

resistance (HOMA-R) were measured. Ethical approval and consent were obtained.

**Subjects:** Children born in PMNS.

**Outcome measures:** Plasma leptin concentrations at 6 years.

**Results:** Plasma leptin concentration was higher in girls than boys (3.1 vs 2.4 ng/ml,  $p < 0.001$ ). Plasma leptin concentration was associated with adiposity and plasma glucose, lipids, and HOMA-R ( $p < 0.01$ , all). Those who were born thin (skin folds) but grew rapidly from 3 years had higher plasma leptin concentration. Higher maternal weight gain in early pregnancy and frequent consumption of fruits and milk products at 18 weeks gestation predicted higher leptin concentration ( $p < 0.01$ ), macronutrient intake and physical activity were not related. Higher maternal red cell folate concentrations at 18 & 28 weeks gestation and lower vitamin C concentrations at 28 weeks predicted higher leptin concentration in children at 6 years.

**Conclusions:** Maternal micronutrient food intake and high circulating folate concentrations in pregnancy predict plasma leptin concentration (and adiposity) in the offspring, suggesting intrauterine nutritional programming of adiposity.

#### 6D-5 Programming of hypothalamic neuropeptide gene expression in rats by early life nutrition

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**Aims:** Early life nutritional experiences are linked to altered susceptibility to obesity. The aim of this study was to see the effect of maternal diet on energy balance hypothalamic neuropeptides in early life.

**Study design:** Wistar rats were fed a control diet (20% protein) or an isocaloric low protein (LP) diet (8%) during pregnancy. Pups were cross-fostered to give 3 groups, control animals (offspring of control dams during pregnancy and lactation), recuperated animals (offspring of LP dams and suckled in litters of 4 by control dams) and postnatal low protein (PLP) animals (offspring of control dams that were suckled by LP dams in uncultured litters).

**Subjects:** Fed and fasted male rats at weaning.

**Outcome measures:** Leptin, insulin and glucose were measured and gene expression of energy balance hypothalamic neuropeptides evaluated using *in situ* hybridisation. Significance was determined by one-way ANOVA.

**Results:** Recuperated pups caught up in size with controls by day 21, yet were hypoleptinemic compared to controls when fed ( $p < 0.001$ ) and showed no drop in leptin concentration on fasting. Despite their lower fed leptin concentration, recuperated animals did not differ from controls in their hypothalamic gene expression. PLP offspring had lower body weight than controls, associated with hypoglycemia, hypoinsulinemia and hypoleptinemia and increased leptin receptor, NPY and AgRP gene expression and decreased POMC and CART gene expression in the ARC (all  $p < 0.05$ ).

**Conclusions:** These results suggest that the early nutritional environment can affect the regulation of energy balance circuits that could alter future obesity risk.

#### 6D-7 Prenatal exposure to famine and functional bowel disorders

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**Aims:** to assess whether prenatal exposure to the Dutch famine is associated with an increased risk of functional gastrointestinal disorders.

**Study design:** cohort study.

**Subjects:** 850 men and women (aged 58) born in the Wilhelmina Gasthuis in Amsterdam around the time of the Dutch famine, whose birth records have been kept.

**Outcome measures:** Rome II questionnaire.

**Results:** People exposed to famine in early gestation more often suffered from one or more functional bowel disorder (odds ratio 1.81, 95% confidence interval 1.04–3.15), in particular functional abdominal bloating (odds ratio 2.58, 95% confidence interval 1.27–5.26). Exposure to famine in late or mid gestation was not associated with an increased risk of any functional bowel disorder. Nor was size at birth associated with the risk of functional bowel disorders.

**Conclusions:** Undernutrition in early (but not in mid or late) gestation appears to negatively affect gut function in later life.

#### 6E-3 Absorption of oral vitamin B-12 in Indians; the Pune Maternal Nutrition Study

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**Aim:** Vitamin B12 deficiency is common among Indian mothers and is associated with an increased risk of delivering a small-for-gestational age baby. Vitamin B12 deficiency in Indians may be due to low dietary intake or poor intestinal absorption. We assessed vitamin B12 absorption by measuring the rise in plasma holotranscobalamin concentration after oral vitamin B12.

**Study design:** Sixty-five families (Group A) received 10 µg×3 doses and 44 families (Group B) received 2µg×3 doses of oral B12 every 6 hours. Fasting blood samples were collected before and after the oral dose. Subjects gave signed consent and the Ethical Committee approved the study protocol.

**Subjects:** 109 families from the Pune Maternal Nutrition Study.

**Outcome measures:** A rise in plasma holotranscobalamin of  $\geq 15\%$  and  $>15\text{pM}$  is considered adequate absorption.

**Results:** Twenty-seven percent of children, 69% fathers and 49% mothers had low B12 levels ( $<150\text{pM}$ ) at baseline. After oral vitamin B12 there was a  $>600\%$  rise in plasma holotranscobalamin in group A, and a  $>300\%$  rise in group B. Vitamin B12 rose by  $\sim 45\%$  and  $\sim 25\%$  respectively. Ninety-four percent of children and 88% of parents had normal absorption. Pre-dose vitamin B12 was not related to the observed rise in holotranscobalamin. Mean plasma total homocysteine fell significantly (18.6 to 17.4µM and 20.1 to 18.2µM respectively for groups A & B,  $p \leq 0.003$  for both) during the study.

**Conclusions:** Intestinal malabsorption is unlikely to be a major cause of the high prevalence of vitamin B12 deficiency in Indians.

#### 6E-4 Body mass index from birth to adulthood and metabolic risk factors for cardiovascular disease; data from the New Delhi Birth Cohort

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**Aims:** To examine the relationship of body mass index (BMI) and height at birth and during childhood to risk of adult metabolic syndrome.