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BDNF, trkB and PSA-NCAM in the hippocampus of Roman rats after forced swimming

Maria Pina Serra[1], Laura Poddighe[1], Marianna Boi[1], Maria A. Piludu[2], Maria G. Corda[2], Osvaldo Giorgi[2], Marina Quartu[1]

[1] Dept of Biomedical Sciences, University of Cagliari, Italy; 2 Dept of Life and Environmental Sciences, University of Cagliari,Italy.

The selective breeding of Roman High- (RHA) and Low-Avoidance (RLA) rats are considered as a genetic model of resilience to stress-induced depression and of vulnerability to that trait, respectively1. There is evidence that alterations in neuronal plasticity in the hippocampus and other brain areas are critically involved in the pathophysiology of mood disorders. Here, we investigated on immunochemical occurrence of Brain-derived neurotrophic factor (BDNF), tyrosine-kinase receptor trkB and polysialilated form of the neural cell adhesion molecule (PSANCAM) in the hippocampus of the Roman rat lines under baseline conditions and after acute forced swimming (FS). Western blot (WB) analyses showed that, in basal conditions, the relative levels of BDNF, trkB and PSA-NCAM markedly differed, appearing lower by 48%, 25% and 65%, respectively, in RLA vs RHA rats. WB analyses carried out after FST showed no differences between baseline and FST rats. In tissue sections, BDNF-, trkB- and PSA-NCAM-like immunoreactivity (LI) showed a distinctive labelling, mainly localized to proximal neuronal processes and nerve fibers distributed in the Ammon's horn and dentate gyrus (DG). A number of PSA-NCAM-positive neurons in the subgranular layer of dentate gyrus also occurred. Densitometric analysis further showed differences in the hippocampal subregions. Thus, upon FST, BDNF-LI was less abundant in the CA3 sector of the Ammon's horn of FST vs control RLA rats (-24%), whereas PSA-NCAM-LI was more abundant in the DG of RHA than RLA rats (+26%). Our findings suggest that an altered neuronal availability of and/or responsiveness to BDNF and inadequate dynamic events related to neuroplasticity may contribute to outline the molecular and morphological basis for the distinct vulnerability to stress-induced depression in the two rat lines.

References

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