LSI SUPPORT FOR PhD-STUDENTS IN APPLIED AREAS

Examining how to assemble plant-based protein threads to be used for creating texture in food: revealed by X-ray scattering

THE PURPOSE OF THE PHD PROJECT

To reduce the impact on the environment and animal wellfare, a shift to eating more plant-based proteins is a possible solution. This shift can be made more attractive for the consumer by replacing meat with something from a plant-based source with similar texture and appearance as meat.

Proteins can be modified into very strong nano-sized fibers, so-called protein nanofibrils (PNFs). We have been able to produce these PNFs from several different plant-based proteins. In the PhD project, we want to investigate if we can use these PNFs to spin threads similar to spider silk (Fig 1). The final aim is to use these threads to texturize future suitable food applications.

It is important to gain knowledge about how the raw materials differ concerning the formation of nanofibrils, which process is most effective, and to understand how this affects the functional properties of the nanofibrils. Depending on factors such as protein source, concentration, and post-treatments, PNFs may have different nanostructures (morphology). This knowledge is essential to be able to scale up the production and to introduce new technology and innovative products on the market.

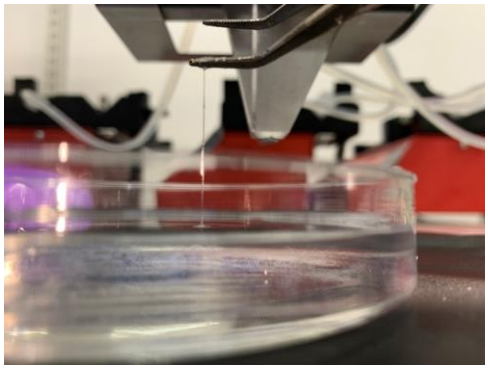

Figure 1. Spider-like thread generated from plat-based PNFs.

USING A LARGE SCALE INFRASTRUCTURE

The high resolution only achieved at large scale X-ray facilities enable us to study how the PNFs align in a flow cell during a variety of different flow conditions. With the help of small-angle X-ray scattering (SAXS) measurements, the goal was to gain a deeper understanding of which conditions generate optimal alignment of the PNFs and the best conditions for creating long and stable threads.

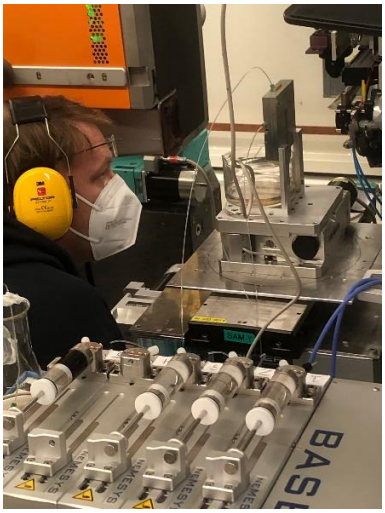

Figure 2. Fredrik Lundell, KTH, controlling the experimental set-up at P03.

RESULTS AND IMPACT

SAXS data on the alignment of plant-based PNFs were collected at the beamline P03 at Petra III, Hamburg (Fig 2).The initial analysis of the massive amount of data we managed to collect, shows that our experiments generated successful data. The results show that we succeeded in creating an alignment of our plant-based PNFs, which with a deeper analysis will give us an increased knowledge of how we can use flow cell technology to create micrometer-thick threads.

The data analysis is underway and performed by PhD student Anja Herneke within the now established knowledge network between SLU, Lantmännen and KTH.

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