

 MEMORY

## Tagging in the cortex

The consolidation of memory at the systems level is thought to involve communication between the hippocampus and the cortex, but the mechanisms involved have not been determined. Now, Lesburguères *et al.* have shown that the establishment of associative, long-term memory involves early ‘tagging’ of cortical networks that subsequently support the memory.

The authors used an olfactory learning paradigm in which a rat learned a preference for a particular food flavour after smelling the flavour on the breath of another rat. Inactivation of the hippocampus with an AMPA receptor antagonist during an early time period post learning (days 0–12) impaired memory retrieval at day 30, but had no effect when performed during a later time period (days 15–27). By contrast, silencing the orbitofrontal cortex (OFC) — which processes associative olfactory information — during either the early or the late time period led to impaired memory retrieval at day 30. The authors therefore

proposed a model in which early hippocampal–cortical interaction leads to tagging of cortical neurons, providing a ‘scaffold’ that supports subsequent enduring memory traces involving cortico–cortical interactions.

NMDA receptor signalling plays a key part in synaptic plasticity, the molecular correlate of learning and memory. Lesburguères *et al.* showed that antagonizing NMDA receptor signalling in the OFC immediately before the learning task impaired remote memory retrieval, supporting the neurobiological validity of their model. Moreover, the involvement of cortical tagging was information-specific: rats that learned the task involving first cocoa and then cinnamon, with OFC inactivation before the second task, showed impaired retrieval of only the memory involving cinnamon at day 30.

Finally, the authors showed that chromatin remodelling in OFC neurons is necessary for consolidation of the memory trace, suggesting a role for epigenetic mechanisms in this process. Future work will be needed to elucidate the precise identity of the cortical network tags.

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**ORIGINAL RESEARCH PAPER** Lesburguères, E. *et al.* Early tagging of cortical networks is required for the formation of enduring associative memory. *Science* **331**, 924–928 (2011)



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