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RESEARCH AREA

Our research group investigates the central nervous system mechanisms that control reproduction. Gonadotropin-releasing hormone (GnRH) neurons represent the final output pathway of the hypothalamic reproductive axis. By releasing GnRH into the hypophysial portal circulation, these neurons trigger the secretion of luteinizing hormone (LH) and follicle-stimulating hormone (FSH) from the anterior pituitary. These hormones then act on the gonads to regulate gametogenesis and sex steroid hormone production.

Using modern molecular and cellular approaches, we aim to better understand how GnRH neurons function and how their activity is regulated, with a particular focus on their transcriptomic characteristics and key regulatory pathways. An important part of this work is the study of hypothalamic kisspeptin-producing neurons, which convey the positive and negative feedback effects of sex steroid hormones and thereby play a crucial role in shaping GnRH neuron activity.

By uncovering these mechanisms, our research may contribute to a better understanding of human reproductive disorders, including central forms of infertility, disruptions of the reproductive cycle and puberty caused by insufficient energy intake or stress, and central nervous system dysfunctions associated with estrogen deficiency after menopause.

TECHNIQUES AVAILABLE IN THE LAB

- *In situ* hybridization
- RNAscope
- Immunohistochemistry
- Light, confocal and electron microscopy
- ELISA
- Laser capture microdissection
- RT-qPCR

SELECTED PUBLICATIONS

Göcz, B., **Rumpler, É.**, Szentkirályi-Tóth, S., Skrapits, K., Takács, S., Sárvári, M., Farkas, I., Póliska, S., & Hrabovszky, E. (2025). Laser-capture microdissection for spatial transcriptomics of immunohistochemically detected neurons. **J Biol Chem 301(2):** 108150.

Rumpler, É., Göcz, B., Skrapits, K., Sárvári, M., Takács, S., Farkas, I., Póliska, S., Papp, M., Solymosi, N., & Hrabovszky, E. (2023). Development of a versatile LCM-Seq method for spatial transcriptomics of fluorescently tagged cholinergic neuron populations. **J Biol Chem 299(9):** 105121.

Göcz, B., **Rumpler, É.**, Sárvári, M., Skrapits, K., Takács, S., Farkas, I., Csillag, V., Trinh, S. H., Bardóczi, Z., Ruska, Y., Solymosi, N., Póliska, S., Szőke, Z., Bartoloni, L., Zouaghi, Y., Messina, A., Pitteloud, N., Anderson, R. C., Millar, R. P., Quinton, R., … Hrabovszky, E. (2022). Transcriptome profiling of kisspeptin neurons from the mouse arcuate nucleus reveals new mechanisms in estrogenic control of fertility. **Proc Natl Acad Sci U S A 119(27):** e2113749119.

Rumpler, É., Takács, S., Göcz, B., Baska, F., Szenci, O., Horváth, A., Ciofi, P., Hrabovszky, E., & Skrapits, K. (2020). Kisspeptin Neurons in the Infundibular Nucleus of Ovariectomized Cats and Dogs Exhibit Unique Anatomical and Neurochemical Characteristics. **Front Neurosci 14:** 598707.

Rumpler, É., Skrapits, K., Takács, S., Göcz, B., Trinh, S. H., Rácz, G., Matolcsy, A., Kozma, Z., Ciofi, P., Dhillo, W. S., & Hrabovszky, E. (2021). Characterization of Kisspeptin Neurons in the Human Rostral Hypothalamus. **Neuroendocrinology 111(3):** 249–262.