

# SysCompart

## New technologies and methods for analysing and modelling dynamics of eukaryotic metabolism involved in compartmentation

(2009 - )

### A project in the BMBF Program SysTec "New Methods in Systems Biology"

This project aims to develop new experimental methods and theoretical concepts for systems biology study of metabolism associated with compartmentation in eukaryotic cells. The focus of the scientific question is on expanding our knowledge of *in vivo* dynamics of key metabolic reactions in the conjunction of glycolysis and tricarboxylic acid cycle which take place in both cytosol and mitochondria. Specifically, the following new experimental methods and technologies are developed to overcome the obstacle of compartmentation: (1) An automated fast-sampling and quenching apparatus for quantitatively measuring metabolites in the cytosol and mitochondria under *in vivo* and dynamic conditions; (2) Novel microdevices for targeted disruption of cell membrane and for fast separation of organelles; (3) Cutting-edge optic methods for spatiotemporal studies of organelles and enzymes; (4) Advanced methods of *in-vivo*  $^{13}\text{C}$  labelling flux analysis to distinguish compartmental events. On the theoretical site, new concepts and models are to be developed for: (1) *in vivo* kinetics for key enzymes of mitochondria metabolism; (2) Simulation of cells and organelles as particles in micro-fluidics; (3) Molecular modelling of proteins and interfacial processes; (4) Modelling of steady-state and dynamics of isotopomer network for estimation of compartmental concentrations and fluxes. The new technologies and modelling approaches will be developed hand in hand and applied in an integrated way to address as an example of compartmentation the metabolism of pyruvate and tricarboxylic acid cycle, a key question in biology with high impacts for both biotechnology and biomedicine.

#### Project partners:

Prof. Dr. An-Ping Zeng (Coordinator): Hamburg University of Technology (TUHH)

Prof. Dr. Stefan Heinrich: TUHH

Prof. Dr. Elmar Heinzle: University Saarbrücken

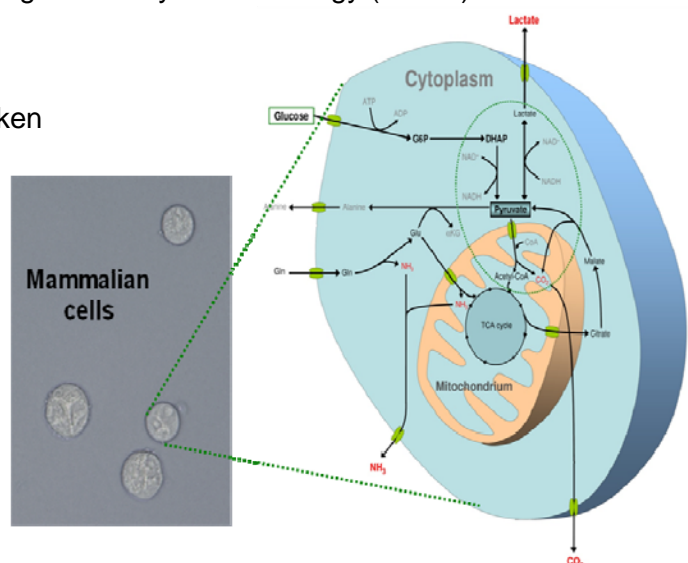
PD Dr. Stefan Jakobs: MPI Göttingen

Prof. Dr. Frerich Keil: TUHH

Prof. Dr. Andreas Liese: TUHH

Prof. Dr. Jörg Müller: TUHH

Prof. Dr. Thomas Scheper: Uni Hannover



Contact: Prof. Dr. A. -P. Zeng, Institute of Bioprocess and Biosystems Engineering, TUHH.

Email: AZE@TUHH.de