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in kemijsko tehnologijo

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VABILO NA PREDAVANJE
V OKVIRU DOKTORSKEGA ŠTUDIJA
KEMIJSKE ZNANOSTI / INVITATION TO THE
LECTURE WITHIN DOCTORAL PROGRAMME IN
CHEMICAL SCIENCES

Dr. Martin Trapecar, Assistant professor

Johns Hopkins University School of Medicine,
Institute For Fundamental Biomedical Research, USA

z naslovom / title:

Engineered microphysiological environments offer new insight into cell signaling and target discovery

v sredo, 14. 12. 2022 ob 15. uri /
on Wednesday, 14. 12. 2022 at 15.00
v predavalnici 1 v 1. nadstropju Fakultete za kemijo in kemijsko tehnologijo, Večna pot 113 **/ in lecture room 1,** 1st floor at the Faculty of Chemistry and Chemical Technology, Večna pot 113

Vljudno vabljeni! / Kindly invited!

Abstract:

Human multiorgan microphysiological systems (MOMPS) are engineered environments whose purpose is to mimic native cellular surroundings. This is accomplished with the use of tissue-specific biomaterials, machined or printed 3D architecture and perfusion. Controlled interaction of individual human tissues and the scalability of biological complexity in MOMPS, supported by advances in systems biology, might hold the key to identify novel relationships between interorgan crosstalk, metabolism, and immunity. The Trapecar lab is integrating 3D bioprinted donor-matched tissues into MOMPS to investigate how i) interorgan communication directs complex tissue development and organ-level renewal and how ii) a disruption thereof leads to emergence of immunometabolic pathologies. We show that tissue-level interaction between and within the three main germ layers ectoderm (neurons), mesoderm (lymphoid) and endoderm (gut and liver) leads to increased tissue maturation and increased *in vivo*-like functionality. In our approach we reconstruct donor-matched hepatic, gut-mucosal and neuronal tissue via digital light-assisted bioprinting, under fluidic communication and presence of the donors circulating immune cells. We further use the established system to derive how a metabolic disruption in immune-tissue signaling contributes to overlapping inflammatory disorders of the gut-liver-brain axis such as inflammatory bowel disease and neurodegeneration. Paired with multiomic analysis and resolution into molecular underpinnings of cellular and tissue homeostasis, MOMPS represent a unique opportunity to systematically dissect how interactions at a lower order inform new behavior at the macroscale within and between organ systems. Such scalable complexity might yield new insight into fundamental emergence of disease and reveal previously hidden targets.

Trapecar M, Wogram E, Svoboda D, Omer A, Lungjangwa T, Communal C, Phabmixay P, Velazquez J, Schneider K, Wright CW, Mildrum S, Hendricks A, Butty V, Levine S, Lee M, Lauffenburger D, Trumper D, Jaenisch R,Griffith LG. A Human Gut-Liver-Brain physiomimetic approach to parse links between microbial metabolites and neurodegenerative diseases. *Science Advances* **2021**; 7:eabd1707.

Trapecar M. Multiorgan microphysiological systems as tools to interrogate interorgan crosstalk and complex diseases. *FEBS Letters* **2022**, *596*, 681-695.

Trapecar M, Communal C, Velazquez J, Maass CA, Huang Y, Schneider K, Wright CW, Eng G, Yilmaz O, Trumper D, Griffith LG. Gut-Liver physiomimetics reveal paradoxical modulation of IBD-related inflammation by short-chain fatty acids. *Cell Systems* **2020**, 10, 223-239.