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## Introduction

In CF patients, sputum bacterial load is associated with increased airway inflammation and poor clinical outcomes, especially in patients with high bacterial load. CF sputum rheological properties may predict disease progression and assess the efficacy of treatment.

The goal of this study is to determine correlations between bacterial load and rheological properties in sputum samples from CF patients.

## Methods

- Sputa collected from N = 23 patients and frozen (-80°C); thawed and vortex homogenized prior to measurements.
- Bacterial load: quantitative culture (colony forming units [CFU].g<sup>-1</sup>) and quantitative PCR (qPCR) using a probe-detection system targeting the 16S rRNA gene.
- Rheology: oscillatory strain sweep test (1 Hz, strain range 1–3,000%) to determine the elastic (G') and viscous (G'') moduli. In the linear range (< 10% strain), G' > G'' and are constant (soft viscoelastic solid). The Tack, G''/G'<sup>2</sup>, is a marker of adhesivity. At larger strains (> 1,000%), G' decreases and comes below G'', this is where the mucus starts to flow. The onset defines the critical stress  $\sigma_c$  which describes the ability to transport mucus over long distances. Finally, Elastic Force EF = G' $\sigma_c$  is a marker of the total energy dissipated at the flow onset.
- Statistics: bilateral Pearson correlation test on logarithmically-transformed values; significance level set at p < 0.05.

## Conclusions

We identified correlations between sputum linear viscoelastic properties and microbial load determined by qPCR. This relationship was not apparent by quantitative culture, suggesting that the viscoelastic moduli may reflect the amount of DNA in a sample rather than the number of viable bacteria. To confirm the potential of sputum rheology as a quantitative biomarker of infection in pulmonary diseases, host DNA should thus be quantified in parallel.

In contrast, critical stress was found constant ( $\approx$  25 Pa), suggesting that mucus infection is not directly related to bronchial obstruction.

## Results

