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Enhanced social interaction skills in CB1 receptor knockout mice

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Introduction: Social abilities play a crucial role for survival of an individual and the species. In humans, many neuropsychiatric disorders, including social anxiety disorders, several personality disorders, schizophrenia and autism, result in difficulties in creating and/or maintaining adequate social contact, highlighting the importance of intact social skills. Rodents are social animals and possess complex social systems that are both, territorial and colonial, including a rich repertoire of behavioural patterns used for social investigation, affiliation, sex and aggression (Whishaw et al., 2001). The social phenotype is regulated by a variety of neurochemical systems and brain structures. Studies on the role of the endocannabinoid (ECB) system and cannabinoid actions on non-aggressive social behaviour are rare, but indicate that cannabinoid receptor agonists reduce social interaction and induce social withdrawal in rodents and monkeys. Furthermore, disturbances in social abilities have been linked to alterations in ECB signalling (Schneider and Koch, 2005; Leweke and Schneider, 2011).

Methods and Results: With the present study we examined social skills in CB1 receptor knockout (CB1-KO) mice in the social interaction test by detailed ethological analysis (Schneider et al., 2008). Social interaction was assessed in an open field where animals were allowed to interact freely with an unknown social partner for 5 min (CB1-KO/WT: n = 12). Behaviour was videotaped and the following elements quantified blind by a trained observer: (A) Social behaviour: contact behaviour and social exploration; (B) social avoidance/anxiety-related behaviour; (C) self grooming behaviour; and (D) aggressive behaviour. As expected, CB1-KO mice showed an enhanced emotional response towards an unfamiliar social partner upon initial contact (CB1-KO: 3.6 ± 0.6, WT: 1.6 ± 0.5; p = 0.02, t-test). Likewise, anogenital contact was reduced compared to control animals (CB1-KO: 5.2 ± 0.6, WT: 8.3 ± 0.8; p = 0.005, t-test). However, throughout the experiment, CB1-KO mice were found to perform more social contact behaviour (CB1-KO: 1 ± 0.1, WT: 0.3 ± 0.2; p = 0.04, t-test) and more total social behaviour (e.g. non-anogenital exploration, nosing and approach/following; CB1-KO: 50.6 ± 2.9, WT: 41.3 ± 3.5; p = 0.05, t-test) than wild-type controls.

Conclusions: Taken together, although CB1-KO mice react more anxious towards an unknown social partner (especially during inital testing), they exhibit increased social interaction skills and appear to be more sociable than wild-type controls, indicating a clear involvement of ECB signaling in social abilities and competence.

References:

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