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Study finds link between small birth size and changes to the cardiovascular system that predispose to disease in later life

Researchers have found the first evidence that smaller size at birth is associated with specific alterations in the functioning of the heart and circulation in children and that these changes differ between boys and girls.

The research by Dr Alexander Jones and colleagues, published online in Europe's leading cardiology journal, the *European Heart Journal* [1] today (Wednesday 23 July), adds to the evidence that adverse environments experienced by the baby before birth and indicated by low birth weight, can cause long-term changes in the heart and blood vessels, leading to heart and blood vessel disease in later life. So far, the mechanisms involved have been poorly understood, and there has been little research into the alterations that might occur during childhood.

Dr Jones, who was a clinical research fellow at the Medical Research Council's Epidemiology Resource Centre at the University of Southampton and Southampton General Hospital, UK, at the time of the research (he is now a Clinician Scientist at the UCL Institute of Child Health, London), studied 140 children aged between eight and nine, while they underwent a psychosocial stress test. Growing evidence suggests that measures of the way the heart and blood vessels function during stress reveal individual characteristics associated with a greater risk of hypertension (high blood pressure) and disease of the heart and blood vessels.

The children had been healthy babies, born in a maternity hospital in Southampton, and were within the normal birth weight range (with an average of 3.56 kg for boys and 3.41 kg for girls). They were asked to perform a public-speaking task involving storytelling followed by mental arithmetic while the performance of their heart and circulation was recorded using electrical sensors.

Dr Jones said: "In boys, we found that the lower their birth weight was, within the normal range, the more likely they were to have a higher vascular resistance – the resistance to flow that has to be overcome to push blood around the circulatory system – and higher blood pressure, particularly 25-30 minutes after the start of the stress test. This probably represents a prolongation of the vascular stress response in these boys.

"In contrast, girls who were smaller at birth did not demonstrate a specific response to stress. They consistently (whether under stress or at rest) showed evidence of greater activity in the sympathetic nervous system – the part of the nervous system that controls involuntary actions and becomes more active during stress, contributing to the 'fight or flight' response.

"This is the first evidence in children of relationships between size at birth and the later function of the heart and blood vessels. The sex differences in these relationships were striking and may eventually lead to a better understanding of why men and women tend to develop high blood pressure and heart or vascular disease at different times in their lives. It suggests that different underlying mechanisms for developing the same disorder may exist in the two sexes but have the same eventual result."

While the changes in the children's responses to stress did not show that they had any early indications of disease, Dr Jones said: "We have strong reasons to believe that children with more

exaggerated stress responses are more likely to become adults who develop hypertension and go on to develop heart or vascular disease earlier in life than those who do not demonstrate these greater responses.”

A strength of the study was that it was carried out in young children before puberty when it was unlikely that any disease processes would have started that might alter the results – unlike the situation in adults. “Thus, we can be more confident that the differences we are finding represent the very early indicators of processes that underlie later disease,” said Dr Jones.

“By highlighting these specific heart and circulatory changes in the developing child, we may, in the future, be able to develop interventions that target the origins of heart and circulatory diseases. These diseases are the world's biggest killers but their causes are still poorly understood and the vast majority of medical attention is given to their palliation once they have already occurred. I believe my studies and future studies will focus more on childhood in an effort to better understand the processes that lead to disease and to seek to reverse them before it is too late to do anything about it.”

(ends)

Notes:

[1] Sex-specific programming of cardiovascular physiology in children. European Heart Journal. doi:10.1093/eurheartj/ehn292.

**A pdf of the full paper is available on request from Emma Mason or is available at:
http://www.oxfordjournals.org/our_journals/eurheartj/press_releases/freepdf/ehn292.pdf**

The European Heart Journal is the flagship journal of the European Society of Cardiology (<http://www.escardio.org>). Please acknowledge the journal as a source in any articles.

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