

Brain changed by caffeine in utero, study finds

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New research finds caffeine consumed during pregnancy can change important brain pathways that could lead to behavioral problems later in life. Researchers in the Del Monte Institute for Neuroscience at the University of Rochester Medical Center (URMC) analyzed thousands of brain scans of nine and ten-year-olds, and revealed changes in the brain structure in children who were exposed to caffeine in utero.

"These are sort of small effects and it's not causing horrendous psychiatric conditions, but it is causing minimal but noticeable behavioral issues that should make us consider long term effects of caffeine intake during [pregnancy](#)," said John Foxe, Ph.D., director of the Del Monte Institute for Neuroscience, and principal investigator of the Adolescent Brain Cognitive Development or ABCD Study at the University of Rochester. "I suppose the outcome of this study will be a recommendation that any caffeine during pregnancy is probably not such a good idea."

Elevated behavioral issues, attention difficulties, and hyperactivity are all symptoms that

researchers observed in these children. "What makes this unique is that we have a biological pathway that looks different when you consume caffeine through pregnancy," said Zachary Christensen, a M.D/Ph.D. candidate in the Medical Science Training Program and first author on the paper published in the journal *Neuropharmacology*. "Previous studies have shown that children perform differently on IQ tests, or they have different psychopathology, but that could also be related to demographics, so it's hard to parse that out until you have something like a biomarker. This gives us a place to start future research to try to learn exactly when the change is occurring in the brain."

Investigators analyzed [brain scans](#) of more than 9,000 nine and ten-year-old participants in the ABCD study. They found clear changes in how the white matter tracks—which form connections between brain regions—were organized in children whose mothers reported they consumed caffeine during pregnancy.

URMC is one of 21-sites across the country collecting data for the ABCD study, the largest long-term study of brain development and child health. The study is funded by the National Institutes of Health. Ed Freedman, Ph.D., is the principal investigator of the ABCD study in Rochester and a co-author of the study.

"It is important to point out this is a retrospective study," said Foxe. "We are relying on mothers to remember how much caffeine they took in while they were pregnant."

Previous studies have found caffeine can have a negative effect on pregnancy. It is also known that a fetus does not have the enzyme necessary to breakdown caffeine when it crosses the placenta. This new study reveals that caffeine could also leave a lasting impact on neurodevelopment.

The researchers point out that it is unclear if the

impact of the caffeine on the fetal [brain](#) varies from one trimester to the next, or when during gestation these structural changes occur.

"Current clinical guidelines already suggest limiting [caffeine](#) intake during pregnancy—no more than two normal cups of coffee a day," Christensen said. "In the long term, we hope to develop better guidance for mothers, but in the meantime, they should ask their doctor as concerns arise."

More information: Zachary P. Christensen et al, Caffeine exposure in utero is associated with structural brain alterations and deleterious neurocognitive outcomes in 9–10 year old children, *Neuropharmacology* (2021). DOI: [10.1016/j.neuropharm.2021.108479](https://doi.org/10.1016/j.neuropharm.2021.108479)

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