

CEIPEX MENDELU 4

Položka / Field	Obsah / Content
CEIPEX Research Topic Level2	ADVANCED MATERIALS: advanced biomaterials
Název výzkumné skupiny	Research group of Intelligent Nanoengineering
Téma	Light-programmable 3D-bioprinted cardiac patches for on-demand oxygen delivery after myocardial infarction
Anotace k tématu	Myocardial infarction produces acute and persistent tissue hypoxia that restricts cardiomyocyte survival and cardiac repair. this project will develop a 3D-bioprinted epicardial patch containing stabilized photosynthetic units derived from plant chloroplasts. Under illumination, these units will split water and generate oxygen, allowing oxygen production to be regulated through light intensity, duration and pulse frequency. The project will optimize photosynthetic-unit isolation, stabilization, hydrogel composition and printing architecture to preserve photosystem II activity and achieve predictable oxygen delivery. A compartmentalized bioink will incorporate antioxidant protection and a contained electron-acceptor/cofactor-regeneration system while preventing photosynthetic components from contacting cardiac tissue directly. Oxygen generation, photosynthetic lifetime, reactive oxygen species, mechanical compatibility and degradation will be characterized. Therapeutic performance will be evaluated using cardiomyocytes and engineered cardiac tissues under hypoxia-reoxygenation conditions, measuring cell survival, mitochondrial function, calcium handling and contractility. The project will establish a controllable photosynthetic biomaterial platform for localized oxygenation of ischemic myocardium.
Webpage / Kontakt	Xiaohui (Sophie) Ju, PhD Assistant Professor, Research Group Leader at Intelligent NanoEngineering (iNANO) Department of Chemistry and Biochemistry, Faculty of AgriScience, Mendel University in Brno https://af.mendelu.cz/o-fakulte/organizacni-struktura/ustav-chemie-a-biochemie/ LinkedIn: https://www.linkedin.com/in/xiaohui-ju/ Google Scholar: https://scholar.google.com/citations?user=FjppyJQAAAAJ&hl=en