

Opioid-dependent mothers with reduced oxytocin levels give fewer gentle touches to babies

7 November 2019



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Mothers being treated for opioid-dependency showed impaired responsiveness and sensitivity to their babies, compared to mothers not dependent on opioids but similar in socioeconomic and lifestyle factors.

The opioid-dependent mothers' sensitivity deficits were associated with reduced oxytocin (OT) release. OT, which is made in the hypothalamus of the brain, is normally released during mothers' interactions with their babies, as well as during lactation and labor.

Katrina Daigle made these discoveries when she was a psychology graduate student at the University of Maine.

UMaine psychology professor Marie Hayes advised Daigle, who now is a clinical psychology doctoral student at Suffolk University. Daigle, from Glenburn, Maine, also works as a graduate study research assistant in the Chu Laboratory at Massachusetts General Hospital.

"Understanding this [opioid use](#)—maternal behavior relationship is necessary to improve the behavioral outcome for these children and through that, improve the future of societies impacted by the opioid epidemic," says Daigle.

"My long-standing fascination with the development of complex [human behavior](#) and the brain processes that drive them drew me to the study of psychology. Growing up just outside of Bangor, Maine, I found myself interested with the opioid crisis and how it may impact the future of our society through behavior.

"In this way, focusing on how opioids impact maternal responsiveness and [infant development](#) was an important gap in the research literature to be studied."

Pairs of mothers and their 4-to-6-month old babies took part in the study.

Opioid-dependent mothers were recruited from Maine opioid treatment programs.

And mothers not dependent on opioids were recruited from Northern Light Health Eastern Maine Medical Center family medicine practice and the Women, Infants, and Children (WIC) program.

Mothers who hadn't been exposed to opioids were matched to opioid-dependent mothers in terms of socioeconomic status, verbal ability, psychiatric status, and use of alcohol, tobacco and cannabis during pregnancy.

Daigle found that maternal opioid use dampens oxytocin (a core social neuropeptide) response, and may contribute to less-responsive maternal behaviors toward their infants.

Baseline oxytocin was determined after mothers were briefly separated from their infants and compared to oxytocin following their reunion during a standard attachment task which is called the Still Face paradigm.

Edward Tronick, a psychology professor at the University of Massachusetts Boston, designed the paradigm.

Oxytocin levels in the mothers' saliva correlated strongly with sensitive and prosocial maternal behaviors in response to infant initiation, as has been found in human and animal studies, says Daigle.

To begin, for two minutes, mothers were asked to face their babies (in infant seats) and engage with them at eye level like they would at home.

After a 15-second "reset" when mothers looked at the ground, for the next two minutes, mothers were asked to gaze at their babies and maintain a still—expressionless—face. They also were asked to stay silent and not touch or respond to their children.

During "still face," infants often become upset when their mothers do not engage with or react to them.

After another 15-second reset, mothers and children "reunited" for two minutes to interact and play. Daigle asked mothers to play with their babies for an additional 10 minutes to allow optimal increase of oxytocin levels in their saliva.

During the reunion, or recovery, phase, Daigle says opioid-exposed mothers responded with fewer gentle touches.

They also had mismatched responses to their distressed babies, including smiling when the baby cried.

In contrast, mothers not affected by opioids were silent and gave more gentle touches when their babies cried during the reunion phase.

The opioid-dependent mothers' actions didn't help their infants recover, says Daigle. That could negatively affect mother-infant attachment, child

stress adaptation over the long-term, as well as the children's social, emotional, behavioral and cognitive development.

Childbearing women are among the 2.5 million people in the United States impacted by opioid addiction.

Methadone, the most-common opioid replacement/treatment pharmaceutical, crosses the placental barrier between a pregnant woman and fetus. It's been found to lead to neonatal abstinence syndrome (NAS), or withdrawal symptoms, for 60–80% of exposed newborns. And prenatal opioid exposure and NAS are associated with infant neurobehavioral deficits.

While NAS has been frequently studied, Daigle says not a lot is known yet about the impact of maternal opioid treatment on maternal responsivity.

And maternal psychological competence—behaviors, skills and strategies that promote positive and adaptive child development outcomes—is critical for infant care.

Daigle suggests parent skills training for opioid-exposed mothers, as well as possible pharmaceutical intervention to improve oxytocin functioning during this critical stage of mother-child bonding.

She encourages cautious interpretation of the study's preliminary findings. The sample size was small and the mothers' experience of having a baby withdrawing from addiction also may impact their maternal behaviors.

A mother's ability to engage with a newborn also may be a function of the mother's recovery process as well as stability in income, housing and support structure, says Daigle.

In addition to Hayes, Daigle collaborated with Julie Gosse, a UMaine associate professor of molecular and biomedical sciences. Gosse led the oxytocin peptide analysis with then-UMaine biochemistry Ph.D. candidate Juyoung Shim, now a lecturer of biology at the University of Maine Augusta, and Husson University professor of pharmacology

William Lindblad.

Siena College professor Nicole Heller, a former doctoral student of Hayes, led the design, maternal-infant measures and statistics, and conceptual aspects of the study.

Dr. Mark S. Brown, chief of pediatrics at Northern Light Eastern Maine Medical Center, was a central collaborator. He medically treated mothers and infants and managed neonatal abstinence syndrome.

Developmental Psychobiology published the research article titled "Maternal responsivity and oxytocin in [opioid-dependent mothers](#)."

More information: Katrina M. Daigle et al. Maternal responsivity and oxytocin in opioid?dependent mothers, *Developmental Psychobiology* (2019). [DOI: 10.1002/dev.21897](https://doi.org/10.1002/dev.21897)

Provided by University of Maine

APA citation: Opioid-dependent mothers with reduced oxytocin levels give fewer gentle touches to babies (2019, November 7) retrieved 3 March 2021 from <https://medicalxpress.com/news/2019-11-opioid-dependent-mothers-oxytocin-gentle-babies.html>

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