Society for Endocrinology - Media Release

Embargoed until 18:00 BST, Tuesday 8 April 2008

Heart disease predetermined by oxygen levels in the womb

The amount of oxygen available to a baby in the womb can affect their susceptibility to developing particular diseases later in life. Research presented at the annual Society for Endocrinology BES meeting in Harrogate shows that your risk of developing cardiovascular disease can be predetermined before birth, not only by your genes, but also by their interaction with the quality of the environment you experience in the womb.

Researchers at the University of Cambridge, led by Dr Dino Giussani, examined the role that oxygen availability in the womb plays in programming your susceptibility to different diseases. His group found that babies that don't receive enough oxygen in the womb (e.g. due to pre-eclampsia or placental insufficiency) are more likely to suffer from cardiovascular disease when they are adult. A reduction of oxygen levels in the womb can lead to reduced growth rates in the baby and to changes in the way that their cardiovascular, metabolic and endocrine systems develop. Combined, these alterations to the development of key systems in the body can leave the baby more prone to developing cardiovascular disease later in life.

Dr Giussani's research also indicates methods by which we can potentially combat this problem. The detrimental effects of low oxygen levels on the development of the unborn's cardiovascular system appear to be due to the generation of oxidative stress. Treatment with antioxidants in animal pregnancies complicated by low oxygenation can reverse these effects on the developing cardiovascular system and this could form the basis for new therapeutic techniques to prevent the early origin of heart disease in complicated human pregnancy.

Cardiovascular disease is the most common cause of death in the UK, accounting for 4 in every 10 deaths. Almost 2.6 million people are affected by heart and circulatory conditions in the UK, with someone having a heart attack every 2 seconds.

Scientist Dr Dino Giussani said:

"We have known for a while that changes in maternal nutrition can affect fetal development and influence disease susceptibility later in life, but relatively little work has investigated how low oxygen levels in the womb may affect infant development. Our research shows that changes to the amount of oxygen available in the womb can have a profound influence on the development of the fetus in both the short- and long- term, and trigger an early origin of heart disease.

Interestingly, the adverse effects on the developing heart and circulation of poor fetal oxygenation are due to oxidative stress. This gives us the opportunity to combat prenatal origins of heart disease by fetal exposure to antioxidant therapy. This may halt the development of heart disease at its very origin, bringing preventative medicine back into the womb."

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Notes for editors

The paper will be presented at the Society for Endocrinology BES meeting at 08:45 on Tuesday 8 April 2008. The abstract for this work is reproduced below: see http://www.endocrine-abstracts.org/ea/0015/ea0015S18.htm. This work was funded by the British Heart Foundation, The Royal Society, The Lister Institute for Preventive Medicine, the BBSRC and the Isaac Newton Trust.

In addition to normal enquiries, Dr Giussani will also be available for extended interviews from 09:00-11:00 on Wednesday 9 April 2008.

The Society for Endocrinology BES 2008 is Britain's biggest scientific meeting on hormones, and is taking place at the Harrogate International Centre, Harrogate, from 7-10 April 2008. For the full programme, please see http://www.endocrinology.org/meetings/2008/BES2008/prog/prog.aspx.

Please mention the Society for Endocrinology BES 2008 in any story.

The Society for Endocrinology is Britain's national organisation promoting endocrinology and hormone awareness. For general information, please visit our website: http://www.endocrinology.org

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ABSTRACT

Hypoxia: its short- and long-term effects on the developing fetus

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In addition to traditional risks, such as smoking and obesity, the quality of our prenatal development plays a role in determining whether we suffer disease. In turn, the quality of the intrauterine environment is largely determined by the available nutrient and oxygen supply to the growing young. As such, the association between poor conditions *in utero* and increased risk of disease in adulthood has exploded a number of studies investigating the effects of changes in materno-fetal nutrition on programming of disease. In contrast to this international research effort, the contribution of fetal hypoxia, of the type that can occur during pre-eclampsia or placental insufficiency, to developmental programming has been comparatively ignored. Further, the mechanisms underlying the early programming of disease in complicated pregnancy remain unknown, preventing the identification of potential therapeutic targets for clinical intervention. Here, we put forward the hypothesis that oxidative stress in the fetus underlies the

molecular basis via which prenatal hypoxia alters fetal growth and contributes to the developmental programming of disease. Observations in human pregnancy at high altitude and experiments in chick and rat embryos show that developmental hypoxia independent of changes in maternal nutrition not only alters the trajectory of fetal growth, but it also induces changes in the cardiovascular, metabolic and endocrine systems, which are normally associated with disease states in later life. Treatment with antioxidants of animal pregnancies complicated with reduced oxygen delivery to the fetus prevents the alterations in fetal growth, the fetal cardiovascular, metabolic and endocrine remodelling, and the increased oxidative stress. Combined, the human and experimental data support the hypothesis tested and the work offers both insight into mechanisms and possible therapeutic targets for clinical intervention against the early origin of disease in risky pregnancy.