Medical Xpress

Brain caught 'filing' memories during rest

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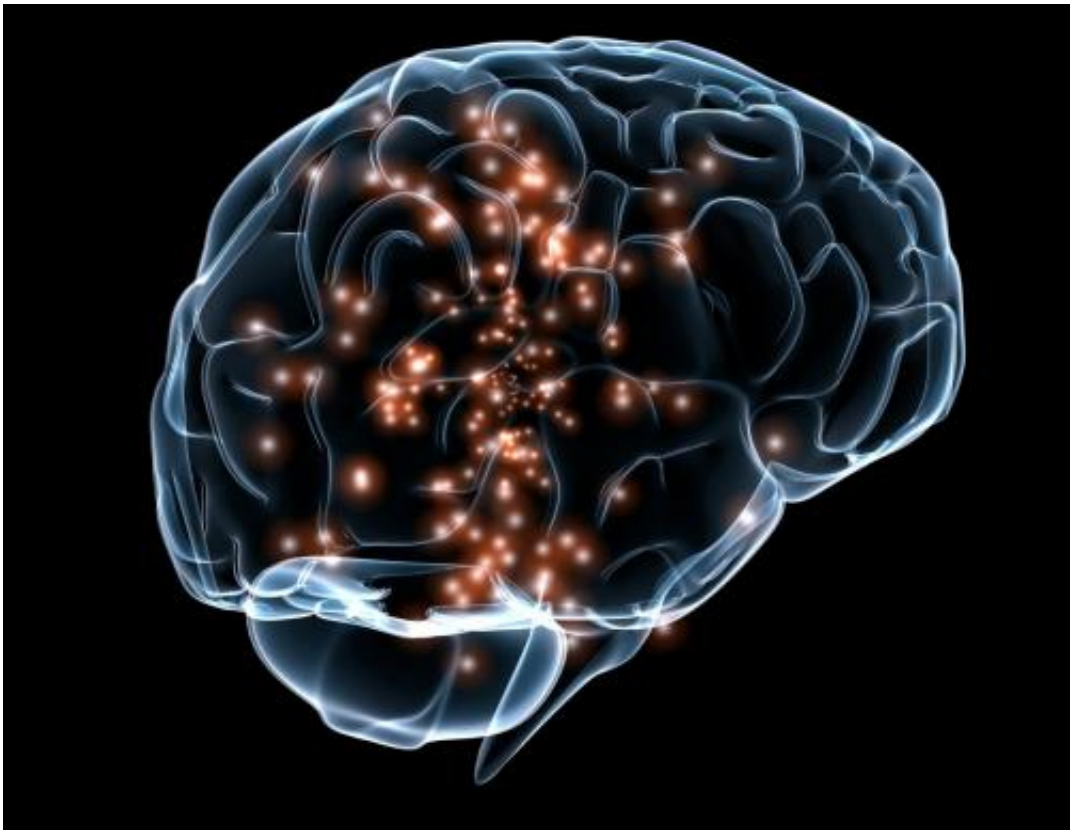

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Memories formed in one part of the brain are replayed and transferred to a different area of the brain during rest, according to a new UCL study in rats.

The finding suggests that replay of previous experiences during rest is important for memory consolidation, a process whereby the brain

stabilises and preserves memories for quick recall in the future. Understanding the physiological mechanism of this is essential for tackling amnesiac conditions such as Alzheimer's disease, where memory consolidation is affected.

Lead researcher, Dr Freyja Ólafsdóttir (UCL Cell & Developmental Biology), said: "We want to understand how a healthy brain stores and accesses memories as this will give us a window into how conditions such as Alzheimer's disease disrupt the process. We know people with Alzheimer's have difficulty recalling the recent past but can often readily remember childhood memories, which seem more resilient. The parts of the brain we studied are some of the first regions affected in Alzheimer's and now we know they are also involved in memory consolidation."

The study, published today in *Nature Neuroscience* and funded by the Wellcome Trust and Royal Society, investigated the role of sleep in memory consolidation by simultaneously studying two areas of the brain as the rats rested following activity.

Six rats each ran for 30 minutes on a six metre long track before resting for 90 minutes. During rest, the team studied the responses of place cells in the hippocampus, where memories are formed, and grid cells in the entorhinal cortex, where the memories were found to transfer to.

The response of the place cells showed that the rats re-ran the track in their minds as they rested but did so at speeds 10-20 times faster than they experienced in reality. The same replay happened almost simultaneously, with a 10 millisecond delay, in grid cells located in a different part of the brain, suggesting that the rats' memories transferred from one part of the brain to another.

Study supervisor, Dr Caswell Barry (UCL Cell & Developmental Biology), said: "This is the first time we've seen coordinated replay

between two areas of the brain known to be important for memory, suggesting a filing of memories from one area to another. The hippocampus constantly absorbs information but it seems it can't store everything so replays the important memories for long term storage and transfers them to the entorhinal cortex, and possibly on to other areas of the brain, for safe-keeping and easy access."

The scientists plan to investigate memory transfer to other areas of the brain and replay in rats with Alzheimer's disease to better understand the memory consolidation mechanism and the link between quality of sleep and amnesiac conditions.

More information: H. Freyja Ólafsdóttir, Francis Carpenter & Caswell Barry, 'Coordinated grid and place cell replay during rest' *Nature Neuroscience*, Monday April 18, 2016. DOI: 10.1038/nn.4291

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