

Summary

The aim of this work was to investigate processes that are induced by retrieving a consolidated memory in the honeybee, *Apis mellifera*. In order to do so, an appetitive olfactory learning paradigm, the proboscis extension response was used. Three pairings of an odor (conditioned stimulus; CS) with sucrose (unconditioned stimulus; US) result in the induction of a protein synthesis-dependent consolidation process. During the time-interval of this process the initially sensitive CS-US association becomes persistent which results in the formation of a long-term memory.

Retrieval of a consolidated memory by presentation of the CS-only can initiate two consolidation processes: Consolidation of an extinction memory and/or reconsolidation of an acquisition memory. Extinction is thought to be new learning, where animals learn about the CS-noUS association. The term reconsolidation describes a process during which the original memory is destabilized by the retrieval and requires protein synthesis in order to be restored. It is supposed that reconsolidation is necessary to add new information to the original memory.

In a series of experiments I asked how the strength of the retrieval is associated with the subsequent consolidation processes. To do so I changed the number of CS-only presentation (one, two or five) to retrieve the consolidated memory and inhibited the resulting consolidation process by using the consolidation blocker emetine and anisomycin.

Spontaneous recovery from extinction is induced by many (five), but not by few (one or two) retrieval trials. Spontaneous recovery from extinction is blocked by application of a consolidation inhibitor. The phenomenon of spontaneous recovery is explained by the reappearance of the CS-US association after an extinction session. I concluded that reconsolidation of the acquisition memory underlies the phenomenon of spontaneous recovery.

An extinction process is induced after two CS-only trials and the consolidation of the extinction memory can be inhibited by protein synthesis inhibitor. The induction of a protein synthesis-dependent consolidation of the extinction memory is contingent on the duration of the reward during conditioning.

One CS-only trial induces a reconsolidation process, which can be inhibited only by the application of the double amount of consolidation inhibitor. Hence, reconsolidation after one retrieval trial is less vulnerable to protein synthesis inhibitor than consolidation.

I demonstrated that in the honeybee retrieval of a consolidated memory leads to reconsolidation of the acquisition memory or consolidation of the extinction memory, depending on the number of retrieval trials.