

# Prenatal exposure to alcohol disrupts brain circuitry

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(Medical Xpress)—Prenatal exposure to alcohol severely disrupts major features of brain development that potentially lead to increased anxiety and poor motor function, conditions typical in humans with Fetal Alcohol Spectrum Disorders (FASD), according to neuroscientists at the University of California, Riverside.

In a groundbreaking study, the UC Riverside team discovered that [prenatal exposure](#) to alcohol significantly altered the expression of genes and the development of a network of connections in the neocortex—the part of the [brain](#) responsible for high-level thought and cognition, vision, hearing, touch, balance, motor skills, language, and emotion—in a mouse model of FASD. Prenatal exposure caused wrong areas of the brain to be connected with each other, the researchers found.

These findings contradict the recently popular belief that consuming alcohol during pregnancy does no harm.

"If you consume alcohol when you are pregnant you can disrupt the development of your baby's brain," said Kelly Huffman, assistant professor of psychology at UC Riverside and lead author of the study that appears in the Nov. 27 issue of *The Journal of Neuroscience*, the official, peer-reviewed publication of the Society of Neuroscience. Study co-authors are UCR Ph.D. students Hani El Shawa and Charles Abbott.

"This research helps us understand how substances like alcohol impact

[brain development](#) and change behavior," Huffman explained. "It also shows how [prenatal alcohol exposure](#) generates dramatic change in the brain that leads to changes in behavior. Although this study uses a moderate- to high-dose model, others have shown that even small doses alter development of key receptors in the brain."

Researchers have long known that ethanol exposure from a mother's consumption of alcohol impacts brain and cognitive development in the child, but had not previously demonstrated a connection between that exposure and disruption of neural networks that potentially leads to changes in behavior.

Huffman's team found dramatic changes in intraneocortical connections between the frontal, somatosensory and visual cortex in mice born to mothers who consumed ethanol during pregnancy. The changes were especially severe in the frontal cortex, which regulates motor skill learning, decision-making, planning, judgment, attention, risk-taking, executive function and sociality.

The neocortex region of the mammalian brain is similar in mice and humans, although human processing is more complex. In previous research, Huffman and her team created what amounts to an atlas of the neocortex, identifying the development of regions, gene expression and the cortical circuit over time. That research is foundational to understanding behavioral disorders such as autism and FASD.

Children diagnosed with FASD may have facial deformities and can exhibit cognitive, behavioral and motor deficits from ethanol-related neurobiological damage in early development. Those deficits may include learning disabilities, reduced intelligence, mental retardation and anxiety or depression, Huffman said.

Milder forms of FASD may produce no [facial deformities](#), such as

wideset eyes and smooth upper lip, but behavioral issues such as hyperactivity, hyperirritability and attention problems may appear as the child develops, she added.

Based on her earlier research, Huffman said, she expected to find some disruption of intraneocortical circuitry, but thought it would be subtle.

"I was surprised that the result of alcohol exposure was quite dramatic," she said. "We found elevated levels of anxiety, disengaged behavior, and difficulty with fine motor coordination tasks. These are the kinds of things you see in children with FASD."

The next phase of her research will examine whether deficits related to prenatal exposure to alcohol continue in subsequent generations.

The bottom line, Huffman said, is that women who are pregnant or who are trying to get pregnant should abstain from drinking [alcohol](#).

"Would you put whiskey in your baby's bottle? Drinking during pregnancy is not that much different," she said. "If you ask me if you have three glasses of wine during pregnancy will your child have FASD, I would say probably not. If you ask if there will be changes in the brain, I would say, probably. There is no safe level of drinking during pregnancy."

Provided by University of California - Riverside

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