

2.1.1.b. Annual highlights in PREDICT

Center for Molecular Prediction of Inflammatory Bowel Disease was established on March 1, 2021, at Aalborg University Copenhagen. On August 27, 2021, the center was officially opened by the Minister for Higher Education and Science, Jesper Petersen; the Chair of the Danish National Research Foundation, Jens Kehlet Nørskov; and Aalborg University's Rector Per Michael Johansen with participation of distinguished guests and collaborators, and accompanied by Jonas Suni and band with songs for an upcoming album on living with inflammatory bowel disease (IBD). By the end of 2021, 10 months after the establishment of the center, PREDICT had 59 full- and part-time employees with a 50:50 gender balance. Among our PhD students, postdocs, and statisticians, 43% are of international background.

The overall aim of PREDICT is to build a state-of-the-art model for linking biological information from the Danish National Biobank to the wealth of unselected longitudinal population-based information available in the Danish nationwide population-based registers and from regional population-based cohorts, using IBD as a model disease. The first phase of creating this data lake has been challenged by the current GDPR situation in Denmark affecting all researchers working with health data. Waiting time for obtaining permissions and accessing data through different authorities is disconcertingly long. It has taken a full year, *after* ethical approval had been obtained, to have a cohort list transferred through the authorities to the Danish National Biobank for the biobank to start identifying samples and selecting controls. Fortunately, we have had access to other data and have been able to carry out a systematic list of projects, which will pave the way for the future data lake.

First, we have developed new algorithms for the definition of IBD based on nationwide data, which is essential for the current identification of patient samples in the biobank and for all upcoming work on the data lake. To further prepare for omics-derived analyses of disease occurrence and disease outcome, we have during year 2021 produced a state-of-the-art paper on the use of omics to predict IBD, which has been published in *Nature Reviews Gastroenterology and Hepatology* in year 2022. To prepare for the use of register- and cohort data in combination with omics data to study disease occurrence and disease course, we have developed new methods to study heritability of diseases in nationwide registers and have examined the use of nationwide data to identify environmental disease risk factors, such as early life exposure to parasites and medications in relation to IBD. The uniqueness of the data lake will be the ability to combine heritability and environmental risk factors with biology in the understanding of disease development. We have also continued working on the gut-brain axis and its impact on IBD, also leading to a state-of-the-art paper submitted to *Nature Reviews Gastroenterology and Hepatology*. To prepare for data lake studies on the impact of biology on treatment response and adverse effects, we have worked with world-leading pharmacoepidemiologists from Sorbonne University to explore the possibilities for using Danish nationwide prescription data to assess treatment response and side effects with omics data and to examine the potential for using French nationwide medication data for validation. We have further developed bioinformatics pipelines to be used for in-depth characterization of the composition and functional properties of metagenomes to enable characterization of such properties in the gut microbiota of IBD patients. Lastly, we have studied the outcome of COVID-19 in patients receiving immunosuppressants and we have contributed to national and international guidelines in the field of IBD.

Based on a broad interest in PREDICT from international colleagues, we have been invited to present the center vision at institutions such as Harvard Medical School and the world-leading IBD hospital Mount Sinai NY. We have also been invited as speakers and faculty at all leading events in the field internationally and we have contributed to a number of podcasts and media to the lay public in Denmark and abroad during the first year of PREDICT.