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RESEARCH AREA

Cardiovascular diseases lead mortality statistics worldwide. Congestive heart failure and atrial fibrillation are major contributors to cardiovascular mortality and morbidity, in addition, their prevalence is constantly increasing. The two conditions often co-exist, further increasing mortality in these patients. Despite significant improvements in their treatment in the last two decades, congestive heart failure and atrial fibrillation remain significant health care problems. Our laboratory aims at the identification of common and separate elements of electrical remodeling (changes in the expression of transmembrane ion channels and transporters in response to these conditions) in heart failure and atrial fibrillation that can serve as novel therapeutic targets with the help of different animal models of atrial fibrillation established in our laboratory with continuous clinical collaboration. Furthermore, new compounds acting on identified molecular targets are also tested in our atrial fibrillation models. Another important goal of our work is to study the mechanisms responsible for increased arrhythmia susceptibility in models of congestive heart failure, with special attention to elements of electrical remodeling. In addition, our laboratory also focuses on the unmet need for improved preclinical models for better prediction and prevention of proarrhythmic adverse effects of drugs in development in order to improve cardiovascular safety of novel compounds entering the market. In this regard, in the last 5 years, for the first time in the world, we have participated in the creation of several transgenic rabbit models of long QT syndromes.

TECHNIQUES AVAILABLE IN THE LAB

In vivo cardiac electrophysiology methods, including pacemaker implantation and radiofrequency catheter ablation for heart failure and atrial fibrillation models. *In vivo* electrocardiography, echocardiography and setups for advanced hemodynamic studies. *In vivo* models for antiarrhythmic and proarrhythmic studies. *In vitro* techiques include Langendorff-perfused isolated heart, conventional microelectrode technique, patch-clamp technique in native cardiomyocytes and in cellular expression systems. Adenoviral gene transfer, PCR and other standard molecular biological techniques.

SELECTED PUBLICATIONS

Castiglione, A., Hornyik, T., Wülfers, E.M., Giammarino, L., Eder, I., Jowais, J.J., Rieder, M., Perez-Feliz, S., Koren, G., Bősze, Z., Varró, A., Zehender, M., Brunner, M., Bode, C., Liin, S.I., Larsson, H.P., **Baczkó, I.**, Odening, K.E. (2021) Docosahexaenoic acid normalizes QT interval in LQT2 transgenic rabbit models in a genotype-specific fashion. **Europace** euab228.

Varró, A., Tomek, J., Nagy, N., Virág, L., Passini, E., Rodriguez, B., **Baczkó, I.** (2021) Cardiac transmembrane ion channels and action potentials: cellular physiology and arrhythmogenic behavior. **Physiol Rev 101:** 1083-1176.

Hornyik, T., Castiglione, A., Franke, G., Perez-Feliz, S., Major, P., Hiripi, L., Koren, G., Bősze, Z., Varró, A., Zehender, M., Brunner, M., Bode, C., **Baczkó I.***, Odening K.E.* (2020) Transgenic LQT2, LQT5 and LQT2-5 rabbit models with decreased repolarisation reserve for prediction of drug-induced ventricular arrhythmias. **Br J Pharmacol 177:** 3744-3759. *shared senior authorship

Ferdinandy, P., **Baczkó, I.**, Bencsik, P., Giricz, Z., Görbe, A., Pacher, P., Varga, Z.V., Varró, A., Schulz, R. (2019) Definition of hidden drug cardiotoxicity: paradigm change in cardiac safety testing and its clinical implications. **Eur Heart J 40:** 1771-1777.

Diguet, N., Trammell, S.A.J., Tannous, C., Deloux, R., Piquereau, J., Mougenot, N., Gouge, A., Gressette, M., Manoury, B., Blanc, J., Breton, M., Decaux, J.F., Lavery, G., **Baczkó, I.**, Zoll, J., Garnier, A., Li, Z., Brenner, C., Mericskay, M. (2018) Nicotinamide riboside preserves cardiac functions in a mouse model of dilated cardiomyopathy. **Circulation 137:** 2256-2273.