

Investigating neural circuits underlying social and affective memory in mice

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In our laboratory, we are investigating the molecular and cellular mechanisms that underlie learning and memory (L&M) as well as social & affective behaviors in mice. Our primary focus is on dissecting specific cell types and neural circuits involved in these behaviors. For instance, we have been exploring the effects of dysfunctions in cell type-specific Ras signaling on hippocampal L&M. Our research has shown that mutations in key components of this signaling pathway, such as Nf1, Shp2, and Raf, have distinct impacts on various cell types in the hippocampus.

More recently, we have expanded our research to investigate the neural projections that modulate social and affective behaviors. This expansion encompasses multiple brain regions, including the medial prefrontal cortex (mPFC) and the cerebellum. In this presentation, I will introduce two neural circuits: the mPFC-to-nucleus accumbens (NAc) pathway and the cerebellum to brainstem. We found that the mPFC to NAc circuit is involved in social recognition. Intriguingly, we found that NAc-projecting IL neurons are activated when a mouse interacts with a familiar conspecific. This suggests that this specific circuit is responsible for social recognition memory in mice.

Recently, we began to work on the non-motor cognitive functions of the cerebellum. Although the cerebellum is well known for its role in motor coordination and learning, it is also critically involved in many non-motor cognitive functions including fear memory processing. I will introduce our exciting results demonstrating how the cerebellum modulates classical fear conditioning via its projection to the other brain areas.