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RESEARCH AREA

The main research area of our group is the study of the molecular regulatory mechanisms of potassium channels. The focus is on the background potassium channels (with two pore domains per subunit, K2P), but we also reported results on the function of voltage-gated Kv8.2 and lysosomal, unconventional TMEM175 channels. Significant results have been obtained in the detection of heterodimerization of subunits of the TASK and TREK subfamilies and in the study of the regulation of TASK and TRESK channels by signaling pathways. We are known for the first detection of the TASK-1 / TASK-3 heterodimer and the comprehensive description of the TRESK regulation by calcineurin-dependent dephosphorylation.

TECHNIQUES AVAILABLE IN THE LAB

Molecular biology - (e.g. RT-PCR, in vitro site-directed mutagenesis, subcloning with restriction enzymes, cRNA synthesis). Protein Expression in E. coli - production, purification and microinjection of GST- and His-tag fusion proteins. Maintenance of cell lines (e.g. HEK-293, COS-7), transfection. Basic confocal microscopy - detection of green fluorescent protein (GFP) protein labeling. Electrophysiology - two-electrode voltage clamp (TEVC), patch clamp (whole cell, excised patch methods). Detection of proteins and ion channel protein phosphorylation - immunoblot and Phos-tag SDS-PAGE methods.

SELECTED PUBLICATIONS

Czirják, G., Tóth, Z.E., Enyedi, P. (2004) The two-pore domain K^+ channel, TRESK, is activated by the cytoplasmic calcium signal through calcineurin. **Journal of Biological Chemistry 279:**18550-8.

Czirják, G., Enyedi, P. (2006) Targeting of calcineurin to an NFAT-like docking site is required for the calcium-dependent activation of the background K^+ channel, TRESK. **Journal of Biological Chemistry 281:**14677-82.

Enyedi, P., **Czirják, G.** (2010) Molecular background of leak K^+ currents: two-pore domain potassium channels. **Physiological Reviews 90:** 559-605.

Braun, G., Lengyel, M., Enyedi, P., **Czirják, G.** (2015) Differential sensitivity of TREK-1, TREK-2 and TRAAK background potassium channels to the polycationic dye ruthenium red. **British Journal of Pharmacology 172:**1728-38.

Pergel, E., Veres, I., Csigi, G.I., **Czirják, G.** (2021) Translocation of TMEM175 Lysosomal Potassium Channel to the Plasma Membrane by Dynasore Compounds. **International Journal of Molecular Sciences 22:**10515.