Leptin receptor-expressing neurons

Leptin receptor-expressing neurons are a subset of GABAergic cells.

Animal behavior and metabolism are tightly coordinated with sleep-wake cycles governed by the brain in harmony with environmental light: dark cycles. Within the brain, the dorsomedial hypothalamic nucleus (DMH) has been implicated in the integrative control of feeding, energy homeostasis, and circadian rhythms, but the underlying cell types are unknown. Faber et al. identified a role for DMH leptin receptor-expressing neurons (DMHLepR) in this integrative control. Using a viral approach, they showed that silencing neurotransmission in DMHLepR neurons in adult mice not only increases body weight and adiposity but also phase-advances diurnal rhythms of feeding and metabolism into the light-cycle and abolishes the normal increase in dark-cycle locomotor activity (LMA) characteristic of nocturnal rodents. Finally, DMHLepR-silenced mice fail to entrain to a restrictive change in food availability. Together, these findings identify DMHLepR neurons as critical determinants of the daily time of feeding and associated metabolic rhythms [1].

Schiffino et al. examined how lateral hypothalamic leptin receptor-expressing (LHLEPR) neurons, regulate motivation in mice. We find that LHLEPR neuronal activation significantly increases progressive ratio (PR) performance, while inhibition decreases responding. Moreover, we mapped LHLEPR axonal projections and demonstrated that they target the ventral tegmental area (VTA), form functional inhibitory synapses with non-dopaminergic VTA neurons, and their activation promotes motivation for food. Finally, we find that LHLEPR neurons also regulate motivation to obtain water, suggesting that they may play a generalized role in motivation. Together, these results identify LHLEPR neurons as modulators within a hypothalamic-ventral tegmental circuit that gates motivation [2].

1)
Faber CL, Deem JD, Phan BA, Doan TP, Ogimoto K, Mirzadeh Z, Schwartz MW, Morton GJ. Leptin-receptor neurons in the dorsomedial hypothalamus regulate diurnal patterns of feeding, locomotion, and metabolism. Elife. 2021 Feb 2;10:e63671. doi: 10.7554/eLife.63671. Epub ahead of print. PMID: 33527893.

2)
Schiffino FL, Siemian JN, Petrella M, Laing BT, Sarsfield S, Borja CB, Gajendiran A, Zuccoli ML, Aponte Y. Activation of a lateral hypothalamic-ventral tegmental circuit gates motivation. PLoS One. 2019 Jul 10;14(7):e0219522. doi: 10.1371/journal.pone.0219522. PMID: 31291348; PMCID: PMC6619795.

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