Present century is an apogee of incidence of civilization diseases caused by unhealthy lifestyle. It has been reported repeatedly that many of such disorders are connected with endothelial dysfunction. This includes also the liver disorders e.g. fatty liver disease. In this organ the unique type of endothelial cell is present: the liver sinusoidal endothelial cell (LSEC) that forms the fenestrated wall of the hepatic sinusoid. This cells exhibit the unique morphology and functions and differs significantly from other endothelia in the body. LSECs are characterized by numerous pores called fenestrations (diameter ~150 nm) allowing passage of molecules between the sinusoid lumen and underlying hepatocytes. The structure of LSECs is closely linked to its functions, as the loss of fenestrations is the phenotypic marker of LSEC dysfunction, and correlates with liver disorders. A striking functional characteristic of LSEC is also the endocytic capacity. It has been shown that LSECs represent one of the most actively endocytosing cell types in the body, that mediate clearance of soluble waste macromolecules. However, during liver injury, LSECs undergo morphological and functional changes, such as loss of fenestrations and endocytic capability. This may further contribute to development of liver disorders e.g. nonalcoholic fatty liver disease.

Raman spectrometer combined with confocal microscope represent the innovative approach in field of cellular research, providing the possibility to obtain high resolution images of the sample together with its chemical characteristic. Raman spectroscopy proved to be a valuable tool in cellular and subcellular investigations, enabling detection and localization of biochemical changes upon development of pathologies, as well as investigation of various cellular events. Due to its label-free characteristic, high spatial resolving power and specificity it facilitates the monitoring of cellular uptake processes.

The aim of this project is to develop effective, Raman spectroscopy-based method enable to monitor the uptake processes in LSECs *in vitro*. Such method will allow to assess the influence LSEC dysfunction on endocytic capacity, as this issue has not been broadly investigated. Therefore, the project will new insight and knowledge about LSECs cellular uptake and its role in maintaining liver homeostasis.