Thirst, Hunger, Memory

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The motivational states of thirst and hunger are represented in the brain by shared and unique neuromodulatory systems. However, it is unclear how such systems direct expression of appropriate state-specific behavior. Here, we investigated this question by studying state-dependent memory expression in the fruit fly *Drosophila melanogaster*. we show that release of a neuropeptide from two neurons in the fly brain regulates both thirst- and hunger-dependent expression of water and sugar-seeking memories. The activity of these neurons increases in thirsty and hungry flies and their outputs are necessary for state-relevant memory expression. Interestingly, the neuropeptide released from these neurons promotes thirst-specific water memory expression by inhibiting specific dopaminergic neurons, but the same neuropeptide activates another group of dopaminergic neurons to facilitate hunger-dependent expression of sugar memory. These data indicate that deprivation state-specific control of behavior emerges from differential modulation of dopamine systems in the brain.