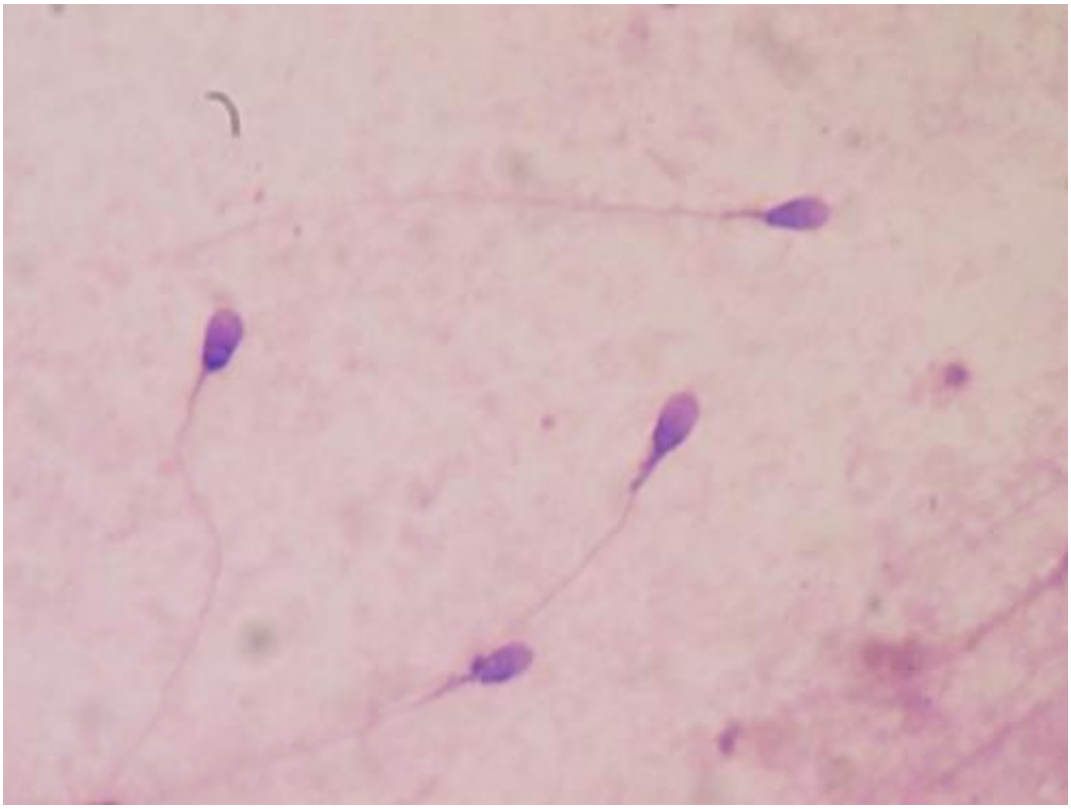
Paternal sperm may hold clues to autism

April 15 2015



Human sperm stained for semen quality testing in the clinical laboratory. Credit: Bobjgalindo/Wikipedia

In a small study, Johns Hopkins researchers found that DNA from the sperm of men whose children had early signs of autism shows distinct patterns of regulatory tags that could contribute to the condition. A detailed report of their findings will be published online in the *International Journal of Epidemiology* on April 15.

Autism spectrum disorder (autism) affects one in 68 children in the U.S. Although studies have identified some culprit genes, most cases remain unexplained. But most experts agree that autism is usually inherited, since the condition tends to run in families. In this study, investigators looked for possible causes for the condition not in genes themselves, but in the "epigenetic tags" that help regulate genes' activity.

"We wondered if we could learn what happens before someone gets autism," says Andrew Feinberg, M.D., M.P.H., the King Fahd Professor of Molecular Medicine and director of the Center for Epigenetics at the Johns Hopkins University School of Medicine. "If epigenetic changes are being passed from fathers to their children, we should be able to detect them in sperm," adds co-lead investigator Daniele Fallin, Ph.D., professor and chair of the Department of Mental Health in the Bloomberg School of Public Health and director of the Wendy Klag Center for Autism and Developmental Disabilities.

In addition to being easier to sample than egg cells from women, sperm are more susceptible to environmental influences that could alter the epigenetic tags on their DNA. Feinberg, Fallin and their team assessed the epigenetic tags on DNA from sperm from 44 dads. The men were part of an ongoing study to assess the factors that influence a child early on, before he or she is diagnosed with autism. The study enrolls pregnant mothers who already have a child with autism and collects information and biological samples from these mothers, the new baby's father and the babies themselves after birth. Early in the pregnancy, a sperm sample was collected from fathers enrolled in the study. One year after the child was born, he or she was assessed for early signs of autism using the Autism Observation Scale for Infants (AOSI).

The researchers collected DNA from each sperm sample and looked for epigenetic tags at 450,000 different positions throughout the genome. They then compared the likelihood of a tag being in a particular site with

the AOSI scores of each child. They found 193 different sites where the presence or absence of a tag was statistically related to the AOSI scores.

When they looked at which genes were near the identified sites, they found that many of them were close to genes involved in developmental processes, especially neural development. Of particular interest was that four of the 10 sites most strongly linked to the AOSI scores were located near genes linked to Prader-Willi syndrome, a genetic disorder that shares some behavioral symptoms with autism. Several of the altered epigenetic patterns were also found in the brains of individuals with autism, giving credence to the idea that they might be related to autism.

The team plans to confirm its results in a study of more families and to look at the occupations and environmental exposures of the dads involved. There is currently no genetic or epigenetic test available to assess autism risk.

Provided by Johns Hopkins University School of Medicine