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EVIDENCE OF ALTERED BIOCHEMICAL COMPOSITION IN THE MYOCARDIUM OF ADULT INTRAUTERINE GROWTH RESTRICTED OFFSPRING USING FTIR MICRO-SPECTROSCOPY: IMPLICATIONS FOR THE PROGRAMMING OF HEART DISEASE

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Background and aims: Epidemiological studies clearly link intrauterine growth restriction (IUGR) with increased risk of heart disease in adulthood; mechanisms leading to this increased risk are poorly understood. The aim of this study was to examine the biochemical composition of the left ventricular (LV) myocardium in adulthood in growth-restricted and non-growth-restricted rat offspring.

Methods: Wistar Kyoto (WKY) dams were fed either a low protein diet (LPD; 8.7% casein) or a normal protein diet (NPD; 20% casein) during pregnancy and lactation. At 18 weeks of age female offspring were anaesthetized, hearts arrested in diastole and perfusion fixed (NPD n=9; LPD n=7). Heart weights and myocardial wall volumes were measured. The biochemical composition of the LV myocardium was analyzed using Fourier transform infrared (FTIR) micro-spectroscopy.

Results: Body weights at postnatal day 4 were significantly lower and remained lower throughout the experimental period in the growth-restricted offspring compared to controls. At 18 weeks there were no significant differences in relative LV weights and LV wall volumes between the groups. FTIR analysis of the chemical images clearly demonstrated marked upregulation in the lipid, proteoglycan and carbohydrate content in the LV myocardium of the IUGR offspring.

Conclusions: IUGR hearts have an altered cardiac biochemical composition in adulthood compared to hearts from offspring that were non-growth-restricted. These changes in the biochemical composition of the myocardium provide a likely mechanism for the increased vulnerability to cardiovascular disease in growth-restricted offspring.