The association between disease severity and telomere length in cystic fibrosis - from genetics to prognosis?

Cystic fibrosis (CF) is one of the most widespread life-shortening genetic diseases. Clinical picture of the disease is complex. CF patients frequently suffer from pulmonary disease (most frequent cause of death), exocrine pancreatic insufficiency, diabetes, renal dysfunction, metabolic bone disease and others. These conditions lead to chronic disability and early death.

Although we already know a lot about the disease we still need a better picture of what makes the disease more severe and what drives it to advance. Latest research shows that genetic markers can reflect changes in time according to the disease progression. One such promising marker could be the telomere length. What are telomeres? Telomeres are elegant structures that protect our genetic material from damage when each cell divides. As a result they become shorter with each cell cycle. It has been shown that changes in telomere length can predict unfavorable prognosis in some diseases such as leukemia and pediatric malignancies, therefore it seems like they can be used as an independent and powerful tool in foreseeing the course of disease.

The aim of the proposed study is to measure telomere length in CF and healthy subjects at different time points: at birth, at the age of 5-10 and over 20. The expected results will show, that CF patients have shorter telomeres in comparison to healthy subjects and the effect is evident at the earliest point of life. Moreover, the research methodology allows to investigate the long-term telomere variation (5-10 years) and compare it with those observed in healthy subjects. Telomere length tends to change significantly in response to various environmental factors such as lifestyle, stress or inflammation. Therefore the study will include CF and healthy newborns to limit the impact of confounding factors before they start acting. The results will be interpreted in clinical context and correlated with the disease severity. The telomere length will be measured in blood picked from finger, therefore the sampling will be less invasive for the subjects. The measurement itself will be performed by the newest approach in telomere analysis (qPCR).

The proposed study contributes significantly to better understanding of CF pathophysiology and might provide a useful marker in the clinical follow up. Such a tool for monitoring the course of the disease over time will help in its management by i.e., optimizing the treatment. In addition, the results of this project will be of interest to the broader scientific community since they offer novel insights into the biology of diseases and deepen our knowledge of medical genetics.