

Involvement of BDNF and trkB in the limbic system of Roman High and Low Avoidance rats that show different copulatory patterns

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Roman High- (RHA) and Low-Avoidance (RLA) outbred male rats differ for a respectively rapid vs. poor acquisition of the active avoidance response in the shuttle-box. When put in the presence of a sexually receptive female rat, Roman rats display major differences in sexual activity that concur with the distinctive behavioural traits of the two lines [1]. Thus, sexual motivation and copulatory performance, usually higher in RHA vs. RLA rats, are clear in naïve rats (which copulate for the first time), persist when sexual experience has been acquired, and involve activation of limbic brain areas [Sanna et al., 2014]. Mood disorders show reduced neuronal plasticity whose neurochemical and anatomical ground may reside in the impaired brain-derived neurotrophic factor (BDNF)-trkB signalling as shown in the hippocampus of Roman rats [2]. To clarify the possible role of BDNF in mesolimbic neuronal plasticity, here we report on the immunochemical presence of BDNF and trkB in ventral tegmental area (VTA), nucleus accumbens (Acb) and medial prefrontal cortex (mPFC) of control (no sexual behaviour), sexually naïve and experienced (exp) RHA and RLA rats. As a general rule, BDNF and trkB relative expression levels changed differentially, often conversely, in the VTA, Acb and mPFC of naïve and exp vs. control Roman rats. Thus, for example, after the first copulation BDNF increased in the Acb core and shell in RHA rats displaying an opposite trend in RLA rats, while in sexually exp rats increased only in the VTA of RHA rats. TrkB changes were similar to those of BDNF in the Acb shell, while were opposite in the VTA and mPFC. Our findings highlight a role for the BDNF-trkB trophic system in modulating the activation of neuronal circuits of motivation and reward related to sexual activity in the Roman rat lines.

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References

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[2] Serra MP et al.. (2017) *Brain and Behavior* 2017;7:e00861.

Key words

RHA and RLA rats, depression, limbic system, sexual behavior, sexual experience, BDNF, trkB, Western Blot, immunohistochemistry.