Further dangers of smoking while pregnant revealed by new study

January 30 2015

New research into smoking while pregnant

Smoking while pregnant causes chemical changes to the DNA of a foetus detectable from as early as 12 weeks and may predispose children born to smokers to a range of health conditions which last throughout life, new research by Scottish academics has revealed.

Their findings, published today in *BMC Medicine*, add significant weight

to existing knowledge of the dangers of smoking while pregnant and show that risks may be even greater than previously thought.

The study, by researchers from the universities of Aberdeen, Edinburgh and Glasgow, together with Professor Kevin Sinclair from the University of Nottingham, showed that maternal smoking leads to crucial changes in chemical tags known as 'epigenetic marks' which are normally attached to DNA. These epigenetic marks, known as DNA methylation, can affect how genes function. The researchers were able to show for the first time that such changes are present in the livers of foetuses of between 12 and 20 weeks gestation.

Professor Paul Fowler, from the University of Aberdeen who led the Medical Research Council funded project, said: "We identified changes in DNA methylation of genes which are crucial for the growth and development of a baby when a mother smokes.

"These findings strengthen and extend previous studies by showing that such changes are detectable during second trimester development. This is a clear demonstration that maternal smoking early in pregnancy can programme incorrect development of the liver, which is a vital organ both in the foetus and, of course, after birth.

"This is significant because a worryingly high number of women will continue to smoke during pregnancy and the observed effects of DNA methylation may become amplified with ongoing exposure to cigarette smoke in the womb."

Despite current health warnings, it is estimated that the prevalence of smoking during pregnancy remains high. In developed countries up to 25% of pregnant women smoke and fewer than 4% stop smoking while pregnant.

These early changes in DNA methylation may mean the baby is more susceptible to a range of diseases in the future.

Dr Amanda Drake from the University of Edinburgh said: "From as early as the second trimester, a baby whose mother smokes is at an increased risk of developing obesity, cardiovascular disease, cognitive problems and asthma and this risk lasts throughout life. The liver is a key metabolic target tissue and changes here are likely to have a direct effect on foetal development and long-term health.

"The research also suggests that these changes in DNA methylation may occur as a consequence of changes in enzymes and compounds (including the important vitamin B12) which are necessary for DNA methylation, in the liver of foetuses of mothers who smoke."

Professor Peter O'Shaughnessy from the University of Glasgow added: "Our study also detected important sex differences in foetal liver function. We found that exposure to maternal smoking resulted in the livers of male foetuses becoming more like female livers and vice-versa.

"Differences in tissues and organs between the sexes are known to be important for health. Our study demonstrates that maternal smoking is disturbing these normal sex differences, even in the second trimester human foetus."

Professor Paul Fowler concluded: "This is the first time such changes have been detected so early in pregnancy and this study demonstrates another way in which the burden of maternal smoking persists into adulthood, with these babies more likely to grow up to be obese and diabetic."

More information: The full academic paper can be viewed online at www.biomedcentral.com/1741-7015/13/18

Provided by University of Aberdeen