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SOCIAL NEUROSCIENCE

Parental controls

> “high stimulation intensities drove infanticidal behaviours, whereas low stimulation intensities resulted in pup grooming”

Many social behaviours are sexually dimorphic; however, the brain differences that underlie distinct behavioural responses in males and females remain largely unclear. Hong and colleagues now reveal sex differences in a specific population of medial amygdala (MeA) neurons that control parenting behaviour.

The MeA has been implicated in parenting behaviour, but little is known about the circuits involved or their sexual dimorphism. Here, the authors examined the effects of optogenetically manipulating the activity of specific MeA neuronal populations in male and female mice on their interactions with pups.

Virgin female mice exposed to pups usually exhibit parenting behaviours, such as grooming, whereas virgin male mice typically exhibit infanticidal behaviour. The authors found that stimulation of GABAergic neurons in the MeA in virgin female mice increased pup grooming. In virgin male mice, however, stimulation of these neurons drove infanticidal behaviour, suggesting that the MeA regulates sexually dimorphic pup-directed behaviours.

Fibre-photometric measurement of neural activity in MeA GABAergic neurons in freely behaving mice showed an increase in their activity during pup interactions in both males and females. However, this activity was markedly higher during infanticidal behaviours in virgin males than in any animals engaged in pup grooming, suggesting that these opposing behaviours are regulated in an activity level-dependent manner.

Credit: Catherine MacBride/Getty

To further examine this possibility, the authors investigated the effects of stimulating MeA neurons at different intensities on behaviour. Changing the intensity of laser stimulation did not alter the parenting behaviour of female mice. However, in both virgin males and fathers, high stimulation intensities drove infanticidal behaviours, whereas low stimulation intensities resulted in pup grooming.

This finding suggested that there may be sex differences in the neuronal composition or other features of the MeA. The authors carried out single-cell RNA sequencing of more than 44,000 MeA cells from males and females to comprehensively characterize sex differences at the single-cell level. This revealed no differences in the cell types present or their relative abundance. However, they found that MeA GABAergic neurons exhibited greater sex differences in gene expression than did MeA glutamatergic neurons, providing a possible molecular basis for the observed sexual dimorphism in circuit function and behaviour.

These findings demonstrate a key role for the MeA in parenting behaviour and provide insight into the mechanisms by which a single brain area can mediate opposing behaviours in males and females.

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