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Hypothalamic circuits for the hormonal stress response

Survival of an animal relies on its ability to mount a rapid and effective stress response. The stress response involves a transient boost of vital physiological functions, for example the hypothalamic-pituitary-adrenal (HPA) axis, from homeostatic operation to emergency response. Despite decades of research on HPA axis (patho)physiology, we still know surprisingly little about the neural dynamics that rapidly transitions HPA axis activity from its baseline to levels of elevated stress. In my presentation, I will discuss our recent work that recorded, for the first time, optogenetically-identified *in vivo* single-unit activities of corticotropin-releasing hormone (CRH) neurons in the paraventricular nucleus of the hypothalamus (PVN), the effector neurons of the HPA axis, in mice. Strikingly, we found state-dependent activity dynamics change in CRH_{PVN} neurons. By using a tight combination of *in vivo* and *ex vivo* electrophysiology with computational modeling, we present a novel circuit model that can control state-dependent activity switch between baseline and elevated stress levels, at the gatekeepers of stress outputs.