Laboratory of Integrative Neuroendocrinology

Department of Endocrine Neurobiology
Head of Momentum-supported Laboratory:
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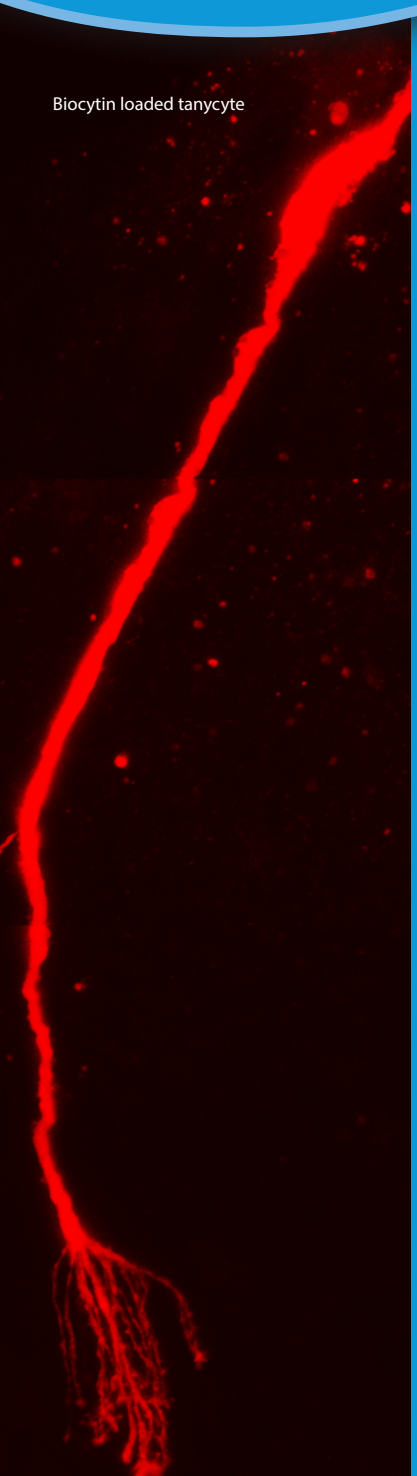
Mission statement

Obesity has risen to epidemic level in Europe. It causes devastating and costly health problems and reduces life expectancy. Despite the high impact of obesity on population health, reasonable medical therapy is currently unavailable due to the absence of proper drug targets. Therefore, understanding the mechanisms regulating the energy homeostasis has critical importance.

Complex interplay of peripheral organs and the central nervous system is critical for the regulation of energy homeostasis. The peripheral organs report the actual conditions of energy stores and the amount of consumed nutrients via peripheral sensory nerves and circulating hormones and metabolites to the energy homeostasis related circuits of the central nervous system. These circuits integrate the peripheral signals with inputs from other neuronal circuits, like the reward related neuronal networks, and regulate the energy homeostasis by controlling the hypothalamic-pituitary-endocrine axes, food intake, locomotor activity and the sympathetic and parasympathetic inputs of the peripheral organs.

The major goal of the Laboratory is to elucidate the anatomy and physiology of the neuronal networks involved in the central regulation of the energy homeostasis in rodents and humans. Special attention is paid to research focusing on the integration of the hypophysiotropic thyrotropin-releasing hormone-releasing hormone synthesizing neurons into neuronal networks regulating energy homeostasis. The laboratory described the anatomy and the physiological role of neuronal circuits involved in the regulation of the HPT axis during fasting. In their current studies they elucidate the role of the short and long term neuronal plasticity in this regulatory process. The laboratory also demonstrated



Biocytin loaded tanycyte

Postdoctoral fellows: Zoltán Péterfi PhD, Mónika Tóth PhD, Barbara Vida PhD
PhD students: Erzsébet Farkas, Andrea Kádár, Anett Szilvásy-Szabó, Györgyi Zséli
Junior scientists: Judit Szabon MSc, Edina Varga
Technician: Ágnes Simon

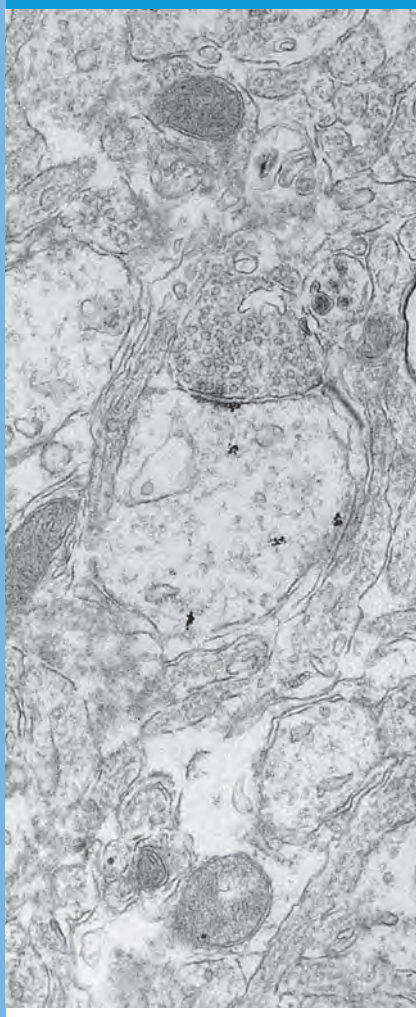
that the local increase of T3 (the active form of thyroid hormone) concentration in the hypothalamus that is caused by increased type 2 deiodinase activity of the special glial cells, the tanycytes, is responsible for the infection induced inhibition of the HPT axis. As a continuation of these studies, they further explore the role of tanycytes in the regulation of the HPT axis and the energy homeostasis. Another focus of the Laboratory is elucidation of the anatomy and physiology of novel satiety related neuronal networks. The methodologies used by the laboratory to achieve these goals include expression profiling, laser capture microdissection, immunohistochemistry, *in situ* hybridization, electron microscopy, transgene technologies, electrophysiology, optogenetics and metabolic profiling.

Ongoing Research Support:
Lendület program of the Hungarian Academy of Sciences, Hungarian Scientific Research Fund (OTKA K109710), National Brain Research Program, Seventh EU Research Framework Programme (Health-F2-2010-259772).

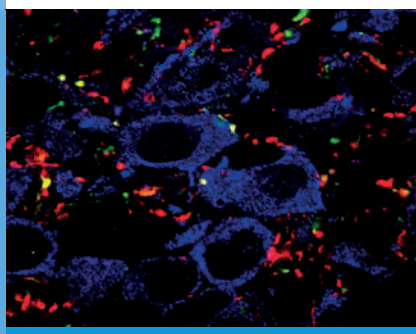
Selected publications from the last 10 years:

- Fekete C, Lechan RM. Central Regulation of Pituitary-Thyroid Axis Under Physiological and Pathophysiological Conditions. ENDOCRINE REVIEWS 35(2)pp. 159-194 (2014)
- Fonseca TL, Medina MC, Campos MPO, Wittmann G, Werneck-de-Castro JP, Arrojo e Drigo Rafael, Mora-Garzon ME, Ueta CB, Caicedo A, Fekete Csaba, Gereben B, Lechan RM, Bianco AC. Coordination of hypothalamic and pituitary T3 production regulates TSH expression. JOURNAL OF CLINICAL INVESTIGATION 123:(4) pp. 1492-1500. (2013)
- Kola B, Farkas I, Christ-Crain M, Wittmann G, Loll F, Amin F, Harvey-White J, Liposits Z, Kunos G, Grossman AB, Fekete C, Korbonits M. The orexigenic effect of ghrelin is mediated through central activation of the endogenous cannabinoid system. PLOS ONE 3:(3) p. e1797. (2008)
- Füzesi T, Wittmann G, Liposits Z, Lechan RM, Fekete C. Contribution of noradrenergic and adrenergic cell groups of the brainstem and agouti-related protein (AGRP)-synthesizing neurons of the arcuate nucleus to neuropeptide-Y innervation of corticotropin-releasing hormone neurons in hypothalamic paraventricular nucleus of the rat. ENDOCRINOLOGY 148: pp. 5442-5450. (2007)
- Fekete C, Gereben B, Doleschall M, Harney JW, Dora JM, Bianco AC, Sarkar S, Liposits Z, Rand W, Emerson C, Kacskovics I, Larsen PR, Lechan RM. Lipopolysaccharide induces type 2 iodothyronine deiodinase in the mediobasal hypothalamus: Implications for the nonthyroidal illness syndrome. ENDOCRINOLOGY 145: pp. 1649-1655. (2004)

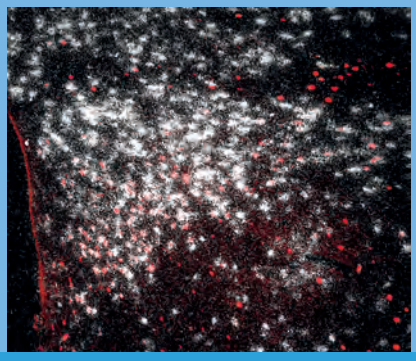
Ultrastructural localization of the neuronal nitric oxide synthase in the hypothalamic paraventricular nucleus



Noradrenergic and adrenergic innervation of CRH neurons in the hypothalamic paraventricular nucleus.



from left: Zsuzsa Beliczai, Erzsébet Farkas, Anett Szilvásy-Szabó, Csaba Fekete, Judit Szabon, Barbara Vida, Györgyi Zséli



Presence of VGLUT2 mRNA in the refeeding-activated neurons in the hypothalamic paraventricular nucleus.