

P3.03.

Glutamatergic and GABAergic innervation of GnRH neurons in the human hypothalamus

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Neurosecretory projections of gonadotropin-releasing hormone (GnRH) neurons to the hypophysial portal capillaries represent the final common output way of the hypothalamus in the neuroendocrine control of reproduction. GnRH neurons receive afferent input from a variety of neurotransmitter systems which are only partly characterized in the human. In the present study we used immunohistochemical approaches to address the contribution of the amino acid neurotransmitters GABA and glutamate to the afferent regulation of human GnRH neurons. According to previous findings in rodents where GABA represents the main neurotransmitter in the afferent control of GnRH neurons, we found that vesicular GABA transporter-immunoreactive GABAergic axons abundantly innervated the cell bodies and the dendrites of human GnRH neurons. While in rats, only glutamatergic axons of the VGLUT2 phenotype innervate GnRH neurons, in human samples we observed both VGLUT1- and VGLUT2 immunoreactive afferent contacts on GnRH neurons, with a preferential accumulation on GnRH dendrites. These morphological observations implicate the classic amino acid neurotransmitters GABA and glutamate in the afferent regulation of human GnRH neurons. As in rodents, GABA-ergic and glutamatergic afferents may have important contributions to metabolic-, sex steroid-, circadian- and stress signaling to the reproductive axis.

Supported by: OTKA K69127, T73002 and K83710; ETT 122/2009; FP7/2007-2013 (n° 245009)