Nucleus of the solitary tract cholecystokinin-expressing neurons control appetite

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The nucleus of the solitary tract (NTS) is a principal gateway for meal-related signals entering the brain from the periphery and is comprised of cells with diverse neurochemical identities.
We identified a distinct subset of NTS neurons that express cholecystokinin (CCK^{NTS}) and whose function was previously not known.
We observed that CCK^{NTS} neurons are responsive to nutritional states and that chemogenetic manipulation of this subset of neurons produces profound metabolic effects. Specifically, chemogenetic activation (hM3Dq-mCherry) of CCK^{NTS} neurons suppresses appetite and rapidly reduces body weight with a mechanism involving downstream activation of CCK receptors.
Cell-specific anterograde tracing revealed that CCK^{NTS} neurons innervate discrete hindbrain and hypothalamic regions, including the paraventricular nucleus of the hypothalamus (PVH). Moreover, *in vivo* optogenetic activation of CCK^{NTS} axon terminals reveal the satiating function CCK^{NTS} neurons to be mediated by a NTS^{CCK}→PVH pathway. Optogenetic activation of this circuit reduces food consumption and also encodes positive valence.
Thus, our data provide an evidence base for a novel CCKergic circuit originating from the NTS that transmit satiating and appetitive information to the hypothalamus to regulate appetite.