Enhanced synaptic integration of adult-born neurons in the olfactory bulb of lactating mothers.

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Abstract:

One of the most dramatic events during the life of adult mammals is the transition into motherhood. This transition is accompanied by specific maternal behaviors, displayed by the mother, that ensure the survival and the well-being of her offspring. The execution of these behaviors is most likely accompanied by plastic changes in specific neuronal circuits, but these are still poorly defined. In this work, we studied the mammalian olfactory bulb (OB), which has been shown to be an essential brain region for maternal behaviors in mice. In the OB, we focused on adult-born neurons, which are continuously incorporated into the circuit during adulthood, thus providing a potential substrate for heightened plasticity after parturition. We analyzed the dynamics and morphological characteristics of adult-born granule cells (abGCs), innervating the OB of primiparous lactating mothers, shortly after parturition as well as in naive virgins. In vivo time-lapse imaging of abGCs revealed that dendritic spines were significantly more stable in lactating mothers compared with naive virgins. In contrast, spine stability of resident GCs remained unchanged after parturition. In addition, while spine size distribution of abGCs was approximately similar between mothers and naive virgins, the spine density of abGCs was lower in lactating mothers and the density of their presynaptic components was higher. These structural features are indicative of enhanced integration of adult-born neurons into the bulbar circuitry of lactating mothers. This enhanced integration may serve as a cellular mechanism, supporting changes in olfactory coding of new mothers during their first days following parturition.

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