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Corticotropin-releasing factor induces social preferences in male prairie voles

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Abstract

Exposure to stressors facilitates the formation of social preferences in monogamous male prairie voles (*Microtus ochrogaster*). In the present study, the hypothesis was tested that treatment with corticotropin-releasing factor (CRF), a neuropeptide released during stress, is capable of inducing social preferences in male prairie voles. The effects of five doses of CRF (0.01, 0.1, 1.0, 10 and 100 ng; i.c.v.) on social preference were assessed. Exogenous CRF did not alter the amount of social contact that occurred between the experimental animal and partner during the initial cohabitation period. However, when tested after 3 h of cohabitation, animals that had been treated with 0.1 or 1.0 ng CRF spent significantly more time in physical contact with the partner than a stranger. In contrast, 3 h of cohabitation was not sufficient to induce social preferences in animals pre-treated with an artificial CSF vehicle or other doses of CRF. Furthermore, co-administration of a CRF receptor antagonist prevented the formation of CRF-induced social preferences. These data provide support for a role of the hypothalamic–pituitary–adrenal axis in social bonding in prairie voles. © 2002 Published by Elsevier Science Ltd.

Keywords: HPA axis; Glucocorticoid; Adrenal; Monogamy; Behavior

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1. Introduction

Monogamy is rare among mammals, and is particularly uncommon among rodents (Kleiman, 1977). Prairie voles (*Microtus ochrogaster*) are small rodents that exhibit many characteristics of monogamy, including the formation of selective social bonds (reviewed in Carter et al., 1995). In the laboratory, social preferences can be induced by housing a male and female prairie vole together for several hours (Williams et al., 1992; DeVries et al. 1995, 1996) or pharmacologically induced in a shorter period of time by treating animals prior to pairing with vasopressin (Winslow et al., 1993; Cho et al., 1999), oxytocin (Williams et al., 1994; Cho et al., 1999; Cushing and Carter, 2000; Insel and Hulihan, 1995), corticosterone (DeVries et al., 1996), or a dopamine (D2) receptor agonist (Wang et al., 1999; Gingrich et al., 2000). Whether these neurochemicals act through a common pathway or distinct pathways to induce social preferences in prairie voles remains to be determined.

Exposing male prairie voles to a moderate stressor also facilitates the induction of social preferences (DeVries et al., 1996). The effects of stress on social preference can be replicated by treatment with exogenous corticosterone, the predominant glucocorticoid released by prairie vole adrenal glands during stress (DeVries et al., 1996). Another potential mediator of stress-induced social bonding is corticotropin releasing factor (CRF). CRF is released from the paraventricular nucleus (PVN) of the hypothalamus and subsequently acts on the hypophysis to cause the release of adrenocorticotrophic hormone (ACTH) into the bloodstream; ACTH in turn induces the synthesis and release of glucocorticoids from the adrenal cortex (reviewed in Jacobson and Sapolsky, 1991). In addition to its endocrine role, CRF is a behaviorally active compound. In rats and mice, treatment with exogenous CRF decreases exploratory behavior (Berridge and Dunn 1987, 1989) and increases anxiety (Schulz et al., 1996). The present study examines the hypothesis that CRF is capable of facilitating the development of social preferences in male prairie voles. The goal of the current study was to determine if central administration of CRF (i) alters social interaction, (ii) facilitates the onset of social preferences and (iii) depends on CRF receptors to induce changes in social preference. Taken together, these data offer a more complete understanding of the role of the hypothalamic–pituitary–adrenal axis in social bonding in prairie voles.

2. Methods and materials

2.1. Animals

Prairie voles were reared from stock originally trapped near Urbana, Illinois. All animals were maintained under a constant light cycle (14 h light: 10 h dark) and allowed ad libitum access to Purina rabbit chow and tap water. The animals were weaned at 21 days of age and housed in same-sex sibling groups. The experimental animals were 50 days of age or older, reproductively naive, and housed individually in polypropylene cages (12×18×28 cm) for at least one week prior to commencement

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