Bachelorarbeit/Masterarbeit: Development of a microfluidic cell culture system for metabolome analysis using NMR (ab sofort)

The use of microfluidic culture systems, including 3D cellular networks, has the potential to significantly reduce the number of animal experiments in medical research and preclinical studies. Nevertheless, the current model systems have certain limitations with regard to the transferability of the results obtained to in vivo systems. This restricts their use in research aimed at understanding the cellular mechanisms involved in various diseases. One significant factor influencing the transferability and acquisition of meaningful results from these systems is the inability to conduct real-time analysis of dynamic processes in cell culture. The metabolism of cells represents such a highly dynamic process that provides the bioenergetic demand required for cellular maintenances and plays an important role in the progression of malignant and infectious diseases. It is imperative to study the metabolic fluxes of cells in the context of different diseases in order to comprehend the disease progression and to develop new therapeutic approaches. At the IMT, we have the opportunity to conduct these analyses in real time on living cultures using NMR spectroscopy. In order to do so, it is necessary to address both the research questions posed by the NMR method and the technological development of microfluidic systems, as well as their application in cell biology.

Your Tasks:

- development of a microfluidic prototype
- establishment of the manufacturing methods using compression molding,
- development of a process for manufacturing polymer-based microfluidic chip
- stability testing,
- adaptation of the prototype to established NMR procedure
- adaptation of existing culture systems for the analysis of cell metabolism in specific diseases using NMR

The final project may be written in either German or English.

Qualification:

- laboratory experience in chemistry/biology
- initial experience in manufacturing techniques for microfluidic system and
- knowledge of NMR spectroscopy is an advantage
- analytical and combinatorial skills
- enjoyment of interdisciplinary work
- willingness to familiarize yourself with new subject areas

Studienrichtung: Chemie- oder Bioingenieurwesen, Biotechnologie, Medizintechnik Verfahrenstechnik, Maschinenbau

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