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## RESEARCH AREA

Neuropeptides are important regulatory molecules of the central and peripheral nervous systems. Tachykinins represent one of the biggest family of neuropeptides, known for their wide expression throughout the brain and diverse actions in the whole body. They can influence among others pain sensation, inflammation, mood regulation and memory consolidation. HK-1, discovered in 2000, is also a member of the tachykinin family originally demonstrated in B cells. The structure of HK-1 is very similar to SP which makes the protein identification difficult and it has very similar binding properties on the NK1 receptor. We proved that HK-1 plays an important role in acute stress, acute and chronic pain conditions as well as in inflammation. The main goal of research is to unravel the expression patterns of HK-1 in the brain and stress-related organs (thymus, adrenal gland), to investigate the role of HK-1 in behavioural and structural changes characteristic for depression and its comorbidities (pain, memory disorders) and to further understand the mechanism of action of HK-1 in neuro-immune interactions.

## TECHNIQUES AVAILABLE IN THE LAB

In vivo investigations in mouse models of neuropsychiatric pathologies (acute and chronic immobilisation/variable stress, anxiety, depression-like behaviour, memory loss) and pain states of different origins; including designing and performing of open field, elevated plus maze, forced swimming, sucrose preference, novel object recognition, Y and radial maze, passive avoidance tests; mechanical pain, thermal hyperalgesia and spontaneous weight distribution measurements, blood and tissue sampling, analysis of transcriptomic and metabolomic data, microscopic methods, figure design, statistical analysis.

## SELECTED PUBLICATIONS

Fülöp, B., Hunyady, Á., Bencze, N., Kormos, V., Szentés, N., Dénes, Á., Lénárt, N., **Borbély, É.**, Helyes, Zs. (2023) IL-1 Mediates Chronic Stress-Induced Hyperalgesia Accompanied by Microglia and Astroglia Morphological Changes in Pain-Related Brain Regions in Mice. *Int J Mol Sci* **13**: 5479.

**Borbély, É.**, Hunyady, Á., Pohóczky, K., Payrits, M., Botz, B., Mócsai, A., Berger, A., Szőke, É., Helyes, Z. (2021) Hemokinin-1 as a Mediator of Arthritis-Related Pain via Direct Activation of Primary Sensory Neurons. *Front Pharmacol* **11**: 594479.

Hunyady, Á., Hajna, Zs., Gubányi, T., Scheich, B., Kemény, Á., Gaszner, B., Borbély, É., Helyes, Z. (2019) Hemokinin-1 is an important mediator of pain in mouse models of neuropathic and inflammatory mechanisms. *Brain Res Bull* **147**: 165-173.

**Borbély, É.**, Payrits, M., Hunyady, Á., Mező, G., Pintér, E. (2019) Important regulatory function of transient receptor potential ankyrin 1 receptors in age-related learning and memory alterations of mice. *Geroscience* **41**: 643-654.

**Borbély, E.**, Hajna, Z., Nabi, L., Scheich, B., Tekus, V., Laszlo, K., Ollmann, T., Kormos, V., Gaszner, B., Karadi, Z., Lénárt, L., Paige, C.J., Quinn, J. P., Szolcsányi, J., Pintér, E., Keeble, J., Berger, A., Helyes, Z. (2017) Hemokinin-1 mediates anxiolytic and anti-depressant-like actions in mice. *Brain Behav and Immun* **59**: 219-232.