Length of pregnancy alters the child's DNA

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Researchers from Karolinska Institutet in Sweden have, together with an international team, mapped the relationship between length of pregnancy and chemical DNA changes in more than 6,000 newborn babies. For each week's longer pregnancy, DNA methylation changes in thousands of genes were detected in umbilical cord blood. The study is published in *Genome Medicine*.

Premature birth, that is before 37 consecutive weeks' of pregnancy, is common. Between 5 and 10% of all children in the world are born prematurely. Most children will develop and grow normally, but premature birth is also linked to respiratory and lung disease, eye problems and neurodevelopmental disorders. This is especially true for children who are born very or extremely prematurely. During the fetal period, epigenetic processes, i.e., chemical modification of the DNA, are important for controlling development and growth. One such epigenetic factor is DNA methylation, which in turn affects the degree of gene activation and how much of a particular protein is formed.

"Our new findings indicate that these DNA changes may influence the development of fetal organs," says Simon Kebede Merid, first author of the study and Ph.D. student at Karolinska Institutet, Department of Clinical Science and Education, Södersjukhuset.

The majority of observed DNA methylations at birth tended not to persist into childhood, but in 17% the levels were completely stable from birth to adolescence. The levels that you are born with in certain genes thus track with age.

"Now we need to investigate whether the DNA changes are linked to the health problems of those born prematurely," says Professor Erik Melén, at the Department of Clinical Science and Education, Södersjukhuset.

Epigenetics is a hot research topic that links genes, the environment and health. This work was done within the international Pregnancy and Childhood Epigenetics (PACE) consortium. The work represents contributions from 26 studies. Professor Melén's group also contributed to the first PACE paper which showed that mother's smoking during pregnancy changes DNA in newborns and lead two PACE studies showing effects of air pollution. Links to diseases such as asthma, allergy, obesity and even aging have also been shown.

"We hope that our new findings will contribute valuable knowledge about fetal development, and in the long term new opportunities for better care of premature babies to avoid complications and adverse health effects," says Erik Melén.

More information: Simon Kebede Merid et al, Epigenome-wide meta-analysis of blood DNA methylation in newborns and children identifies numerous loci related to gestational age, *Genome Medicine* (2020). DOI: 10.1186/s13073-020-0716-9

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