Medical Xpress

Study explores how environmental exposures before conception may impact fetal development

March 17 2021

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Older age at the time of conception and alcohol consumption during pregnancy have long been known to impact fetal development.

Now, a new report published in *Proceedings of the National Academy of Sciences* suggests older age and alcohol consumption in the year leading up to conception also may have an impact by epigenetically altering a specific gene during development of human eggs, or oocytes.

Although the study did not determine the ultimate physical effects of this change, it provides important insights into the intricate relationship between environmental exposures, genetic regulation and human development.

"While the outcome of the change isn't clear, our findings give us a valuable look into how environmental factors affect gene regulation through epigenetics and imprinting," said Peter A. Jones, Ph.D., D.Sc. (hon), Van Andel Institute chief scientific officer and the study's senior author. "A better understanding of these complex processes further our understanding of health and disease and—one day—may be the foundation for new disease prevention measures."

Today's study centers on a gene called *nc886*, which is one of about 100 "imprinted" genes that pass from the mother to the fetus. Imprinted genes retain important chemical tags applied by either the mother or the father before conception. The result is an "epigenetic memory" through which non-genetic information, such as maternal age, may flow directly from parent to offspring. To date, *nc886* is the only known imprinted gene that exhibits variation in the likelihood of imprinting based on maternal factors.

Using data from 1,100 mother-child pairs from South Africa, Jones and colleagues found the imprinting of *nc886* was increased in older mothers but decreased in mothers who drank alcohol the year before conception. The team also investigated cigarette smoking but found no impact on imprinting of *nc886*.

A 2018 study published by Jones and his collaborators demonstrated that failure to imprint *nc886* was associated with higher body mass in children at five years of age. Research by other groups also have linked failure to imprint *nc886* with increased survival in people with acute myeloid leukemia, an aggressive type of blood cancer. Most recently, a group in Taiwan found that lack of imprinting on *nc886* may reduce response to an anti-diabetic drug.

More information: Brittany L. Carpenter et al, Oocyte age and preconceptual alcohol use are highly correlated with epigenetic imprinting of a noncoding RNA (nc886), *Proceedings of the National Academy of Sciences* (2021). DOI: 10.1073/pnas.2026580118

Provided by Van Andel Research Institute