POSTER 113

Memory for object-place-context configurations is dependent on the hippocampus in the rat.

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The hippocampus is required for episodic memory, but its precise role is not understood. While Clayton et al (1998, 2001) showed that scrub jays have episodic-like memory for "what", "where" and "when", developing tasks to demonstrate similar abilities in rats, which are more amenable to neurobiological manipulation, is challenging. Eacott & Norman (2004) have taken an alternative approach, arguing that the "when" component can be replaced by other occasion setters, such as the context in which events occur. Using rats' spontaneous tendency to explore novel aspects of their environment (Ennaceur & Delacour, 1988), they have developed a task that involves rats remembering trial-unique configurations of objects, places and contexts. We aim to elucidate the extent of hippocampal involvement in this task.
Rats were exposed consecutively to two different contexts, each containing the same two objects (A & B). The positions of the objects were reversed in the two contexts. After a 2-min delay, the rat was placed in one of the contexts, and confronted with two identical copies of one of the two objects (e.g. A) placed in the same locations as those used during the exposure phase. Thus, one object-place configuration was novel and one was familiar for that context. Sham operated rats explored the novel object-place-context configuration significantly more than the familiar one during the test phase, but rats with complete bilateral excitotoxic hippocampal lesions were impaired. With a 5-min delay between exposure and test phases, neither group explored the novel configuration more than the familiar one. Control tasks testing memory for object-place and object-context configurations showed no differences between the groups, with both showing a preference for the novel configurations.
These data suggest that the hippocampus is necessary only when all three components of the event must be associated and remembered, and are consistent with the effects of fornix lesions reported by Eacott & Norman (2004).
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POSTER 114

Involvement of dopamine D1/D5 receptors in spatial novelty acquisition, hippocampal LTP and LTD

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Dopamine D1-like receptors are comprised of D-1 and D-5 subtypes and have been shown to modulate hippocampal plasticity in vitro (Otmakova and Lisman, 1996, J Neurosci 16: 7478). Evidence that hippocampal dopamine (DA) plays a role in memory consolidation is generated not just from their known role in synaptic plasticity, but also from the physiologically suggestive localization of these DA receptors on hippocampal terminals, as well as from direct behavioral testing on learning and memory tasks. Our lab has previously shown that LTD is facilitated by novelty exploration (Manahan-Vaughan and Braunewell, 1999, Proc Natl Acad Sci: 8739; Kemp and Manahan-Vaughan, Proc Natl Acad Sci 2004: 8192). We investigated the involvement of D1/D5 receptors in long-term potentiation (LTP) and long-term depression (LTD) in the CA1 region of freely moving rats in both familiar and novel environments. Male rats underwent chronic implantation of a monopolar recording electrode in stratum radiatum of CA1 and a stimulation electrode in the Schaffer collaterals. Experiments were conducted in a familiar recording chamber, where the animals could move freely. The D1/D5 antagonist, SCH23390 or the D1/D5 agonist chloro-PB was infused, as a 5?l volume i.c.v. Low frequency stimulation (LFS, 1 Hz, 900 pulses) induced LTD, which lasted for at least 4h. LFS at 1Hz, 600 pulses was able to induce a short term depression (STD) which recovered after 1 hour. High frequency stimulation (100 Hz) induced LTP >24h. SCH23390 dose-dependently (30-120 nMol) impaired late-LTP. SCH23390 (120 nmol) significantly inhibited late-LTP while it completely abolished LTD induced by (LFS, 900 pulses) and prevented novelty-induced facilitation of STD into LTD. Chloro-PB (120nMol) had no detectable effect on LTP induction or maintenance. However, chloro-PB (120 nMol) transformed STD into robust LTD lasting over 4 hours. These findings lend support to the role of dopamine D1-like receptors in mediating changes in synaptic strength associated with learning a novel environment.

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POSTER 115

Mental number line disruption in a right neglect patient

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Right brain damaged patients with unilateral neglect fail to process the perceptual and/or imagined contralesional space. A typical clinical test for the diagnosis of neglect is the line bisection task where subjects are asked to mark the midpoint of a horizontal line: the patients usually place it rightwards. The same pattern can be observed at an imaginative level: when patients have to state the midpoint number given two numbers that define an interval, they shifted it to the right. We investigated whether MD, a left brain damaged patient with right neglect and with intact numerical and arithmetic skills, could show the same disruption of the mental number line. MD was horally presented two numbers and was asked to choose the midpoint one. The intervals varied in size, kind of extremes (i.e. units, teens or first teens) and order (i.e. increasing or decreasing). MD significantly placed the midpoint leftwards mirroring her deficits in bisecting lines. This behaviour increased as a function of the interval size but was not affected by the kind of extremes and by the order. This latter result suggests that the mental number line is canonically oriented. In conclusion MD performance is symmetrical to the one commonly observed in left neglect patients. These data confirm and support the idea of an important spatial components in number processing.