



Master Thesis Project in Quantitative Proteomics Applied to Receptor Tyrosine Kinase Signaling and Endocytosis.

Background

The Novo Nordisk Foundation Center for Protein Research (CPR) has recently been established at the Faculty of Health Sciences at the University of Copenhagen. The aim of the Center is to promote basic and applied discovery research on medically relevant proteins. CPR comprises a wide range of expertise, skills and resources in Mass Spectrometry (MS)-based proteomics, computational biology, high-throughput protein production and characterization, chemical biology and disease biology.

Within the Center, the Department of Proteomics makes use of recent revolutionary breakthroughs in the technology of Mass Spectrometry-based proteomics. It is now possible to identify thousands of proteins in a wide variety of proteomes, spanning from prokaryotes to cancer tissues. Recent developments in quantitative proteomics also allow comparison to proteomes after stimulation or drug treatment. Other biomedical important capabilities of proteomics include the quantitative determination of post-translational modifications such as phosphorylation, ubiquitination, acetylation, methylation and many others. Not least, proteomics is also able to determine protein-protein, protein-DNA or protein-drug interactions.

Project

Receptor Tyrosine Kinases (RTKs) regulate all the fundamental cellular processes, including cell cycle, cell migration, proliferation and differentiation, metabolism and survival. Once activated, each RTK recruits a unique set of intracellular signaling molecules, inducing specific cellular responses (Schlessinger, 2000). Tight control of signaling propagation and specificity is lost in various diseases, such as cancer (Hanahan and Weinberg, 2011). Endocytosis not only orchestrates the internalization and sorting of diverse sets of molecules, including RTKs, but it is also believed to be a potent regulator of signal transduction (Scita and Di Fiore, 2010).

The aim of the project is to focus on the Epidermal Growth Factor Receptor (EGFR) and the Fibroblast Growth Factor Receptors (FGFRs) as model RTKs to better define the role of endocytosis in signaling regulation. The study will be based on an unbiased approach consisting of MS-driven quantitative proteomics, followed by appropriate functional assays to validate the results.

The project will involve the following techniques: cellular biology techniques (cell growth and transfection, cell proliferation and migration assays), biochemical techniques (SDS-page and Western Blotting, immunoprecipitation, vesicle isolation using sucrose gradients and ultracentrifugation), extensive use of confocal microscopy, sample preparation and phosphopeptides enrichment before MS analysis, basics in high-resolution MS instrumentation, data analysis and bioinformatics.

References

Hanahan and Weinberg, Hallmarks of Cancer: The Next Generation, Cell, 2011.

Scita and Di Fiore, The Endocytic Matrix, Nature, 2010.

Schlessinger, Cell Signaling by receptor Tyrosine kinases, Cell, 2000.

How to apply

We are looking for a highly motivated student who would like to join the Department of Proteomics at CPR for pursuing his/her master project. After the necessary training in all the above mentioned techniques, the student will work independently within an already ongoing project coordinated by postdoctoral fellow Dr. Chiara Francavilla. The master project is expected to last one year and involves a high degree of laboratory work.

This position is available as soon as possible.

If you are interested, please send your CV, a list of grades and a short motivation letter to Dr. Chiara Francavilla, email: chiara.francavilla@cpr.ku.dk and to Prof. Jesper V. Olsen (jesper.olsen@cpr.ku.dk).