LipidomicNet: New EU project in the field of lipidomics promotes translational research towards human disease

The EU-funded LipidomicNet initiative (Lipid droplets as dynamic organelles of fat deposition and release: translational research towards human disease), which has just got underway under the Seventh Framework Programme (FP7) aims to promote research activities in the field of Lipidomics, which is concerned with the structural and functional role of molecular lipid species in human health and disease (www.lipidomicnet.org).

The enormous advances in biology and biomedical research during the last decade originate mainly from the fields of Genomics and Proteomics. The current revolution in lipid analysis, however, promises change. For the first time the methodological possibilities are available to map the entire spectrum of lipids in cells, tissues and whole organisms. Europe has so far played a pioneering and leading role in the biochemistry and analysis of lipids and most of the leading mass spectrometry providers are European companies. These mass spectrometry based nano-scale and high throughput technologies combined with molecular imaging and modern information technology will certainly revolutionize our understanding of the complex interaction networks in a functioning cell and how lipids together with genes and proteins determine cellular functions in health and disease.

Lipids are central to the regulation and control of cellular processes by acting as basic building units for biomembranes, the platforms for the vast majority of cellular functions. Recent developments in lipid mass spectrometry have set the scene for a completely new way to understand the composition of membranes, cells and tissues in space and time by allowing the precise identification and quantification of alterations of the total lipid profile after specific perturbations. In combination with advanced proteome and transcriptome analysis tools and novel imaging techniques using RNA interference, it is now possible to unravel the complex network between lipids, genes and proteins in an integrated lipidomics approach.

LipidomicNet addresses lipid droplets (LD) as dynamic organelles with regard to composition, metabolism and regulation. Lipid storage in multiple cells and tissues
leads to transdifferentiation of multiple organs creating, fatty liver, obesity, white muscle and macrophage foam cells which are the hallmark of all energy overload diseases. LD also play a crucial role in HCV infection, a leading cause of liver disease that will continue to be a major health burden for the foreseeable future. This is why this organelle is in the focus of our project.

The project exploits recent advances in lipidomics technology to establish high-throughput methods to define drugable targets and novel biomarkers related to LD lipid and protein species, their interaction and regulation during assembly, disassembly and storage. The research groups study lipid protein interactions and investigate the dynamics of fat deposition and release in relevant cells as a hallmark of energy overload diseases with major health care impact in Europe.

Translational research from mouse to man applied to LD pathology is a cornerstone of this project at the interface between research and development. To maximize the value of the assembled data generated throughout the project, “LipidomicNet” (www.lipidomicnet.org) as a detailed special purpose Wiki format data base will be developed and integrated into the existing Lipidomics Expertise Platform (LEP) established through the SSA ELife project (www.lipidomics-expertise.de). ELife collaborates with the NIH initiative LIPID MAPS (www.lipidmaps.org) and the Japanese pendant Lipidbank (www.lipidbank.jp) and is connected to the Danubian Biobank consortium (SSA DanuBiobank, www.danubianbiobank.de) for clinical lipidomics.

LipidomicNet builds on a private public partnership (PPP) in order to support the translation of LipidomicNet inventions into new technologies and products that will benefit the health care systems. The 5 SMEs BIOBASE (www.biobase.de), ISB (www.systemsbiology.ru), ZORA Biosciences (www.zora.fi), Integromics (www.integromics.com) and Protagen (www.protagen.de) have been selected as PPP-partners between academia and industry because of their core competence necessary for LipidomicNet.

The EU-funded consortium of 21 European research groups and the 5 SMEs have recognized the utmost importance of promoting Lipidomic research, to attract the best young investigators to this newly forming research area to safeguard Europe’s
vital interests in this important area and to ensure successful competition with the USA and Asia. Funding LipidomicNet in the field of Lipidomics will unequivocally be of benefit for areas such as health, nutrition and disease management.

For more information, please visit:

http://www.lipidomicnet.org