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Role of ribosome biogenesis in stabilization of memory

The initial transition from labile to stable state after learning is called consolidation, whereas the stabilization after recall is called reconsolidation. The purpose of such labile state after recall is to update the original memory. Most efforts to understand experience-induced changes in neuronal gene expression have focused on the transcription products of RNA polymerase II (Pol II)—primarily mRNAs and the proteins they encode. While there has been significant progress in identifying the Pol II dependent transcripts required for early phase long-term synaptic plasticity, In contrast, the transcription products of RNA polymerase I (Pol I), responsible for producing non-coding ribosomal RNA, have been left unexplored The central hypothesis of this project is that de novo rRNA synthesis is a key process for the regulation of memory associated gene expression and hence it controls the stability of protein products whose function underlie the consolidation, re-consolidation and maintenance of memory. In support of this hypothesis, our laboratory recently showed that new rRNA, ribosomal proteins expression and nucleolar activity (new ribosomes) are necessary for consolidation of memory. To advance this research, I aim to determine the role of ribosome biogenesis in the process of reconsolidation of memory and determine if deficits in memory consolidation can be rescued by enhancing ribosome biogenesis in a pathophysiological animal model of autism spectrum disorder. In order to approach this question, I specifically blocked polymerase -1 activity (ribosomal RNA synthesis) before recall and assessed whether this inhibition affects memory after a second recall. Data suggests new ribosomal RNA expression (therefore new ribosomes) are required for memory reconsolidation. furthermore, when I enhanced ribosome biogenesis in ASD mouse model we could rescue memory deficit. These results suggests that the ribosome biogenesis plays an important role in Memory stabilization.

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