We conduct research in structural glycobiology with the aim to advance our understanding of how complex carbohydrates (glycans) affect the function of key proteins in complex biological systems including inflammation, innate immunity, cancer and pathogen-host interactions [1]. We develop and utilise state-of-the-art mass spectrometry-based technologies for the accurate molecular mapping of glycoproteins (glycomics [2] and glycoproteomics [3]) and use molecular and cellular assays to investigate the structure/function relationships of glycosylated proteins in the context of human diseases [4]. The following are examples of available MRES research projects. You will be working closely with PhD students and postdocs in our small but very dynamic research team.

Feel free to come and discuss potential projects.

GLYCOIMMUNOLOGY: EXPOSURE OF GLYCOEPITOPES DURING CELL DEATH

Glycoproteins are directed to specific locations within healthy cells and they carry important chemical information in their terminal epitopes for cell communication [5]. During cell death apoptotic and necrotic cells expose previously hidden glycoepitopes on their surfaces, which may be recognized locally by immune-related lectins and initiate an immune response. Surprisingly little biochemical knowledge has been established of the glycosylation signatures associated with cell death, the proteins carrying these immune-centric glycoepitopes and their involvement in the immune response. In this study we seek to investigate these overlooked aspects using our LC-MS/MS technologies in glycomics [2] and glycoproteomics [3] and lectin cytochemistry to map the exact molecular changes in protein glycosylation during the transition of healthy viable human cells into various death pathways. Advancing our understanding of the molecular mechanisms in cell death is instrumental to delineate many pathologies in particular immunological and inflammatory diseases.
NOVEL HUMAN GLYCOEPITOPES IN INFLAMMATION AND CANCER

We recently discovered a new class of asparagine-linked glycoproteins displaying truncated glycoepitopes in inflamed tissues [6, 7]. We identified that a subset of these, the very short chitobiose core type epitopes (i.e. GlcNAc-Asn and Fuc-GlcNAc-Asn), were abundantly present on intact and fully functional proteins derived from human immune cells [8]. This project will follow up on these exciting findings and investigate for the wider presence of such unusual glycoepitopes in a range of human immune and cancer cells using three approaches: 1) western blotting using GlcNAc-specific antibodies and lectins, 2) glycoproteomics mapping [9] and the parallel analysis of glycoproteomics data already stored in public repositories using the Byonic search engine and 3) curation of the PDB repository to search for 3D structures of chitobiose glycoproteins. It is expected that this work will provide a better understanding of the protein and cellular distribution of these truncated glycoepitopes and yield clues to their involvement in inflammation and cancer.

Selected Publications


publicationslist.org/m.thaysen-andersen