

Differential expression of the immediate early genes c-Fos, Δ FosB and Arc in the limbic system of the Roman High and Low Avoidance rat lines during the acquisition of sexual experience

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Male Roman High (RHA) and Low Avoidance (RLA) rats display major differences in sexual behaviour, since RHA rats exhibit higher motivation and better copulatory performance than RLA rats [1]. Such differences are very evident in sexually naïve rats (which copulate with a receptive female rat for the first time), and persist, after five copulatory tests, when sexual experience has been acquired [2]. Since sexual activity is a natural reward that involves activation of limbic brain areas, we studied whether the differences in sexual activity between the two rat lines are accompanied by changes in the expression of the immediate early genes (IEG) cFos, Δ FosB and Activity regulated cytoskeleton-associated (Arc) protein as indicators of neural activation and synaptic plasticity. By means of Western blot and/or immunohistochemistry, we investigated their expression 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. Expression levels of selected IEG in the Roman lines have been compared with concomitant changes in sexual motivation and copulatory performance in relation to the level of sexual experience. The results show that cFos, Δ FosB and Arc increased differentially in the VTA, Acb (core and shell) and mPFC of RHA and RLA rats. In both rat lines, the increases were very evident in naïve rats, tended to disappear in exp rats, with the exception of Δ FosB which tended to accumulate with sexual experience, and were usually higher in RHA than RLA rats. These findings confirm that sexual activity induces neural activation in limbic brain areas involved in motivation and reward, thereby leading to changes in the mechanisms controlling neural plasticity with the acquisition of sexual experience and imply that changes in these mechanisms may also depend on specific biobehavioural traits.

Work supported by grants from MIUR (SIR 2014, Code no. RBSI14IUX7) to FS, and from the University of Cagliari (Fondi Dipartimentali).

References

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Key words

RHA and RLA rats, sexual experience, limbic system, cFos, Δ FosB, Arc, Western Blot, immunohistochemistry.