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NEUROSCIENCE

Giving birth gives birth to neurons

In mice, pregnancy results in new neurons that support recognition of pups

By **Gerd Kempermann**[1,2]

Neurogenesis (the birth of new neurons from stem cells) is very limited in the adult brain but contributes to highly specific brain functions—most notably, learning and memory. Thus far, its contribution to other brain functions has been less clear. On page 958 of this issue, Chaker *et al.* (*1*) report that in mice, pregnancy elicits transient waves of neurogenesis in specific subsections of the subventricular zone (SVZ), the neurogenic zone that produces new interneurons for the olfactory bulb throughout life. These subsections were barely neurogenic in the absence of pregnancy. Once in the olfactory bulb, the newborn neurons contributed to the recognition of the young mice by smell. The data make a compelling case for how adult neurogenesis in the olfactory bulb contributes to an important brain function beyond learning and memory.

The effects of pregnancy on adult neurogenesis in the mothers have been studied in animal models for many years, often in the context of how changes in sex hormones across the life span affect the generation of new neurons (*2*). Most of these studies focused on the hippocampus, the neurogenic zone involved in learning and memory, and often reported a decrease in cell proliferation and neurogenesis during pregnancy (*3*). This suggested a temporary decrease in the plasticity of the mother's hippocampus. Few of these studies have investigated neurogenesis in the adult olfactory bulb. One study that did, however, found that the lactation hormone prolactin mediates a pregnancy-dependent increase in olfactory bulb neurogenesis and thus a positive effect on mothering behavior in rats (*4*).

Chaker *et al.* did not specifically explore the question of what mediates the selective response of different SVZ precursor cells to pregnancy and the differentiation into the described population of interneurons, which lasted only for the time when the pups were young and maternal attention was critical (see the figure). However, a very suggestive signaling connection between the hypothalamus (the brain structure overseeing hormonal control) and the activation of particular populations of SVZ precursor cells was previously reported (*5*). It is likely, though, that several mechanisms interact to regulate pregnancy-associated neurogenesis.

The identification by Chaker *et al.* of the physiological regulation of adult neurogenesis and function of the newborn cells in the olfactory bulb has ethological relevance. In a previous study, disrupting adult neurogenesis in the olfactory bulb of female mice did not seem to change maternal behavior, although it reduced general social interaction (*6*). Therefore, the findings of Chaker *et al.* indicate that the contribution of adult neurogenesis is more subtle and much more specific than previously thought. Nevertheless, although the pregnancy-dependent activation of neurogenesis in the SVZ might be selective, as the new findings suggest, it still seems to be broader than necessary to produce just the one described interneuronal population. Thus, there might be other functions to be found.

The study of Chaker *et al.* also exemplifies the growing trend of using single-cell transcriptomics data to define cell populations and their functional state. Precursor cell mosaicism in the SVZ was originally observed by using preidentified markers, cell morphology, and information on cell development (*7*). A transcriptomics-based atlas of cell types in the mouse SVZ has since been published (*8*). The new study now indicates that different subregions of precursor cells respond differently to physiological stimulation, and transcriptomic profiling also allowed the identification of a functionally defined neuronal population in the olfactory bulb.

In a previous study, single-cell transcriptomics were used to demonstrate the

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