September 22nd, 2023 09:00 - 11:00

PARALLEL SESSION 22 - NUTRITION 3

ID 861. Defining Optimal Body Composition Outcomes at Term Equivalent Age in Infants Born Very Preterm

Doctor Ariel Alejandro Salas[1], Doctor Christoph Binder[2], Doctor Cornelia Wiechers[3], Doctor Melanie Gsöellpointner[2], Doctor Nadja Haiden[4], Doctor Christoph Fusch[5], Doctor Niels Rochow[5]

[1]University of Alabama at Birmingham, Birmingham, United States, [2]Medical University of Vienna, Vienna, Austria, [3]Eberhard Karls University, Tuebingen, Germany, [4]Kepleruniversityhospital, Linz, Austria, [5]Paracelsus Medical University, Nuremberg, Germany

Background

The growth calculator (www.growthcalculator.org) is an innovative tool that accounts for variability in weight gain observed during the first weeks after birth and defines the optimal growth “trajectory” for very preterm infants. However, body composition outcomes of infants who grow within this newly defined optimal target have not been characterized. We hypothesized that infants with growth trajectories within target from birth to 36 weeks of postmenstrual age (PMA) defined by the growth calculator tool would have the highest fat–free mass (FFM) accretion at 36 weeks PMA.

Methods

We analyzed anonymous growth and body composition data from preterm infants born in the United States, Canada, Germany, and Austria. Infants included had body composition measurements using air–displacement plethysmography around term

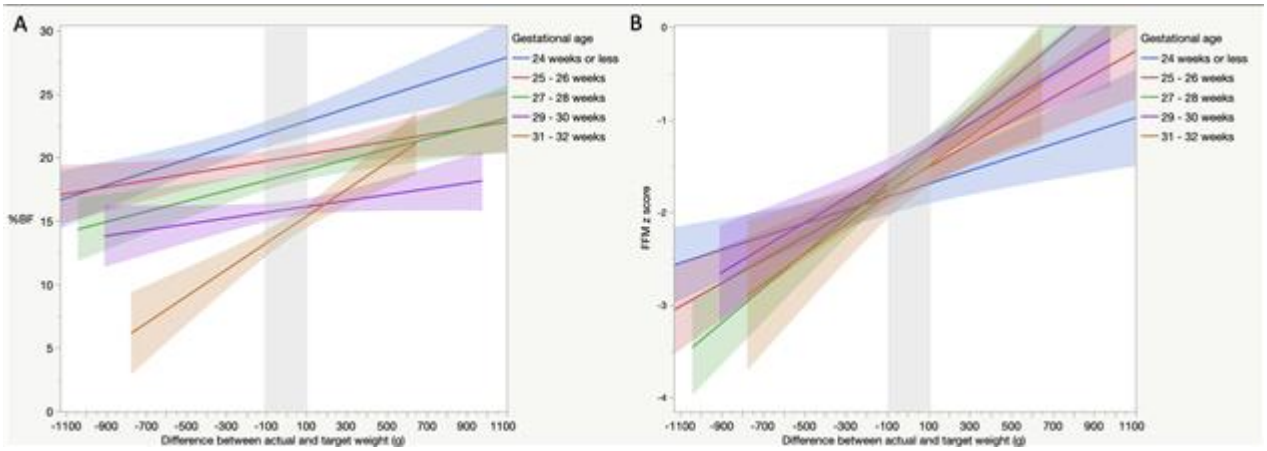
equivalent age or hospital discharge. To test our hypothesis, we entered birth and 36–week anthropometric data in the 'growth calculator' application and determined individualized trajectories for each study participant.

Results

A total of 1026 infants were included. The median gestational age (GA) and birthweight were 28 weeks [IQR, 26–30] and 1020g [SD, 352], respectively. There were significant differences in body fat percentage (%BF) and FFM accretion at 36 weeks PMA across 5 gestational age groups. In very preterm infants with growth trajectories within target, %BF at 36 weeks PMA had a strong correlation with GA (Figure 1A). FFM z scores at 36 weeks PMA ranged from –2 to –1.5 across GA groups (Figure 1B).

Conclusion

This analysis provides strong scientific justification to redefine optimal body composition outcomes in infants born very preterm. Future studies should identify nutritional strategies that increase the probability of achieving these newly defined outcomes.



Body fat percentage (A) and fat–free mass accretion (B) at term equivalent age across 5 gestational age groups.

Body fat percentage (A) and fat–free mass accretion (B) at term equivalent age across 5 gestational age groups.

This study was partially supported by an unrestricted grant from the Neonatal Network

ID 257. IMPACT OF INSULIN-LIKE GROWTH FACTOR 1 AND PRETERM BIRTH ON KIDNEY DEVELOPMENT IN NECROTIZING ENTEROCOLITIS-SENSITIVE PIGS

Mr Jingren Zhong[1], Professor Thomas Thymann[1], Professor Per Sangild[1,2,3], Associate Professor Duc Ninh Nguyen[1], Postdoc Tik Muk[1]

[1]University of Copenhagen, Copenhagen, Denmark, [2]Odense University Hospital, Odense, Denmark, [3]Rigshospitalet, Copenhagen, Denmark

Background: Preterm birth can affect normal prenatal renal development, leading to increased risk of postnatal kidney injury and failure. Preterm infants are deficient in insulin–like growth factor 1 (IGF–1), a critical growth factor that stimulates tissue perfusion and development. Using necrotizing enterocolitis (NEC)–sensitive preterm pigs as a model for preterm infants, we investigated whether exogenous IGF–1 supplementation would improve kidney maturation and ameliorate preterm birth related renal impairments.

Methods: Caesarean–delivered preterm pigs (90% gestation) received vehicle or recombinant human IGF–1 with binding protein 3 (rhIGF–1/IGFBP–3, systemically) for 5, 9 or 19 days. Postnatal age–matched term pigs served as references to preterm pigs. At the end of each experiment, blood and urine samples were collected for biochemical analysis. Kidney tissue was collected for histological, protein and gene expression analyses.

Results: Preterm pigs showed delayed kidney maturation and kidney impairments, as indicated by reduced average glomerular area, increased abnormal glomeruli percentage, altered expression of renal development related genes, and increased markers of renal injury and inflammation, when compared with term pigs. Especially

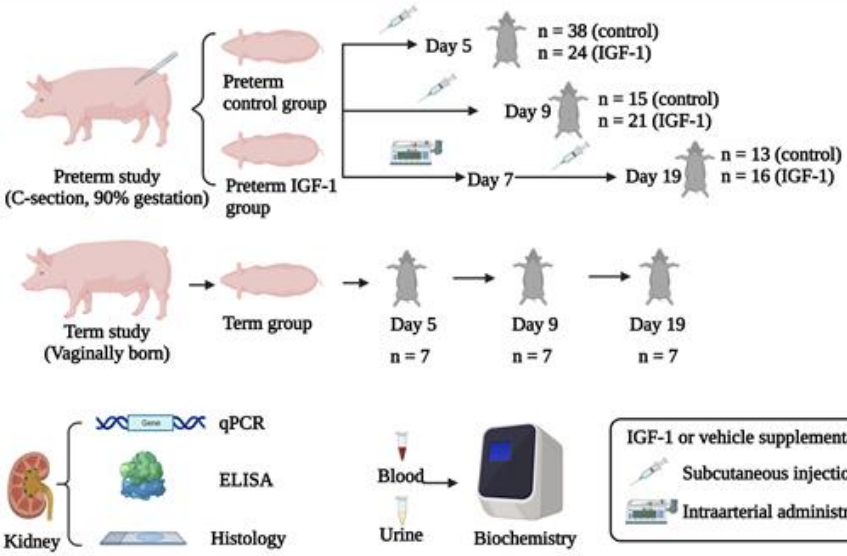
by day 5, IGF–1 supplementation reduced the abnormal glomeruli percentage, renal injury and inflammation related markers, together with up–regulation of selected maturation–related genes. There was limited effect of mild NEC–like lesions on kidney insults.

Conclusion: Preterm birth induced impaired kidney development in pigs. Supplementation of IGF–1, especially in the first week of postnatal life, supports kidney maturation and alleviates kidney insults after preterm birth. How supplemental IGF–1 may affect kidney development in preterm infants should be investigated.

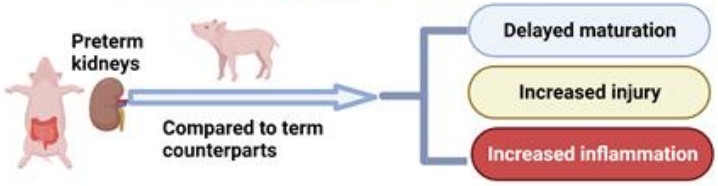
KØBENHAVNS UNIVERSITET

Impact of Insulin-like Growth Factor 1 and Preterm Birth on Kidney Development in Necrotizing Enterocolitis-sensitive Pigs

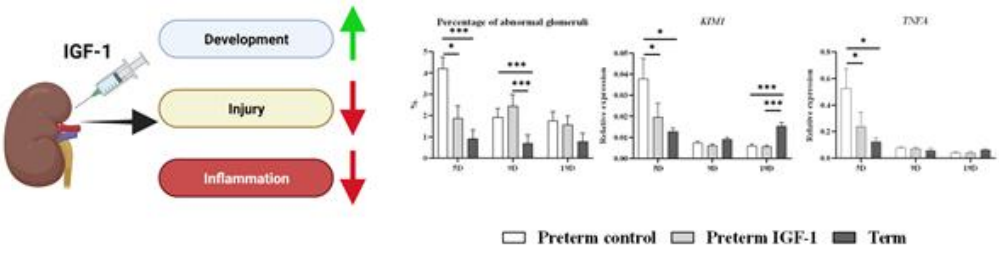
Jingren Zhong, Thomas Thymann, Per Torp Sangild, Duc Ninh Nguyen and Tik Muk



Main outcome



Preterm pigs showed impaired kidney development and health condition compared to term pigs



Supplemental IGF-1 improved kidney maturation and alleviated renal injury and inflammation caused by preterm birth during first 5 days of life

IGF–1 supplementation promotes kidney maturation and alleviates kidney insults in preterm piglets: Study design and main outcome

IGF–1 supplementation promotes kidney maturation and alleviates kidney insults in preterm piglets: Study design and main outcome

Author Per Torp Sangild, Thomas Thymann, Duc Ninh Nguyen, and Tik Muk are currently involved in a patent application directed to use of rhIGF–1 for preterm infants.

ID 971. How to define postnatal growth failure? The analysis of PGF incidence with the use of four different definitions.

MD Justyna Rogulska[1], Professor Tomasz Szczapa[1], MD, PhD Grażyna Greczka[2], Professor Tanis Fenton[3], Professor Katarzyna Wróblewska-Seniuk[1]

[1]II Department of Neonatology, Poznan Univeristy of Medical Sciences, Poznań, Poland, [2]Department of Otolaryngology and Oncological Laryngology, Poznan Univeristy of Medical Sciences, Poznań, Poland, [3]University of Calgary, Calgary, Canada

Background: Maintaining optimal growth is one of the great challenges in the population of premature newborns, especially those with very low birth weight (<1500g). Some studies suggest that growth impairment may impact future neurodevelopment and long-term metabolic and cardiovascular effects. Due to multiple different definitions used in the literature, the incidence of postnatal growth failure (PGF) and its consequences are very difficult to evaluate. The aim of this retrospective study is to determine the incidence of PGF depending on different definitions.

Methodology: We included 146 newborns with VLBW hospitalized in our department between 2018-2021. Patients with congenital disorders were excluded. We gathered data on the perinatal period, maternal and neonatal morbidities. Infants' measurements, such as body weight, head circumference (HC), and length, were collected during hospitalization. We assessed the growth pattern with Fenton charts as a reference. Z-scores were calculated using Fenton Peditools. The group was subdivided based on birth weight into SGA (<10 centiles) and non-SGA newborns (>10 centiles).

In the analysis, we applied four longitudinal definitions of PGF:

1) decrease of weight z–score >1 from birth to discharge;
2) decrease of weight z–score >2 from birth to discharge;
3) decrease of weight z–score >1 from nadir to discharge;
4) simultaneous decrease of weight, HC, and length z–score >1 from birth to discharge.

Results: Depending on the applied definition, the incidence of postnatal growth failure varied greatly from 10.96% (def. 2) up to 56.85% (def. 1). We found that when using definitions 2, 3, or 4, it was significantly more likely to diagnose postnatal growth failure in SGA newborns in comparison to non–SGA group.

Conclusions:
Unifying the definition of PGF is crucial to evaluating its risk factors and incidence. Proper growth evaluation plays an important role in the management of preterm VLBW newborns in the NICU. Appropriate identification of patients with growth impairment may impact their nutritional support in the future and assessment of probable long–term consequences.

None declared

ID 551. Plasma amino acid levels associate with growth in preterm infants fed fortified human milk

Doctor Martin Bo Rasmussen[1], Ms Kristine Holgersen[1,2], Mr Gerrit Van Hall[3], Ms Lise Aunsholt[1,4], Ms Gitte Zachariassen[2], Mr Per Torp Sangild[1,2,4]

[1]Comparative Pediatrics and Nutrition – Dept Veterinary and Animal Sciences, University of Copenhagen, Copenhagen, Denmark, [2]Hans Christian Andersen Children's Hospital, Odense University Hospital, Odense, Denmark, [3]Clinical Metabolomics Core Facility, Clinical Biochemistry, University of Copenhagen, Rigshospitalet, Copenhagen, Denmark, [4]Dept Neonatology, Copenhagen University Hospital, Rigshospitalet, Copenhagen, Denmark

Background: Preterm infants fed human milk require nutrient fortification to reach acceptable in–hospital growth rates. It is unclear how different fortification products affect amino acids (AAs) in plasma and how individual AAs relate to in–hospital growth and growth–promoting hormones. Using infants randomized to two different fortification products, we hypothesized that plasma AAs associate with in–hospital growth during the first weeks after the start of fortification and that this may be mediated by insulin–like growth factor 1 (IGF–1).

Methods: Very preterm infants (n=225, mean gestational age, 29 weeks) were randomized to fortification with a conventional fortifier (CF, PreNan, Nestlé, hydrolyzed whey protein) or bovine colostrum (BC, Biofiber–Damino, intact whey, casein, immunoglobulins), starting at postnatal day 8–9 until 35 weeks postmenstrual age aiming for similar growth (Clin. Nutr. 42, 773–783, 2023). Total protein provision was similar, but AA levels differed between fortification products. Growth was measured as ΔZ weight scores from birth until end of intervention. Preprandial plasma levels of 20 AAs and IGF–1 were measured after one (T1) and two weeks of

fortification (T2). Analyses were adjusted for gestational age at birth, small for gestational age, fortifier type and postnatal age.

Results: BC increased nine AAs (+11–42% for alanine, arginine, glycine, histidine, phenylalanine, proline, serine, tyrosine and valine), total AAs (+9–11%) and combined branched–chain AAs (BCAA) (+15–17%) at both T1 and T2 relative to CF. IGF–1 was unaffected by fortification type but associated positively with arginine, asparagine, lysine, methionine, threonine and valine as well as total and essential AAs at both time points. Regardless of fortification type, alanine, arginine, asparagine, cysteine, glutamine, lysine, methionine, threonine and tyrosine along with total and essential AAs at T1 and T2 associated positively with growth, whereas IGF–1 only associated with growth at T1.

Conclusion: One and two weeks after the start of fortification, fortification–derived protein seems linked to in–hospital growth through numerous individual growth–associated plasma AAs. Although BC provided similar growth, it increased the growth–associated AAs alanine, arginine and tyrosine. IGF–1 may partly mediate arginine, asparagine, lysine, methionine and threonine growth effects. More studies are needed to define the optimal AA composition of fortifiers.

Per T Sangild holds a patent in BC, but has declined any share of potential revenue arising from commercial exploitation of the patent. Other authors declare no conflicts of interest.