

Natural learning: mice lacking the neurotrophin receptor TrkB show intact spatial learning but impaired behavioral flexibility

A.L. Vyssotski^{1,2}, G. Dell'Omo^{1,3}, D.L. Vyssotski², D.P. Wolfer¹, L. Minichiello⁴, R. Klein⁴, H.-P. Lipp^{*1}.

¹Inst. Anat. Univ. Zürich, CH-8057 Zürich, Switzerland; ²P.K. Anokhin Inst., RAS, Moscow; ³Lab. of Vet. Med., ISS Rome, Italy; ⁴EMBL, Heidelberg, FRG.

Mice lacking the neurotrophin receptor TrkB in the forebrain are unable to learn a water maze task, are impaired in a radial maze, but appear less or not impaired in simple learning tasks (Neuron 24, 401-414, 1999). To analyze their learning abilities in a natural context, eight computer-controlled feeders were placed in a mouse colony living in an outdoor pen of 10x10m. Forty mice were released (11 wildtypes; 21 heterozygous and 8 mutants). Food was delivered only during one visit but was withheld upon repeated entries. Visits of transponder-tagged mice were monitored continuously during 21 days. A daily feeding cycle started at 8 p.m. and lasted overnight till 8 a.m. To sustain poorly learning mice, additional free food was placed inside the shelters every third night.

The three groups did not show differences in learning the task. However, differences between mutants and wildtypes emerged gradually at those days with free food inside the shelters. While the wildtypes soon abandoned visits to outside feeders during such nights, the TrkB mutants continued to patrol the boxes in their habitual way ($p < 0.007$). This shows that TrkB deficient mice were able to learn a spatial radial maze type task, but could not switch quickly to a more efficient strategy. This implies that the TrkB neurotrophin receptor plays a role in behavioral flexibility. Supp. by SNF (31-46691.96, 31- 57139.99) and EC BIO4-98-0297/BBW98.0125.

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