## RSNA Press Release

# Prenatal Opioid Exposure May Alter Brain Function in Babies

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At A Glance

- Exposure to opioids in utero may alter connectivity in an area of the brain that regulates emotion.
- The study group included 16 infants, including eight with prenatal opioid exposure and eight without.
- Significant differences were seen in the way the amygdala connects to different brain regions in the infants with prenatal opioid exposure.

CHICAGO — Connectivity in an area of the brain that regulates emotion may be altered in infants exposed to opioids while in utero, according to a new study being presented next week at the annual meeting of the Radiological Society of North America (RSNA).

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Rupa Radhakrishnan, M.D.

Opioid use in pregnancy has become a major public health crisis. Opioids can have a devastating effect on maternal, fetal and infant health. When babies who have been exposed to opioids in utero are born, they suffer from drug withdrawal, or a group of conditions known as neonatal abstinence syndrome (NAS). Exposure to opioids in utero is believed to have lasting consequences on brain development and behavior.

According to the researchers, NAS requires prolonged hospital stays, monitoring and, in severe cases, additional treatment with opioids. Understanding how opioids affect the developing brain would be one of the important steps in early identification and management of NAS and in improving neurodevelopmental and behavioral outcomes in these children.

"Little is known about brain changes and their relationship to long-term neurological outcomes in infants who are exposed to opioids in utero," said Rupa Radhakrishnan, M.D., assistant professor of radiology and imaging sciences at Indiana University School of Medicine in Indianapolis. "Many studies have looked at the impact of long-term opioid use on the adult and adolescent brain, but it is not clear whether social and environmental factors may have influenced those outcomes. By studying infants' brain activity soon after birth, we are in a better position to understand the effect of opioids on the developing brain, and explain how this exposure could influence long-term outcomes in the context of other social and environmental factors."

A team of obstetricians, neonatologists, psychologists and imaging scientists collaborated to study the brains of 16 infants using resting state functional MRI (fMRI), which enables researchers to measure brain activity by detecting changes in blood flow. With resting state fMRI, the connectivity between neural regions—known as resting state networks—can be observed while the brain is at rest.

The research team, led by Dr. Radhakrishnan, investigated the functional connectivity of the amygdala, a region responsible for the perception and regulation of emotions such as anger, fear, sadness and aggression.

The study group included 16 full-term infants, including eight exposed to opioids prenatally and eight who were not exposed to prenatal opioids, or opioid naive. Imaging, including fMRI and anatomical MRI, was performed while the infants were naturally asleep.

To determine the participation of the amygdala in the resting state networks, the team created brain maps and applied regions of interest for the left and right amygdala.

"Our early results show significant differences in the way the amygdala connects to different brain regions between the infants exposed to opioids and the opioid-naive infants," Dr. Radhakrishnan said. "We still need to study what the clinical implication of this finding may be."

Dr. Radhakrishnan said larger and long-term outcome studies are underway to better understand the functional brain changes in prenatal opioid exposure and their associated long-term developmental outcomes.

"Although our early results showed differences between the two groups in a small study sample, it is very important that we further investigate and validate these findings in larger studies," she said. "In order to identify the best methods for managing NAS and improving long-term outcomes in these infants, it is critical to understand changes in brain function that may result from exposure to opioids prenatally."

Co-authors are Nahla Elsaid, Ph.D., Thomas A. Reher, M.D., Andrew J. Saykin, Psy.D., Abbey C. Hines, Psy.D., Izlin Z. Lien, M.D., Emily Scott, M.D., Karmen Yoder, Ph.D., and Yu-Chien Wu, M.D., Ph.D.

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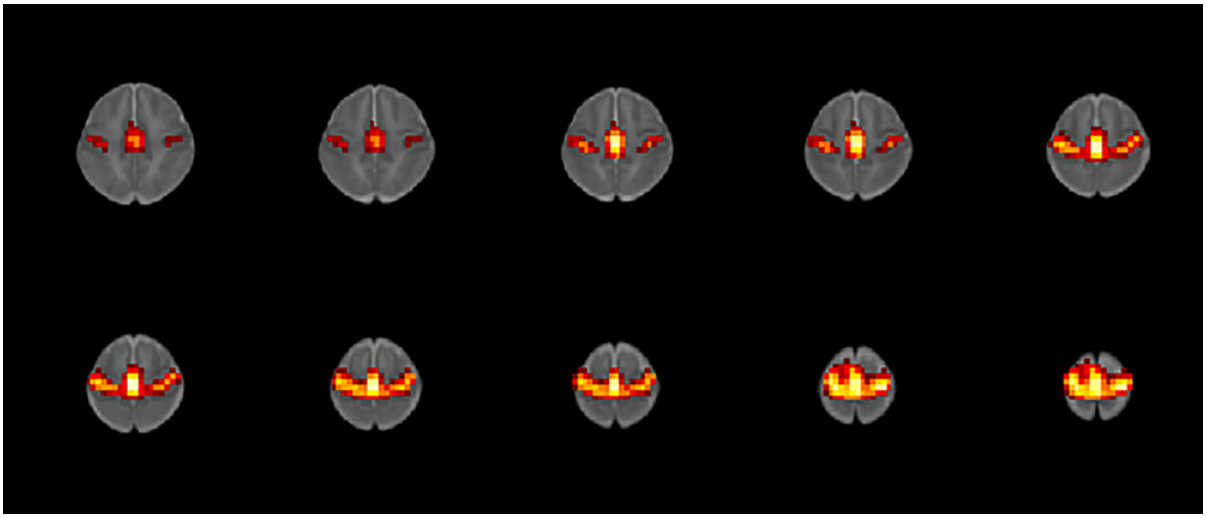

**Figure 1.** Group independent component analysis of resting state functional MRI obtained as a part of this study showing one of the resting state networks of the brain.
High-res (TIF) version

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