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RESEARCH AREA

Mapping the complex mechanisms underlying chronic arthritic pain. A significant proportion of people with rheumatoid arthritis are 'difficult to treat' patients, falling into the categories of non-inflammatory and persistent inflammation. Chronic pain is the main symptom in both cases, with autoimmune, neuroinflammatory and neuropathic processes underlying central and peripheral mechanisms. As conventional analgesics are often ineffective, our aim is to understand the mechanisms of sensitisations responsible for chronic pain and to identify the key mediators and pathways involved. In mouse models of arthritis, we perform complex functional and analytical as well as morphological studies of the central nervous system (glial cell-neuron interactions, neuroinflammation). RNA isolated from peripheral blood mononuclear cells and dorsal root ganglia will be subjected to transcriptomic measurements and from plasma to metabolomic measurements, which will be evaluated using bioinformatic methods. Pain levels will be correlated with other inflammatory and immunological parameters, as well as anxiety and mood changes. Brain functional imaging studies will be performed to map changes in the activation pattern of the "pain matrix".

TECHNIQUES AVAILABLE IN THE LAB

Functional studies in mouse models of arthritis (inflammatory parameters, nociception, anxiety, behavioural testing), blood and tissue sampling, peripheral blood mononuclear cell isolation, RNA isolation, transcriptomic and metabolomic data analysis, participation in bioinformatics analyses, histopathological methods (joint, spinal cord, brain section, immunostaining), microscopic methods, brain imaging, statistical evaluation.

SELECTED PUBLICATIONS

Helyes, Z., Tékus, V., Szentes, N., Pohóczky, K., Botz, B., Kiss, T., Kemény, Á., Környei, Z., Tóth, K., Lénárt, N., Ábrahám, H., Pinteaux, E., Francis, S., Sensi, S., Dénes, Á., Goebel A. (2019) Transfer of complex regional pain syndrome to mice via human autoantibodies is mediated by interleukin-1-induced mechanisms. **Proc Natl Acad Sci USA 116:** 13067-13076.

Kecskés, A., Pohóczky, K., Kecskés, M., Varga, ZV., Kormos, V., Szőke, É., Henn-Mike, N., Fehér, M., Kun, J., Gyenesei, A., Renner, É., Palkovits, M., Ferdinandy, P., Ábrahám, IM., Gaszner, B., **Helyes Z.** (2020) Characterization of Neurons Expressing the Novel Analgesic Drug Target Somatostatin Receptor 4 in Mouse and Human Brains. **Int J Mol Sci. 21:** 7788.

Horváth, Á., Tékus, V., Bencze, N., Szentes, N., Scheich, B., Bölcskei, K., Szőke, É., Mócsai, A., Tóth-Sarudy, É., Mátyus, P., Pintér, E., **Helyes, Z.** (2018) Analgesic effects of the novel semicarbazide-sensitive amine oxidase inhibitor SZV 1287 in mouse pain models with neuropathic mechanisms: Involvement of transient receptor potential vanilloid 1 and ankyrin 1 receptors. **Pharmacol Res. 131:** 231-243.

Botz, B., Kriszta, G., Bölcskei, K., Horváth, ÁI., Mócsai, A., **Helyes, Z.** (2021) Capsaicin-Sensitive Peptidergic Sensory Nerves Are Anti-Inflammatory Gatekeepers in the Hyperacute Phase of a Mouse Rheumatoid Arthritis Model. **Int J Mol Sci. 22:** 1682.

Szentes, N., Tékus, V., Mohos, V., Borbély, É., **Helyes, Z.** (2019) Exploratory and locomotor activity, learning and memory functions in somatostatin receptor subtype 4 gene-deficient mice in relation to aging and sex. **Geroscience 41:** 631-641.