MedicalXpress

Children's body fatness linked to decisions made in the womb

August 22 2012

New born human infants have the largest brains among primates, but also the highest proportion of body fat. Before birth, if the supply of nutrients from the mother through the placenta is limited or unbalanced, the developing baby faces a dilemma: should resources be allocated to brain growth, or to fat deposition for use as an energy reserve during the early months after birth?

Scientists at the University of Southampton have shown that this decision could have an effect on how fat we are as children.

In new research, published in the journal PLoS ONE today, scientists at the Medical Research Council (MRC) Lifecourse Epidemiology Unit at the University, performed ultrasound scans on 381 pregnant women taking part in the Southampton Women's Survey. They measured the blood flow from the placenta to the unborn baby, and the distribution of this blood to either the liver of the baby or bypassing the liver to supply the brain and heart. This was then compared with the infant's body fatness at birth and at four years old.

The findings show that greater blood flow to the baby's liver in late pregnancy was associated with greater body fatness in the infant at birth and at age four. In contrast, lower liver blood flow and a "brain-sparing" blood flow pattern (when the blood bypasses the liver and goes to the brain) occurred when the placenta was smaller and less able to meet baby's demand for essential nutrients in the womb.

These findings were independent of an association between mother's body fatness and the body fatness of her infant.

Keith Godfrey, Professor of Epidemiology and Human Development, at the University who led the study, explains: "In our evolutionary past, the demands of a big brain have led the unborn baby to develop blood flow responses which preserve nutrient delivery to the brain when the supply of essential nutrients from the mother cannot meet the baby's requirements.

"However, having a big brain has also led to evolution of a strategy to adjust blood flow through the baby's liver, which enables the liver to produce more fat Â– this acts as an energy reserve, protecting brain development during periods of illness or under-nutrition in early infancy. Our data suggests that evolution of this strategy has brought with it a predisposition to obesity and later diabetes in contemporary societies with abundant nutrition in later postnatal life."

Professors Guttorm Haugen from the University of Oslo and Torvid Kiserud from the University of Bergen were part of the research team. They comment: "An interpretation of our findings is that there could be programmed effects on the liver that arise from blood flow adaptations in the womb and predispose individuals to gain excess body fat. Although further studies are needed, our findings add weight to current concerns that the current epidemic of childhood obesity and associated disorders may partly have its origins through adaptations made by the developing baby during pregnancy."

Professor Mark Hanson, Director of the University of Southampton's Human Development and Health Academic Unit, adds: "If the supply of nutrients across the placenta is inadequate or unbalanced, the unborn baby has to decide whether to prioritise fat deposition or spare brain growth Â– it does this by changing the amount of blood flowing to the

liver and brain. A decision to increase blood flow to the liver has lasting implications for the child's body fatness.

"Transfer processes across the placenta for some nutrients such as glucose evolved in environments less affluent than those now prevalent in developed populations, and our findings additionally suggest that in circumstances of maternal obesity and nutrient excess these processes now also lead to excessive fat deposition in the womb."

"This strengthens the case for all women of reproductive age having greater access to nutritional, education and lifestyle support to reduce the risk of obesity in their children and improve the health of the next generation."

Professor Cyrus Cooper, Director of the MRC Lifecourse Epidemiology Unit comments: "This study is part of a wider body of work by the MRC Lifecourse Epidemiology Unit into how factors during pregnancy might have a long-term influence on childhood growth and development. This is a wonderful example of multi-disciplinary research using the unique clinical resource provided by the Southampton Women's Survey."

Provided by University of Southampton

Citation: Children's body fatness linked to decisions made in the womb (2012, August 22) retrieved 27 April 2024 from https://medicalxpress.com/news/2012-08-children-body-fatness-linked-decisions.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.