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Neonatal exposure to sevoflurane in mice causes deficits in maternal behavior later in adulthood

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Abstract

Background: In animal models, exposure to general anesthetics induces widespread increases in neuronal apoptosis in the developing brain. Subsequently, abnormalities in brain functioning are found in adulthood, long after the anesthetic exposure. These abnormalities include not only reduced learning abilities but also impaired social behaviors, suggesting pervasive deficits in brain functioning. But the underlying features of these deficits are still largely unknown.

Methods: Six-day-old C57BL/6 female mice were exposed to 3% sevoflurane for 6 h with or without hydrogen (1.3%) as part of the carrier gas mixture. At 7-9 weeks of age, they were mated with healthy males. The first day after parturition, the maternal behaviors of dams were evaluated. The survival rate of newborn pups was recorded for 6 days after birth.

Results: Female mice that received neonatal exposure to sevoflurane could mate normally and deliver healthy pups similar to controls. But these dams often left the pups scattered in the cage and nurtured them very little, so that about half of the pups died within a couple of days. Yet, these dams did not show any deficits in olfactory or exploratory behaviors. Notably, pups born to sevoflurane-treated dams were successfully fostered when nursed by control dams. Mice coadministered of hydrogen gas with sevoflurane did not exhibit the deficits of maternal behaviors.

Conclusion: In an animal model, sevoflurane exposure in the developing brain caused serious impairment of maternal behaviors when fostering their pups, suggesting pervasive impairment of brain functions including innate behavior essential to species survival.

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