystic fibrosis (CF)

**Authors:**

Deirdre Gilpin<sup>1</sup>, Lucas R. Hoffman<sup>2</sup>, Agathe Ceppe<sup>3</sup>, Marianne S. Muhlebach<sup>3,4</sup>

**Affiliations:**

1 Department of Pharmacy Services, Queens University, Belfast, UK.

2 Department of Pediatrics, University of Washington, Seattle Children's Hospital, Seattle WA, USA.

3 Marisco Lung Institute, University of North Carolina, Chapel Hill, NC, USA

4 Department of Pediatrics, University of North Carolina, Chapel Hill, NC, USA.

**What was your research question?**

Bacterial infections of the lungs in CF very often become chronic and are quite difficult to treat. Here we wanted to know if characteristics of bacteria that help them persist in the lungs change over time.

**Why is this important?**

Bacteria can persist despite antibiotic therapy; i.e. they are not effectively killed and eradicated for different reasons. This can be what is known as "antibiotic resistance". Resistance is defined by the microbiology laboratory tests showing that concentrations of a given antibiotic do not kill the bacteria in the culture plate. In chronic infections bacteria can also survive by changing their growth behaviour, for example growing very slowly which makes antibiotics ineffective in killing the bacteria. This can occur even though the bacteria are not "resistant". Therefore we examined aspects that are relevant to this type of persistence.

**What did you do?**

The CF centers at UNC and U. Seattle stored MRSA over time. Here we used bacteria from the first timepoint a person with CF had grown MRSA and one time point about 2 years later. We

# Cystic Fibrosis Research News

collected clinical information on frequency of antibiotic prescriptions, lung function and weight during this time. We examined the bacteria for antibiotic resistance and two virulence factors. One is haemolysis, a trait of MRSA being more virulent but also a marker for other growth functions. The other is biofilm formation i.e. how well they form a slimy appearance that makes them difficult to treat.

## What did you find?

We included early and chronic MRSA from 49 people. The average age at MRSA onset was 9.7 years and many people had decreased lung function. About half of the people showed increased use of antibiotics and poor weight gain after MRSA. We did not find increasing antibiotic resistance of the bacteria over time. The haemolysis and biofilm formation did not differ in the early isolates compared to the chronic isolates. However; when we examined bacteria under conditions of low oxygen as occurs in CF lung infection we noted that antibiotic resistances, haemolysis and biofilm formation differed from the normal conditions.

## What does this mean and reasons for caution?

This shows that clinically many people show a decline after MRSA onset. Secondly, bacteria may not change, especially they may not show increased antibiotic resistance over time, under regular testing conditions but may not behave / grow this way in the lungs. Although we grew bacteria also under conditions of low oxygen this does still not model all the aspects of CF lung infections. We also had to limit the number of assays to characterize all the bacteria.

## What's next?

As stated above there are many more assays one can do on the bacteria under laboratory conditions. Ideally we would also probe the MRSA directly in the sputum to evaluate their growth behaviour and then also relate those findings to looking at new treatment options.

## Original citation in PubMed

<https://pubmed.ncbi.nlm.nih.gov/34103251/>