 Background and Aims:

We aim to evaluate detailed human milk (HM) virome composition and abundance, to compare between transient and mature HM samples and also to evaluate potential changes related to mode of delivery, gestational age, and weight for gestational age.

Methods:

HM samples were collected from 44 mothers: mothers of normal spontaneous delivery-term (NS-T), caesarean delivery-term (CS-T), premature (PT), small for gestational age (SGA), and large for gestational age (LGA) infants. Metagenomic analyses were performed.

Results:

Viruses are detected in 81 out of the 88 HM samples; bacteriopahges 79.5%, eukaryotic viruses 20.5%. In the transient HM, most abundant taxa are Podoviridae and Myoviridae. In mature HM, Podoviridae decreased 6.8% from 46%, and Siphoviridae is the most abundant taxa as 52.6%. At transient HM samples of NS-T group, most abundant taxa are Podoviridae (84.9%), however, Podoviridae dropped to 8.5% in mature milk and switched to Siphoviridae(76.7%). Myoviridae is the predominant taxa in transient
and mature HM samples in CS-T group. In the PT group (all C-section), Podoviridae (57.8%) is the most abundant taxa in transient HM, Siphoviridae (53.2%) and Herpesviridae (24.7) are predominant in the mature HM samples. In SGA group, most abundant taxa are Herpesviridae 44.8% in transient HM and Roseolovirus uc is the most abundant species as 36.3%, followed by Acinetobacter virus 133 (19.9%). In LGA group, Siphoviridae is the predominant in transient and mature HM.

**Conclusions:**

Bacteriophages are the major component of HM virome, varies according to maternal and neonatal factors. Bacteriophages content of HM might play roles for the prevention of infectious disease and antimicrobial resistance.
THE IMPORTANCE OF ADEQUATE NUTRITIONAL STATUS AT BIRTH TO NEONATAL SURVIVAL:
A BRAZILIAN POPULATION-BASED STUDY

T. Konstantyner¹, A. Marinonio², D. Testoni², C. Kiffer³, M. Kawakami², R. Balda², M. Miyoshi², K. Areco⁴, A. Sanudo⁵, P. Paiva⁴, R. Freitas⁵, L. Morais⁶, M. Teixeira⁵, B. Waldvogel⁶, M.F. Almeida², R. Guinsburg²
¹EPM/UNIFESP, Pediatrics, São Paulo, Brazil, ²EPM/UNIFESP, Pediatrics, Sao Paulo, Brazil,
³EPM/UNIFESP, Medicine, Sao Paulo, Brazil, ⁴EPM/UNIFESP, Health Informatics, Sao Paulo, Brazil,
⁵EPM/UNIFESP, Preventive Medicine, Sao Paulo, Brazil, ⁶SEADE Foundation, Public Health, Sao Paulo, Brazil

Background and Aims:

The risk of death in the neonatal period is higher than all other pediatric age groups. The aim was to test the association between nutritional status at birth with neonatal death.

Methods:

We performed a cohort study, including all live term births (37-41 weeks) from 2004 to 2013 in Sao Paulo State, Brazil. Infants with congenital anomaly were excluded. We measured the outcome in terms of time to death (in days) during the neonatal period (0-27 days). We defined the nutritional status (very small, normal or very large) based on the presentation characteristic of the gestational age in the database (week ranges). To define very small and very large, we used the 10th percentile of 37 weeks and the 90th percentile of 41 weeks + 6 days, respectively, based on the Intergrowth-21st newborn birth weight tables. The Log-Rank test and the adjusted Cox regression were carried out.

Results:

From the 5,240,549 births, we identified 7,115 deaths in the neonatal period from 2004-2013 (rate: 1.36/1000). There was a significant difference between the three groups of nutritional status (log-rank, p<0.001). When compared with infants with normal weight for gestational age, the Cox regression showed increase of mortality risk for infants very small (HR=2.70; 95%CI: 2.47-2.96; p<0.001) and very large (HR=5.30; 95%CI: 4.52-6.21), independently of the birth weight.

Conclusions:

Extreme deviations from nutritional status more than doubled risk of death in term newborns. The prevention of insufficient and excessive fetal growth by means of an adequate prenatal care potentially contributes to reduce newborn death.
EFFECT OF GESTATIONAL OBESITY ON THE SKELETAL MUSCLE GENE METHYLATION NETWORK.

A. Prats-Puig¹, M. Puig-Parnau¹, S. García-Retortillo¹, S. Xargay-Torrent², A. López-Bermejo²
¹EUSES. Escola Universitària de la Salut i l’Esport., Physiotherapy, Salt, Spain, ²IDIBGI, Pediatrics, Girona, Spain

Background and Aims:

The alteration of skeletal muscle development has long-term effects on offspring growth and performance. The number of adult muscle fibres is determined prenatally and is highly sensitive to maternal nutrition status. Our goals were 1) investigate if gestational obesity was associated with variation in DNA methylation of skeletal muscle genes and 2) perform a comprehensive network analysis to characterize the differential relationship among genes.

Methods:

Sixteen pregnant women [8 with gestational obesity and 8 without obesity] were studied. DNA methylation was measured in umbilical cord using the Infinium MethylationEPIC BeadChip microarray (Illumina). Data analysis was performed using the minfi R-package (version 1.26.2). Differentially methylated CpGs were identified with Beta Regression Models (false discovery rate (FDR) <0.05 and an Odds Ratio >1.5 or <0.67). Gene methylation network analyses according to gestational obesity were performed using data from Pearson correlation matrices processed by means of Matlab (Mathworks, Natik, MA, USA).

Results:

This identification analysis reported 37 differential methylated genes related to skeletal muscle according to obesity (FDR<0.05; comprising mainly hormones, structural genes, contractility proteins and motor proteins). Interestingly, the possible phenotypic effect of these genes (GaP database) were on body weight (p= 0.004413), HDL (p= 0.03674) and diabetes mellitus (p= 0.04713). Gene methylation network analysis showed a different methylation pattern in all abovementioned genes depending on gestational obesity.

Conclusions:

Our study supports a complex interaction between gestational obesity and foetal skeletal muscle DNA methylation. Additionally, gestational obesity may alter the functional connectivity of methylated genes within a skeletal muscle gene network.
NUTRITIONAL AND NON-NUTRITIONAL FACTORS PREDICTING POSTNATAL GROWTH IN VERY LOW BIRTHWEIGHT INFANTS

L. Immeli¹, U. Sankilampi², P. Mäkelä¹, M. Leskinen¹, R. Sund³, S. Andersson¹, P. Luukkainen¹
¹Helsinki University Hospital, Children’s Hospital, Pediatric Research Center, Helsinki, Finland, ²Kuopio University Hospital, Department Of Paediatrics, Kuopio, Finland, ³University of Eastern Finland, Faculty Of Health Sciences, School Of Medicine, Institute Of Clinical Medicine, Kuopio, Finland

Background and Aims:

Our aim was to study the relationship between nutrient intake during the first postnatal week (W1) and postnatal growth among very low birthweight (VLBW, <1500g) infants. We hypothesised that better protein and energy intake during W1 is associated with improved growth at gestational age (GA) of 39wks.

Methods:

Computerised medication administration records of 662 VLBW infants born <32 gestational weeks in 2005-2013, were assessed for cumulative protein and energy intake during W1. Clinical characteristics and growth parameters at birth and at GA of 39wks were received from the Finnish Medical Birth Register. The relationship between cumulative nutrient intake during W1 and length and head circumference z-score change from birth to GA of 39wks (∆Z-Length, ∆Z-HC) was assessed using linear models, including non-nutritional factors such as GA, being small for GA (SGA), and postnatal morbidities.

Results:

The mean ∆Z-Length was -1.6SD and mean ∆Z-HC 0.0SD. The median cumulative protein and energy during W1 was 18.9g/kg/wk and 616kcal/kg/wk, respectively. The protein intake over the median compared with intake in the lowest quartile (<17.2g/kg/w) was associated with significantly better growth in length and HC (Table 1). Higher energy intake did not associate with improved growth in length or HC (Table 2). In all models, GA of 28-32wks and SGA were the strongest predictors for improved growth.
Table 1. Linear regression model examining the relationship between protein intake during the first postnatal week (W1) and growth (z-score change ΔZ) from birth to gestational age (GA) of 39 wks†. Odds ratios and 95% confidence intervals shown for the selected predictor variables.

<table>
<thead>
<tr>
<th>Predictor variables</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ΔZ — Length</td>
<td>ΔZ-Head circumference (HC)</td>
</tr>
<tr>
<td></td>
<td>(R² 0.23)</td>
<td>(R² 0.17)</td>
</tr>
<tr>
<td>Cumulative protein intake quartile 2 versus quartile 1†</td>
<td>1.04 (0.78-1.38)</td>
<td>1.27 (0.94-1.59)</td>
</tr>
<tr>
<td>Cumulative protein intake quartile 3 versus quartile 1†</td>
<td>1.36 (1.02-1.81)*</td>
<td>1.34 (1.03-1.74)*</td>
</tr>
<tr>
<td>Cumulative protein intake quartile 4 versus quartile 1†</td>
<td>1.38 (1.03-1.86)*</td>
<td>1.10 (0.83-1.44)</td>
</tr>
<tr>
<td>Gender (Female versus Male†)</td>
<td>1.14 (0.93-1.39)</td>
<td>1.00 (0.83-1.20)</td>
</tr>
<tr>
<td>GA (28-32wk versus &gt;32 wk†)</td>
<td>2.17 (1.70-2.77)*</td>
<td>1.32 (1.05-1.66)*</td>
</tr>
<tr>
<td>Being small for GA (Yes)</td>
<td>3.49 (2.66-4.58)*</td>
<td>3.06 (2.39-3.93)*</td>
</tr>
<tr>
<td>Having a central venous catheter (Yes)</td>
<td>0.91 (0.70-1.18)</td>
<td>1.07 (0.84-1.36)</td>
</tr>
<tr>
<td>Multiple birth (Yes)</td>
<td>1.19 (0.87-1.38)</td>
<td>0.94 (0.76-1.16)</td>
</tr>
<tr>
<td>Necrotising enterocolitis (Yes)</td>
<td>0.66 (0.41-1.07)</td>
<td>0.75 (0.48-1.18)</td>
</tr>
<tr>
<td>Respiratory distress syndrome (Yes)</td>
<td>1.02 (0.83-1.25)</td>
<td>0.85 (0.71-1.03)</td>
</tr>
<tr>
<td>Culture positive sepsis (Yes)</td>
<td>1.31 (1.06-1.63)*</td>
<td>0.98 (0.80-1.19)</td>
</tr>
<tr>
<td>Severe IVH (grade 3 or 4)</td>
<td>NA*</td>
<td>1.50 (1.08-2.08)*</td>
</tr>
<tr>
<td>Postnatal corticosteroids (Yes)</td>
<td>1.40 (1.07-1.82)*</td>
<td>0.91 (0.71-1.16)</td>
</tr>
</tbody>
</table>

†Growth parameters taken at 35 to 44 weeks of gestation (mean 38.7wk)
†Quartile 1 corresponding to protein intake of 12.8-17.2g/kg/wk, quartile 2 to protein intake of 17.2-21.3g/kg/wk, quartile 3 to protein intake of 21.3-29.0g/kg/wk and quartile 4 to protein intake of 20.9-26.4g/kg/wk
*statistical significance

Table 2. Linear regression model examining the relationship between energy intake during the first postnatal week (W1) and growth (z-score change ΔZ) from birth to gestational age (GA) of 39 wks†. Odds ratios and 95% confidence intervals shown for the selected predictor variables.

<table>
<thead>
<tr>
<th>Predictor variables</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ΔZ — Length</td>
<td>ΔZ-Head circumference (HC)</td>
</tr>
<tr>
<td></td>
<td>(R² 0.22)</td>
<td>(R² 0.17)</td>
</tr>
<tr>
<td>Cumulative energy intake quartile 2 versus quartile 1†</td>
<td>0.99 (0.75-1.32)</td>
<td>1.37 (1.05-1.78)*</td>
</tr>
<tr>
<td>Cumulative energy intake quartile 3 versus quartile 1†</td>
<td>1.02 (0.76-1.37)</td>
<td>1.00 (0.77-1.31)</td>
</tr>
<tr>
<td>Cumulative energy intake quartile 4 versus quartile 1†</td>
<td>1.11 (0.83-1.50)</td>
<td>1.25 (0.95-1.65)</td>
</tr>
<tr>
<td>Gender (Female versus Male†)</td>
<td>1.13 (0.92-1.38)</td>
<td>1.01 (0.84-1.21)</td>
</tr>
<tr>
<td>GA, 28-32w versus &gt;32 wk†</td>
<td>2.05 (1.64-2.67)*</td>
<td>1.28 (1.02-1.60)*</td>
</tr>
<tr>
<td>Being small for GA (Yes)</td>
<td>3.59 (2.73-4.71)*</td>
<td>3.08 (2.41-3.95)*</td>
</tr>
<tr>
<td>Having a central venous catheter (Yes)</td>
<td>0.96 (0.74-1.24)</td>
<td>1.09 (0.86-1.38)</td>
</tr>
<tr>
<td>Multiple birth (Yes)</td>
<td>1.08 (0.86-1.36)</td>
<td>0.94 (0.76-1.16)</td>
</tr>
<tr>
<td>Necrotising enterocolitis (Yes)</td>
<td>0.62 (0.39-1.01)</td>
<td>0.70 (0.45-1.09)</td>
</tr>
<tr>
<td>Respiratory distress syndrome (Yes)</td>
<td>1.03 (0.83-1.28)</td>
<td>0.86 (0.71-1.05)</td>
</tr>
<tr>
<td>Culture positive sepsis (Yes)</td>
<td>1.31 (1.05-1.63)*</td>
<td>1.0 (0.82-1.22)</td>
</tr>
<tr>
<td>Severe IVH (grade 3 or 4)</td>
<td>NA*</td>
<td>1.51 (1.09-2.11)*</td>
</tr>
<tr>
<td>Postnatal corticosteroids (Yes)</td>
<td>1.42 (1.09-1.85)*</td>
<td>0.92 (0.72-1.17)</td>
</tr>
</tbody>
</table>

†Growth parameters taken at 35 to 44 weeks of gestation (mean 38.7wk)
†Quartile 1 corresponding to energy intake of 361-569kcal/kg/wk, quartile 2 to energy intake of 569-816kcal/kg/wk, quartile 3 to energy intake of 816-661kcal/kg/wk and quartile 4 to energy intake of 661-863kcal/kg/wk
*statistical significance
Conclusions:

Higher protein intake during the first week of life associated with better growth in length and HC at GA of 39wks. Still, non-nutritional factors were stronger predictors for postnatal growth than nutrition during the first week of life.
GROWTH ASSESSMENT OF INFANTS ADMITTED TO A GOVERNMENT HOSPITAL NEWBORN UNIT IN NAKURU, KENYA

A. Morozov¹, M. Van Ormer¹, M. Thoene¹, N. Switchenko², E. Kibaru³, C. Hanson⁴, A. Anderson-Berry¹
¹University of Nebraska Medical Center, Pediatrics, Omaha, United States of America, ²University of Utah Health Sciences, Pediatrics, Salt Lake City, United States of America, ³Egerton University, Health Sciences, Egerton, Kenya, ⁴University of Nebraska Medical Center, Medical Nutrition Education, Omaha, United States of America

Background and Aims:

Inadequate nutrition causes neonatal growth failure. Previously, members of this research team implemented a respiratory intervention in a government hospital newborn unit; Nakuru, Kenya. Growth failure was suspected, so aim of this study is to quantify infant growth velocity and weight z-score changes from birth to hospital discharge.

Methods:

After ethical approval, data was collected from hospital charts of infants (n=704) hospitalized June 2016 - December 2018. Information collected: birth gestational age (GA), birth and discharge weight with z-scores (INTERGROWTH 21st growth chart), length (days) of hospital stay (LOS). Growth velocity was calculated: 1,000xln(discharge weight/birth weight)/LOS. Means are reported, t-test compared growth velocity and z-score changes between infant LOS <or =14 vs. >14 days, regression analysis predicted weight z-score change based on LOS. P-value <0.05 was significant.

Results:

283/704 (40.1%) infants were born <36 weeks GA. Mean birth GA was 36±6 weeks, weight 2.61 kilograms (kg) (z-score -0.024). Mean LOS was 7.4 days, discharge weight 2.54 kg (z-score -0.855). Infants with LOS >14 days (mean 24) experienced more growth failure than infants with LOS < or =14 days (mean 4), z-score change -1.66 vs. -0.64 (p<0.001). Growth velocity was 4.7 grams/kg/day for infants with LOS >14 days, each day predicting -0.044 decrease in weight z-score (p<0.001).
Conclusions:

Infants admitted to a government hospital newborn unit in Nakuru, Kenya experience growth rates that are inadequate to meet recommended velocities by the World Health Organization. Longer lengths of hospital stay contribute to decreases in weight z-score and an increased risk of malnutrition.
DETERMINANTS OF TIME TO FULL ENTERAL FEEDS AMONGST PRETERM AND VERY LOW BIRTH WEIGHT INFANTS IN SUB-SAHARAN AFRICA

Z. Imam1,2, H. Nabwera2,3, I. Abdulkadir4, P. Andang’O5, C. Ezeaka6, B. Ezenwa6, I. Fajolu6, M. Mwangome7, O. Tongo8, A. Akindolire9, D. Umoru9, W. Otierno5,10, G. Nalwa5,10, A. Talbert5, I. Abubakar2, S. Allen2,3
1Massey Street Children’s Hospital, Neonatal Unit, Lagos, Nigeria, 2Liverpool School of Tropical Medicine, Paediatrics, Liverpool, United Kingdom, 3Alder Hey Children's Hospital NHS Trust, Paediatrics, Liverpool, United Kingdom, 4Ahmadu Bello University Teaching Hospital, Paediatrics, Shika, Zaria, Nigeria, 5Maseno University, Paediatrics, Maseno, Kenya, 6Lagos University Teaching Hospital, Paediatrics, Lagos, Nigeria, 7KEMRI-Wellcome Trust Research Programme, Paediatrics, Kilifi, Kenya, 8University College Hospital, Paediatrics, Ibadan, Nigeria, 9Maitama District Hospital, Paediatrics, Abuja, Nigeria, 10Jaramogi Oginga Odinga Teaching and Referral Hospital, Paediatrics, Kisumu, Kenya

Background and Aims:

The Neonatal Nutrition Network (NeoNuNet) seeks to develop and test nutritional interventions to improve outcomes among preterm (gestation <37 weeks) and very-low-birthweight (VLBW; <1500g) infants in sub-Saharan Africa. This analysis aimed to describe factors associated with time to full enteral feeds (tFEF; defined as 120ml/kg/day) amongst hospitalised preterm/VLBW infants from member neonatal units (5 in Nigeria, 2 in Kenya).

Methods:

Data on pregnancy, birth, neonatal characteristics, feeding practices, common morbidities and mortality of preterm/VLBW infants admitted over any six-month period (September 2018-April 2019) were extracted from the NeoNuNet database. Factors associated with TEF in univariate analyses were assessed by multiple linear regression analysis (SPSS version 25).

Results:

Of the 2866 babies in the NeoNuNet database, 445 (16%) were preterm/VLBW. Of these, 129 (29%) were small-for-gestational-age, 75 (19%) stunted and 59 (15%) wasted (INTERGROWTH standards). Amongst the 318 (71%) infants who survived to commencement of feeds, median (IQR) time to first feed was 45.0 hours (26.5, 69.5) and TEF was 8.0 days (5.0, 12.0). Independent predictors of TEF were time to first feed, respiratory morbidities and necrotising enterocolitis (NEC). Every 24-hour delay in commencing feeds and episode of NEC, increased TEF (95%CI) by 1.3 (0.72, 1.92) and 4.2 (0.25, 8.15) days respectively but each episode of respiratory morbidity decreased TEF by 2.9 (0.89, 4.98) days.
Conclusions:

Initiating feeds earlier in preterm/VLBW infants could reduce tFEF. This may result in shorter hospital stay and improved growth. However, these potential benefits may be delayed by the development of NEC. The association between respiratory morbidities and feed tolerance requires further investigation.
MATERNAL SERUM AND CORD BLOOD GHRELIN IN RELATION TO NEWBORN ANTHROPOMETRIC MEASUREMENTS

M. Saleh¹, E. Abdel Hamid¹, L. Sherif¹, H. Elnady¹, H. Ahmed²
¹NRC, Child Health, cairo, Egypt, ²NRC, Hormones Department, cairo, Egypt

Background and Aims:

Background:

Ghrelin is a natural endogenous ligand for growth hormone (GH) secretagogue receptors which plays an important role in regulation of energy balance and glucose homeostasis. Ghrelin may have an effect during intrauterine life, especially in determining adaptations of the fetus to an adverse intrauterine environment, yet this effect is not fully understood.

Aim: To elucidate the relation of serum maternal and cord blood des-acyl ghrelin levels in small, average and large for gestational age infants with newborn birth weight, and anthropometric measures as well as Apgar scores.

Methods:

The present study included 75 full term newborns. Newborns were subdivided according to their gestational weight to 3 groups, SGA (group 1), LGA (group 2) and AGA (group 3). Serum Maternal and umbilical cord Des-acyl ghrelin (DAG) was measured by enzyme-linked immunosorbent assay.

Results:

There was a significant negative correlation between cord blood des-acyl ghrelin and neonatal anthropometric measures (neonatal weight, height, head circumference, mean arm circumference) (P<0.05). Moreover, a significant negative correlation between cord blood des-acyl ghrelin and Apgar score at 1 and 5 min (P<0.05).

Conclusions:

Our results suggest a role of Des-acyl ghrelin (DAG) during the intrauterine growth of a fetus. Ghrelin may have a significant effect on the newborn metabolism and anthropometric measurement, as well as its role in fetal adaptation to intrauterine environment.
INSULIN CONCENTRATION IN HUMAN MILK IN THE FIRST DAYS AFTER BIRTH: COURSE AND ASSOCIATED FACTORS

E. Mank¹, L. Van Toledo¹, A.C. Heijboer², J.B. Van Goudoever¹
¹Emma Children's Hospital, Amsterdam UMC, University of Amsterdam, Department Of Neonatology, Amsterdam, Netherlands, ²Amsterdam UMC, University of Amsterdam, Department Of Clinical Chemistry, Laboratory Of Endocrinology, Amsterdam, Netherlands

Background and Aims:

Human milk is better tolerated than formula in preterm infants. Insulin (not present in formula) has been suggested as a key factor, as it seems to stimulate gut maturation and thereby feeding tolerance. Therefore, it might serve as supplement for formula or additive to fortifiers. However, human milk insulin concentration directly following birth is unknown, so exact dosage schemes are difficult to establish. The objective of this study was to quantify milk insulin concentration following term (≥37 weeks) and preterm delivery (<32 weeks), and to assess the effect of diurnal rhythm and pre-pregnancy BMI.

Methods:

Milk was collected from 25 non-diabetic mothers (preterm, n=15; term, n=10) at serial time points in the first ten days postpartum. Analysis was performed by using luminescence immunoassay.

Results:

Milk insulin peaks (up to 2614 pmol/L) were observed on day 1, which rapidly declined to 207 (110-437) pmol/L on day 3, followed by a gradually decline to 121 (58-236) pmol/L on day 10. Preterm delivery did not affect milk insulin concentration (β -0.005 (-0.580–0.570); p=0.988). Obese mothers (BMI ≥30 kg/m²) had a higher milk insulin concentration over time compared to non-obese mothers (BMI <30 kg/m²) (β 0.711 (0.213–1.209); p=0.005). Insulin concentration increased in the morning (β 0.169 (0.092–0.246); p<0.001), and declined throughout the night (β -0.082 (-0.109—0.055); p<0.001).

Conclusions:

Milk insulin course is characterized by a rapidly decline in the first three days, followed by a gradually decline until day 10 postpartum. Concentration is affected by diurnal rhythm and pre-pregnancy BMI, but not by gestational age at birth.
EXERCISE AND ASTAXANTHIN ADMINISTRATION AMELIORATE OBESITY-INDUCED SENESCENT CELLS OF THE HIPPOCAMPUS IN YOUNG MICE, A PILOT STUDY

T. Ogawa, R. Ryoke, C. Miyauchi, H. Nonaka, M. Hirobe, R. Kawashima
Tohoku University, Idac, Sendai, Japan

Background and Aims:

Obesity has been associated with accelerated biological aging due to an increase in senescent cell accumulation (permanent cell cycle arrest), secreting cytokines, and proteases (SASP), which damage surrounding cells. Evidence suggests that an increase in SASP-expressing senescent cells in the brain correlates with neurodegeneration. However, the role of bioactive compounds in foods or exercise in the induction of senescence in the brain is not well studied. We investigated whether astaxanthin (Asx; ketocarotenoid) ingestion, which can influence cell cycle or endurance exercise (EX) influences the induction of senescence in the brain.

Methods:

A high-fat diet was used to induce senescent cells in young KK-Ay mice for three weeks after randomly allocated to either control (CONT), Ex or Asx (n=4 to 6) group. Mice in the EX group underwent running training using a treadmill. Asx (27mg/100g bw) or placebo canola oil was orally administered daily. Using SA β-gal staining and p16 mRNA expression analysis senescent cell accumulation was evaluated.

Results:

We showed that the accumulation of senescent cells occurred in the Purkinje cells of the cerebellum and Pyramidal cells of the cornu ammonis (CA)-1,2 and 3 and dentate gyrus (DG) region of the hippocampus. The Ex and Asx reduced the % area of SA β-gal stained region of the CA compared to CONT (EX: 39.6%; p<0.1, Asx: 40.4%; p=0.1, CONT: 46.5%). The p16 mRNA expression in the hippocampus was significantly reduced in Asx compared to the CONT(Asx: 0.65; CONT: 1.00; p<0.05).

Conclusions:

Findings suggested that astaxanthin potentially influence brain health in children suffering from obesity.
IS STRESS RELATED TO SLEEP DISORDERS AND BODY COMPOSITION OF CHILDREN?

E. Bryl¹, T. Hanć¹, P. Mamrot¹, M. Dmitrzak-Weglarz², A. Dutkiewicz³, A. Słopień³
¹Adam Mickiewicz University, Biology Department, Poznań, Poland, ²Poznan University of Medical Sciences, Department Of Psychiatry, Poznan, Poland, ³Poznan University of Medical Science, Department Of Child And Adolescent Psychiatry, Poznan, Poland

Background and Aims:

Recent studies show that sleep disorders occur in children who experience stress. It was hypothesized that sleep quality may affect children's body weight and body composition. The aim of the study was to assess the relationship between quality of sleep, stress and body composition in children.

Methods:

The sample included 547 children, aged 6-12y. Based on the simplified version of the Children's Sleep Habits Questionnaire the following subgroups of children presenting sleep disorders were distinguished: Sleep Onset Delay (SOD), Sleep Duration (SD), Sleep Waking (SW), Parasomnias (PA) and Daytime Sleepiness (DS). The body composition was assessed using electric bioimpedance method (TANITA MC-980). The simplified version of Traumatic Events Screening Inventory Questionnaire was used to assess stress.

Results:

Stress caused by witnessing life threats was associated with DS(U=7293, p=0.04). Stress caused by witnessing violence was associated with PA(U=6703, p=0.04). Stress caused by poor grades at school was associated with SW(U=2142, p=0.02), SOD(U=2171.5, p=0.04) and SD(U=2303, p=0.045). We observed lower body weight in children who experienced 5 or more stressors(U=475.5, p=0.045). SW was associated with body fat(R=0.1, p=0.02), waist circumference(R=0.1, p=0.02), WHtR(R=0.11, p=0.008) whereas DS was associated with hip circumference(R=-0.1, p=0.02).

Conclusions:

Some types of stressors were associated with poor quality of sleep and symptoms of sleep disorders. Abnormal sleep-related behaviour was associated with greater body fat and central fat accumulation but the effects, though significant, were very small. Further studies are needed to explore the directions of revealed relations.
THE ASSOCIATION BETWEEN ENERGY AND MACRONUTRIENTS IN INFANCY WITH BODY COMPOSITION IN LATER CHILDHOOD AND ADOLESCENCE.

L. Jones¹, N. Hays², Y. Shahkhalili-Duloo³, C. Taylor¹, P. Emmett¹
¹University of Bristol, Centre For Academic Child Health, Bristol, United Kingdom, ²Nestle Product Technology Center, Societe Des Produits Nestle Sa, Vevey, Switzerland, ³Nestle Research, Societe Des Produits Nestle Sa, Lausanne, Switzerland

Background and Aims:

Obesity research is increasingly focused on early-life nutrition as a predictor of adult overweight and metabolic disease. In contrast to infant feeding, little is known about potential effects of early childhood diet on later body composition.

Methods:

Diet was assessed in children from the UK Avon Longitudinal Study of Parents and Children at 18mo using three 1-day unweighed food diaries; participants who misreported energy intake were excluded. Weight, height, BMI, fat mass and fat-free mass (whole-body DXA) were assessed at 9y and 17y. Linear regression models stratified by sex and adjusted for covariates including breastfeeding duration, maternal BMI and education were used to assess associations of dietary intake with body composition.

Results:

In boys (n=155–292), percentage energy (%E) from fat was positively associated with fat mass (0.16; 0.05,0.28kg; p=0.005) at age 9y, with similar but negative associations for carbohydrate %E. In addition, energy intake (100kcal intervals) was positively associated with BMI (0.51; 0.31,0.72kg/m²; p<0.0001) and fat-free mass (0.36; 0.22,0.50kg; p<0.0001). At age 17y in boys, only an attenuated association between energy intake and fat-free mass remained (0.51; -0.02,1.03kg; p=0.059). In girls (n=160–217), energy intake was positively associated with BMI (0.33; 0.12,0.54kg/m²; p=0.002) and fat mass (0.40; 0.04,0.77kg; p=0.032) at age 9y but not 17y.

Conclusions:

Diet at age 18mo was associated with body composition at age 9y, but relationships differed by sex and were attenuated by age 17y. Dietary interventions in early life may have implications for later childhood and adolescent obesity.
LONGITUDINAL LIFESTYLE PATTERN AND BODY MASS INDEX TRAJECTORIES IN EARLY CHILDHOOD: A MULTI-TRAJECTORY MODELLING APPROACH

M. Zheng¹, S. Lioret², K. Hesketh¹, K. Campbell¹
¹Deakin University, Institute For Physical Activity And Nutrition, Melbourne, Australia, ²Université de Paris, Center For Research In Epidemiology And Statistics (cress), Inserm, Inra, Paris, France

Background and Aims:

Lifestyle risk factors of obesity: dietary intake, physical activity and sedentary behaviours often cluster together to form “unhealthy” and/or “healthy” lifestyle patterns. To date, the longitudinal relationship between lifestyle patterns and childhood obesity remains unexplored. This study aimed to identify joint-trajectories of lifestyle patterns and body mass index (BMI) z-scores from ages 18 to 60 months, and to explore predictors of group memberships.

Methods:

Data of children aged 18, 42 and 60 months from the Melbourne InFANT program were used. Lifestyle patterns were derived using principle component analysis based on dietary intake, outdoor play and TV viewing time. Group-based multi-trajectory modelling was used to identify groups of children following similar trajectories of lifestyle patterns and BMI z-scores, and to assess its child and maternal predictors.

Results:

Two lifestyle patterns: “LP1: discretionary food, screen” and “LP2: fruit, vegetable, outdoor” were consistently identified across ages. Three trajectory groups were identified: “Unhealthy stable (high LP1-low LP2), normal weight 30%”, “Healthy stable (low LP1-high LP2), risk of overweight 53%”, and “Unhealthy (high LP1-low LP2), overweight 17%”. Maternal pre-pregnancy overweight and high maternal TV viewing time increased the probability of child membership in “Unhealthy lifestyle pattern, overweight” group. Child low birth weight decreased the probability of child membership in “Healthy, risk of overweight” and “Unhealthy, overweight” group.

Conclusions:

Various longitudinal trajectories of lifestyle patterns and BMI z-scores in early childhood were revealed. The findings support interventions to target maternal pre-pregnancy BMI and sedentary behaviours for reducing childhood unhealthy lifestyle patterns and obesity.
FACTORS THAT PREDICT ABNORMAL GROWTH

T. Ylöstalo
University of Tampere, Faculty Of Social Sciences, Tampere, Finland

Background and Aims:

The main aim of the study is to identify the primary trajectories of Body Mass Index (BMI) development. More specific, the aim is to identify the trajectories that may lead to overweight or obesity for children at later stages of life and the factors that are affecting this abnormal growth.

Methods:

The longitudinal data consist of growth measurements from 6906 Finnish children from six birth cohorts: 1974 (n=1108), 1981 (n=977), 1991 (n=586), 1995 (n=786), 2001 (n=765) and 2003-04 (n=2684). The anthropometric data was collected from birth up to the age of 15 in the health records as well as the pregnancy health data for birth cohorts 1991, 1995, 2001 and 2003-04.

A trajectory analysis was used to identify trajectories for BMI development. Factors that lead to abnormal growth tracks were analyzed using logistic regression models.

Results:

Trajectory analysis identified four main trajectories of BMI growth. Two trajectories doesn’t seem to follow the normal growth pattern. The highest growth track appears to lead to overweight while the low growth track differs among the sexes.

Pre-pregnancy BMI, gestational diabetes mellitus and gestational weight gain are associated with higher risk for overweight growth track (blue line). Respectively, pregnancy weeks, low birth weight and pre-pregnancy BMI increases the risk of low birth BMI growth track (pink line).
Conclusions:

Trajectory analysis provide a powerful tool to analyse longitudinal data and the development of BMI. Study results suggest primary prevention strategies for offspring obesity by targeting maternal pre-pregnancy BMI and gestational weight gain.
A PROSPECTIVE BIRTH COHORT STUDY: DESIGN OF THE AMSTERDAM INFANT MICROBIOME STUDY (AIMS)

J. De Ruyter¹, J. Ujcic-Voortman¹, M. De Jong², J. Seidell¹,³, A. Verhoeff⁴
¹Public Health Service Amsterdam, Dept. Of Epidemiology, Health Promotion & Care Innovation/ Sarphati Amsterdam, Amsterdam, Netherlands, ²Amsterdam UMC, Medical Microbiology, Amsterdam, Netherlands, ³Vrije Universiteit, Faculty Of Science, Department Of Health Sciences, Amsterdam, Netherlands

Background and Aims:

Childhood overweight and obesity is an epidemic public health problem worldwide. In Amsterdam 19% of the children are currently overweight or obese. Another, yet related public health problem is dental caries that nowadays affects 41% of the five-year-old children in the Netherlands. In current scientific literature there is increasing attention for the microbiome and its effect on (adverse) health outcomes. We aim to study the development of the microbiome in relation to healthy growth and development (i.e. growth trajectories) as well as oral health in young children.

Methods:

AIMS is a multi-ethnic, prospective birth cohort study in 1,000 children, their mothers and other family members in Amsterdam. We will collect biosamples from birth until the baby is 3 years old. Samples (except the birth samples) are collected at home by participants with self-collection kits, and picked up by courier. Through questionnaires and 3-day food diaries we assess (oral) health status, nutrition, and other data relevant to growth and development, oral health, and/or changes in the microbiota. AIMS is a substudy of the Sarphati Cohort, in which data collection is linked to the infrastructure of Youth Health Care in Amsterdam.

Results:

The inclusion of participants is currently taking place in collaboration with midwife practices. Sampling and data collection has started in August 2019. During the conference, we will present the study design and first results.

Conclusions:

With AIMS we aim to investigate fixed and modifiable factors that influence the development of the microbiota and provide strategies for the acquisition of a health-promoting microbiome.
Background and Aims:

The European Commission requested EFSA to update its 2009 opinion on the appropriate age range of introduction of complementary foods (CFs). EFSA conducted a systematic review of the effect of age at introduction of CFs on 14 health outcomes, including overweight/obesity.

Methods:

EFSA developed an assessment protocol to select studies with groups of infants differing only in the timing of introduction of CFs. The risk of bias (RoB) was assessed for each study and outcome. Pooled estimates of effects/associations were obtained from extracted data using random effects meta-analyses. EFSA drew conclusions from studies with low/intermediate RoB (Tier 1-2) on the risk of developing overweight/obesity and graded the confidence in the overall evidence.

Results:

The pooled analysis for obesity, six prospective studies (Tier 2, CF introduction at <1 and <4 months vs ≥3 to ≥6 months) and for overweight, ten prospective studies (Tier 1-2, CF introduction at ≤2 and ≤4 months vs >2 to >6 months) did not show an associations between the age of introduction of CFs and the odds of developing overweight/obesity, assessed up to 11 and 13 years, respectively. There were no concerns with respect to the generalisability of results to infants living in Europe. Publication bias was not detected.

Conclusions:

From studies rated as low/intermediate RoB there is no evidence that the timing of introduction of CFs is associated with higher risk of developing overweight/obesity (moderate level of confidence). Results were
consistent across populations and outcomes investigated, including weight-, BMI- and fat-mass-related outcomes.
ORAL PRESENTATIONS SESSION 3: INFANCY I
08-27-2020 20:00 - 21:30

CATCH-UP-GROWTH FROM BIRTH TO 6-MONTHS OF LIFE AND RELATIONSHIP WITH BMI AND METABOLIC RISK IN HEALTHY CHILDREN AT 4 YEARS OLD

N. Sepúlveda-Valbuena¹, A. Nieto-Ruiz²,³, E. Dieguez², F. Herrmann², J.A. García-Santos², M. García-Bermúdez², M.T. Miranda⁴, M. Rodriguez-Palmero⁵, R. De Castellar⁶, C. Campoy⁵,⁶
¹Pontificia Universidad Javeriana, Nutrition And Biochemistry Department, Bogotá, Colombia, ²University of Granada, Euristikos Excellence Centre For Paediatric Research, Granada, Spain, ³University of Granada, Brain, Mind And Behaviour Research Centre-cimcy, Granada, Spain, ⁴University of Granada, Biostatistics, Granada, Spain, ⁵Ordesa Laboratories, S.L., I+d+i Research Department, Barcelona, Spain, ⁶University of Granada, Department Of Paediatrics, Granada, Spain

Background and Aims:

Recent research has established early weight gain as predictor of BMI and possible metabolic risks during childhood. We analyzed the association between weight gain during the first 6 months of life in healthy infants and its relationship with children’s BMI and metabolic risk at 4 years old.

Methods:

170 healthy infants were included in the COGNIS RCT study to receive either a standard infant formula (SF, n=85) or an enriched-infant formula [LC-PUFAs, MFGM, synbiotics, nucleotides and gangliosides] (EF, n=85). Furthermore, a control group of breastfeed infants (BF, n=50) was included in the study. Growth was evaluated using WHO standards. Catch-up growth was calculated as the Z-Score difference for weight/age and weight/length from birth to 6 months of age, and classified as: slow (SWG<−0.67), normal (NWG≥−0.67 and ≤+0.67) or rapid weight gain (RWG>+0.67). Metabolic risk was analyzed according to waist/age, and the children were classified as at risk (≥P75) or risk-free (<P75). ANOVA, Student T-test and Chi-Square test were performed using SPSS 22.0.

Results:

No differences in the catch-up growth at 6 months and children’s BMI/age at 4 years old were found according to the feeding group. Children with RWG (n=38) for age and length were classified more frequently as overweight in comparison with SWG (n=50) and NWG (n=80) children (p=0.006/p=0.002). Furthermore, metabolic risk at 4 years old were more frequently in RWG for age (p=0.004).

Conclusions:

RWG during the first 6 months of life is associated with overweight and metabolic risk at 4 years old.
CORTICAL VISUAL EVOKED POTENTIALS AND GROWTH IN INFANTS FED WITH BIOACTIVE COMPOUNDS-ENRICHED INFANT FORMULA: RESULTS FROM COGNIS RANDOMIZED CLINICAL TRIAL

A. Nieto-Ruiz¹, J.A. García-Santos², M. García-Bermúdez², F. Herrmann², E. Dieguez², N. Sepúlveda-Valbuena², S. García-García³, M.T. Miranda⁴, R. De Castellar⁶, M. Rodriguez-Palmero⁶, A. Catena⁷, C. Campoy²,⁸

¹University of Granada, Brain, Mind And Behaviour Research Centre-cimyc, Granada, Spain, ²University of Granada, Euristikos Excellence Centre For Paediatric Research, Granada, Spain, ³Pontificia Universidad Javeriana, Nutrition And Biochemistry Department, Bogotá, Colombia, ⁴University Hospital San Cecilio-PTS Granada, Service Of Neurophysiology, Granada, Spain, ⁵University of Granada, Biostatistics, Granada, Spain, ⁶Ordesa Laboratories, S.L., I+d+i Research Department, Barcelona, Spain, ⁷University of Granada, International Mind, Brain And Behavior Centre (cimyc), Granada, Spain, ⁸University of Granada, Paediatrics, Granada, Spain

Background and Aims:

Postnatal nutrition is essential for growth and neurodevelopment. We analyzed the influence of a new enriched-infant formula with bioactive compounds on growth, neurodevelopment, and visual function (VF) in healthy infants during their first 18 months of life.

Methods:

A total of 170 infants were randomized in the COGNIS randomized clinical trial (RCT) to receive a standard infant formula (SF=85) or a new experimental infant formula supplemented with functional nutrients (EF=85). As a control, 50 breastfed infants (BF) were enrolled. Growth patterns were evaluated up to 18 months of life; neurodevelopment was assessed by general movements at 2, 3, and 4 months; VF was measured by cortical visual evoked potentials at 3 and 12 months. ANCOVA, generalized linear mixed model for repeated measures, Chi Square test and McNemar test were performed using SPSS 22.0.

Results:

No differences in growth and neurodevelopment were found between groups. Regarding VF, SF and EF infants presented prolonged latencies and lower amplitudes in the P100 wave than BF infants. In the EF group, a higher percentage of infants presented response at 7½'of arc at 12 months compared to 3 months of age; a similar proportion of BF and EF infants presented responses at 7½'of arc at 12 months of age.

Conclusions:

Early nutritional intervention with bioactive compounds could narrow the gap in growth and neurodevelopment between breastfed and formula-fed infants.
INFANT FEEDING PRACTICES AND EARLY GROWTH AMONG CHILDREN OF THE NATIONWIDE ELFE COHORT

A. Camier\(^1\), C. Davisse-Paturet\(^1\), S. Nicklaus\(^2\), S. Lioret\(^1\), B. Heude\(^1\), M.-A. Charles\(^1\), B. De Lauzon-Guillain\(^1\)

\(^1\)Université de Paris, Center For Research In Epidemiology And Statistics (cress), Inserm, Inra, Paris, France, \(^2\)INRA, Center On Taste And Feeding Behavior, Dijon, France

**Background and Aims:**

Rapid early growth is considered as a risk factor for obesity later in life. Breastfeeding is associated with slower growth in the first months of life, but the complementary diet of non-exclusively breastfed infants remains poorly considered. Our objective was to analyze the links between infant diet during the first year and growth up to 18 months.

**Methods:**

Analyses included 7380 infants from the Elfe birth cohort. Infants were grouped into clusters using hierarchical clustering according to infant diet characteristics (breastfeeding duration, introduction of infant formula, main food groups and unmixed foods). Association between clusters and weight, height and BMI between 6 and 18 months was analyzed by linear regressions adjusted on confounding factors, including parental BMI and 2-month infant weight.

**Results:**

Six groups of infants were identified: “intermediate complementary feeding introduction (CF)”, “late CF/intermediate breastfeeding duration (BF)”, “late CF/long BF”, “intermediate CF but early sweetened beverages introduction”, “early CF” and “early CF but late cow’s milk and sweetened beverages introduction”. Considering the “intermediate CF” group as the reference, weight and height were lower from 6 to 18 months in the two late CF groups (with greater effect sizes for the one with longer BF) and weight was higher in the “intermediate CF but early sweetened beverages introduction” group and “early CF” group. BMI was lower only in the group associated with longer breastfeeding.

**Conclusions:**

These results confirm the association between breastfeeding and early growth, while clarifying the important role of complementary feeding for shortly breastfed infants.
FACTORS ASSOCIATED WITH RAPID WEIGHT GAIN IN PRESCHOOL CHILDREN IN PUBLIC DAY CARE CENTERS

EPM/UNIFESP, Pediatrics, São Paulo, Brazil

Background and Aims:

Rapid weight gain in first thousand days has been associated with being overweight in childhood and, consequently, with increased risks for chronic non-communicable diseases.

The aim was to evaluate the prevalence and identify factors associated with rapid weight gain in preschool children.

Methods:

A cross-sectional study was carried out with 136 children between 24 and 35 months of age attending public day-care centers in Mogi das Cruzes between February and December 2014. Interviews were conducted with the mothers for clinical, sociodemographic and anthropometry characterization of the children. It was considered as rapid weight gain when the children presented difference greater than 0.67 between the z score of weight for age from birth to the evaluation. A logistic regression model was adjusted for factors associated with rapid weight gain.

Results:

50 children (36.8%) presented rapid weight gain and 36 (26.5%) were overweight. Of these, 22 children were in the rapid weight gain group. The logistic model showed the longest total breastfeeding time [OR=0.94 (95%CI 0.88-0.99), p=0.031] as protection factor and the low socioeconomic level [OR=4.18 (95%CI 1.04-18.60), p=0.044] as a risk factor for rapid weight gain.

Conclusions:

There was a high prevalence of rapid weight gain and overweight among preschoolers in the third year of life attending a sample of public day care centers in Brazil. Encouraging the practice of breastfeeding of children in the first years of life and guiding adequate food, especially for families with low socioeconomic status, potentially contributes to reduce rapid weight gain and, consequently, future metabolic complications of overweight.
NATURAL CHOLINE FROM EGG YOLK PHOSPHOLIPIDS IS MORE EFFICIENTLY ABSORBED COMPARED WITH CHOLINE BITARTRATE; OUTCOMES OF A RANDOMIZED TRIAL IN HEALTHY HUMANS

L. Smolders
AAK, Special Nutrition, Zaandijk, Netherlands

Background and Aims:

Background and Aim: Choline is a vitamin-like essential nutrient, important throughout lifespan, and especially during infant development. Therefore choline salts are added to infant formula. However, if choline is present in a natural form, e.g. bound to phospholipids, it may be more efficiently absorbed. The study aim was to evaluate if choline uptake is improved after consumption of an egg yolk phospholipid drink, containing 3 g of phospholipid bound choline, compared to a control drink with 3 g of choline bitartrate.

Methods:

Method: We performed a randomized, double blind, cross-over trial with 18 participants. Concentrations of plasma choline, and choline’s main metabolites betaine and dimethylglycine were determined before and up to 6 hours after consumption of the drinks.

Results:

Results: The plasma choline response, as determined by the incremental area under the curve, was 4 times higher after consumption of the egg yolk phospholipid drink compared with the control drink (P<0.01). Similar outcomes were also observed for choline’s main metabolites, betaine (P<0.01) and dimethylglycine (P=0.01).

Conclusions:

Conclusion: Consumption of natural choline from egg yolk phospholipids improved choline absorption compared to consumption of chemically produced choline bitartrate. This information is of relevance for the infant formula producers, instead of adding choline salts, adding choline from egg yolk phospholipids can improve choline uptake and positively impact infants health.
Background and Aims:

Vitamin D deficiency (VDD) during pregnancy is linked to increased risk for multiple maternal and child health complications, yet there has been limited definitive research assessing its impact on fetal growth. This study aimed to assess change in maternal vitamin D (VD) status from early to mid-pregnancy and associations between maternal VDD and infant growth.

Methods:

As part of a larger study, low-risk pregnant women were recruited from antenatal clinics at Monash Health, Melbourne, Australia. Maternal blood samples and 24-hour dietary recalls were collected at multiple time-points across pregnancy. Birthweight and infant biometry data were retrieved via medical records. Serum VD was analysed by liquid chromatography-tandem mass spectrometry (LC/MS/MS). VDD was defined as 25(OH)D <50nmol/L. Preliminary analyses included 244 women (64.3% Caucasian) with 25(OH)D measured at early (10-20 weeks) and mid (21-27 weeks) pregnancy.

Results:

Mean serum VD increased from 84±23nmol/L (early) to 97±29nmol/L (mid) pregnancy (p<0.01). Prevalence of VDD was 5% at both early and mid-pregnancy. 97% of women were taking VD-containing supplements. Mean infant birthweight was 3373.5grams, length 50.0cm and head circumference 34.3cm. 12% of babies were born macrosomic (>4000g), 14% large for gestational age, 6% small for gestational age and 4% had low birthweight. Maternal VD status at either early or mid-pregnancy was not associated with birthweight or biometry measures.

Conclusions:

Prevalence of VDD was low in this sample. Maternal VD was not associated with infant growth yet assessment of safe and adequate levels of maternal VD in relation to longer term child health and growth is warranted.
TERM INFANT FORMULA SUPPLEMENTED WITH 2’FUCOSYLLACTOSE SUPPORTS AGE-APPROPRIATE GROWTH AND IS WELL-TOLERATED: A DOUBLE-BLIND, RANDOMIZED CONTROLLED TRIAL

G. Corsello¹, Y. Vandenplas², P. Roggero³, S. Jespers⁴, S. Peeters⁵, J.-P. Stahlens⁶, M. Amico⁷, B. Berger⁸, C. Cercamondi⁹, P. Alliet¹⁰
¹University of Palermo, Department Of Health Promotion Sciences Maternal And Infant Care, Palermo, Italy, ²UZ Brussel - Vrije Universiteit Brussel, Department Of Pediatrics, Brussel, Belgium, ³University of Milan, Department Of Clinical Sciences And Community Health, Milan, Italy, ⁴Clinique et Maternité Sainte-Elisabeth, Department Of Pediatrics, Namur, Belgium, ⁵Algemeen Stedelijk Ziekenhuis Aalst, Department Of Pediatrics, Aalst, Belgium, ⁶Centre Hospitalier de Wallonie Picarde, Department Of Pediatrics, Tournai, Belgium, ⁷Nestlé Research, Biostatistics & Data Mgmt, Lausanne, Switzerland, ⁸Nestlé Research, Host-microbe Interaction, Lausanne, Switzerland, ⁹Nestlé Product Technology Center - Nutrition, Research And Development, Vevey, Switzerland, ¹⁰Jessa Hospital, Department Of Pediatrics, Hasselt, Belgium

Background and Aims:

Evidence suggests that human milk oligosaccharides have important physiological functionalities in the development during early life. This trial evaluated the growth, safety and tolerance in infants fed probiotic-containing infant formula with 2’fucosyllactose (2’FL) added at a level found in breast milk of secretor mothers.

Methods:

Healthy infants <14 days old (n=289) were randomized to receive cow’s milk-based infant formula containing Lactobacillus reuteri at 1x10⁷ CFU/g (Control) or the same formula with 1.0 g/L 2’FL (Test) until 6 months of age. A non-randomized breastfed (BF) group served as a reference (n=60). Primary endpoint was weight gain through age 4 months. Secondary endpoints included additional anthropometric measures, stool pattern, gastrointestinal tolerance and associated behaviors via 3-day parent diary, and adverse events (AEs).

Results:

Weight gain was similar in formula-fed groups (p=0.736); difference between Test and Control (mean; 95%CI: 0.26; -1.26, -1.79 g/day) was above non-inferiority margin (-3 g/day). Anthropometric Z-scores for weight-for-age, length-for-age, weight-for-length and head circumference-for-age were comparable among Test, Control and BF groups, and tracked closely with the WHO growth standards during the 6-month study period. Both formulas were well-tolerated and similar for stool frequency and stool consistency with a trend for softer stool patterns in Test vs. Control. Parent-reported GI symptoms (spitting-up, flatulence) and behavioral patterns (crying, fussiness, and sleep) as well as physician-confirmed gastrointestinal AEs were low and similar between the formula groups.
Conclusions:

Probiotic-containing infant formula supplemented with 2'FL at 1.0 g/L supports age-appropriate growth and is well tolerated.
INFANT FEEDING AND ETHNIC DIFFERENCES IN BMI DURING PRESCHOOL AGE

O. Sirkka¹, T. Vrijkotte², L. Van Houtum³, M. Abrahamse-Berkeveld⁴, J. Halberstadt¹, M. Olthof¹, J. Seidell¹
¹Vrije Universiteit, Faculty Of Science, Department Of Health Sciences, Amsterdam, Netherlands, ²Amsterdam UMC, University of Amsterdam, Department Of Public Health, Amsterdam Public Health Research Institute, Amsterdam, the Netherlands, Netherlands, ³Sarphati Amsterdam, Municipal Health Service Amsterdam, -, Amsterdam, the Netherlands, Netherlands, ⁴Danone Nutricia Research, -, Utrecht, Netherlands

Background and Aims:

Childhood overweight risk differs between ethnic populations. Although infant feeding characteristics are associated with childhood overweight risk, their potential role in explaining ethnic differences in childhood BMI is largely unexplored.

Methods:

We used data on Dutch and Turkish children (N=204) participating in a prospective study in Amsterdam, the Netherlands. At 6 months, milk- and complementary feeding (CF) factors, including breastfeeding duration, feeding frequency, timing and variety of CF (number of types of CF) were obtained using a standardized questionnaire and a food recall. Body mass index (BMI) was measured at 5 years during regular health examinations and BMI sds-scores were derived using the WHO growth reference (2007). Linear regression analyses were performed to assess the association between ethnicity and BMI at 5 years, and the explanatory role of the feeding factors.

Results:

At 5 years, Turkish children had a higher BMI relative to Dutch children (B: 0.66; 95% CI: 0.40, 0.93). CF variety at 6 months markedly reduced the association between ethnicity and BMI, however, the ethnic differences in BMI remained significant. Other feeding factors did not explain the observed association.

Conclusions:

CF variety seems to partly explain the observed ethnic differences on BMI at 5 years of age. Hence, a better understanding of complementary feeding practices across ethnic groups may provide important insights in reducing ethnic inequalities in preschool BMI.
EFFECT OF VITAMIN D SUPPLEMENTATION IN CHILDREN WITH SEVERE ACUTE MALNUTRITION IN A NUTRITIONAL REHABILITATION CENTRE: A RANDOMIZED CONTROLLED TRIAL

P. Sharma, M.M. Maurya
M.L.N Medical college, Paediatrics, Allahabad, India

Background and Aims:

According to World Health Organization (2013) approximately 35% of the under-five mortalities are due to nutrition related factors & 4.4% of deaths are due to severe wasting. It has been found that Vitamin D levels are low in children with malnourished and sick children. Even the prevalence of vitamin D deficiency is very high in Indian subcontinent. In WHO recommendations for the management of severe acute malnutrition there is no role of vitamin D supplementation.

Objective: To study the effect of vitamin D supplementation on severe acute malnourished children admitted in nutritional rehabilitation Centre.

Methods:

Design: Single blinded Randomized controlled, parallel group trial.

Setting:Nutritional Rehabilitation Centre (NRC) of a tertiary care hospital. Participants: 70 severe acute malnourished children aged 6 months to 59 months admitted in the NRC were randomized by computer generated random table. Intervention: 6 lakhs IU vitamin D was given intramuscularly on day one of therapy after an informed consent to the study group and other group was given only management of SAM.

Outcome measure: outcome indicators of NRC i.e.cure rate,death rate,non-responders,relapse rate.

Results:

Results: There was no significant difference in the outcome indicators of NRC i.e cured,death,non-response and relapse rate (p=0.32) and average weight gain (p= 0.38) and length of stay (p=0.42) between two groups at discharge but wasting (p=0.02 on first, p=0.008 on third and p=0.04 on fourth follow up respectively) improved significantly on follow up.
Conclusions:

Conclusions: vitamin D supplementation does not have any significant improvement in the outcome indicators at discharge but significantly improves wasting on follow up.
BIRTH WEIGHT AND THE COURSE OF LINEAR GROWTH DURING PUBERTY IN BOYS

M. Durda-Masny1, A. Szwed2
1Adam Mickiewicz University, Department Of Human Biological Development, Poznań, Poland, 2Adam Mickiewicz University, Department Of Human Biological Development, Poznan, Poland

Background and Aims:

The aim of the study was to investigate whether the birth weight is associated with early and late markers of adolescent growth spurt such as: age at take-off (ATO), age at peak height velocity (APHV), velocity at take-off (VTO), peak height velocity (PHV), height at TO and PHV, as well as predicted adult height (PAH) in boys.

Methods:

This longitudinal study included 121 boys born on time, for whom birth weight and body height measurements were obtained in 2, 4, 6, 8, 10 years of age. For statistical analysis, the surveyed boys were divided into two groups based on birth weight (bw): 1) bw <2500 g, and b) bw >2500g. The structural growth model JPA2 available in the AUXAL SSI 3.1 program was used to assess selected markers of growth spurt. The Mann-Whitney U test was used to assess the relationship between birth weight and growth spurt parameters.

Results:

A significant relationship has been found between low birth weight and a) lower ATO (Z= -3.42; p<0.001), b) lower height at TO (Z= -5.68; p<0.001), c) lower height at PHV (Z= -5.61; p<0.001), d) higher PHV (Z= 2.92; p<0.05), and e) lower PAH (Z= -4.87; p<0.001). There were no relationship between bw and other studied parameters of adolescent growth spurt.

Conclusions:

Birth weight below the 2500g in boys may be critical for the initiation of the pubertal growth spurt (lower ATO and height at TO) and affects the progression of pubertal development resulting in higher PHV, lower height at PHV, and lower final height.
AGE AT MENARCHE AND SELECTED MARKERS OF ADOLESCENT GROWTH SPURT IN GIRLS SMALL FOR GESTATIONAL AGE

A. Szwed, M. Durda -Masny
Adam Mickiewicz University, Department Of Human Biological Development, Poznan, Poland

Background and Aims:

The aim of the study was to determine the relationship between birth weight and age at menarche, pace of linear growth measured by age and height at TO and PHV in SGA girls.

Methods:

In 297 girls aged 10-18 years several measurements of body height and weight have been taken during girls’ development. Girls were divided into 2 groups: SGA (N=67) with birth weight below -2SDS and AGA (N=230) with birth weight between -2SDS and +2SDS. SGA girls were classified as: no catch-up if their body mass remained below the −2 SDS (n=23) during the first two years of life, and catch-up growth (n=44) indicating the achievement of weight at or above the −2 SDS. Girls were asked about their age at menarche. To investigate the rate of linear growth the age and height at TO and PHV for each girl were calculated using mathematical structural model JPA2. Other statistical analyzes were made using Kruskal-Wallis and Kaplan-Meier tests.

Results:

The menarcheal age for the entire group was 12.59±1.13 (Me = 12.52, Min = 9.9, Max = 16.0). There were a statistically significant differences in the age at menarche between SGA-catch-up, SGA-no catch-up and AGA girls (H=18.41, p<0.001). The earliest maturing girls were SGA-catch up (12.27±0.90), then AGA (12.57±1.16) and the latest SGA-no catch-up girls (13.74±1.62). Height at TO and PHV showed similar, statistically significant differences (TO: H=6.54, p=0.04; PHV: H=7.20, p=0.03).

Conclusions:

The lack or existence of catch-up growth affects linear growth and the rate of biological maturation of SGA girls.
Background and Aims:

Conventional milk contains A1 and A2 β-casein proteins. Digestive process of A1 may cause adverse gastrointestinal (GI) effects that can be alleviated by substituting with A2.

Methods:

Healthy toddlers 12-36 months old without diagnosed milk intolerance were randomized in 2:1 allocation to either receive A2 growing-up milk (GUM, intended for children aged 12-36 months) or continue their current feeding regimen including conventional milk (predominantly GUM) for 14 days (d).

Results:

Of 387 enrolled toddlers, 359 completed the study. In all study participants, parents reported less constipation in those drinking A2 GUM vs. conventional milk (p=0.02). While changes in overall gut comfort score (GCS) on d14 from baseline was not significantly different between groups, A2 GUM supported good digestive tolerance by sustaining low GCS (14.0-15.1; GCS range 10-60) throughout the study (Table). Stratified analysis was further conducted and showed that, in a subset of toddlers (one-third of all) who had minor GI discomfort at enrollment (B-GCS>=17), those consuming A2 GUM (vs. conventional milk) experienced significantly improved overall digestive comfort and reduced individual GI symptoms on d7 and d14 (Table). In the remainder of toddlers with essentially no GI issues (B-GCS<17), switching to A2 GUM maintained very low GCS (12.0-13.0) over the study period (Table).
Conclusions:

A2 GUM was shown to be easy-to-digest and reduce parent-perceived constipation in all healthy toddlers. Among those with mild GI distress, switching to A2 GUM alleviated multiple GI symptoms and improved overall digestive comfort in as little as one week.

<table>
<thead>
<tr>
<th>Table 1: Toddler Gut Comfort Questionnaire (Full Analysis Set)</th>
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<tbody>
<tr>
<td><strong>A2 GUM</strong></td>
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<tr>
<td>n</td>
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<tr>
<td>---</td>
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<tr>
<td><strong>Overall Gut Comfort Score in all toddlers</strong></td>
</tr>
<tr>
<td>Baseline</td>
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<tr>
<td>Day 7</td>
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<td>Day 14</td>
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<td><strong>Overall Gut Comfort Score in toddlers with minor digestive discomfort (B-GCS≥17)</strong></td>
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<td>Day 7</td>
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<td>Day 14</td>
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<tr>
<td><strong>Overall Gut Comfort Score in toddlers with essentially no digestive discomfort (B-GCS&lt;17)</strong></td>
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<tr>
<td>Baseline</td>
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<td>Day 7</td>
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<td>Day 14</td>
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**Individual GI Symptoms in toddlers with minor digestive discomfort (B-GCS≥17)**

<table>
<thead>
<tr>
<th>Day 7</th>
<th>Day 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment effect (95% CI)</td>
<td>P value</td>
</tr>
<tr>
<td>Did your child have constipation?</td>
<td>-0.5 (-0.8, -0.2)</td>
</tr>
<tr>
<td>Did your child have diarrhea?</td>
<td>-0.4 (-0.6, -0.1)</td>
</tr>
<tr>
<td>Did your child experience gassiness?</td>
<td>-0.4 (-0.7, -0.1)</td>
</tr>
<tr>
<td>Did your child have abdominal pain?</td>
<td>-0.3 (-0.5, -0.1)</td>
</tr>
<tr>
<td>Did your child feel bloated?</td>
<td>-0.4 (-0.6, -0.1)</td>
</tr>
</tbody>
</table>

GCS=Gut Comfort Score, which was derived from a parent-reported Gut Comfort Questionnaire (GCS ranging 10-60 with higher scores indicating greater GI distress); B-GCS=Baseline Gut Comfort Score; NA=Not applicable.

*Treatment effect was analyzed by ANCOVA adjusting for baseline GCS, age, sex and breastfeeding.
Background and Aims:

Young child formula (YCF), assisting young children in improving their critical nutrients intake, is widely used in Thailand and Malaysia. However, data on the effect of YCF consumption on growth and other health outcomes are limited. Therefore, we performed a secondary data analysis on anthropometric measurements from a YCF intervention study executed in 2008-2010 to evaluate the occurrence of infections (www.trailregister.nl NTR1451).

Methods:

Anthropometric data at baseline and after 6- and 12-months of intervention recorded as safety parameters were evaluated for 321 healthy 1-3-year-old Thai and Malaysian children. The composition of both studied YCFs were similar; energy (67 kcal/100ml) and protein content (1.5 g/100ml) met the 2015 expert recommendations. Statistical evaluation of the data confirmed that a pooled data analysis across both studied YCF groups was allowed.

Results:

The median YCF consumption during intervention was 630 ml/day (IQR 583-690 ml/day). During the intervention period, mean z-scores for WHO weight-for-age (WAZ), length-for-age (HAZ) and BMI-for-age (BAZ) were rather stable suggesting an adequate growth in line with WHO growth standards. Interestingly, children in the lowest HAZ quartile at baseline (HAZ: -2.2; IQR -2.8 - -1.9) did significantly improve in HAZ after 12 months of intervention (HAZ: -1.6; IQR -2.2 - -1.2 (p<0.05)); WAZ and BAZ showed a similar pattern. No apparent associations with amount of YCF consumption and any of the growth parameters were observed.

Conclusions:

Thai and Malaysian children consuming YCF with a composition like our study products demonstrated an adequate growth. In the smallest children, a moderate and proportionate catch-up growth was observed.
MALNUTRITION AFFECTS MOTOR ABILITY NETWORK CONNECTIVITY WORSE THAN STUNTING IN YOUNG CHILDREN IN INDIA

M. Bruchhage¹, M. Tiwari², A. Kumar², V. Kumar², V. D'Sa¹, S. Deoni¹
¹Warren Alpert School of Medicine, Brown University, Abi Lab, Providence, United States of America,
²CEL, Public Health, Lucknow, India

Background and Aims:

Early motor skill acquisition is an important developmental stepping stone for more complex cognitive tasks. While cognitive performance and overall health are negatively impacted by both growth stunting and malnutrition, few studies have been conducted to compare their influence on neurodevelopment. We investigate the relationship between motor ability and brain functional connectivity (fc) in currently stunted and never stunted, as well as currently underweight and average weight young children (< 2 years) living in an Indian region with one of the worst human development indicators.

Methods:

MRI data were acquired on a 3 T Philips Achieva scanner (participant demographics in Table 1). We used the Mullen Scales of Early Learning to assess motor functioning. Weight and height for age z scores were assessed to define the groups (z scores≤-2) but no participant was stunted and underweight. Analyses were corrected for age and biological sex and with FDR-correction for multiple comparisons at p≤.05.

Results:

Across motor domains, fewer fc were available in the stunted and underweight cohorts (Figures 1,2), possibly indicating an under-recruitment of brain networks. With increasing motor complexity, malnutrition affected network fc more negatively and widespread than the stunted group (Figure 2).
Gross Motor
Average weight

Underweight

Gross Motor
Never stunted

Currently stunted
Fine Motor
Average weight

Underweight

Fine Motor
Never stunted

Currently stunted
Conclusions:

Our results of fewer network fc recruitment and availability with increasing motor skill complexity could imply that with higher demand for physical development, skill acquisition might be secondary. Moreover, they imply a stronger negative effect of malnutrition over stunting on brain development and motor ability, underlining the need for early detection and interventions.
FACTORS ASSOCIATED WITH VOLUME OF MOM AT DISCHARGE IN VLBW INFANTS - A COHORT STUDY

M. Oliveira¹,², D. Volkmer¹
¹Hospital Moinhos de Vento, Neonatology, Porto Alegre, Brazil, ²Federal University of Health Sciences of Porto Alegre, Paediatrics, Porto Alegre, RS, Brazil

Background and Aims:

There are dose-response benefits of human milk for very low birth weight infants. It is a challenge to maintain milk production. Understanding factors that are related to maintenance of mother's own milk production until discharge may be important to implement practices to achieve this goal. The aim of this study was to describe factors associated with low(< 50% of total diet volume) MOM volume at discharge.

Methods:

All infants with birth weight ≤ 1500g and/or gestational age ≤ 30 weeks admitted to a private, Brazilian NICU, without contraindications to mothers' milk were followed to discharge. Group 1 consisted of infants receiving ≥ 50% of total diet volume with MOM and Group 2, of infants receiving < 50% of MOM. Multivariable analysis of factors associated with lower volumes of MOM at discharge was performed.

Results:

Of 314 patients, 229 (73%) received a high volume of MOM at discharge. All patients were breastfed at least once daily, receiving MOM exclusively (54 patients, 17%) or mixed with formula when the mother was absent. Characteristics associated with low MOM volume were being multiple, lower gestational age and birth weight, and developing BPD. Regression analysis showed that being multiple (RR 2.18; CI 95% 1.53-3.11; p<0.001) and developing BPD (RR 1.75; CI 95% 1.01-3.05; p=0.04) increased the likelihood of low MOM volume at discharge.

Conclusions:

It is possible to maintain a high MOM volume production, even for very preterm infants. Understanding factors that reduce mothers' milk volume might help develop strategies to increase production during the NICU stay.
Background and Aims:

Background:
Bone turnover and thus the skeletal integrity may be affected by diabetes, and diabetic bone disease can represent a hitherto overlooked complication of type 1 diabetes mellitus.

AIM:
To assess bone modelling through the measurement of bone formation and resorption indexes in diabetic children and their correlations with disease duration.

Methods:
Serum level of osteocalcin bone formation marker by host-ELISA kit and urinary levels of deoxypyridinoline (DPD) as bone resorption marker by high-performance liquid chromatography (HPLC), were measured in 40 children with DM1 (group 1) and Twenty healthy non diabetic children as control (group 2). Severity and duration of the disease were assessed

Results:
Serum concentration of osteocalcin was significantly decreased in children with DM1 compared to non-diabetic children (P<0.05). Meanwhile, a significant increase in the urinary DPD level in diabetic children compared to control (P<0.05). Age and sex did not influence the bone biochemical markers significantly. Meanwhile, a highly significant positive correlation between serum osteocalcin and duration, as well as severity was observed (p< 0.001). On the other hand, urinary DPD showed an insignificant negative correlation with severity and duration of the disease. Furthermore, no correlation between serum osteocalcin and urinary DPD was noticed (p>0.05).

Conclusions:
Markers of both bone formation and bone resorption are altered diabetic children. Thus, diabetes mellitus type 1 is a state of low bone turnover, which in turn may lead to more fragile bone. Further efforts are necessary to establish preventive methods for osteopenia in diabetic patients especially in children.
FATTY ACIDS PERCENTAGE DISTRIBUTION IN SPHINGOMYELIN AND PHOSPHATIDYLETHANOLAMINE IN MOTHER’S MILK WITH A LOW DHA DIET.

H. Gonzalez¹, S. Visentin¹, A. Malpeli¹, L. Pescio², N. Sterin Speziale³, V. Fasano¹

¹IDIP - Hospital de Niños de La Plata - Min Sal/IDIP CIC-PBA, Nutrition, La Plata, Argentina, ²Faculty de Farmacia y Bioquimica UBA, Catedra De Biologia Celular Y Molecular, CABA, Argentina, ³Conicet, Iquifyb, CABA, Argentina

**Background and Aims:**

Background: Human milk provides infants polyunsaturated fatty acids (PUFAs) for growth and development. Sphingomyelin (SM) esterifies mainly saturated and monounsaturated fatty acids, PUFAs are esterified mainly in phosphatidylethanolamine (PE). Accumulation of PUFAs in PE protects them from peroxidation.

Objective: To assess PUFAs percentage distribution present in SM and PE in mother’s milk with a low docosahexaenoic acid (DHA) diet.

**Methods:**

Material and methods: We performed a descriptive, cross-sectional study analyzing milk samples obtained from adult mothers attending Public Health System, 90 days after delivery (2017-2018). Food intake was assessed with a 24-hours reminder. Techniques were: gas chromatography, thin-layer chromatography and Fiske-Subbarow. The protocol was approved by the Institutional Research Review Board.

**Results:**

Results: The study included 14 milk samples from exclusively breastfeeding mother. Median age was 25 years (20.25-30). The most frequently consumed foods by mothers were: sunflower oil, beef, chicken meat, processed baked goods and dairy products. Complex lipids distribution was: 40.70 ± 5.11% of SM; 21.12 ± 2.32% phosphatidylcholine; 4.22 ± 1.25% phosphatidylinositol; 7.94 ± 1.96% phosphatidylserine and 26.03 ± 5.98% PE. Median DHA in milk was 0.13% and 0.42% arachidonic acid (ARA).

The fatty acids mean percentage and standard deviations in SM and PE respectively were: palmitic acid 34.45 (1.94) vs 5.38 (0.94), oleic acid 16.50 (4.07) vs 9.43 (4.05); linoleic acid 5.91(4.69) vs 9.05 (4.5). DHA in SM was not detectable but 55.33% (14.46) was found in PE.

**Conclusions:**

Conclusion: Mother’s milk with low DHA diet presented, 55% of DHA in PE but DHA in SM was not detected.
Background and Aims:

Chronotype reflects individual circadian preference in behavioral and biological rhythm that is synchronized with external light-dark cycle. However, little is known about the relationship between chronotype with nutritional and psychosocial factors during pregnancy. This prospective cohort study aimed to examine the association between chronotype with nutritional and psychosocial factors in pregnant women.

Methods:

Chronotype of the subjects was determined using Morningness-Eveningness Questionnaire (MEQ), whereby higher scores indicate greater morningness. Sleep quality and psychological distress were assessed using Pittsburgh Sleep Quality Index questionnaire (PSQI) and Depression, Anxiety and Stress Scale (DASS-21) respectively. Pedometer was used to measure 5-day physical activity. Pre-pregnancy weight and height were self-reported.

Results:

To-date, 100 pregnant women were approached at selected government maternal and child clinics in Kuala Lumpur, Malaysia. Subjects were mostly Malay (67%). Mean age was 28 (4.3) years; 12% were underweight and 19% were overweight/obese before pregnancy. Stress, anxiety, and depression of moderate severity or above were found in 13%, 49% and 12% of the subjects, respectively. The prevalence of poor sleepers was 70%. Sedentary behaviour was observed in 73% of the subjects (4086 ± 2247 steps/day). In the linear regression model, chronotype was a significant predictor of stress (β = -0.421, p = 0.015) and depression (β = -0.208, p = 0.042) during pregnancy.

Conclusions:

Preliminary findings from this study suggested that chronobiological approaches may be important to tackle psychological distress during pregnancy, which may impact birth outcomes and subsequently, infant growth. Circadian rhythm of subjects will be determined based on salivary hormone in upcoming analysis.
ASSOCIATION OF GESTATIONAL WEIGHT GAIN IN TWIN PREGNANCY WITH NEONATAL, INFANT AND CHILDHOOD ANTHROPOMETRICS: EVIDENCE FROM THE PERI/POSTNATAL EPIGENETIC TWIN STUDY

D. Ashtree1,2, D. Osborne2, A. Lee3, M. Umstad4,5, R. Saffery6, J. Craig7,8, K. Scurrah1,2

1University of Melbourne, Centre For Epidemiology And Biostatistics, School Of Population And Global Health, Parkville, Australia, 2Twins Research Australia, School Of Population And Global Health, Parkville, Australia, 3Royal Women's Hospital, Department Of Nutrition, Parkville, Australia, 4University of Melbourne, Department Of Obstetrics And Gynaecology, Parkville, Australia, 5Royal Women's Hospital, Department Of Maternal Fetal Medicine, Parkville, Australia, 6Murdoch Children's Research Institute, Cancer And Disease Epigenetics, Parkville, Australia, 7Deakin University, Centre For Molecular And Medical Research, School Of Medicine, Faculty Of Health, Waurn Ponds, Australia, 8Murdoch Children's Research Institute, Molecular Epidemiology, Parkville, Australia

Background and Aims:

Multifetal pregnancies are at risk of adverse maternal, neonatal and long-term health outcomes, and gestational weight gain (GWG) is a potentially modifiable risk factor. Knowledge about appropriate GWG for twin pregnancies is limited, as the current Institute of Medicine (IOM) recommendations are unlikely to be representative of all twin pregnancies. We aim to explore GWG in an Australian twin pregnancy cohort, and determine whether GWG is associated with infant and childhood growth and anthropometric outcomes.

Methods:

The Peri/Postnatal Epigenetic Twin Study (PETS) recruited women during their second trimester, with follow-up of the twins at age six. GWG was calculated from pre-pregnancy weight and weight at delivery. We examined the percentage of women gaining within the guidelines, calculated GWG-for-gestational-age z-scores, and fitted regression models to assess associations of GWG with twin birthweight and anthropometrics at 18 months and six years of age.

Results:

Preliminary Results:

Two-hundred and forty-four women had GWG measurements and 20% gained below, 32% gained within, and 48% gained above the current IOM guidelines. Higher GWG-for-gestational-age z-score was associated with higher birthweight (β: 91.67 g, 95%CI: 25.92 to 157.42, p=0.006) and higher BMI (β: 0.93 kg/m², 95%CI:0.40 to 1.47, p=0.001) in the twins at age six.
Conclusions:

Most women in the PETS did not meet the IOM recommendations. Weight gain outside the current guidelines was associated with neonatal and childhood anthropometric outcomes, indicating that maternal growth during pregnancy may be important for neonatal, infant and childhood growth. More research is needed to establish comprehensive guidelines for GWG in twin pregnancies.
THE EFFECT OF PARTLY REPLACING VEGETABLE FAT WITH BOVINE MILK FAT IN INFANT FORMULA ON POSTPRANDIAL LIPID METABOLISM AND SATIETY: A PROOF-OF-PRINCIPLE STUDY

J. Hageman\textsuperscript{1,2}, J. Keijer\textsuperscript{2}, A. Nieuwenhuizen\textsuperscript{2}
\textsuperscript{1}FrieslandCampina, Global Nutrition Development, Amersfoort, Netherlands, \textsuperscript{2}Wageningen University, Human And Animal Physiology, Wageningen, Netherlands

Background and Aims:

Besides vegetable fat sources also bovine milk fat is used in infant formula (IF). These fat sources differ in fatty acid (FA) composition and triacylglycerol (TAG) structure. The type of FAs and TAG structure affect the absorption and metabolism of fat. The aim of this trial was to study the effect of replacing 67% of vegetable fat in IF with bovine milk fat on postprandial lipid metabolism and satiety.

Methods:

A proof-of-principle study with 20 healthy male adults was conducted. Using a randomized controlled double-blind cross-over design, subjects consumed IFs with 100% vegetable fat and with 67% bovine milk fat and 33% vegetable fat on two separate days. Before, and every 30 minutes after consumption, until five hours postprandially, satiety was determined and venous blood samples were taken to perform lipidomics analysis and to determine satiety hormones.

Results:

No differences in concentrations of serum lipids or lipoprotein metabolism were observed between IFs. Concentrations of serum ketone bodies were increased, satiety was found to be prolonged, and the postprandial responses of secretin and acylated ghrelin were increased after consumption of the IF containing milk fat compared to the IF containing only vegetable fat.

Conclusions:

The use of bovine milk fat in IF does not affect postprandial lipemic response, but it does prolong satiety in healthy male adults, compared to an IF containing only vegetable fat. This difference might be related to an increased postprandial secretin response. Whether the exact same effects occur in infants requires experimental verification.
INTERGENERATIONAL DYNAMICS TOWARDS TALLER PEOPLE: IMPROVED NUTRITIONAL STATUS OF WOMEN -> TALLER MOTHERS ACROSS THE 19TH/20TH CENTURIES -> LARGER NEONATES -> TALLER NEXT GENERATION?

K. Staub, K. Matthes, J. Floris
University of Zurich, Institute Of Evolutionary Medicine, Zurich, Switzerland

Background and Aims:

Changes in growth and height reflect changes in nutritional status and health. Systematic surveillance of growth can suggest areas for interventions. The phenotypic variation has in addition a strong intergenerational component. There is a lack of family data to follow the transmission of height over subsequent generations. Maternal height is a proxy for conditions experienced by one generation that relates to the health/growth of the next generation. Cross-section/cohort studies have shown that shorter maternal height is closely associated with smaller size (weight) at birth in offspring.

Methods:

We analyzed maternal height and offspring weight at birth of neonates in the maternity hospital Basel 1896-1939 (N=ca. 10'000) using GAM-models.

Results:

We observed that average height of the mothers increased by ca. 4cm across 60 birth years, as did average birth weight of their children 28 years later. Our final model (adjusted for year, parity, sex of the child, gestational age, socioeconomic background of the parents, maternal year of birth) revealed a significant and almost linear maternal height effect on birth weight. In terms of contribution to AIC, maternal height was the second most important variable, after gestational age. In additional, we also found a significant effect on height of the newborn boys resp. men 19 years later at conscription (aggregated published data).

Conclusions:

Our results have the following implications for public health: When (female/maternal) height increases due to improved nutritional status, size at birth and later also adult height of the next generation increase as well.
ORAL PRESENTATIONS SESSION 6: NEONATAL & PREMATURITY II
08-28-2020 18:00 - 19:30

THE ASSOCIATION BETWEEN MATERNAL ONE-CARBON NUTRIENTS INTAKE IN THE YEAR BEFORE PREGNANCY AND BIRTH ANTHROPOMETRY IN THE FRENCH EDEN COHORT

M. Lecorguille¹, S. Lioret¹, B. De Lauzon-Guillain¹, E. De Gavelle², A. Forhan¹, F. Mariotti², M.-A. Charles¹,³, B. Heude¹
¹Université de Paris, Center For Research In Epidemiology And Statistics (cress), Inserm, Inra, Paris, France, ²AgroParisTech, INRA, Université Paris-Saclay, Umr Pnca, Paris, France, ³Ined-Inserm, Efs Joint Unit Elfe, Paris, France

Background and Aims:
Maternal diet plays a key role by providing essential nutrients for fetal development. Vitamins B2, B6, B9, B12, choline, methionine and betaine are especially involved in the one-carbon metabolism and DNA methylation. Our objective was to characterize dietary patterns in the year before pregnancy according to the one-carbon nutrients contribution and to study their associations with anthropometric measurements at birth.

Methods:
1,638 women were selected from the EDEN mother-child cohort, recruited in two French hospitals. Dietary intake before pregnancy was measured using food frequency questionnaire. We used reduced rank regression to identify dietary patterns using the nutrients as intermediate variables. We studied the associations between the individual scores on each dietary pattern and 1) maternal characteristics, 2) birth measurements using multivariate linear regressions adjusted for maternal characteristics and vitamins supplementation before and during pregnancy.

Results:
Three patterns were identified: ‘Varied’ (characterized by high intake of B vitamins, choline, methionine); ‘Vegetarian-like’ (B6, B9); ‘Bread and starch rich food’ (betaine). High maternal education was positively associated with adherence to the ‘Vegetarian-like’ pattern; smoking with both lower scores on the ‘Vegetarian-like’ and ‘Varied’ patterns; underweight with lower scores on the ‘Varied’ pattern. After adjustment, higher score on the ‘Varied’ pattern was related with higher birth length and tended to be related with higher birth weight.

Conclusions:
We identified three patterns describing the variability of one-carbon nutrients intake in the diet of French women of childbearing age. High scores on a pattern with combined intake of major nutrients may have a small contribution to birth length variability.
BREAST-FED NEONATES SHOW INCREASED IMMUNE TOLERANCE AGAINST MATERNAL ANTIGENS

G. Toldi¹,², H. Wood¹,², R. Powell², A. Ewer¹,³, P. Moss²
¹Birmingham Women’s and Children’s NHS FT, Department Of Neonatology, Birmingham, United Kingdom, ²University of Birmingham, Institute Of Immunology And Immunotherapy, Birmingham, United Kingdom, ³University of Birmingham, Institute Of Metabolism And Systems Research, Birmingham, United Kingdom

Background and Aims:

The neonate’s immune system needs to develop and maintain tolerance in order to accommodate the colonizing microbiome in the gut after birth. Maternal antigens during pregnancy trigger immune tolerance in the developing fetus. We hypothesized that this effect, contributing to immune tolerance in general, is extended after birth in breastfed neonates.

Methods:

We collected cord blood (CB) and peripheral blood samples at 3 weeks of age from 37 healthy, term neonates delivered by elective Caesarean sections. A pre-delivery maternal peripheral blood sample was also obtained. T cells were isolated and mixed lymphocyte reactions (MLRs) were performed over 5 days (CB or neonatal responders versus maternal antigens and vice versa). In a subset of samples, MLRs were also studied following the depletion of CD25+ cells.

Results:

Maternal T cells showed an increased response against neonatal antigens at 3 weeks compared to CB antigens. The neonatal T cell response against maternal antigens decreased by 3 weeks of age. However, this decrease was only observed in breast-fed (n=24), but not in exclusively formula-fed (n=13) infants. When CD25+ cells were depleted from the samples, an increase was observed in the response of maternal and neonatal T cells.

Conclusions:

We identified that breast-fed neonates show a decreased T cell response to maternal antigens at 3 weeks of age compared to birth. This appears to be mediated by regulatory (CD25+) T cells. This postnatal immune tolerance towards maternal antigens may be an important contributor to the development of the gut microbiome and warrants further investigation.
BRAIN MRI VOLUMETRICS IN NEWBORN AND MATERNAL PUFA SUPPLEMENTATION

E. Ogundipe
Chelsea & Westminster Hospital/Imperial College London, Neonatal Intensive Care, London, United Kingdom

Background and Aims:

Background: Docosahexaenoic acid (DHA), and arachidonic acid (ArA) are important for mammalian central nervous system development. During the last trimester of pregnancy and first postnatal months, human brain has a growth spurt, with significant increase in cerebral content of arachidonic acid (ArA) and docosahexaenoic acid (DHA), both essential polyunsaturated fatty acids (PUFAs). Fetuses and newborn infants depend on maternal supply of DHA and ArA.

Aim: Determine whether maternal brain specific PUFA supplementation relates to newborn infants’ brain MRI volumes

Methods:

Methods: In a double blinded placebo controlled trial, 89 babies born to women randomised in FOSS study to receive, ‘fish oil’ with brain specific PUFA supplementation or placebo early in pregnancy had MRI scans to measure their regional brain volumes. Statistical comparisons used Pearson’s Correlation, student t test/Mann Whitney U test for continuous variables and chi-squared test for categorical variables using SPSS and Stata statistical packages.

Results:

Results: Of 86 scans analysed, were female (43%) and male (57%). Infants of supplemented mothers had better neonatal and growth outcomes at birth. On brain MRI scan soon after birth, the infants of supplemented mothers had larger total and sub-regional brain volumes when compared to those born to the mothers who received placebo.

Conclusions:

Conclusion: This study gives first anatomical evidence relating early maternal brain specific PUFA supplementation to newborn infants’ and brain volumes (total and regional) on brain MRI scan, particularly in boys.
Background and Aims:

Central lines, like peripheral inserted central catheters (PICC), are the prerequisite for the delivery of concentrated parenteral nutrition to optimise postnatal growth in sick preterm and term infants. The aim of this study was to determine the placement success rate, dwell-time and the complications related to insertion extremity and final catheter tip position (CTP).

Methods:

Data was extracted retrospectively from the patient file system for infants who received a PICC treated at the Karolinska University hospitals NICU (level 3) during 2017. All CTP were judged and classified to “peripheral”, “intermediate” and “central” by x-ray review.

Results:

191 PICCs and 1847 catheter days were analysed. Mean gestational age (GA) at birth and birth weight were 27.41 ± 3.60 weeks and 1056 ± 639.63g respectively. PICC were inserted at median day 6 of life (IQR 3-10), a dwell-time of median 8 days (IQR 4-14) and with 70% central CTP. Figure 1 shows final tip position in relation to insertion extremity.
117 (61.26%) PICCs could be electively eliminated. Central CTP had significantly lower infection rate, longer dwell-time and higher rate of elective elimination. Intermediate and central CTP had equal rates of mechanical complications (Figure 2).

Risk for mechanical complications increased with GA and was highest at term.
Conclusions:

PICC placement from the lower extremity had the highest chance to reach central CTP, which was associated with lower infection risk, longer usability duration and elective elimination. This should be taken into account when placing PICC in sick infants at the NICU.
Background and Aims:

Preterm born infants usually show impaired postnatal growth. Catch-up growth after postnatal growth restriction consider to be key mechanism underlying programming of chronic cardio-metabolic disease in later life. The disproportional increase in fat mass during catch up growth could also contribute to the later metabolic consequences of preterm birth.

This study evaluated body composition in preterm infants at term corrected age compared to term born infants.

Methods:

Infants born between 28 to 42 weeks of gestation were enrolled in the study. Body composition in term infants was assessed by dual-energy x-ray absorptiometry (DXA) in the first week of life. In preterm infants first DXA examination was in the second week of life and the second one was at term corrected age. Anthropometry was carried out at birth and on the day of DXA scan.

Results:

Mean birth-weight were 3121±299 g for term AGA (n=50), 2326±369 g for term SGA(n=31), 1920±402 for preterm AGA (n=29) and 1633±264 for preterm SGA (n=23) infant. After birth, FM% for term AGA, term SGA, preterm AGA and preterm SGA infants were 5.8±1.2, 5.4±1.5, 4.5±0.5 and 4.5±0.3%, respectively. FM% for preterm infants at term corrected age was significantly higher compared to term AGA infants (7.5±4.1 vs 5.8±1.2, P=0.04). In subgroup analysis, only preterm SGA had significantly higher FM% compared to term AGA infants (8.3±4.8 vs 5.8±1.2, p=0.006).

Conclusions:

FM% is higher in preterm infants at term corrected age compared to term born infants. This finding might have its impact on later metabolic consequences in preterm born infants.
COGNITIVE SCORES ARE ASSOCIATED WITH DIFFERENT GUT MICROBIOTA COMMUNITY IN INFANTS

C. Campoy¹, ², A. Ruiz³, I. Acuña³, F. Torres-Espínola¹, R. Jauregui⁴, N. Jehmlich⁵, S.-B. Haange⁵, M. Von Bergen⁵, A. Suarez³
¹University of Granada, Euristikos Excellence Centre For Paediatric Research, Granada, Spain,
²University of Granada, Department Of Paediatrics, Granada, Spain, ³University of Granada, Biochemistry And Molecular Biology, Granada, Spain, ⁴AgResearch Grasslands, Tennent Drive, Palmerston North, New Zealand, ⁵Helmholtz Centre for Environmental Research- UFZ, Department Of Molecular System Biology, Leipzig, Germany

Background and Aims:

It is well known that gut microbiota plays a major role immediately after birth in the development of the intestinal function, immune system and “brain-gut-axis”.

Methods:

We conducted a longitudinal study in 68 healthy full-term infants where cognitive function was assessed with Bayley III at 6 months old, and was associated with gut microbial composition and structure. Infants were categorized according to their Bayley scores within each domain into two groups, above and below the median (50th percentile).

Results:

Composite cognitive scale (CCS) was the only test in which both study groups showed significant differences in gut microbial composition. Higher evenness (p<0.004), Shannon (p<0.011) and Simpson (p<0.021) diversity and reduced dominance (p<0.021) values characterized the gut microbiota of infants with above median CCS. Principal coordinated analysis based on weighted UniFrac metrics of β-diversity showed that the gut microbiota of infants were clustered by CCS (p<0.014), indicating significant phylogenetic dissimilarities in the microbial profile of highly abundant taxa. Taxa within Lactococcus and Lachnospiraceae_Incertae_Sedis were significantly enriched in infants with below the median for CCS. Conversely, taxa within Bacteroides showed a higher abundance in children with above the median for CCS.

Conclusions:

In conclusion, the results show an association between gut microbiota and infant cognitive performance at 6 months old.

This study was funded by Spanish Ministry of Innovation and Science. Junta de Andalucía: Excellence Projects (P06-CTS-02341); Spanish Ministry of Economy & Competitiveness (BFU2012-40254-C03-01); and MyNewGut FP7 EU Project (nº 613979).
The authors declare no conflict of interest.
Background and Aims:

Infant feeding practices are subject to multiple influences. The age of onset of complementary feeding (CF) varies according to many factors such as maternal characteristics (smoking, age, education level, body size, country of birth) or infant characteristics (sex) (Bournez et al., 2017). The aim was to study if, in addition to these factors, age could depend on the child’s growth. We hypothesized that larger children (or heavier / more corpulent ones) would be introduced to CF earlier than "average"-sized children would.

Methods:

Data from the French ELFE cohort (French Longitudinal Study since Childhood) made it possible to describe the age of CF, and to model estimates of growth at different ages. We evaluated associations between length, weight, body mass, estimated growth rates at 3 months of age (i.e. before the minimum age of 4 months recommended for CF), and age of CF initiation, using linear regressions adjusted for potential confounders, for 9078 children.

Results:

Children with a higher weight, a higher length at the age of 3 months and growing the fastest between birth and 3 months were more likely to be introduced to CF earlier, especially before 4 months. It confirms the hypothesis that the decision to initiate CF could be influenced, consciously or not, by the fact that the child grows (in weight and length) rapidly.

Conclusions:

Infants who were heavier, taller, or growing more quickly at 3 months were introduced to CF earlier than other children, and most often before 4 months.
University of Helsinki and Helsinki University Hospital, Children’s Hospital And Pediatric Research Center, HUS, Helsinki, Finland

Background and Aims:

We have previously observed that high maternal and infant 25-hydroxyvitamin D concentration [25(OH)D] associate with growth decline in infants during the first year of life. We now aimed to investigate if maternal or child 25(OH)D has a relation to growth parameters in 2-year-old children in a Vitamin D intervention in infants study (VIDI).

Methods:

This study involved 820 healthy children and their mothers in Finland. We assessed 25(OH)D during pregnancy, in umbilical cord blood (UCB) at birth and in the child at 2 years of age. Children were allocated to vitamin D supplementation of 10µg or 30µg/day. Child age- and sex-adjusted length, weight, length-adjusted weight and head circumference were measured at 2 years and transformed to national age- and sex-adjusted SD scores (SDS). Multivariate linear regression models were applied.

Results:

Of the mothers and infants, 96% and 99% were vitamin D sufficient [25(OH)D ≥50 nmol/L]. Pregnancy and UCB 25(OH)D had no linear association with length, weight, length-adjusted weight, or head circumference SDS (p for all >0.2) at 2 years, when adjusted for birth size, parental heights and 2-year 25(OH)D. Higher 25(OH)D at 2 years associated with lower weight (p=0.011). Further, a similar negative trend was observed between child 25(OH)D and length (p=0.07) and length-adjusted weight (p=0.052), but not with head circumference (p>0.7).

Conclusions:

Our results suggest that the effect of maternal vitamin D status on infant growth is no longer evident at age 2 years. Higher 25(OH)D associated with lower weight among 2-year olds in a vitamin D supplementation trial.
Dietary protein intake during complementary feeding and its impact on infant growth in area facing double burden of childhood malnutrition

K. Kittisakmontri, M. Fewtrell, J. Lanigan
UCL GOS Institute of Child Health, Childhood Nutrition Research Center, London, United Kingdom

Background and Aims:

High protein intake during complementary feeding (CF) is associated with increased obesity risk whilst inadequate intake adversely influences infant growth. This study investigated protein quantity and quality during CF and associations with infant growth in a population experiencing double-burden malnutrition.

Methods:

Demographic data, anthropometry and 24-hour food recalls were collected at 6, 9 and 12 months (m) of age and serum growth hormone, IGF1 and IGFBP3 were measured at 12m in 145 healthy term infants (49.7% female, 64.1% first-born) from Chiang Mai, Thailand.

Results:

56.6% of infants were exclusively breast-fed at 6m and 37.9% received only breast milk alongside CF until 12m. Stunting, wasting and overweight were present in 4.8%, 3.4% and 0.7% at 12m. Protein intake increased markedly from 6-12m; 97.9% consumed >1.14 g/kg/day recommended by WHO and 65.5% had protein-energy percentage (%PE) above 14% at 12m. Infants with %PE in the highest quartile (>17.3%) had higher z-scores for weight-for-age (WAZ), weight-for-length (WLZ) and length-for-age (LAZ) at 12m (e.g., WLZ 0.31 vs -0.30 vs -0.46, p = 0.001; LAZ -0.13 vs -0.54 vs -0.68, p = 0.03 in Q4, Q2-Q3, Q1, respectively). Associations with WAZ, WLZ and BMI-Z were explained by milk and animal protein intake. After adjusting for gender and nutritional status, only %PE from milk was positively related to IGF1.

Conclusions:

Protein intake of these Thai infants markedly increased during CF and two-thirds had %PE above 14%. Higher intake of animal-based protein was associated with higher weight/adiposity related z-scores at 12m, but only dairy protein was associated with IGF1.
AN INFANT FORMULA WITH PARTIALLY HYDROLYSED WHEY PROTEIN SUPPORTS ADEQUATE GROWTH, IS SAFE AND WELL TOLERATED IN HEALTHY, TERM INFANTS


1Hopital de la Croix Rousse, Hospices Civils De Lyon, Lyon, France, 2Spolka Lekarska, Nzla Michalkowice Jarosz I Partnerzy, Siemianowice-Slaskie, Poland, 3Sp. z.o.o., Poliklinika Ginekologczno-polozniczca, Bialystok, Poland, 4Przyladek Zdrowia, Specjalistyczna Poradnia Medyczna, Krakow, Poland, 5Hospital Universitari Sant Joan de Reus, Planta De Pediatria, Tarragona, Spain, 6Hospital Quironsalud Barcelona, Pediatria, Barcelona, Spain, 7Private Practice, Pediatrics, Bramsche, Germany, 8Danone Nutricia Research, Clinical Research, Utrecht, Netherlands, 9Danone Nutricia Research, Pediatric Innovation, Utrecht, Netherlands, 10Danone Nutricia Research, Metabolism And Growth, utrecht, Netherlands, 11Gabinet Lekarski, Korczowski Bartosz, Rzeszow, Poland, 12Mazela J, Schlembach D, Oudshoorn JH, Kalach N, Pastor Rosado J, Nermes M And Laitinen K, Utrecht, Netherlands

Background and Aims:

Exclusive human milk is the preferred feeding for term infants. It is recommended that infants with an increased risk for allergies who are not (exclusively) breastfed are provided with partially hydrolysed formula to prevent allergic sensitization. This study evaluated safety and tolerance of a partially hydrolysed whey protein infant formula (PHF) versus an infant formula with intact protein (IPF) in healthy, term infants.

Methods:

In a randomized, multi-country, double-blinded, prospective, controlled clinical trial, fully formula fed infants were randomised ≤14 days of age to receive either PHF or IPF until 17 weeks of age. Safety was evaluated by equivalence analysis of weight gain per day within margins of ±3 g/d (primary outcome) and by recorded adverse events, growth and gastro-intestinal tolerance parameters (i.e. stool frequency and consistency, regurgitation and vomiting). A group of breastfed infants served as reference.

Results:

A total of 268 infants were randomised in the PHF (n = 134) and IPF (n = 134) groups. Equivalence of weight gain per day was demonstrated for the PHF compared to IPF group (difference in means -0.12 g/d; 90%CI [-0.24;0.02]) with estimated means (SE) of 30.2(0.5) g/d and 31.4 (0.5) g/d, respectively. Secondary outcomes, including other growth parameters, the number, severity or type of (serious) adverse events and tolerance outcomes, were not significantly different between both formula groups.

Conclusions:

The investigated partially hydrolysed whey protein infant formula supports an adequate infant growth, equivalent to intact protein formula, is safe for use and well-tolerated in healthy term infants.
CHANGES IN WEIGHT-STATUS, EATING HABITS AND PSYCHOSOCIAL PARAMETERS DURING TWO-YEARS OF GONADOTROPIN-RELEASING HORMONE ANALOGUE TREATMENT IN GIRLS WITH PRECOCIOUS/EARLY-FAST PUBERTY

S. Demol¹, S. Abargil Loochi², N. Nagelberg¹, Y. Lebenthal¹-³, M. Phillip¹-³, M. Yackobovitch Gavan¹-²
¹Schneider Children’s Medical Center of Israel, The Jesse Z And Lea Shafer Institute For Endocrinology And Diabetes, National Center For Childhood Diabetes, Petah Tikva, Israel, ²Sackler Faculty of Medicine, Tel Aviv University, Epidemiology And Preventive Medicine Graduate School Of Medicine, Tel Aviv, Israel, ³Tel Aviv University, Sackler Faculty Of Medicine, Tel Aviv, Israel

Background and Aims: We aimed to evaluate the changes in anthropometric measures, adiposity, eating-habits and psychosocial parameters in girls with precocious/early-fast puberty (PP/EFP) during two years of gonadotropin-releasing hormone analogue (GnRHa) treatment.

Methods: Thirty-two girls with PP/EFP (age: 8.9±0.9 years, BMI-SDS: 0.56±0.75) were treated with GnRHa and followed for two years. Outcome measures assessed at baseline, after 4-months, 1 and 2 years included anthropometric and body-composition measurements, Basal-metabolic-rate (BMR) by indirect calorimetry, 3-day food-diaries, Child Eating-Behaviour-Questionnaire, Pediatric Quality-of-life (PedsQL), self-esteem, body-image and state-anxiety questionnaires. Mixed models repeated measures analysis adjusted for baseline age and Tanner stage were performed.

Results: Changes in anthropometric and body-composition measurements (BMI-SDS, fat and muscle percentages, waist circumference and waist-per-height) indicated a gradual increase in body-fat, and a concomitant gradual decrease in muscle-mass, especially during the first year of treatment, which tended to stabilize after 2-years of treatment (P<0.001 for all parameters). These findings could not be explained by the participants’ dietary patterns, physical activity levels and BMR, which all indicated adequate and a relatively low energy intake as compared to energy requirements. The main significant psychosocial parameter which changed during GnRHa treatment was a gradual decline in physical functioning subscale of the PedsQL questionnaire after 1 and 2-years of GnRHa treatment (P<0.001).

Conclusions: Our findings highlight the need for comprehensive surveillance in girls treated with GnRHa for the indication of PP/EFP. Dynamics in weight status and body composition point towards the need for tailored nutritional guidance as well as physical activity counseling directed to prevent obesity.
P. Massara\textsuperscript{1,2}, L. Erdman\textsuperscript{3}, C. Keown-Stoneman\textsuperscript{4,5}, E. Ohuma\textsuperscript{6,7}, J. Maguire\textsuperscript{1,8,9,10}, C. Bourdon\textsuperscript{2}, E. Comelli\textsuperscript{1,11}, C. Birken\textsuperscript{1,12}, R. Bandsma\textsuperscript{1,2}

\textsuperscript{1}University of Toronto, Nutritional Sciences, Toronto, Canada, \textsuperscript{2}The Hospital for Sick Children, Translational Medicine, Toronto, Canada, \textsuperscript{3}University of Toronto, Computer Science, Toronto, Canada, \textsuperscript{4}St. Michael's Hospital, Applied Health Research Centre, Toronto, Canada, \textsuperscript{5}University of Toronto, Dalla Lana School Of Public Health, Toronto, Canada, \textsuperscript{6}The Hospital for Sick Children, Centre For Global Child Health & Child Health Evaluative Sciences, Toronto, Canada, \textsuperscript{7}University of Oxford, Centre For Tropical Medicine And Global Health, Oxford, United Kingdom, \textsuperscript{8}St. Michael's Hospital, Pediatrics, Toronto, Canada, \textsuperscript{9}Unity Health Toronto, Li Ka Shing Knowledge Institute, Toronto, Canada, \textsuperscript{10}The Hospital for Sick Children, Pediatric Outcomes Research Team, Toronto, Canada, \textsuperscript{11}University of Toronto, Joannah And Brian Lawson Centre For Child Nutrition, Toronto, Canada, \textsuperscript{12}The Hospital for Sick Children, Child Health Evaluative Sciences, Toronto, Canada

\textbf{Background and Aims:}

Growth patterns across childhood have been linked to health outcomes in adulthood, including obesity and cardiovascular disease. Various factors have been associated with growth in children including breastfeeding, maternal average BMI, and maternal smoking habits. Here, we examined the association between child and family-derived determinants (CFD) and growth patterns using different data integration approaches.

\textbf{Methods:}

We studied 331 children from The Applied Research Group for Kids (TARGet Kids!) Cohort, a Canadian community pediatrician-based cohort, with both CFD including maternal, family and child-related factors and growth data available. We estimated their BMI for age z-scores (zBMI) trajectories from birth until age 12 years using quadratic splines. We used similarity network fusion (SNF) to fuse trajectory data with 14 CFD and identify groups according to both datasets. Elastic net regression was used to examine the associations between the SNF growth clusters and the 14 CFD.

\textbf{Results:}

SNF identified 2 trajectory classes (class 1 increasing-developing overweight, class 2 normal-decreasing) that shared similarities between the growth data and the CFDs. Our analysis showed that the 57\% of all children similarities were due to both longitudinal growth and CFDs data. Of the 14 CFDs, maternal average BMI was a strong predictor of the fused clusters.
Conclusions:

Our analysis showed that CFDs and longitudinal growth measurements have common and complementary signals that can be used for growth patterns detection. Data integration can provide additional insight for the importance of both CFD and growth data for determining children similarity with regards to growth patterns identification.
Background and Aims:

Because parental child feeding practices affect their child’s dietary intake, we identified patterns of food parenting practices regarding junk food and sugary drinks (JS) in a large sample of parents and their children (12-17 years).

Methods:

Dyadic survey data from Family Life, Activity, Sun, Health and Eating, a cross-sectional, Internet-based study conducted in 2014, were analyzed. Latent class analysis was used to identify patterns of parent- and child-reported JS parenting practices (n=6). Model covariates included self-reported parent sex, body mass index (BMI), sugar intake, and JS legitimacy of parental authority (LPA); and self-reported child age, sex, BMI percentile, sugar intake, and JS LPA.

Results:

Based on 1,657 parent-child dyads, five latent classes were identified – Negative Influencers (20%), Indifferent Influencers (21%), Minimal Influencers (18%), Disagreeing Influencers (13%), and Complete Influencers (28%). Compared to older child dyads, younger child dyads had 77%, 65%, and 34% lower odds of belonging to Indifferent, Minimal, and Disagreeing versus Complete Influencers. Odds of belonging to Negative Influencers were 3% higher for every unit increase in parent sugar intake; odds for Minimal Influencers were 8% lower for every unit increase in child sugar intake versus Complete Influencers. Dyads with low (compared to high) parental and child agreement with JS LPA had between 2 and 27 times the odds of belonging to one of the other classes versus Complete Influencers.

Conclusions:

This study’s findings suggest that distinct patterns of JS parenting practices exist and are associated with dyadic demographic characteristics, dietary intake, and JS LPA.
DIFFERENTIAL ASSOCIATIONS BETWEEN CHILDHOOD MACRONUTRIENT INTAKES AND PUBERTY TIMING IN UK BOYS AND GIRLS

T.S. Cheng, S. Brage, N. Forouhi, K. Ong
University of Cambridge School of Clinical Medicine, Mrc Epidemiology Unit, Institute Of Metabolic Science, Cambridge, United Kingdom

Background and Aims:

Early puberty timing is associated with adverse health outcomes, particularly in women. To understand the potential modifiable risk factors, we aimed to examine the association between prepubertal macronutrient intakes and puberty timing in boys and girls.

Methods:

In the Avon Longitudinal Study of Parents and Children, macronutrient intakes at age 6 years were predicted using linear mixed-effect model, based on diet at 3, 4, 7 (assessed by food frequency questionnaire) and 7.5 years (by a 3-day food diary). Timings of puberty onset (Tanner stage 2 genital or breast (B2) development) and puberty completion (voice breaking (VB) or menarche) were determined from annual parental reports at 8-17 years on the Petersen Pubertal Development Scale. Age at peak height velocity (aPHV) was derived from height measures at 5-20 years. Linear regressions were used to investigate the associations of total energy (EI) and macronutrient intakes (carbohydrate, fat, protein) with puberty timing traits, adjusting for maternal and infant characteristics.

Results:

Among 3811 boys, higher EI was associated with earlier VB. Among 3919 girls, higher EI was associated with earlier B2, aPHV and menarche. Furthermore, in girls, higher protein intake (but not carbohydrate or fat intake in energy partition model) and substitution of dietary protein for carbohydrate (in residual and nutrient density models) was also associated with earlier B2 and aPHV. Findings were unchanged on additional adjustment for body fat percentage at 11 years.

Conclusions:

Higher childhood total energy intakes, and also protein intakes in girls, may stimulate earlier pubertal development through non-adiposity mechanisms.
NUTRIENT ADEQUACY OF FILIPINO YOUNG CHILDREN BY MILK CONSUMPTION TYPE.

T.N. Mak¹, I. Angeles-Agdeppa², M. Tassy¹, M. Capanzana², E. Offord¹
¹Nestlé Research, Nestlé Institute Of Health Science, Vers-Chez-Les-Blancs, Switzerland, ²Food and Nutrition Research Institute, Department Of Science And Technology, Taguig City, Philippines

Background and Aims:
Malnutrition is a major public health concern in the Philippines. Milk and dairy products are important sources of key nutrients for growing children. This study aims to determine the nutritional adequacy Filipino children aged 3 to 5 years by type of milk consumption.

Methods:
Using dietary intake data from the 8th National Nutrition Survey 2013, Filipino children aged 3 to 5 years (n=1389) were analysed. Children were stratified by milk consumption type: Young child milk beverage (YCMB) consumers, milk consumers, and non-dairy consumers. Non-parametric Kruskal-Wallis test and post hoc Dunn’s test of multiple comparisons were used compare the mean nutrient intakes of the three consumer groups.

Results:
The majority of children (57%) were non-dairy consumers, 35% were milk consumers and only 8% consumed YCMB. Non-dairy consumers had the lowest intakes for key micronutrients (calcium, iron, vitamins B1,B2,B3,B6,D,E, zinc; all p< 0.001) compare to other groups. Compared to milk consumers, YCMB consumers had lower total sugars intake (26g/d vs. 37g/d; p<0.001). No significant differences were found between the two groups concerning energy or other macronutrients. Highest level of adequacy was seen amongst YCMB consumers for calcium, iron, vitamins B1, B3, B6, B12, folate, vitamins C, D, magnesium, potassium, selenium and zinc, compare to milk or non-dairy consumers.

Conclusions:
Many Filipino children are not consuming any milk or dairy products from a young age. YCMB consumers had higher nutrient adequacy than non-YCMB consumers. YCMB may serve as a good carrier of micronutrients that are lacking in the diets of young Filipino children.