Prenatal cannabis exposure linked to cognitive deficits, altered behavior

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Regular cannabis exposure in rats during pregnancy may cause their offspring to have long-term cognitive deficiencies, asocial behavior, and anxiety later in adulthood.

That's according to a new study by neuroscientists in Washington State

University's Integrative Physiology and Neuroscience unit that provides a rare look at the effects of using cannabis during pregnancy.

"The reality of cannabis research is there's not a lot of it," said Halle Weimar, first author on the paper and graduate student in the neuroscience program. "This research helps get information out to women so they can make an educated decision that is best for them."

Weimar and her colleagues found the offspring of pregnant rats exposed to cannabis vapor were more likely to make regressive errors after they were trained new methods to receive sugar pellets. They were also less social and more anxious when placed in new environments.

Weimar said the research is especially significant as recreational and medicinal cannabis use continues to increase among pregnant women as well as the general population.

The study, recently published in the journal *Neuropharmacology*, utilized a first-of-its-kind e-cigarette technology to deliver cannabis vapor to pregnant female rats before and throughout their entire gestation period.

"The idea was to use a more clinically relevant model to mirror how humans use cannabis, specifically how pregnant women use cannabis," Weimar said.

Researchers also delivered propylene glycol vegetable glycerol mixture, commonly found in vape juice, to explore its effects in rats. A control group was left in their home cage and not exposed to any vapor.

Vapor was administered twice daily to rats in one-hour sessions during mating and pregnancy.

The research team found significant behavioral changes and cognitive

deficits that persisted into adulthood in the offspring of the pregnant rats exposed to cannabis.

Using different levers and a cue light, researchers trained and rewarded rats with sugar pellets for pressing a lever paired with the cue light. The rats were then required to change their strategy during test day and instead ignore the cue, which was used as a measure of cognitive flexibility.

"While rats eventually caught on, those whose mothers were exposed to cannabis were more likely to revert to the old pattern and make regressive errors," Weimar said. "They also took more trials to learn the rules."

Male and female juvenile rats whose mothers were exposed to cannabis also engaged in far fewer play behaviors. The male rats were especially hesitant to engage with other rats in their initial social introductions.

Moreover, adult rats whose mothers were exposed to cannabis exhibited anxiety-like behavior in new environments.When placed in a large, elevated maze with open and closed arms, the rats were more likely to stay in the closed arms of the maze and explore the open, exposed arms less.

"They tend to feel safer in closed arms as opposed to rats that are less anxious and willing to venture into open spaces and take more risks," Weimar said.

She said the finding is significant because it shows cannabis vapor administered to a rat during pregnancy may cause its offspring to have age-dependent effects well into adulthood, noting the observation wasn't noted in rats when they were juveniles.

The researchers noticed changes in the rats' behavior as pups as well.

Weimar said rats whose mothers were exposed to cannabis made more than 100 more ultrasonic vocalizations, or cries for their mother, compared to the control group, days after birth.

"It's pretty noteworthy because this is one of the only tests you can do that looks at emotional reactivity in neonates and they were far more reactive than the other groups," Weimar said.

More information: Halle V. Weimar et al, Long-term effects of maternal cannabis vapor exposure on emotional reactivity, social behavior, and behavioral flexibility in offspring, *Neuropharmacology* (2020). DOI: 10.1016/j.neuropharm.2020.108288

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