Medical Xpress

Discovery of schedule for circuit formation in the hippocampus

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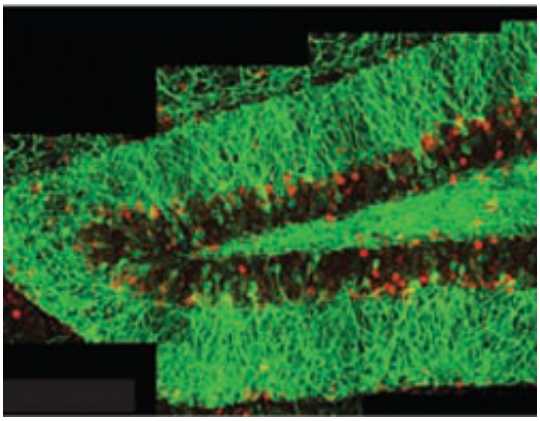

Neurobiologists from the Friedrich Miescher Institute for Biomedical Research have determined the schedule of neuronal circuitry assembly in the hippocampus. As published online in Nature Neuroscience, they are the first to show that in the hippocampus, subpopulations of neurons follow a defined schedule for maturation, forming of synapses and connecting in circuits. This knowledge will be important for the understanding of memory formation.

A London cab driver has to walk the streets for approximately three years before he can memorize all the streets, places and parks. Only by then has he formed the "complex memories"-as neurobiologists call them-that allow him to perform his job well. Complex memories are

formed in the brain in a structure called hippocampus. Once this structure is lost or damaged, people lose the ability to form new memories. The hippocampus updates and structures memories and keeps them separately filed. In the past, scientists have anatomically mapped neuronal connections linking different hippocampal areas, but how groups of individual neurons connect with each other to process memories remained unclear.

Pico Caroni, group leader at the Friedrich Miescher Institute for Biomedical Research (FMI), and his team have now published a study in the latest issue of Nature Neuroscience that addresses exactly this question. They could show that during development different subpopulations of neurons in the hippocampus mature at different time points. Depending on the time window, the neurons then interconnect selectively with their temporally matched counterparts in the next hippocampal area. Thereby circuits of neurons assemble from one section of the hippocampus to the next, following a clearly defined schedule. The FMI scientists are the first to show that there are indeed subpopulations of neurons arranged in clearly defined microcircuits in the hippocampus.

"We have found five maybe six subpopulations of neurons in the hippocampus that are generated during distinct time windows during the formation of the hippocampus. Amazingly, it is this temporal scheme of neuronal specification and synaptogenesis that underlies the specific assembly of circuits in the hippocampus", comments Caroni. "Understanding how the hippocampus then computes complex memories with these subpopulations of neurons remains our next big challenge."

More information: Publication in *Nature Neuroscience*: www.nature.com/neuro/journal/v … nt/full/nn.2768.html

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