

Neurobiology of Learning and Memory Laboratory

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Research in this laboratory is focused on investigating memory formation at the molecular, cellular, and systems levels of analysis. In specific, we study the roles of signaling proteins, such as kinases, phosphatases, and transcription factors in information storage in the mammalian brain. We also test hypotheses about whether multiple memory systems, which are specialized for different kinds of memory, are independent or interactive during memory formation and retrieval. A final interest is the application of findings about molecular and cellular mechanisms of memory to studies of age-related memory impairment under normal (e.g. non-pathological) aging conditions. Research on these aims is conducted in parallel and combines behavioral analyses of learning and memory in rats with molecular-biological techniques.

One of our research strategies is to test hypotheses about the roles of proteins in memory formation by altering their levels or function locally and in a time-controlled manner using viral-mediated gene transfer. A first step is to identify proteins that are altered during learning or memory consolidation. Next, viral vectors are designed to cause expression of either wild-type or mutant forms of proteins of interest, such as CREB, that are implicated in memory formation. Using these techniques we have been able to cause memory enhancement as well as impairment in rodent model systems and we are working currently on strategies to prevent and recover age-associated memory loss.

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