Genetic errors linked to life-threatening pregnancy disorder

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Scientists have identified genetic errors in women with autoimmune diseases that increase the risk of preeclampsia, a potentially life-threatening condition that occurs in 10 percent of all pregnancies.

The researchers also found the same mutations in some women with preeclampsia who don't have underlying autoimmune diseases. Their findings provide genetic targets for new treatments and suggest that screening tests could one day identify women at risk of the condition, which accounts for 15 percent of all preterm births.

"We're going to need to confirm these links in a larger study, but if they are validated it may be possible to develop better ways to identify and treat women at risk," says senior author John P. Atkinson, MD, of Washington University School of Medicine in St. Louis.

Preeclampsia typically develops after the 20th week of pregnancy. It causes dangerously high blood pressure, protein in the urine, headaches and swelling of a mother's hands and face. The only treatment is to induce delivery, which can be fatal to the baby if preeclampsia strikes too early in pregnancy.

The research, published March 22 in PLoS: Medicine, is an international collaboration among researchers at Washington University, Weill Cornell Medical College, the University of Utah at Salt Lake City, Newcastle University in the United Kingdom and the Georges-Pompidou Hospital of Paris.

Preeclampsia results from a breakdown of the placenta, which delivers oxygen and nutrients to the baby. If the condition is not treated, preeclampsia can lead to seizures, strokes, kidney and liver damage and breathing problems that threaten the lives of both mother and baby.

Scientists have suspected that problems with the immune system provoke many cases of preeclampsia because women with lupus and certain other autoimmune diseases have an increased risk of the disorder.

"Preeclampsia seems to involve multiple hits," says Atkinson, the Samuel B. Grant Professor of Medicine. "First you may have a genetic predisposition for small blood vessels, which can worsen problems with inflammation. Then maybe you have lupus or another autoimmune condition. Then along comes pregnancy, which is a major source of stress on the organs."

For the new study, researchers studied 250 pregnant women with lupus and/or a related condition, antiphospholipid antibody syndrome. Thirty of the women developed preeclampsia during the study, and 10 had suffered from the condition in previous pregnancies.

In these 40 women, researchers looked at three genes involved in the body's immune response to injury and infection. They found seven women had mutations in at least one of these genes.

The scientists also found the mutations in five of 59 pregnant women with preeclampsia who did not have an underlying autoimmune disease.

Researchers zeroed in on the three genes because of their link to atypical hemolytic uremic syndrome, a rare, but potentially fatal disorder that triggers an out-of-control immune response.

A drug treatment for atypical hemolytic uremic syndrome that suppresses the immune response is now in clinical trials. According to Atkinson, if further research confirms the links between immune system dysfunction and preeclampsia, it may be possible to adapt the drug, called eculizumab, to treat preeclampsia in at-risk mothers.

The researchers now plan to study additional pregnant women and other genes known to play a role in regulating immune response to further understand the genetic links to preeclampsia.

More information: Salmon JE, Heuser C, Triebwasser M, Liszewski MK, Kavanagh D, Roumenina L, Branch DW, Goodship T, Fremeaux-Bacchi V, Atkinson JP. Mutations in complement regulatory proteins predispose to preeclampsia: a genetic analysis of the PROMISSE cohort. *PLoS Medicine*, March 22, 2011. www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.1001013

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