

## **Lipids in the City**

### **The 9th Yeast Lipid Conference, Berlin, Germany, 21-23 May 2009**

During three days in May 2009, Berlin was the centre of yeast lipidology. The 9<sup>th</sup> Yeast Lipid Conference (YLC) was a stimulating, interdisciplinary meeting on novel developments in the field of yeast lipids and their crucial role in cellular metabolism and applied science. This conference was the ninth regular meeting of this kind hosted every second year in a different European city. This year, YLC was jointly organized by Christine Lang from the Technical University Berlin and Thomas Pomorski from the Humboldt University Berlin and kindly supported by the German Research Foundation (DFG). About 120 principal investigators, postdoctoral and graduate students from 14 European countries as well as from the USA, Canada and Japan contributed with 26 lectures and 48 posters. The scientific programme was wide-reaching, and topics ranged from lipid metabolism, signalling and transport to regulation of all main classes of lipids in yeast.

The meeting was opened on Thursday 21 May, in the afternoon at the Humboldt University Berlin with a presentation by Henk Tabak (Amsterdam, Netherlands), who discussed the role of the endoplasmic reticulum (ER) in peroxisome biogenesis. This new concept of peroxisome formation invigorates the field with interesting questions regarding the targeting of peroxisomal membrane lipids and proteins. On the next day, the conference continued at the terrific industrial campus of the Technical University Berlin in the Wedding district. The first session focused on topics of membrane biogenesis and synthesis of membrane lipids, bridging lipid biochemistry to cell biology. Sepp Kohlwein (Graz, Austria) presented studies showing direct regulation of neutral lipid (triacylglycerol) metabolism by cell-cycle-regulatory kinases. These new findings suggest coordination of membrane synthesis with cell-cycle progression. Roger Schneider (Fribourg, Switzerland) provided exciting data on lipid droplet formation. His findings indicated that formation of lipid droplets occurs within the lumen of the ER. Christer Ejsing (Odense, Denmark) described a new method for isolating membranes with very high purity and mass spectrometry techniques to analyze the lipid composition of the purified organelles. This approach revealed that the trans-Golgi network exhibits the capacity to sort membrane lipids. J.K Hiltunen (Oulu, Finland) reported on the finding that deletion of any gene in the mitochondrial fatty acid type II biosynthetic pathway results in defective mitochondrial RNA processing. This may provide switch-like control of mitochondrial gene expression in response to the metabolic state of the cell. Using yeast mutants defective in sterol metabolism, Francis Karst (Strasbourg, France) cloned and characterized plant sterol isomerases, enzymes that are important targets for a variety of inhibitors used in agriculture and medicine. The session closed with two short presentations: Melanie Connerth (Graz, Austria) provided exciting new insights into yeast lipotoxicity, while Jean-Marc Nicaud (Thiverval-Grignon, France) reported detailed lipidomic and transcriptomic analysis during biomass to bio-lipid production in the yeast *Yarrowia lipolytica*.

The second session of this day addressed various aspects of membrane lipid topology and transport. Organelle membranes of eukaryotic cells display striking differences in the composition, texture and sidedness of their membrane lipids that need to be generated and maintained by specifically localised lipid metabolic and transport processes. Andreas Conzelmann (Fribourg, Switzerland) reported on the topology of acyltransferases that are involved in phospholipid synthesis in the endoplasmic reticulum (ER). He showed that several acyltransferases have their active site in the lumen of the ER. These observations suggest that, in contrast to the traditional view, at least part of phospholipid synthesis occurs at the luminal leaflet of the ER. Yoshifumi Jigami (Tsukuba, Japan) gave new insights into the biosynthesis and remodelling of glycosylphosphatidylinositols that serve as anchors for a number of cell

surface proteins. Tim Levine (London, UK) presented work on a yeast protein implicated in non-vesicular sterol transport, showing that it is capable of being a structural component of membrane contact sites and can function at such a site, since an ER-anchored isoform functions well. Apart from the need for phospholipids to shuttle between intracellular membranes, they also have to adopt a particular distribution within a certain membrane. Joost Holthuis (Utrecht, Netherlands) reported on a new subfamily of P-type ATPases as prime candidate lipid flippases that help establishing an asymmetric arrangement of phospholipids in late secretory and endocytic compartments. These transporters form heteromeric complexes with members of the Cdc50 protein family. Evidence was provided that these interactions are necessary for catalytic activity. Studies on the distribution of sterols in the yeast plasma membrane were presented by Anant K. Menon (New York, USA) suggesting an enrichment of ergosterol in the inner plasma membrane leaflet.

The last day of the meeting started with a presentation by Miriam L. Greenberg (Detroit, USA) on the role of cardiolipin in cell function and aging. The data demonstrated that perturbation of cardiolipin synthesis leads to decreased longevity in yeast, which is restored by altering signalling through stress response pathways. Nils Faergemann (Odense, Denmark) addressed the role of fatty acid synthesis and transport in regulating the unfolded protein response and membrane biogenesis. Günther Daum (Graz, Austria) discussed the complex metabolic pathways for neutral lipid storage and mobilization in yeast. Exciting new insights into the internal structure of lipid droplets were provided. Tobias Walther (Martinsried, Germany) reported progress in identifying new genes required for the assembly and organization of eisosomes, large protein assemblies that are localized underneath the yeast plasma membrane with a role in endocytosis. Three related presentations highlighted the important role of phosphatidic acid in signalling and membrane biogenesis. The biochemistry and cell biology of the lipin family of phosphatidic acid phosphatases was discussed by both George Carman (New Brunswick, USA) and Symeon Sinioglou (Cambridge, UK). These enzymes regulate gene transcription and control the structure of the ER, in particular the nuclear envelope. Christopher Loewen (Vancouver, Canada) reported that altered cellular pH has a novel effect by changing the protonation state of phosphatidic acid, critically altering its protein binding partners.

The session on applied aspects of yeast lipid metabolism started with a presentation by Jens Nielsen (Gothenburg, Sweden) on a metabolic model for lipid metabolism in eukaryotic cells. Using different approaches such as flux analysis and transcriptomics a complex regulation network could be established. Tatiana Boukh-Viner (Montreal, Canada) from the lab of Vladimir Titorenko discussed proteins that extend yeast life span by remodelling lipid metabolism in the ER, peroxisomes and lipid droplets. Leif-A. Garbe (Berlin, Germany) reported on the metabolism of epoxy fatty acids in yeast and highlighted their important role in crucial mechanisms, such as detoxification of xenobiotics, regulation of inflammation and blood pressure, and sex attractant. Andreas Raab (Berlin, Germany) presented an approach to engineer the plasma membrane sterols of yeast to synthesize mammalian sterols and thus foster functional expression of mammalian proteins. Production and application of sophorolipids were discussed by Inge Van Bogaert (Ghent, Belgium). The meeting closed with a presentation by Steven Kelly (Swansea, UK) on azole resistance in clinically relevant strains of *Candida*.

As at previous meetings, the 'science' of the conference was embedded into a framework of pleasant social activities. The Welcome Reception took place in the main building of the Humboldt University close to the old centre of Berlin. Local beer and pretzels were served, and a lively band of musicians made this reception pleasant event. A guided city tour gave the

visitors the opportunity to see the different faces of Berlin. On one hand, it is the historical and political side of the coin with the remnants from the Nazi regime, the documentation of the holocaust and the remainders of the Berlin Wall reminding to the horror of the communist era; and on the other hand it is the modern and fashionable Berlin with its generous architecture and vital people. Finally, a conference dinner in a traditional down-to-earth brew house atmosphere was an enjoyable experience and enabled delegates to taste rather heavy German food at its finest.

The next YLC has already been planned. The 10th Yeast Lipid Conference will be held in 2011 in Oulu, Finland, and will be organized by Kalervo Hiltunen (University of Oulu, Finland). For information about previous and future meetings, please visit the YLC Homepage <http://www.yeastlipidconference.tugraz.at/>.

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