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RESEARCH AREA

Our research group, which has been operating for more than 25 years, investigates the tissue and cellular biochemical basis of myocardial stress adaptation and attempts to identify new drug targets for the development of cardioprotective drugs together with national and foreign pharmaceutical industrial partners. We focus primarily on matrix metalloproteinase-2 (MMP-2) and its possible substrate molecules, which enzyme is also found in the intra- and extracellular compartments of the heart. In the preclinical phases of drug development, we investigate the inhibitory effect of potential drug candidate molecules on MMP-2. In addition, in close collaboration with the Institute of Pharmacology at Semmelweis University, we investigate the role and expression changes of microRNAs during acute myocardial infarction. We synthesized microRNAs, which showed significant change during myocardial ischemia/reperfusion injury and test their potential cardioprotective effect by administration of these so called protectomiRs in a mouse model of acute myocardial infarction. With both of the above-mentioned therapeutic options, our aim is to develop cardioprotective drugs or therapeutic formulations that can have a positive effect on cardiac muscle even in the presence of cardiovascular risk factors, comorbidities, and already authorized and widely used other pharmacological treatments (e.g. antihyperlipidemic or antihypertensive drugs). Moreover, our ultimate goal is to achieve prolonged cardioprotection by the use of the above drug candidate molecules to improve cardiac function and to prevent or decelerate the development and progression of post-infarction heart failure.

TECHNIQUES AVAILABLE IN THE LAB

The techniques available in our research group are based on *in vivo* animal experiments. We use basic and microsurgical techniques to develop acute myocardial infarction and post-infarction as well as volume overload-induced heart failure in mice and rats. To better visualize and understand microsurgical techniques, we use a stereomicroscope, which displays the image seen in the ocular on a large monitor. These models are characterized by echocardiography and measurement of hemodynamic parameters by pressure-volume catheterization. Simulated infarction and viability assays on cardiac myocyte cultures as well as enzymological and protein determination methods are included in our laboratory's repertoire.

SELECTED PUBLICATIONS

Gömöri, K., Szabados, T., Kenyeres, É., Pipis, J., Földesi, I., Siska, A., Dormán, G., Ferdinandy, P., **Bencsik, P.** (2020) Cardioprotective effect of novel matrix metalloproteinase inhibitors. **Int J Mol Sci. 21:** 6990.

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Bencsik, P., Kupai, K., Gorbe, A., Kenyeres, E., Varga, Z.V., Paloczi, J., Gaspar, R., Kovacs, L., Weber, L., Takacs, F., Hajdu, I., Fabo, G., Cseh, S., Barna, L., Csont, T., Csonka, C., Dorman, G., Ferdinandy, P. (2018) Development of Matrix Metalloproteinase-2 Inhibitors for Cardioprotection. **Front Pharmacol 9:** 296.

Kiss, K., Csonka, C., Pálóczi, J., Pipis, J., Görbe, A., Kocsis, G.F., Murlasits, Z., Sárközy, M., Szűcs, G., Holmes, C.P., Pan, Y., Bhandari, A., Csont, T., Shamloo, M., Woodburn, K.W., Ferdinandy, P.*, **Bencsik, P.** (2016) Novel, selective EPO receptor ligands lacking erythropoietic activity reduce infarct size in acute myocardial infarction in rats. **Pharmacol Res 113:** 62-70.