Nature Reviews Neuroscience | Published online 7 Sept 2017; doi:10.1038/nrn.2017.115

REWARD

Eating goes down a treat

> "*in vivo*, photostimulation of CeA^{HTR2A} terminals in the PBN increased food intake"

The central amygdala (CeA) has been implicated in reward and feeding, but dissecting behaviourally relevant circuits of this brain region has proved difficult owing to its high complexity. Klein *et al.* now identify a population of CeA neurons expressing the serotonin 2A receptor (CeA^{HTR2A} neurons) that project to the parabrachial nucleus (PBN) and promote food consumption.

Given the role of other populations of CeA neurons in feeding, the authors investigated the effects of CeA^{HTR2A} neuronal activity in various feeding tests. Pharmacogenetic activation of CeA^{HTR2A} neurons in satiated mice increased food intake in a free-feeding test, whereas ablation of these cells in mice that had been fasted for 24 hours reduced their food intake.

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However, in a test of motivation for feeding, chemogenetic activation of CeA^{HTR2A} neurons did not alter the maximum number of nose pokes a mouse produced to receive a single food pellet. Moreover, in a similar instrumental task in which hungry mice nose-poked to obtain food pellets, the activity of CeA^{HTR2A} cells did not change during the appetitive phase (nose-poke and reward cue) but did increase during the consumption phase. Together, these results suggest that CeA^{HTR2A} neurons may promote food consumption, but not the motivation to eat.

Next, the authors asked whether CeA^{HTR2A} neuron activity is positively reinforcing. Mice were presented with two differently flavoured gels and, once their flavour preference was established, the authors paired optogenetic stimulation of the CeA^{HTR2A} neurons with the less-preferred flavour. With time, the originally less-preferred flavour became the more-preferred flavour, indicating that the activity of CeA^{HTR2A} neurons may propagate ongoing feeding by positively reinforcing food-reward properties such as palatability.

Fluorescent labelling of CeA^{HTR2A} neurons revealed that these cells densely innervate the PBN, which has previously been implicated in suppressing appetite. In acute brain slices, optogenetic stimulation of CeA^{HTR2A} neurons induced inhibitory postsynaptic currents (IPSCs) in PBN neurons. Notably, *in vivo*, photostimulation of CeA^{HTR2A} terminals in the PBN increased food intake, and was positively reinforcing, as reflected in the real-time place preference test by an increased preference for the photostimulation-paired chamber. CeA neurons expressing protein kinase Cδ (CeA^{PKCδ} neurons) have been previously shown to inhibit feeding; in the new study, optogenetic stimulation of these cells induced IPSCs in PBN-projecting CeA^{HTR2A} neurons that were identified by retrobead labelling. Thus, CeA^{HTR2A} neurons may reinforce feeding by inhibiting PBN neurons, and may be inhibited themselves by appetite-suppressing CeA^{PKCδ} neurons.

Finally, the authors used monosynaptic tracing to map direct inputs to CeA^{HTR2A} neurons. These cells receive diverse inputs, including some from several regions involved in gustatory processing and feeding regulation, and others from the raphe nucleus and substantia nigra. Intriguingly, the authors observed that PBN-projecting CeA^{HTR2A} neurons receive inputs from feeding-related centres, such as the arcuate nucleus and parasubthalamic nucleus.

Overall, this study defines a CeA–PBN circuit that promotes food consumption by reinforcing the rewarding aspects of food, such as palatability.

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ORIGINAL ARTICLE Douglass, A. M. *et al.* Central amygdala circuits modulate food consumption through a positive-valence mechanism. *Nat. Neurosci.* http://dx.doi.org/10.1038/nn.4623 (2017)