Microparticles from the placenta may offer major clues on the in utero development of neurobehavioral disorders

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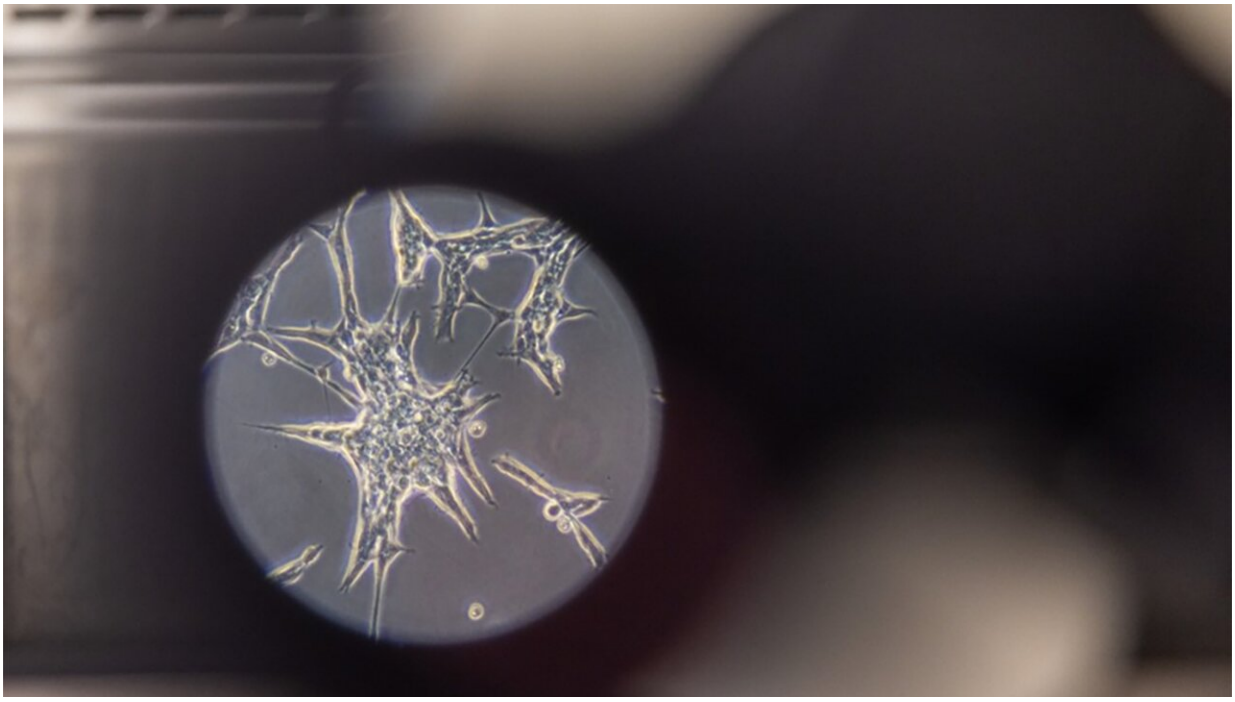

In the study, the researchers analyzed mouse neural progenitor cells prior to placental-derived extracellular vesicles treatment. Credit: University of Missouri

For 30 years, Cheryl Rosenfeld has studied how biological information gets transferred from mothers to babies during pregnancy. The research is personal for Rosenfeld, whose niece, Sara, was exposed to sedative

drugs in utero. Although the little girl was born healthy, she started developing respiratory, neurological, and other health issues in her teenage years.

"While I can't reverse what was done to my niece, Sara, I can try to prevent similar things from happening to other children by learning more about how biological information gets transported during pregnancy," said Rosenfeld, a professor of biomedical sciences at the University of Missouri College of Veterinary Medicine. "The sooner we can identify abnormalities in fetal brain development, the sooner we can diagnose the potential for disorders to surface later in the baby's life."

Special delivery

The placenta, an organ that develops in the uterus during pregnancy, has a big job. It allows the fetus to communicate with its mother by transferring proteins, lipids, micro RNA, and neurotransmitters to the fetal brain during pregnancy. For the first time—thanks to Rosenfeld's recent study—researchers are learning exactly how that biological information is shuttled to the developing brain.

Rosenfeld found that microscopic extracellular vesicles—bubble-like microparticles produced by placental cells—act as a protective "shipping-and-handling" mechanism transporting important biological information from the placenta to emerging neurons.

The findings could lead to earlier diagnosis of neurological disorders, including autism spectrum disorders (ASD) or schizophrenia.

"We've long known what information travels between the placenta and fetal brain, but we've never known how it gets there," Rosenfeld said. "The extracellular vesicles are the missing link." Sampling such structures either during pregnancy through the maternal blood or at birth

via the placenta it may lead to early diagnosis and the ability to even prevent such neurobehavioral diseases.

Currently, individuals with neurological disorders may not get diagnosed until clinical signs and symptoms arise (which might not be until the individual is a few years old). If disorders could be identified during pregnancy, interventions can begin much sooner, ultimately leading to improved long-term health outcomes.

A pioneer in her field

Rosenfeld's research has also helped scientists and health care professionals better understand how medications or chemicals that are exposed to the fetus through pregnant mothers can potentially lead to long-term harm unintentionally.

For example, her 2022 study found prenatal opioid exposure may trigger neurological and behavioral changes later in life. Her 2021 study found that placentas exposed to bisphenol A (BPA) from the mother could negatively impact the fetal brain development of the offspring.

In 2021, Rosenfeld was named a Fellow of the American Association for the Advancement of Science (AAAS) in the Medical Sciences division for her efforts to advance biomedical sciences and her distinguished contributions to the field of reproductive biology.

"Extracellular vesicles from mouse trophoblast cells: Effects on neural progenitor cells and potential participants in the placenta-brain axis" was published in *Biology of Reproduction*.

More information: Jessica A Kinkade et al, Extracellular vesicles from mouse trophoblast cells: Effects on neural progenitor cells and potential participants in the placenta–brain axis, *Biology of Reproduction*

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