Cortical-hippocampal circuits mediate prosocial behaviors

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Social decision-making encompasses interactions within the social domain influenced by or directed toward others. Among these, social learning - the ability to acquire behaviors by observing conspecifics - is a key mechanism for the transmission of adaptive behaviors. Like humans, mice learn from their conspecifics to associate cues predicting threats or rewards for self and others, a fundamental aspect of inter-individual relationships across mammals. The prefrontal cortex is involved in the regulation of higher-order cognitive functions, including social cognition. Using a social decision-making paradigm, we previously revealed that the dorsal CA1 region (dCA1) of the hippocampus is a critical area for learning of prosocial behaviors through observation. However, the current understanding of brain circuits and its molecular mechanisms, how prosocial behaviours are acquired and its integration between cortical regions and the hippocampus, remains unclear. To investigate the neural circuits involved in the observation of prosocial behaviors we used retroviral tracing in the dCA1 using Fos2A-iCreER mice to permanently label activated cells. Direct dCA1 inputs from cortical regions were primarily the prelimbic (PL) and retrosplenial (RSC) cortices. Silencing PL-->dCA1 projections didn’t affect social learning but resulted in a shift toward selfish choices. Therefore, we implemented the analysis of the PL-->dCA1 and RSC-->dCA1 neural activities using fiber photometry. In coclusion, this study advances our understanding of the neural basis of social decision-making relevant for disorders characterized by social and cognitive impairments.