Bio-Scientific Aspects of Growth and Long-Term Health

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The incidence of obesity is increasing at an alarming rate and this worldwide epidemic represents an ominous predictor of increases in diseases such as type 2 diabetes and metabolic syndrome. Epidemiological and animals studies suggest that maternal obesity and alterations in postnatal nutrition are associated with increased risks for obesity, hypertension, and type 2 diabetes in the offspring. Furthermore, there is also growing appreciation that developmental programming of neuroendocrine systems by the perinatal environment represents a possible cause for these diseases (fig. 1). This lecture provides a synthesis of recent evidence concerning the actions of perinatal hormones and nutrition in programming the development and organization of neural circuits that regulate body weight and energy balance. Particular attention will be given to the neurotrophic actions of the adipocyte-derived hormone leptin on hypothalamic development.
Fig. 1. Developmental programming of brain metabolic pathways. The developmental programming of hypothalamic neuroendocrine systems by the perinatal environment represents a possible mechanism by which maternal obesity, gestational diabetes, and alterations in perinatal nutrition predispose the offspring to develop metabolic syndrome and altered energy balance. The hormones insulin and leptin are well positioned to signal alterations in the nutritional environment to the central nervous system and alter the development and activity of these neural circuits, which may result in abnormal regulation of metabolism later in life.