



# Paternal Deprivation and Female Biparental Family Rearing Induce Dendritic and Synaptic Changes in *Octodon degus*: I. Medial Prefrontal Cortex

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In most mammalian species parent-offspring interactions during early life periods primarily comprise social contacts with the mother, whereas the role of males in parental care is one of the most overlooked and understudied topics. The present study addressed the hypothesis that the complete deprivation of paternal care delays or permanently retards synaptic connectivity in the brain, particularly in the medial prefrontal cortex (mPFC) of the offspring in a sex-specific manner. Another aim of this study was to address the question whether and in which way replacing the father with a female caregiver (in our experiments the "aunt") can "buffer" the detrimental effects of paternal deprivation on neuronal development. The comparison of: (a) single mother rearing; (b) biparental rearing by father and mother; and (c) biparental rearing by two female caregivers revealed that: (i) paternal care represents a critical environmental factor for synaptic and dendritic development of pyramidal neurons in the vmPFC of their offspring; (ii) a second female caregiver ("aunt") does not "buffer" the neuronal consequences of paternal deprivation; and that (iii) neuronal development in the vmPFC is differentially affected in male and female offspring in response to different family constellations.

**Keywords:** dendritic spines, prefrontal cortex, paternal deprivation, family structure, sex difference, pyramidal neuron

## INTRODUCTION

The vast majority of studies emphasize the important role of the mother in supporting infant growth and survival and facilitating cognitive as well social-emotional development (Meaney, 2001; Zhang et al., 2013; Bock et al., 2014; Maccari et al., 2014; Glynn and Baram, 2019). In contrast, the father's contribution to infant development has been less studied. This is surprising since in humans as well as in several other bi-parental mammalian species the father represents a major source of emotional and social interactions (Feldman et al., 2019). Recent studies comparing maternal and paternal behavior in humans showed that fathers provide the same level of sensitivity as mothers during interactions with their children and make a unique contribution to the child's social development and emotion regulation, particularly to the child's later capacity to function adaptively within the social milieu (Feldman, 2016; Kohl et al., 2017, 2018; Abrahams and Feldman, 2018). Absence of a paternal caregiver influences the socialization and increases the probability of drug and

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# Paternal Deprivation

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