Motherhood and olfactory neurogenesis

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MOTHERHOOD AND OLFACTORY NEUROGENESIS

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Profound behavioral changes occur in the mother at parturition, a time when the maternal brain undergoes extensive remodeling of neural circuits. Adult neurogenesis, a form of brain plasticity, could constitute an adaptive response to motherhood. New neurons are continuously added in the olfactory bulb and the aim of our research is to characterize the importance of olfactory neurogenesis in the establishment of maternal behavior. In sheep, odor cues emitted by newborns are essential to establish maternal behavior at parturition and to provide a basis for individual recognition of the offspring. We characterized the activation of adult-generated olfactory neurons in mothers exposed for 2 hours to either their own lamb, an unfamiliar lamb or a familiar adult sheep, after having 2 days of contact with their lamb. Bromodeoxyuridine, a marker of cell division, was injected 3 months before parturition and revealed through immunocytochemistry in combination with markers of activation or neuronal maturation. Results show that the 3-month-old neuroblasts, are preferentially activated by lamb exposure and not by adult exposure and that the preferential activation is specific to olfactory neurogenesis but not hippocampal neurogenesis. We also hypothesized that chemical disruption of olfactory neurogenesis impair the establishment of maternal behavior. At one month of gestation, ewes received either infusion of the antimitotic drug Ara-C or saline into the lateral ventricles for one-month. Ara-C infusion dramatically decreased olfactory neurogenesis, but spared hippocampal neurogenesis. Mothers exhibiting more than a 70% reduction in olfactory neurogenesis emitted fewer maternal bleats and they were not able to discriminate their own lamb from an alien lamb. These results indicate that adult-born olfactory neurons are to some extent involved in the establishment of maternal behavior by contributing to the processing of offspring odors and reveal the extreme plasticity of the maternal brain.
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