Maternal Stress During Pregnancy Has Long-Term Effects on Development

Evidence has been building that maternal stress during pregnancy can have long-term effects on the children's development outcomes, including lower birth weight, risk for metabolic syndrome as well as cognitive, emotional and behavioral problems. This finding may be an example of what has been called "fetal programming". Fetal programming means that experiences during gestation can change the way in which the child's mind and body respond later in life, probably through a process called "epigenetics". This phenomenon is also called the Barker's Hypothesis after the scientist who first proposed it (Barker, 2004).

We have known for many years that a person's characteristics are determined by an interaction between their genetic heritage, provided by their biological parents, and their environment. More recently, the science of epigenetics is providing answers about how this interaction occurs. Both human and animal research has demonstrated that different environmental conditions turn individual genes "on" or "off" through the processes of methylation and histone modification that can alter the expression of genes without changing the inherited DNA.

Since the way in which genes are expressed determines a person's characteristics, conditions that affect this expression can have long-term effects. Study of "fetal programming" began by looking at the relationships between maternal nutrition, low birth weight and adult health. Early studies found that low birthweight babies had a higher risk for obesity, type-2 diabetes, high blood pressure and cardiac problems when they reached adulthood. More recently, maternal stress during gestation has been linked with lower birthweight and anxiety. It is believed that this relationship results from the effects of stress hormones called glucocorticoids. When a person experiences a high level of stress, their body produces a

hormone called cortisol. In the short term, cortisol helps the body respond to the stressful situation by providing an energy boost and focusing the body's resources to deal with the perceived danger. However, when there is chronic, high level stress, this same hormone can suppress immunity, making the body more vulnerable to disease. It can also raise blood pressure and affect the way the body uses nutrients. There is also increasing evidence that such stress can affect the child's mental and emotional health (Davis & Sandman, 1010)

It is likely that the effects of maternal stress during pregnancy on the child are the result of the exposure of the fetus to cortisol. It is believed that chronic stress can alter the expression of genes in the fetus which persist into later life and result in mental and physical health problems. However, it is important to remember that these findings are the result of chronic and severe stress. Scientists investigated children of women who had experienced famine and war as well as natural disasters like earthquakes. Mild stress and the routine stress of everyday life have not been found to have negative effects for children. In addition, pregnant women who have good social support and adequate nutrition are less affected.

For more information about the effects of stress in pregnancy, here are some articles.

Barker, DJP (2004). The Developmental Origins of Adult Disease. *Journal of the American College of Nutrition* (American College of Nutrition) **23** (6): 588S–595S.

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Weinstock, M (2008) the long-term behavioural consequences of prenatal stress. *Neuroscience and Biobehavioral Reviews*, 32, 1073-1086.

For further information regarding this article please contact Dr. Claire D. Coles at the Center for Maternal Substance Abuse and Child Development, Emory University School of

Medicine, Department of Psychiatry and Behavioral Sciences, 12 Executive Park Drive NE, Atlanta, Georgia, 30329. You can also phone us at 404-712-9814 or visit our website at http://www.emory.edu/MSACD

The Center for Maternal Substance Abuse and Child Development is funded by the Georgia Department of Behavioral Health and Developmental Disabilities