Determining organ viability during (long-term) machine perfusion using high-end analytics and advanced sensing

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Project Description

Donor organs are of vital importance to treat patients with diseased and strongly reduced organ function. Transplanting healthy organs in patients with failing organs is lifesaving. The organs to be transplanted need to be maintained and stored properly before actual transplantation. Due to declining quality of donor organs in the general population (aging, obesity), there is an increased need to test and treat these damaged organs first outside the body, before implantation.

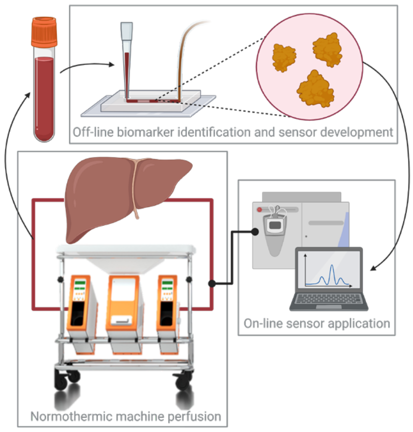
Machine perfusion provides a controlled environment to feed, reoxygenate and repair these damaged organs. To check the effect of treatment and whether an organ has regained proper function is of utmost importance. Normothermic machine perfusion allows this assessment of the organ's viability because it facilitates normal metabolism within the organ. As for the liver, specific biomarkers in the perfusate for the health state of the donor organ remain unknown.

This Convergence project working under the flagship '*Organ transplantation: making unsuitable donor organs suitable*' focuses on using normothermic machine perfusion to test and treat donor livers prior to transplantation. This PhD-project is divided into three phases:

1 - **Biomarker Identification**: investigate different high-end analytical methods to analyze the functioning and state of a donor liver via perfusate samples

2 - **Off-line Sensor Development**: design and develop a miniaturized chemical sensor that can determine the health state of a donor liver via selected biomarkers in perfusate

3 - **On-line Sensor Application**: integrate the sensor in the liver perfusion set-up at EMC



This project is composed of an experimental component for the identification and quantification of biomarkers in the perfusate using Mass- and Raman spectroscopy, a design component for the development of a chemical sensor using microfluidics, and a computational component for data analysis and predictive modelling.