



Danish National Research Foundation
Center for Functional Genomics and Tissue Plasticity
ATLAS

Highlights Summary 2020

The overarching aim of the Center for Functional Genomics and Tissue Plasticity (ATLAS) is to obtain detailed mechanistic understanding of how the different cell types in the liver and adipose tissue change their functions during diet-induced obesity and regression in mouse models; and to translate this for in-depth understanding of human liver and adipose tissue plasticity in response to severe obesity and reversal following bariatric surgery. The long-term ambition is that this insight can be used to improve diagnosis and treatment of obesity comorbidities.



The year 2020 has been a challenging year, where both clinical and basic research has been slowed due to the COVID-19 pandemic. In addition, most meetings have been rescheduled to virtual meetings and visits have been cancelled. However, there were also several highlights in 2020 including:

3rd Annual ATLAS Meeting at Gl. Avernæs:

In October 2020 ATLAS convened at the beautiful site of Hotel Sinatur, Gl. Avernæs for a two-day meeting on recent advances in our center as well as inspirational talks. Due to COVID-19 restrictions, our international Scientific Advisory Board could only participate virtually. To add a translational perspective to our work, we had invited two patients from our cohort who had already undergone bariatric surgery to explain about their experiences during this process. In addition, Professor Thorkild I.A. Sørensen, University of Copenhagen gave an excellent and provocative talk about the causes of obesity. These talks were highly stimulating and very well received by the entire ATLAS team. Another success at the meeting was the one-day overlap with the Annual Meeting of Center for Adipocyte Signaling (ADIPOSIGN). During the common day, members of the Scientific Advisory Board of both centers gave excellent presentations, and we organized small workshop sessions on selected topics suggested by both centers. This joint day was emphasized by both centers as a highlight that should be repeated.



During 2020, we published several ATLAS papers investigating adipose and liver plasticity during diet-induced obesity. In a landmark paper we published the first report on the plasticity of adipose tissue at single cell resolution. In this work we applied single nucleus RNA-sequencing to study the plasticity of white adipose tissue in mice in response to diet-induced obesity. Interestingly, this work also allowed us to for the first time map the changes in gene expression along the entire developmental trajectory from progenitor cells to mature fat cell. In another key paper, we applied single-cell transcriptomics to map cells in healthy and injured mouse livers. We showed that we could map the changes in gene expression as so-called stellate cells develop into myofibroblast, and we discovered novel markers of advanced fibrosis in non-alcoholic fatty liver disease. These first studies of mouse liver and adipose tissue plasticity constitute an important foundation for future single cell studies of liver and adipose tissue plasticity in ATLAS.

Recruitment of skilled Postdocs and PhD fellows to ATLAS:

In 2020 we have recruited three new postdocs and three PhD fellows funded by the center grant, as well as two PhD fellows funded by the Danish Diabetes Academy. With their strong and diverse backgrounds and enthusiasm for the project, our team now stand as strong as ever.

Publication of the first studies of liver and adipose tissue plasticity at single cell resolution:

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First human samples from follow-up visit obtained:

The COVID-19 pandemic has slowed down the completion of the surgeries. However, in 2020 we obtained the first human biopsies from the two-year visit following bariatric surgery. These important samples are currently waiting to be analyzed to reveal cellular plasticity in response to obesity regression.

