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Maternal, embryonic and fetal nutrition and the programming of obesity

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Given the marked increase in the global prevalence of obesity and the association between a high fat mass and the metabolic syndrome, type 2 diabetes and cardiovascular disease, there is intense interest in determining those factors which contribute to and amplify obesity. Associations have been demonstrated between the nutritional environment experienced before and immediately after birth, different patterns of postnatal growth and body fat mass in adult life. The extent to which such associations program an 'intergenerational cycle of obesity' is currently being debated. In this presentation, we will review the evidence for the relationship between prenatal and postnatal growth patterns and the development of fat mass. Either in vivo or ex vivo manipulation of the embryonic nutritional environment can program a subsequent increase in body fat mass. We have investigated the impact of in vitro culture of sheep embryos in different nutritional environments on the subsequent growth trajectory of the placenta, fetus and on the growth and development of visceral fat stores. We have also investigated the effects of an increase in maternal nutrition in late pregnancy on adipocyte gene expression and on the expression of neuropeptides which regulate appetite in adult life in the lamb at one month of age. These studies are important to help define those critical windows during an individual's lifespan when nutritional or other intervention strategies will have the maximum benefit in preventing the subsequent development of obesity