sex and baseline anthropometrics. Energy intake was significantly correlated with weight gain (r=+0.31, p<0.001), length gain (r=+0.20, p<0.001) and head circumference growth (r=+0.26, p<0.001). In addition, protein intake was independently positively associated with weight gain, and the effect of macronutrient intakes on growth varied with postnatal age.

Conclusions Extremely preterm infants in Sweden received lower macronutrient intakes than recommended and showed postnatal growth failure. We found significant positive correlations between intakes of energy and macronutrients and growth. This suggests that optimized energy and macronutrient intake is important to prevent growth failure in these vulnerable infants.

350 EFFECTS OF DIFFERENT FATTY ACIDS ON RED BLOOD CELL MORPHOLOGY

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Background and Aims Recently echinocytosis and subsequent haemolytic anaemia was described in a premature infant receiving omega-3 fatty acids (Omegaven) in parenteral nutrition. It was presumed that omega-3 fatty acids caused echinocytosis. No study has been done to compare the effect of different fatty acids used in parenteral nutrition on human red blood cell (RBC) morphology. We therefore studied the effect of omega-3 fatty acids (Omegaven) and omega –6 fatty acids (Intralipid) at different concentrations on RBC in vitro.

Methods Blood samples were obtained from 12 healthy adult volunteers. Aliquots with 0.5 ml of washed RBC resuspended in autologous plasma to a hematocrit of 48% and containing 0%, 5%, 10%, 20%, 30% and 40% of Omegaven or Intralipid were prepared and incubated for 30 min at 37 °C. The cells were then fixed with 1% glutaraldehyde and inspected under an inverted brightfield microscope. The extent of echinocytosis was quantified by means of the morphological index (MI), calculated according to the standard protocol.

Results It was found that at concentrations equal to and higher than 20%, Omegaven produced significantly higher RBC morphological index (MI) than Intralipid: mean MI at 20% for Intralipid was 0.61±0.24 and for Omegaven 1.12±0.43 (p<0.01), whereas at 40% MI was 1.47±0.37 and 2.48±0.66 for Intralipid and Omegaven, respectively (p<0.01).

Conclusions At concentrations over 20% Omegaven is more likely to cause echinocytosis than Intralipid. The higher concentrations may occur in vivo if Omegaven is given separately from other parenteral nutrition fluids (two-in one).

351 DIFFERENTIAL REGULATION OF CORD BLOOD NESFATIN-1 IN LARGE FOR GESTATIONAL AGE PREGNANCIES

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Background and Aims Large-for-gestational-age (LGA) infants are at increased risk for developing alterations in metabolic programming, which may lead to impaired glucose homeostasis during infancy, childhood and adulthood. Adipocytokines play an important role in short- and long-term energy balance, insulin resistance and fetal growth. The objective of the present study was to investigate circulating concentrations of nesfatin-1 (novel adipocytokine, also expressed by the gastric mucosa and pancreatic β-cells) in fetal samples from LGA and appropriate-for-gestational-age-(AGA) pregnancies and study their association with gender, parity, and delivery mode.

Methods Cord blood nesfatin-1 concentrations were prospectively measured by enzyme-linked immunosorbent assay in 40 LGA (9 born from diabetic mothers and 31 born from non-diabetic mothers) and 20 AGA singleton full-term infants.

Results Cord blood nesfatin-1 concentrations were lower in LGA compared to AGA neonates, after controlling for confounding factors (b= –0.206, p=0.005, SE 0.07). However, cord blood nesfatin-1 concentrations were elevated in infants born from mothers presenting with gestational diabetes mellitus (GDM), compared to those born from non-diabetic mothers, after controlling for group (b=0.190, p=0.050, SE 0.10). Finally, cord blood nesfatin-1 concentrations were lower in cases of vaginal delivery (b=0.11, p=0.042, SE 0.05).

Conclusions Down-regulation of nesfatin-1 in LGA fetuses probably represents a negative feedback exerted by adipose tissue on nesfatin-1 production. On the other hand, fetal nesfatin-1 concentrations are higher in cases of GDM, probably indicating the possible involvement of nesfatin-1 in the regulation of insulin secretion from pancreatic β-cells. Finally, vaginal delivery-associated inflammation could probably account for lower cord blood nesfatin-1 concentrations.

352 LONGITUDINAL INFUSION OF INSULIN-LIKE GROWTH FACTOR-I AND IGF-BINDING PROTEIN-3 COMPLEX TO FIVE PRETERM INFANTS - PHARMACOKINETICS AND SHORT TERM SAFETY

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Introduction In preterm infants, low levels of insulin like growth factor-I (IGF-I) and IGF binding protein 3 (IGFBP-3) are associated with impaired brain growth and retinopathy of prematurity (ROP).

Treatment with IGF-I/IGFBP-3 may be beneficial for brain development and decrease the prevalence of ROP.

Methods In a phase II pharmacokinetic and safety study, five infants (3 girls) with a median (range) gestational age (GA) of 26+6 (26+0 – 27+2) weeks and birth weight (BW) of 990 (900–1212) g received continuous intravenous infusion of rhIGF-I/rhIGFBP-3. Treatment was initiated during the first postnatal day and continued for a median (range) duration of 168 h (47–168) in doses between 21–111 μg/kg/24h.

Results Treatment with rhIGF-I/rhIGFBP-3 was associated with higher serum IGF-I and IGFBP-3 concentrations (p<0.001) than model-predicted endogenous levels. Out of 74 IGF-I samples measured during study drug infusion, 37 (50%) were within target range, 4 (5%) above and 33 (45%) were below. Predicted dose of rhIGF-I/rhIGFBP-3 to establish circulating levels of IGF-I within the intrauterine range in a 1000 g infant was 75–100 μg/kg/24 h. No hypoglycemia or other adverse effects were recorded.

Discussion Continuous intravenous infusion of rhIGF-I/rhIGFBP-3 was effective in increasing serum concentrations of IGF-I and IGFBP-3. Administration under study conditions was safe.

353 PRETERM BIRTH AND THE METABOLIC SYNDROME: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background and Aims Preterm birth is associated with raised blood pressure (BP) and other features of the metabolic syndrome in later life, but effect sizes and biological mechanisms are unknown. We conducted a meta-analysis to address these associations in adult life.

Methods We performed a systematic review and meta-analysis of studies in which metabolic syndrome associated indices were compared in adults (≥18 years of age) born preterm (< 37 weeks gestation) and at term (37–42 weeks gestation). Outcome measures included; systolic blood pressure (SBP), diastolic blood pressure (DBP), BMI, percentage fat mass and fasting plasma levels of lipids, glucose and insulin.

Results Data from 27 studies and 306,123 adults (16,094 preterm, 290,029 term) were included, with an average outcome age of 26.1 years. In adults, preterm compared with full-term birth was associated with significantly higher SBP (mean difference [95% confidence interval]: 4.2mmHg [2.7, 5.7], p<0.001), DBP (2.7mmHg [1.2, 4.2], p<0.001) and low density lipoprotein (LDL) (0.14mmol/L [0.05, 0.22], p=0.01). Meta-regression revealed a significant gender effect, with 3.0mmHg greater SBP in preterm compared to term women than in preterm-term men (95%CI: 1.3, 4.7, p=0.002); for DBP this difference was 2.1mmHg greater (0.6, 3.6, p=0.009).

Conclusions Preterm compared to term birth, is associated with higher blood pressure and LDL in adult life. Women born preterm appear to be at greater risk than men born preterm. Follow-up of older subjects born preterm will be required to determine if the effects we observe are exacerbated by age.

354 ADIPOCYTOKINES OMENTIN AND VASPIN ARE UPREGULATED IN LARGE FOR GESTATIONAL AGE FETUSES AT TERM

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Background and Aims Fetal macrosomia is associated with significant perinatal and long-term complications, including higher risk for later development of insulin resistance/metabolic syndrome. Besides regulating whole body metabolism, adipocytokines have been implicated in fetal growth. We aimed to investigate circulating concentrations of omentin-1 and vaspin (important adipocytokines, regulating glucose metabolism and insulin sensitivity) in fetal samples from large-for-gestational-age-(LGA) and appropriate-for-gestational-age-(AGA) pregnancies and correlate them with several maternal and fetal anthropometric/clinical variables.

Methods Sixty five LGA (14 born from mothers presenting with gestational diabetes mellitus and 51 born from non-diabetic mothers) and 35 AGA singleton full-term infants were recruited. Determination of cord blood omentin-1 and vaspin concentrations was performed by enzyme-linked immunosorbent assay.

Results Cord blood omentin-1 concentrations were significantly higher in LGA compared to AGA neonates (b=0.119, p=0.002, SE 0.036), after controlling for confounding factors. Similarly, cord blood vaspin concentrations were significantly elevated in LGA cases, compared to AGA controls (p=0.011). Finally, cord blood omentin-1 concentrations were lower in cases of vaginal delivery (b=0.072, p=0.020, SE 0.030), after controlling for group.

Conclusions Higher concentrations of omentin-1 and vaspin in LGA compared to AGA fetuses, probably suggest the potential role of both adipocykines in intrauterine growth, as well as their possible implication in the metabolic disturbances characterizing fetal macrosomia both in the short- and long-term. Vaginal delivery-associated inflammation may account for the lower cord blood omentin-1 concentrations.

355 FETAL GROWTH IS ASSOCIATED WITH ALTERED EXPRESSION OF IMPRINTED GENES IN THE PLACENTA

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Background and Aims Both low and high birthweight is associated with adverse health outcomes throughout life. Altered expression of imprinted genes which regulate fetal and placental growth may be one mechanism linking the environment and later disease risk. We have studied the expression of candidate imprinted genes in placenta with respect to anthropometric parameters at birth.

Methods 58 term placentas (27 male) were obtained from the Edinburgh Reproductive Tissue BioBank. Pregnancies complicated by congenital abnormalities or diabetes were excluded. Gene expression was analysed using real-time PCR.

Results Median birthweight was 3900g (interquartile range: 2949–4340g). Insulin-like growth factor 2 (IGF2) mRNA levels correlated positively with standard deviation scores for birthweight (Spearman's rho=0.335, p=0.005), head circumference (Spearman's rho=0.424, p=0.001) and length (Spearman's rho=0.259, p=0.041). Growth factor receptor-bound protein 10 (GRB10) mRNA levels correlated negatively with birthweight standard deviation score (Spearman's rho= –0.221, p=0.048). The expression of two other imprinted genes, PHLDA2 and ZIM2 showed no relation to size at birth.

Conclusion Both IGF2 and GRB10 are imprinted in the placenta and impact on fetal and placental growth. IGF2 is paternally imprinted and increased expression is implicated in overgrowth disorders; in contrast, GRB10 is maternally imprinted in trophoblasts and disruption in mice leads to overgrowth. Additionally, GRB10 has recently been identified as having a role in insulin signaling. As genomic imprinting is under epigenetic regulation, these targets are strong candidates for exploration of environmentally influenced non-Mendelian effects on fetal size and developmental programming.

356 ALBUMIN SYNTHESIS RATES IN VLBW INFANTS - EFFECTS OF HIGH DOSE AMINO ACID AND LIPID ADMINISTRATION FROM BIRTH ONWARDS

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Introduction Albumin is one of the most important proteins in plasma and plays a key role in physiological processes like preservation of colloid osmotic pressure and binding of bilirubin and drugs. However, albumin concentrations are often low during the first days of life in preterm infants.

We hypothesized that early parenteral lipid and high dose amino acid (AA) administration from birth onwards to very low birth weight (VLBW) infants increases hepatic albumin synthesis rates and albumin concentration.

Methods Inborn VLBW infants were randomized to one of three different parenteral nutritional regimens within 6hrs after birth