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Specific genetic cause of fetal alcohol-related developmental disorders found

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Alcohol consumption by pregnant women hinders brain development in their children by interfering with the genetic processes that control thyroid hormone levels in the fetal brain, a new animal study found.

Fetal alcohol exposure—even from moderate drinking during pregnancy—can cause neurodevelopmental disorders, such as emotional behavioral disorders and deficits in learning, memory and speech. There is currently no treatment for these problems, said the author who will present the study results, Laura Sittig, a student at Northwestern University Feinberg School of Medicine.

Past animal research shows that some of these lasting cognitive impairments occur because alcohol consumption during pregnancy decreases the level of maternal thyroid hormones and, therefore, fetal thyroid hormones.

"Specific concentrations of thyroid hormones must be available in the fetal brain to support normal neurological development," Sittig said.

One of the enzymes that control thyroid hormone levels in the fetal brain is the iodothyronine deiodinase type III, or Dio3, she explained.

Sittig and her colleagues hypothesized that alcohol exposure in the womb leads to cognitive impairments by inducing epigenetic alterations—changes to DNA that do not alter the actual DNA sequence—of developmental genes like Dio3 in the fetal brain. To

investigate this hypothesis, they used rats to model moderate alcohol consumption during pregnancy.

The study, which was funded by the National Institutes of Health, demonstrated that fetal alcohol exposure disrupts the epigenetic "imprinting" of Dio3. In this process, Dio3 normally originates from the father's gene, while the maternal gene is silenced by epigenetic control. But alcohol exposure changes the paternal-maternal dosage of Dio3, which increases the amount of the enzyme present in specific brain regions of the fetus, the authors found.

This increase, in turn, reduces the availability of vital thyroid hormones in the parts of the brain that control learning, memory and emotional behaviors.

"In light of our current finding, we can begin testing specific dietary supplements that could reverse the epigenetic alterations that disrupt the regulation of Dio3," Sittig said. "When given to the mother or newborn, this might correct the imprinting deficits induced by alcohol."

"This is a promising avenue to improve the prognosis of alcohol-related neurodevelopmental disorders, for which we currently have no intervention strategy," she said.

Source: The Endocrine Society (news : web)