ZOLTÁN GIRICZ

Semmelweis University
Faculty of Medicine
Department of Pharmacology and Pharmacotherapy

Address: Nagyvárad tér 4., H-1089 Budapest, Hungary

RESEARCH AREA

Extracellular vesicles (EVs) – including exosomes and microvesicles – have emerged in recent years as one of the most promising areas in cardiovascular research. These nanosized particles, secreted by cells, carry proteins, lipids, and nucleic acids, and thus play a crucial role in intercellular communication. In cardiovascular diseases such as atherosclerosis, heart failure, and ischemic injury, both the quantity and molecular composition of EVs are altered, enabling their potential use as biomarkers for early diagnosis. From a therapeutic perspective, EVs can promote regenerative processes, for instance by restoring endothelial function or reducing inflammation. Furthermore, artificially modified EVs represent promising therapeutic tools or drug delivery vehicles, as they can selectively target injured cardiac and vascular tissues. However, the clinical application of EVs remains challenging, mainly due to limited theoretical understanding and the lack of standardized biotechnological and analytical methodologies.

Main research areas of our group:

- The role of extracellular vesicles in cardiovascular diseases: from prognosis to therapy
- Extracellular vesicles in regenerative medicine: potential role in restoring dysfunctional hearts
- Development of novel technologies and tools for the isolation of highly purified extracellular vesicles
- Production and development of extracellular vesicle-based therapeutic preparations
- Bioinformatic data analysis to better understand the pathophysiology of extracellular vesicles

TECHNIQUES AVAILABLE IN THE LAB

- Maintenance of mammalian cell cultures, biochemical assays in cell culture systems, generation of molecular biological modifications
- Fluorescent confocal microscopy
- Isolation and characterization of extracellular vesicles from various biofluids
- Investigation of the effects and safety of extracellular vesicles in cellular systems
- Work with laboratory animals, cardiac ultrasound examinations
- Application of bioinformatic and biostatistical methods, data visualization

SELECTED PUBLICATIONS

Kovácsházi, C., Hambalkó, S., Sayour, N. V., Gergely, T. G., Brenner, G. B., Pelyhe, C., Kapui, D., Weber, B. Y., Hültenschmidt, A. L., Pállinger, É., … **Giricz, Z.** (2024). Effect of hypercholesterolemia on circulating and cardiomyocyte-derived extracellular vesicles. **Sci Rep 14(1):** 12016.

Sayour, N. V., Brenner, G. B., Makkos, A., Kiss, B., Kovácsházi, C., Gergely, T. G., Aukrust, S. G., Tian, H., Zenkl, V., Gömöri, K., Szabados, T., ... & **Giricz, Z.** (2023). Cardioprotective efficacy of limb remote ischaemic preconditioning in rats: discrepancy between a meta-analysis and a three-centre in vivo study. **Cardiovascr Res 119(6):** 1336–1351.

Weber, B. Y., Brenner, G. B., Kiss, B., Gergely, T. G., Sayour, N. V., Tian, H., Makkos, A., Görbe, A., Ferdinandy, P., & **Giricz, Z.** (2022). Rosiglitazone Does Not Show Major Hidden Cardiotoxicity in Models of Ischemia/Reperfusion but Abolishes Ischemic Preconditioning-Induced Antiarrhythmic Effects in Rats In Vivo. **Pharmaceuticals (Basel) 15(9):** 1055.

Jelemenský, M., Kovácsházi, C., Ferenczyová, K., Hofbauerová, M., Kiss, B., Pállinger, É., Kittel, Á., Sayour, V. N., Görbe, A., Pelyhe, C., Hambalkó, S., ... & **Giricz, Z.** (2021). Helium Conditioning Increases Cardiac Fibroblast Migration Which Effect Is Not Propagated via Soluble Factors or Extracellular Vesicles. **Int J Mol Sci 22(19):** 10504.