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**Project term:** 2009 – 2012  
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## SysCompart WP1:

### Controlled culture and fast-sampling systems, technology integration

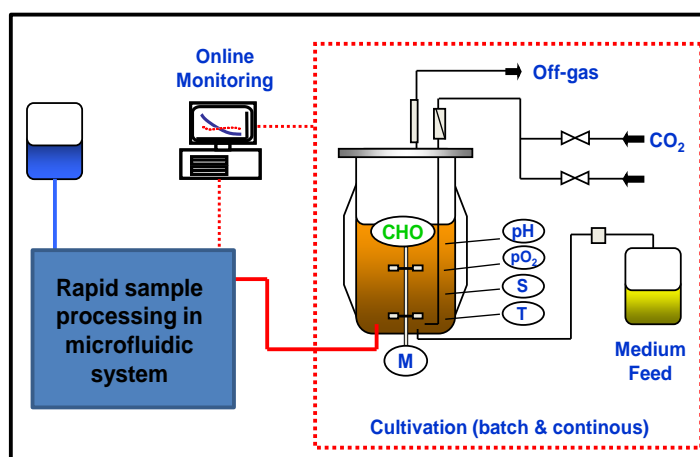
#### Description:

Control over cell proliferation, metabolism, and apoptosis is important in bioprocess engineering and animal cell culture, which can result in a significant improvement in productivity. Furthermore, it would allow researchers to establish an efficient integration of process operations of high predictability and reliability which is needed for quantitative physiology and systems biology.

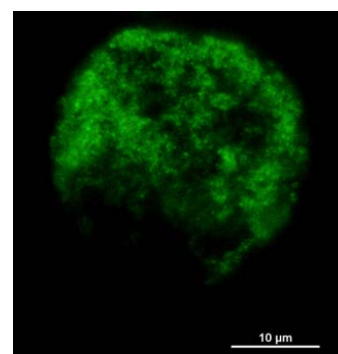
*SysCompart* is a project in the BMBF program – New Methods in Systems Biology, SysTec, which aims to develop new experimental methods and theoretical concepts for systems biology study of metabolism associated with compartmentation in eukaryotic cells. The focus of this project is the separated analysis of those metabolites of glycolysis and tricarboxylic acid cycle, which are located in both cytosol and mitochondria. Mitochondria play central roles in energy metabolism and other important processes such as programmed cell death (apoptosis).

One aim of this work package is the development of a computer controlled and regulated bioreactor with an integrated system for determination of the compartmentated cell metabolism. This system has to assure fast-sampling, quenching, cell disruption, and mitochondria separation of small sample amounts. To provide standard controls *on-line* measurement of pH,  $pO_2$ ,  $O_2$  uptake, and  $CO_2$  production rates, as well as glucose, glutamine, and lactate concentration will be implemented.

In this cultivation system Chinese Hamster Ovary (CHO) cells are cultivated under different physiological and metabolic conditions. In a further step, mitochondria are isolated and analyzed regarding their activity, shape, enzymatic distribution and content of metabolites, amongst others. These studies are conducted in cooperation with our projects partners of the project *SysCompart*.



**Fig. 1:** Automated and integrated system for cultivation of CHO cells and rapid sample processing using micro chip devices.



**Fig. 2:** Mitochondria inside a CHO-K1 cell; Labeled with Anti-TOM20 antibody coupled to GFP.

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