Hippocampal lesions alter spatial behavior in the water-maze, naturalistic environments and Intellicage

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Hippocampal lesions impair water-maze learning. Mutant mice with impaired hippocampal function are also unable to learn this task, but patrol feeders in an outdoor pen without re-entry errors, yet fail to modify search behavior in presence of novel feeding sites.

58 female C57BL/6 mice received bilateral hippocampal lesions by NMDA injections (HC), or sham lesions (CTL). 14 HC and 10 CTL were tested in a water-maze. Wall hugging and floating of HC mice entailed impairments in spatial acquisition and reversal, but also in cue navigation. 20 HC and 20 CTL were transponder-tagged and released into an outdoor pen (10x10m). During daytime, food was available inside two shelters. During the night, food was available in 8 computer-controlled feeder boxes, but only during the first visit.

Only two CTL mice were lost overall, but half of the HC mice died during the first 3 days. Further monitoring over 42 days showed that CTL mice learned the task making few re-entry errors. The HC mice (n=8) visited feeders frequently but showed spatial stereotypies and many re-entry errors. 8 CTL and 10 HC were tested in automated learning cages (INTELLICAGE). Adaptation and patrolling behavior to 4 drinking corners was monitored individually during 4 weeks. HC mice developed a stereotyped preference for a given corner, while CTL mice showed less preferences and visited other corners regularly.

Thus, hippocampal lesions in mice result in stereotyped spatial behavior in large and small terrestrial environments. How this relates to the water-maze findings showing equally stereotyped escape strategies remains to be determined.

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