IS001 / #22

PLENARY SESSION 01: HOT TOPICS IN INFANT NUTRITION
20-02-2025 12:10 - 13:25

SHOULD INFANTS BE GIVEN UNMODIFIED ANIMAL MILK FROM 6 MONTHS

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Human milk is the optimal feeding choice that can meet the nutritional needs of most infants up to around 6 months of age. After this, complementary foods should be introduced to meet the increased demands of relatively rapid growth and development. Since 2003, the World Health Organisation (WHO) recommends exclusive breastfeeding for up to around the first six months of life as optimal for most infants. Breastfeeding should continue up to the age of 2 years and beyond if the mother and infant desire. Where this is not possible, suitable breastmilk substitutes should be given (WHO, 2003). Breast milk substitutes in wide use globally are mostly infant formulas based on modified animal milks. These can be given during the 2nd half of infancy where mothers are unable or choose not to continue breastfeeding. Infant formulas are mostly based on cow's milk modified to provide essential micronutrients and reduce protein content. In 2023 WHO published a new guideline on complementary feeding of infants aged 6-23 months (WHO, 2023). For the first time, the guideline included both breast-fed and formula fed infants and made the following recommendation: *"For infants 6–11 months of age who are fed milks other than breast milk, either milk formula or animal milk can be fed'.* This recommendation was based on evidence from a systematic review, assessing outcomes in infants 6-12 months fed either animal milks or formula milks. Although the evidence was considered to be of low certainty, the review found nutritional benefits for other milks (formula milks) over animal milk. Compared to infant formula, cow's milk was associated with: increased risk of anaemia (based on 2 RCTs and 2 cohort studies), increased gastrointestinal blood loss (1 RCT, 1 cohort) Increased risk of IDA (2 cohorts) and lower Hb (3 RCTs, 2 cohorts). The recommendation also took into consideration available resources in different settings. The new WHO recommendation may be appropriate in lower-income settings, where formula milk is not widely available/affordable or cannot be safely prepared. In such settings, continued breastfeeding is undoubtedly the optimal practice alongside complementary feeding, animal milks can provide many essential nutrients in adequate amounts. Exceptions include Iron which is an 'at risk' nutrient during complementary feeding. Although iron needs can be met through dietary sources, this can be difficult to achieve

in resource-poor settings. A further concern is that unmodified animal milks are higher in protein compared with human milk. This is particularly relevant in high-income countries where the double burden of malnutrition is a concern. In such settings, scientific evidence suggests that high protein consumption in early life may increase the risk of obesity and associated non-communicable diseases (NCDs) (Stokes et al, 2021). One disadvantage of the new WHO recommendation on complementary feeding is that the evidence review did not consider all studies that reported *associations* between intake of animal milks and outcomes such as iron status or adiposity, hence there is no mention of the potential for risk of cow's milk in these settings. In this presentation, additional evidence informing associations between protein intake during complementary feeding and how this may influence the risk of later obesity will be reviewed and discussed. Consideration will also be given to the potential impact of animal-based milk given as a breastmilk substitute during the second 6 months of life on iron status. The overarching aim is to evaluate the suitability of the new guidelines and the need for adaptation in different settings.

IS002 / #24

PLENARY SESSION 01: HOT TOPICS IN INFANT NUTRITION
20-02-2025 12:10 - 13:25

EARLY DIET AND THE RISK OF COELIAC DISEASE. 2024 POSITION PAPER BY THE ESPGHAN SIG ON COELIAC DISEASE

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The 2024 Position Paper by the European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) Special Interest Group on Coeliac Disease (SIG-CD) provides an updated review of the evidence surrounding early diet and its relationship to coeliac disease (CD) risk. This update revisits the 2016 recommendations, in line with ESPGHAN's policy of reassessing guidelines every five years, particularly when new data are available. The core recommendations from 2016 remain largely unchanged in 2024. Specifically, breastfeeding (whether exclusive or partial) does not reduce the risk of developing CD. Additionally, the timing of gluten introduction between 4 months (≥17 weeks) and 12 months of age does not significantly alter the cumulative risk of CD. However, earlier introduction may lead to earlier seroconversion and the onset of the disease. Observational studies in high-risk groups have suggested that consuming larger quantities of gluten during weaning and early childhood, particularly in the first 2-3 years (and up to 5 years in some cases), may be linked to an increased risk of CD. Despite these findings, there is insufficient evidence to establish clear thresholds for safe gluten intake, and the potential benefits of reducing gluten intake in healthy children without a known CD risk remain unknown. As a result, no specific recommendations regarding gluten quantity can be made for either the general population or infants with HLA-related genetic risk factors. Lastly, no definitive guidance can be provided on the types of gluten-containing foods to introduce during weaning, due to a lack of conclusive data. This presentation will summarize the key updates and reinforce the ongoing areas of uncertainty that require further research. Reference: Szajewska H, Shamir R, Auricchio R, et al. Early diet and the risk of coeliac disease. An update 2024 position paper by the ESPGHAN special interest group on coeliac disease. J Pediatr Gastroenterol Nutr. 2024 Aug;79(2):438-445.

IS003 / #25

PLENARY SESSION 01: HOT TOPICS IN INFANT NUTRITION
20-02-2025 12:10 - 13:25

INFANT FORMULAS SUPPLEMENTED WITH BIOTICS. A 2024 POSITION PAPER BY THE ESPGHAN SIG ON GUT MICROBIOTA & MODIFICATIONS

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Breastfeeding is the gold standard for optimal nutrition in all infants, especially for the first six months of life. When breastfeeding is not possible, infant formula is the second nutritional choice for infants. The addition of biotics, including probiotics, prebiotics, human milk oligosaccharides, synbiotics and postbiotics to infant formula is of significant relevance. For many years, biotics has been added to infant formula in an effort to reduce differences in gut microbiota composition and, ultimately, to enhance the health outcomes of formula-fed infants. Since 2011, new information on infant gut microbiota composition and factors related to the microbiota composition during the first 1000 days of life has become available. There is increasing research on nutritional postnatal interventions using biotics to promote the establishment of a beneficial microbiota, more closely relate to that in breastfed infants. To review and update the evidence on biotic-supplemented infant formula, the Special Interest Group on Gut Microbiota and Modifications (SIG-GMM) of the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) evaluated the clinical outcomes of infant formula supplemented with probiotics, prebiotics, synbiotics, postbiotics, and human milk oligosaccharides-analogues (HMO-a); with one priority research question: "*Should biotics be added to infant formula? If yes, which specific biotic and for which indications?*". The aim of this position paper summarizes the technical reports that evaluated the different biotics in infant formula up to December 31, 2023 and focuses on the following outcomes (if available): anthropometric measurements, safety, tolerability, stool frequency, stool consistency, infantile colic, infections and use of antibiotics, and allergic disorders. Studies in which HMOa, prebiotics, probiotics, synbiotics, and/or postbiotics were not introduced during the manufacturing process but administered thereafter were excluded. Formulas with partially or extensively hydrolyzed protein, studies that dealt with preterm infants, cow's milk allergy or any condition or disease. It also discusses the overall conclusions from these studies and present practical recommendations. Additionally, we highlight the limitations of the current evidence and identify research gaps.

IS004 / #27

PARALLEL SESSION 01: OPTIMIZING GROWTH: FROM EARLY NUTRITION TO MANAGING OBESITY
20-02-2025 14:25 - 15:25

NUTRITION IN THE FIRST 6 MONTHS OF LIFE

Alexandra Papadopoulou
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Breastfeeding is not only the natural, but also the best way of feeding infants. If the mother follows a balanced diet, breast milk contains all the important macro- and micronutrients for normal growth and development. Breastfeeding is associated with a lower risk of obesity, as the growth rate is lower in the critical first months of life, and fewer infectious and atopic diseases. Breastfeeding for 6 months has been shown to prevent ~3 cases of obesity, 13 cases of acute otitis media, 15–63 episodes of acute gastroenteritis and 2–6 hospitalisations due to acute gastroenteritis, ~2 cases of asthma, ~3 cases of eczema and 1 case of sudden infant death syndrome, compared to bottle-feeding. In addition, breastfeeding is associated with better cognitive abilities in childhood, a 2-3 point higher IQ score in adolescence and longer education and higher income in adulthood. The above effects are attributed to the ω3 and ω6 fatty acids (docosahexaenoic acid, DHA and arachidonic acid, ARA) contained in breast milk, which are important for the normal growth of the infant's brain.

The optimal time to start breastfeeding a healthy newborn is within two hours of birth. Not all mothers find breastfeeding easy, so support and counselling from trained staff is very important. If exclusive breastfeeding is not possible, partial breastfeeding should also be encouraged. In this case, infants should be fed an infant formula based on cow's milk protein with a low protein content, supplemented with long-chain polyunsaturated fatty acids. The protein content should be as close as possible to the protein content of breast milk (1.2 g/100 ml), but in any case <2 g/100 kcal, as this can reduce the risk of obesity later in life. Supplementation with long-chain polyunsaturated fatty acids (DHA and ARA) is important for the maturation of vision and brain development. Supplementing infant formula with pre- or probiotics in an attempt to approximate the content of the formula to that of breast milk is safe and may be beneficial for the infant. In infants with a family history of atopic disease, the use of infant formula based on partially hydrolysed protein until the start of complementary

feeding has been shown to reduce the risk of atopic dermatitis. Follow-on milk can be given after the introduction of complementary foods.

Complementary feeding should not be introduced before the beginning of the 5th month. It should be noted that in exclusively breastfed infants, the infant's iron reserves are almost exhausted after 4–6 months. A mixture of vegetables, potatoes and meat is therefore recommended as the first semi-solid food (fatty fish instead of meat once or twice a week) to provide highly bioavailable iron and zinc. Early consumption of meat, liver and fish during complementary feeding is associated with thriving growth and good cognitive development in later childhood.

Variety in ingredients (home-cooked vegetable meals) is also important to encourage the development of taste preferences. It has been shown that school-age children consume more vegetables if they eat a variety of home-cooked vegetable meals at the age of 6 months. However, it should be noted that infants generally only accept new flavours after 8 to 12 offers. Parents should therefore be aware that the introduction of complementary foods requires patience. It has also been shown that early rather than late introduction of pureed peanuts in the complementary feeding phase is associated with a lower risk of developing a peanut allergy in selected infants. Regarding gluten, neither delayed introduction of gluten (>6 months) nor early introduction (<4 months) reduces the risk of coeliac disease. However, it is recommended to introduce gluten in small amounts (one spoonful of cereal-based baby food) at first and then gradually increase it.

Conclusion:
The nutrition of infants in the first months of life has long-term effects on health and development. Paediatricians should therefore inform and advise families about healthy feeding practises for infants.

IS005 / #31

PARALLEL SESSION 02: LONG-TERM CONSEQUENCES OF SURVIVING CHILD MALNUTRITION (SURVIVE AND THRIVE)
20-02-2025 17:25 - 18:40

FOLLOW-UP OF SAM CHILDREN IN ETHIOPIA (NCD, GROWTH)

Getu Gizaw[1], Jonathan Ck Wells[2], Alemayehu Argaw[3], Mette Frahm Olsen[4], Alemseged Abdisa[5], Feyissa Challa[6], Melkamu Berhane Arefayine[7], Steve Collins[8], Kate Sadler[8], Erin Boyd[9], Henrik Friis[10], Paluku Bahwere[11], Rasmus Wibaek[12], Tsinuel Girma[13]
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Background: Severe acute malnutrition (SAM) is a major global public health problem, associated with 12-times higher risk of mortality compared to healthy children. Ethiopia has one of the highest burdens of SAM globally and to address this, has invested heavily in rolling out the Community-based Management of Acute Malnutrition (CMAM) approach. These efforts have dramatically increased coverage and early identification of cases, and reduced short-term SAM-related mortality. However, whilst the short-term outcomes have been well documented, limited data exists on the longer-term outcomes of SAM-survivors. We hypothesized SAM-survivors would not achieve catch-up growth at 5-year follow-up and would be deficient in lean-mass that could also impact their physical activity. Furthermore, they would have increased cardiometabolic risk, in particular those children with the most severe malnutrition who experienced the most rapid weight gain during post-recovery period. **Objective:** The overall objective of this study was to determine the long-term association of exposure to SAM and recovery with growth, body composition, physical activity, and cardiometabolic risk markers at 5-

year follow-up, in comparison with community controls. Recognizing the heterogeneity of SAM case definitions and patterns of nutritional recovery, we also aimed to identify distinct BMI-for-age (BAZ) trajectories of SAM children in the first-year follow-up and examine their associations with cardiometabolic risk markers 5-years later. **Method:** A prospective cohort study in 2013 enrolled children aged 6-59 months, SAM-recovered (n=203), or non-wasted controls (n=202), in Ethiopia. Anthropometry, body composition (expressed as fat-free mass index [FFMI] and fat-mass index [FMI]), physical activity (vector magnitude counts per minute [cpm]) and cardiometabolic markers were assessed at 5-year follow-up. Multiple linear regression models compared outcomes between SAM-recovered and controls. Furthermore, we used latent class trajectory modelling to identify BAZ trajectories in the first-year follow-up and compared these trajectory groups with controls for cardiometabolic risk markers at 5-year follow-up. **Results:** We traced 291 (71.9%) children (mean age 6.2 years) at 5-year follow-up. SAM-recovered children had higher stunting prevalence than controls at discharge (82.2% compared with 36.0%; $P < 0.001$), 1-year (80.2% compared with 53.7%; $P < 0.001$), and 5-year follow-up (74.2% compared with 40.8%; $P < 0.001$). SAM-recovered children remained 5 cm shorter at 5-year follow-up, indicating no HAZ catch-up. Similarly, they had lower hip -2.05 cm (-2.73, -1.36) and waist -0.92 cm (-1.59, -0.23) circumferences and lower-limb length -1.57 cm (-2.21, -0.94) than controls at 5-year follow-up. They also had deficits in FFMI at 5-year follow-up ($P < 0.001$), which was associated with lower physical activity level compared to controls (436 compared with 480.5 cpm, $p=0.018$). No differences were detected in head circumference, sitting-height, or FMI. Overall, compared to controls, SAM-recovered children did not differ in cardiometabolic risk. However, we identified 4 BAZ trajectories among children recovered from SAM: “Increase” (74.6%), “Decrease” (11.0%), “Decrease-increase” (5.0%), and “Increase-decrease” (9.4%). Compared to controls, the “Decrease-increase” trajectory had lower glucose -15.8 mg/dL (-31.2, -0.4), while the “Increase-decrease” trajectory had higher glucose 8.1 mg/dL (-0.8, 16.9). Compared to controls, the “Decrease-increase” and “Decrease” trajectories had higher total-cholesterol 24.3 mg/dL (-9.4, 58.4) and LDL-cholesterol 10.4 mg/dL (-3.8, 24.7), respectively. The “Increase” trajectory had lowest cardiometabolic risk. **Conclusion:** Five years after CMAM treatment for SAM, children maintained deficits in HAZ and FFMI, with preservation of FMI, sitting height, and head circumference at the expense of lower-limb length, indicating a “thrifty growth” pattern relative to community controls. Additionally, they spent more time in sedentary behavior. Moreover, both rapid BAZ increase and decrease during early post-recovery from SAM were associated with greater cardiometabolic risk 5-years later. The findings indicate the need to target post-recovery interventions to optimize healthy weight and height recovery.

IS006 / #32

PARALLEL SESSION 02: LONG-TERM CONSEQUENCES OF SURVIVING CHILD MALNUTRITION (SURVIVE AND THRIVE)
20-02-2025 17:25 - 18:40

FOLLOW-UP OF SAM CHILDREN IN MALAWI (NCD, GROWTH)

Natasha Lelijveld[1,2]
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More children are now suffering from but surviving severe acute malnutrition (SAM): hunger is on the rise globally, but treatment coverage and effectiveness are improving. Early exposure to malnutrition can affect long-term adult health, particularly non-communicable disease (NCD) risk. However, the majority of the evidence for this comes from exposure to malnutrition before birth or in the first few months of life. Over the past decade, we have been trying to understand the long-term health implications for survivors of SAM in Malawi and elsewhere. In 2013, we followed-up a cohort of children (n=352) treated for SAM in 2006 in Blantyre, Malawi (median age 9.5 years). We assessed mortality, morbidity, growth and early risk signs of cardiovascular NCDs. We found that 10% of the cohort died in the first year post-discharge and a further 4% died between 1 and 7 years post-discharge. SAM survivors were significantly shorter, thinner and underweight than community and sibling controls. They had less lean mass, weaker handgrip strength, and lower levels of physical activity. However, levels of fat mass and fat distribution, lung function, blood pressure, lipid profile and glucose tolerance were not significantly different to controls. While differences in metabolome were not overt between the groups, there were associations between stunting, lower lean mass, and metabolic profile. In 2022, the same cohort were followed up again (n=168) (median age 17 years); results indicated ongoing deficits in stunting and hand-grip strength compared to controls, but some narrowing of the gap since the previous follow-up. There was little evidence of any differences in body composition, blood pressure, glucose tolerance, and cognition, in SAM survivors compared to controls. These findings are contrary to systematic reviews linking cardiometabolic NCD risk to severe childhood malnutrition and famine exposure. It is possible that the Malawi survivors are still too young to see the implications, or that the control group are also exposed to a variety of nutritional challenges. These findings suggest that although those who had severe childhood malnutrition might have residual stunting, there is optimism for survivors regarding ongoing catch-up growth and the recovery of strength deficits into

adolescence. The first 1000 days of life is important, but so might be the “next 7000 days”, with longer-term interventions in later childhood and adolescence helping individuals reach their full physical, developmental, cognitive, and social potential. We have also been questioning whether SAM treatment adaptations could maximise long-term health as well as survival and sustained recovery. An analysis of the rate of weight gain during treatment in the Malawi cohort found that faster weight gain was associated with lower risk of death, greater hand grip strength, and less severe stunting. However, faster weight gain was also associated with increased waist:hip ratio, a potential indicator of later-life NCD risk. However, despite adjustment, weight deficit at admission was likely a major confounder in all analyses. Those who were more severely malnourished at admission tended to catch up faster. Hence, focusing on preventing such severe losses in weight could reduce NCD risk and maximise growth. It would also reduce the mortality risk during and after treatment and avoid the severe negative consequences of SAM on early childhood development. Focusing research efforts on how to catch children and effectively treating them at the moderate stage of malnutrition should be a priority over to ensure children in low resource context survive and thrive.

IS007 / #34

PARALLEL SESSION 02: LONG-TERM CONSEQUENCES OF SURVIVING CHILD MALNUTRITION (SURVIVE AND THRIVE)
20-02-2025 17:25 - 18:40

LONG-TERM METABOLIC CONSEQUENCES OF SAM IN EARLY LIFE

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Severe malnutrition (SM) in childhood, encompassing conditions such as kwashiorkor and marasmus, is a significant global health challenge, particularly in low- and middle-income countries. While efforts to treat and prevent acute malnutrition have improved survival rates, less is understood about its long-term metabolic consequences, which can persist well beyond childhood and impact adult health. This lecture explores how early-life malnutrition disrupts metabolic pathways, with implications for lifelong health and disease risk, with emphasis on results obtained from omics-based approaches (especially metabolomics and proteomics). Research on how SM impairs critical systems, including growth, immune function, and organ integrity, during the acute phase will initially be discussed. Using insights from longitudinal studies and omics-based approaches, we will then illustrate how these disruptions have lasting effects on metabolism and health of SM survivors. This talk aims to highlight opportunities for future research and interventions based on our molecular understanding to improve the health trajectories of children affected by SM worldwide.

IS008 / #36

PARALLEL SESSION 03: FROM GENES TO GUT MICROBES: OPTIMIZING GROWTH THROUGH PRECISION NUTRITION
20-02-2025 17:25 - 18:40

PROTEIN REQUIREMENTS FOR OPTIMAL GROWTH: A CRITICAL REVIEW

Silvia Bettocchi
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Dietary protein influence physical development and metabolic health. While adequate protein intake supports rapid growth and tissue development, a dietary excess, depending also on sources, might have adverse consequences. We draw insights from recent current evidence on protein requirements in early life, considering dietary patterns, protein sources, and their broader health implications. Protein intake undergoes a marked shift during infancy, rising from approximately 5% of total energy in exclusively breastfed infants to around 15% with the introduction of complementary foods. The shift is based on the introduction of complementary foods, Several research suggests that excessive protein intake in early life can elevate insulin-like growth factor I (IGF-I) levels, accelerate weight gain, and increase obesity risk. On the other hand, also the rapid decrease of fat intakes, following the transition towards solid from exclusive breastfeeding, has been hypothesized at the origin of a later predisposition towards obesity. While the two hypotheses are interchangeable, socioeconomic inequalities starting from infancy are now indicated as a major environmental determinant of later predisposition to obesity and other chronic non-communicable disorders (NCD). Protein quality and source may also play a key role in shaping health outcomes in different fashion according to either the animal and vegetal sources. For instance, plant-based diets, though more sustainable, may require careful balancing to ensure adequate intake of essential amino acids. Finally, the dietary meaning of proteins may change through the years as for preventive outcomes (ranging from NCD to sarcopenia), and in relation to physical activity and environmental background. Recent research has highlighted the potential of alternative protein sources, such as edible insects, which offer a sustainable option rich in high-quality protein, essential fats, and micronutrients. However, integrating these options into diets remains a challenge due to cultural acceptance and practical barriers.Further research is needed to refine recommendations, particularly regarding novel protein sources and personalized nutritional strategies.

IS009 / #37

PARALLEL SESSION 03: FROM GENES TO GUT MICROBES: OPTIMIZING GROWTH THROUGH PRECISION NUTRITION
20-02-2025 17:25 - 18:40

THE EPIGENETIC OF MALNUTRITION: IMPLICATIONS FOR GROWTH AND DEVELOPMENT

Begoña De Cuevillas[1], Alfredo Martinez[1], Fermin Ignacio Milagro[2], Omar Ramos-Lopez[3]
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Undernutrition is a facet of malnutrition concerning underfeeding and impaired nutritional health, habitually caused by an energy intake deficit or hidden nutrient deficiencies. This condition often accompanies starvation, voluntary low food consumption, gastrointestinal disorders, infections, and physio-pathological disturbances inducing cachexia and disturbed tissue metabolism. A role of epigenetics in understanding the pathways and mechanisms by which malnutrition affects biological processes and metabolism regulation has been theorized. Epigenetic signatures involve modifications in gene expression without concomitant changes in DNA sequence, such as DNA methylation, histone modifications, and noncoding RNAs, but affect gene functions. These processes can be triggered by environmental factors like undernutrition, leading to intrauterine growth restriction (IUGR) and low perinatal weight. Undernourishment during gestation or lactation jeopardizes in-utero and infant growth, neurocognitive functions, and later wellbeing. During developmental periods, such as prenatal and early childhood stages, the body is particularly sensitive to nutritional inputs. Hence, inadequate nutrition during these periods can lead to epigenetic changes altering genes involved in growth, metabolism, and cell functions. Fetal malnutrition, for instance, aligns with the "thrifty phenotype" hypothesis, where limited nutrients prioritize survival overgrowth. These adaptive changes, beneficial short-term, may cause long-term health disturbances like obesity, diabetes, cardiovascular events, and other chronic diseases. This metabolic reshaping reflects the "developmental origins of health and disease" (DOHaD) theory, highlighting early-life nutrition’s importance for health. Indeed, undernutrition relates to immunodeficiency, accelerated aging, and deleterious effects on adult health, including neurological disorders, cardiovascular diseases, obesity, diabetes, and cancer. These manifestations may be triggered or influenced by epigenetic processes. Furthermore, these epigenetic alterations can be passed to future generations, creating

a cycle of malnutrition and poor health outcomes. Undernutrition's impact on the epigenome may be driven by deficiencies or excesses of dietary methyl donors (e.g., choline, betaine, folate, and vitamins B_2, B_6, B_{12}), other micronutrients, low-protein diets, calorie restriction, and famine exposure. Obesity is another face of malnutrition, which is usually induced by an excessive intake of foods and calories in relation to energy requirements. Obesity has also been associated with altered epigenetic marks and shifts affecting the expression and regulation of genes related to Inflammation, lipid turnover and adiposity, cell metabolism, appetite, thermogenesis etc., where a deep knowledge of these mechanisms will contribute to personalized nutrition and precision medicine. While epigenetic changes induced by malnutrition may result in having long-lasting effects, some of these modifications may be reversible. Improving nutrition during early life stages or later in life may help mitigate the negative consequences of malnutrition on development and health. However, the extent to which epigenetic changes can be modulated remains an area of ongoing research. Future investigations should be focused on identifying specific epigenetic signatures associated with malnutrition and understanding the involvement of nutritional interventions that can modify these markers. Such knowledge could lead to the development of targeted epigenome-based nutritional strategies to prevent and treat with precision the adverse effects of malnutrition, ultimately improving growth, development and health outcomes in the newborn and across life. As a corollary**,** the epigenetic mechanisms through which malnutrition impacts growth and development are complex and multifaceted. Malnutrition during critical periods of development can lead to long-lasting epigenetic alterations that affect not only growth but also long-term health, predisposing individuals to chronic diseases. Understanding the epigenetic bases of these effects should provide valuable insights to recognize the role of early-life nutrition on shaping lifelong health and offer potential avenues for intervention and prevention strategies to mitigate the impact of malnutrition in the offspring across generations.

IS010 / #38

PARALLEL SESSION 03: FROM GENES TO GUT MICROBES: OPTIMIZING GROWTH THROUGH PRECISION NUTRITION
20-02-2025 17:25 - 18:40

GUT MICROBIOME AND GROWTH

Galia Gat-Yablonski
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The term ‘gut microbiota’ (GM) refers to the community of microbes, including bacteria, archaea and eukarya, residing within the intestinal tract and engaging in a symbiotic relationship with the host. Numerous studies show that GM affects many aspects of human health, including nutritional intake, metabolism, the immune response and neuro-behavioral development. Emerging research highlights a significant role for GM in linear growth, particularly in malnourished children, where reduced microbial diversity correlates with stunting severity. However, confounding variables such as nutrition, sanitation, and healthcare access may skew these findings. Notably, genetic, environmental, and geographic factors also impact GM composition, underscoring the complexity of its influence on growth. Recent studies suggest that early-life GM composition may modulate child growth through immune, metabolic, and endocrine pathways, affecting longitudinal bone growth at both systemic and local (growth plate) levels. These insights propose that the interaction between nutrition, hormones, and GM could be crucial for understanding childhood stunting and idiopathic short stature. Research in germ-free mice has demonstrated GM's ability to modulate the growth hormone (GH) axis, indicating a potential avenue for influencing growth outcomes. This presentation will review recent findings linking GM composition with childhood stunting and idiopathic short stature, including evidence from murine models and human studies. Despite technological advances, effective therapeutic interventions remain elusive. I will discuss how studies in this field highlight the potential role of GM in explaining variations in linear growth among children and could serve as a starting point for personalized growth-promoting therapies targeting the GM offering new hope for children affected by growth limitations.

IS011 / #41

OPENING CEREMONY AND KEYNOTE LECTURE
20-02-2025 18:45 - 19:30

EVOLUTION VS. GROWTH AND DEVELOPMENT OF THE HUMAN BRAIN IN THE EARLY YEARS OF LIFE

George P. Chrousos
University of Athens, Endocrinology, Athens, Greece

The evolution of the human brain involved pivotal genetic changes that took place in the past 5 million years, with most growth having occured in th past 2 million years. On the other hand, the ontogeny, i.e. the growth and development of the human brain, especially in the early years of life, is a highly complex process that shapes our cognitive, emotional, and social abilities. Understanding this process helps us appreciate how early experiences, environment, nutrition, and biology interact to influence brain growth, development and function. The development of the human brain begins by the third week of pregnancy forming a structure called the “neural tube”, which eventually gives rise to the brain and spinal cord. Around the fifth week, the neural tube begins to differentiate into the different regions of the brain, including the forebrain, midbrain, and hindbrain. During this period, neurons start forming and multiplying at a rapid rate, a process called “neurogenesis”. Throughout the second and third trimesters, brain development becomes increasingly sophisticated. Neurons migrate to their designated positions, and “synaptogenesis”— the formation of connections between neurons—begins. The brain’s cortical layers, responsible for higher cognitive functions, also start forming. The fetal brain is influenced by genetic factors, the mother’s health, nutrition, as well as by environmental factors such as stress or exposure to toxins. The period from birth to two years of age is one of the most significant phases of brain development. At birth, the human brain is approximately 25% of its adult size, but by age two, it reaches about 80% of its adult volume. This rapid growth is due to synaptogenesis, with trillions of neural connections being formed reaching a maximum at 2 years. These early connections serve as the foundation for sensory experiences like vision, hearing, and touch, and early forms of language and motor skills. During this period, the brain exhibits remarkable “plasticity”—i.e., ability to reorganize itself based on experiences and environmental stimuli. This allows infants to learn quickly from their surroundings. Early interactions with caregivers help shape a “secure emotional attachment” and facilitates the development of emotional, social, and language skills. As a child progresses from infancy into early childhood, brain development becomes more specialized and refined. This phase is marked by “synaptic

pruning", a process where the brain eliminates unused or redundant connections. Experiences during this time heavily influence which connections are strengthened and which are pruned. By the age of five, a child's brain is about 90% of its adult size. This phase is critical for language acquisition, social development, and executive functioning, which includes skills like attention, problem-solving, and impulse control. The frontal cortex, which plays a role in decision-making, self-control, and emotional regulation, undergoes significant maturation. Early childhood education and social experiences are vital during this period. A stimulating environment that includes opportunities for play, exploration, and learning is essential. Play, especially unstructured and imaginative play, fosters creativity, problem-solving, and social skills by activating multiple areas of the brain.

IS012 / #42

PARALLEL SESSION 04: NECROTIZING ENTEROCOLITIS IN PRETERMS
21-02-2025 10:30 - 11:30

PREDICTIVE DIAGNOSTICS

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The intestinal microbiome and metabolome are increasingly considered to play a key role in the pathogenesis of necrotizing enterocolitis and gram-negative late-onset sepsis in preterm infants. This knowledge opens avenues towards the development of novel strategies for early diagnostics of NEC and sepsis in clinical practice by microbiota-based biomarkers. Furthermore, novel interventions aimed at targeted manipulation of the microbiome may decrease the risk of NEC and gut-derived sepsis, improving outcome. In this presentation, an overview will be given on the potential of novel technologies to predict NEC and sepsis and novel microbiome and metabolomics data from the Dutch Generation-P project will be presented, including > 3000 neonates from 9 neonatal intensive care units in the Netherlands.

IS013 / #43

PARALLEL SESSION 04: NECROTIZING ENTEROCOLITIS IN PRETERMS
21-02-2025 10:30 - 11:30

PREVENTIONAL STRATEGIES – PROBIOTICS, HUMAN MILK AND NEW APPROACHES

Mark Johnson
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Necrotising Enterocolitis (NEC) is a devasting inflammatory condition of the bowel which causes ischaemia and necrosis. It generally affects infants born very preterm but can also occur in term infants, especially those with problems with oxygenation such as a period of perinatal hypoxia or congenital cardiac disease. The aetiology of NEC remains unclear but is felt to be multifactorial and involves a combination of nutritional, microbiological and immunological factors. NEC is associated with high mortality and morbidity, including short bowel syndrome and adverse neurodevelopmental outcomes for preterm infants. Whilst it can be treated by antibiotics, gut rest and surgery where necessary, these are not always effective and so the best strategy by far is prevention. This talk will cover the various strategies that currently exist that can help reduce the risk of NEC, and the evidence for their use in clinical practice. Such strategies include the choice of milk feed used, with current evidence supporting breast milk as the most effective and simple approach to reduce NEC risk when compared to formula milk. Donor breast milk also confers some risk reduction compared to formula milk, and this will also be considered alongside breastmilk fortifiers. The timing of initiation of milk feeds together with the speed at which they are increased will also be discussed. There is also good evidence for the use of probiotics to reduce NEC risk which will be reviewed, and newer nutritional interventions such as milk fat globule membrane and human milk oligosaccharides offer potential for the future are will also be discussed.

IS014 / #44

PARALLEL SESSION 04: NECROTIZING ENTEROCOLITIS IN PRETERMS
21-02-2025 10:30 - 11:30

NUTRITION FOLLOWING NEC

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Infants recovering from treatment of necrotizing enterocolitis (NEC) or focal intestinal perforation (FIP) present significant challenges in nutritional management. NEC, characterized by intestinal inflammation and ischemia, often leads to severe intestinal damage, while FIP typically presents as isolated perforations. Both conditions necessitate tailored nutritional approaches. Post-surgical nutritional strategies are still for discussion, but requires a phased strategy, starting with parenteral nutrition during the acute phase and transitioning to minimal enteral nutrition (MEN) to promote gut adaptation before increase to full EN. The logistics of how, when, and what to feed are though unclear. EN with breast milk is preferred due to its protective and immunological benefits. Challenges include growth faltering, micronutrient deficiencies, and electrolyte imbalances. New approaches, such as mucous fistula refeeding and early stoma closure, show promise in improving outcomes among these infants. In the absence of high-quality evidence, a consensus based early nutrition guideline, agreed upon by a multidisciplinary team, is recommended. Multicenter nutritional research projects are urgently needed in NEC and FIP patients.

IS015 / #47

PARALLEL SESSION 05: IODINE DEFICIENCY
21-02-2025 10:30 - 11:30

THE SPECTRUM OF IODINE DEFICIENCY: ADVERSE EFFECTS AND THE SITUATION WORLDWIDE

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Iodine status is determined at the population level because there is no validated biomarker for assessing chronic iodine status in individuals. Severe iodine deficiency is associated with adverse effects across the lifespan. In pregnancy it increases risks for miscarriage, stillbirth, perinatal maternal mortality, and infant mortality. At any age it can cause hypothyroidism and goiter. Severe iodine deficiency in utero or in early life can lead to impaired mental and physical development. Cretinism is a syndrome of profound intellectual impairment, growth impairment, and sometimes deafness in children born to mothers with very low iodine intakes in pregnancy. Pioneering studies in the 1970s demonstrated that optimizing iodine intakes before pregnancy could eliminate cretinism. More recent meta-analyses suggest that optimizing iodine status in severely iodine deficient regions will increase average population IQ by 8 -13 points. Universal salt iodization (USI) is the primary strategy employed worldwide to prevent iodine deficiency disorders. In 1993 the World Health Assembly resolved to eliminate iodine deficiency disorders globally. A that time, 110 countries were iodine deficient. As of 2023, only 20 countries globally were considered to have iodine deficiency. This represents a major public health triumph. A 2019 analysis suggested that the global prevalence of clinically apparent iodine deficiency had fallen from 13% in 1993 to 3.2%, meaning that about 720 million cases had been prevented by salt iodization. This translates into 20.5 million newborns protected annually and an estimated global economic benefit (largely due to improvement in cognitive development) of nearly $33 billion. USI has been feasible even in very low resource settings. No country currently is severely iodine deficient overall. Even countries such as Nigeria and India which have unstable food systems and millions of malnourished children, there is good coverage with iodized salt. However, challenges remain. Many countries have no recent iodine surveillance data. In some countries classed as iodine sufficient overall, there is substantial regional variation in iodine status which may contribute to health and socioeconomic disparities. In other countries, following the establishment of salt iodization programs there has been backsliding due to political or economic instability,

or because resources are diverted away from USI programs once iodine sufficiency is achieved. Given the severe harms associated with severe iodine deficiency, it is important to avoid complacency and to ensure that public health interventions aimed at eliminating iodine deficiency are sustainable.

IS016 / #613

PLENARY SESSION 02: YEARBOOK
21-02-2025 13:45 - 15:00

OBESITY, METABOLIC SYNDROME AND NUTRITION

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Childhood obesity is a significant global health issue with serious implications for the well-being of children and society at large. It adversely affects both physical and mental health and often continues into adulthood, increasing the risk of morbidity and mortality. The multifaceted nature of childhood obesity arises from a complex interplay of genetic, environmental, socio-economic, and behavioral factors. Nutrition plays a significant role in both the prevention and management of childhood obesity. Despite substantial efforts, numerous challenges remain in addressing this issue and promoting healthy nutrition. These challenges include socio-economic disparities in access to nutritious food, pervasive marketing of unhealthy foods to children, inadequate nutrition education, and cultural norms surrounding food and eating behaviors. Early life conditions significantly impact the physiology and metabolism of the unborn child, contributing to the early shaping of human health. Several studies reviewed in this chapter examine in utero exposures such as maternal weight, maternal gestational diabetes, maternal diet quality during pregnancy and postpartum, and maternal supplementation during pregnancy with folic acid, docosahexaenoic acid, and fish oil. These studies explore the associations between these factors and the subsequent development of childhood obesity and cardiometabolic risk in offspring. Early life nutrition also plays a significant role in lifelong health. Some studies evaluated breastfeeding as a preventive measure against obesity and examined the content of infant formula as a factor influencing childhood adiposity, insulin resistance, and cardiometabolic risk. Additionally, one study assessed the impact of the timing and quality of complementary food introduction in infancy on ectopic fat deposition in childhood Further studies investigated the impact of diet composition and mineral intake during childhood on adiposity. A healthy diet is essential for fostering healthy growth and preventing future diseases. The global increase in ultra-processed food consumption has contributed to rising obesity trends. Children with obesity are at higher risk of developing obesity-related comorbidities. A systematic review presented in this chapter reports on the impact of ultra-processed food intake on obesity and

cardiometabolic comorbidities in children and adolescents. In this year's edition of the Yearbook chapter focused on the relationship between nutrition and obesity, we conducted a Medline search for articles dealing with the following topics: nutrition and obesity and nutrition and cardio-metabolic comorbidities from infancy to childhood and young adulthood. We selected 14 notable articles from many meritorious manuscripts that offer some insight into these issues published in the past year between July 2023 and June 2024.

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IS017 / #615

PLENARY SESSION 02: YEARBOOK
21-02-2025 13:45 - 15:00

COGNITION

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Maternal and early-life nutrition, especially during critical periods such as preconception, pregnancy, infancy, and early childhood, significantly contribute to anatomic and functional brain development. The interplay between dietary patterns and specific micronutrient intake with cognitive outcomes has been a growing focus of research. This chapter presents a selection of recent studies published between July 1, 2023, and June 30, 2024, focusing on the relationship between nutrition and cognitive function across these sensitive phases. The selected original articles, including randomized controlled trials (RCTs), observational studies, and reviews, are grouped into two principal areas: "dietary patterns" and "micronutrients," each one further divided into two main categories: "pregnancy" and "infants/children." Indeed, while in previous years we used to subdivide the chapter on cognition and growth by classes of age (intrauterine stage, infancy and lactation, early childhood, adolescents) for any single nutrient, this year, due the rapid increase of interest in dietary patterns, closely connected to the widespread concept of sustainability, we have chosen to emphasize this topic. Micronutrients, on the other hand, represent an area of malnutrition closely connected to brain development and function, particularly in low-resource settings.

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IS018 / #618

PLENARY SESSION 02: YEARBOOK
21-02-2025 13:45 - 15:00

PREGNANCY: IMPACT OF MATERNAL NUTRITION ON INTRAUTERINE FETAL GROWTH

Tomer Avnon
Tel Aviv Medical Center, Lis Women's Hospital, Tel Aviv, Israel

Maternal nutrition during pregnancy plays a crucial role in fetal development and the long-term health of the child. The composition of a mother's diet influences various aspects of offspring health, including growth, neurological function, vascular health, and metabolic outcomes. This chapter reviews ten influential studies that explore how maternal diet impacts fetal growth and child development. Among those studies the effect of one-carbon nutrition was evaluated. A prospective study demonstrated that higher maternal food folate and choline intakes were associated with better language scores and that higher maternal food folate intakes were also associated with better cognitive scores. Another cohort study of 808 pairs of mother and child demonstrated that better maternal nutrition quality was associated with greater height among children at the age of 7 years and was also associated with increased body fat among boys and the lower body fat among girls. A cohort study of 77,237 patients showed that severely low protein levels at early pregnancy were associated with a higher risk for impaired communication, fine motor and problem-solving skills. A double-blinded randomized controlled trial of 586 women found that preconception and antenatal supplementation with myo-inositol, probiotics, and micronutrients were associated with a lower risk of rapid infant weight gain and obesity with a better weight gain trajectory at the age of 2. Further studies have explored the effects of specific nutrients. A prospective study evaluating caffeine intake among 4362 women demonstrated that moderate (>50 mg/day) to high maternal caffeine intake during the 1st trimester of pregnancy was associated with higher risk for small for gestational age baby. A prospective study of 321 patients evaluated lipidomic profiles during pregnancy and found that longitudinal changes were associated with neonatal anthropometry. In a cohort study of 44 healthy women and term newborn dyads, magnetic resonance imaging examination was performed at the age of 2 weeks. The study demonstrated that 1st trimester sodium intake according to dietary guidelines was associated with better neonatal white matter microstructural development measurement. A longitudinal cohort study of 434 pairs of mother-child did not demonstrate any effect of maternal fish consumption with offspring's cardiovascular health at the age of 11. We also included a couple of animal

studies due to their major findings through basic science which was not possible among human subjects. In a randomized control trial of 32 heifers, one-carbon metabolites supplementation was found to modulate fetal vascular development in the small intestines of bovine fetuses under maternal nutrient restriction. In a randomized control trial of 40 sows, intrauterine growth restriction was found to cause abnormal intestinal DNA methylation in a pig model. This was found to be alleviated by maternal methyl donor supplementation which regulates the related gene expression and their function in various biological processes. In conclusion, this chapter highlights the significant impact of maternal nutrition on fetal and child development, emphasizing the need for improved prenatal care and further research into the complex relationships between diet and health outcomes. By advancing our understanding of these nutritional influences, we aim to support better medical practices and encourage future innovation in maternal and child health research.

IS019 / #50

PARALLEL SESSION 06: WHAT MAKES CHILDREN GROW? PART II – BEYOND THE 1ST 1000 DAYS HYPOTHESIS
21-02-2025 15:10 - 16:10

WHAT MAKES CHILDREN GROW? PART II – BEYOND THE 1ST 1000 DAYS HYPOTHESIS

Barry Bogin
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Background: Human development from conception to age 2 years, often called the first 1,000 days, is a critical period for growth. One version of the '1st 1000 days hypothesis' proposes that adult height is determined by the age of 2 Years. There are related suggestions in the literature that height stunting is both established and irreversible by about 2 years of age. If these claims are true, then there is little value in any intervention or treatment of growth faltering after infancy.
Sample and Methods: The sample includes children and adolescents 5 to 17 years old, measured between 1953-1999, and attending schools in Guatemala. The analysis is based on differences in mean heights between earlier and later decades of the study.
Results: For students from high-income European and Guatemalan families attending an expensive private school, mean differences in stature between the 1950s and 1990s cohorts increase from the age 5 to 17 years for girls and especially for the boys. The increases in height of the 1990s cohort are not due to maturational effects as the 1950s cohort has greater skeletal age estimates than the 1990s cohort. Results are more variable when comparing students from low-income Maya (Indigenous) families, measured in the 1980s, a time of the most intense civil war and declining economic conditions, compared with Maya students measured in the 1990s, a decade with improving economic conditions and a peace accord. Maya children under age 12 years old are, on average, shorter in the 1990s. Maya students ages 12 and older tend to be taller in the 1990s.
Conclusion: Social-Economic-Political-Emotional factors associated with the findings are discussed. These two analyses of Guatemalan boys and girls provide evidence that interventions to improve height growth are worthwhile at all ages.

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IS020 / #51

PARALLEL SESSION 06: WHAT MAKES CHILDREN GROW? PART II – BEYOND THE 1ST 1000 DAYS HYPOTHESIS
21-02-2025 15:10 - 16:10

THE IMPACT OF POLITICS ON HEIGHT: THE SECULAR GROWTH TREND IN GERMANY FROM IMPERIALISM TO DEMOCRACY

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Background: The regulation of human height has been attributed to genetic, economic, nutritional, health related and social factors. These factors are highly interrelated, but the extent to which they ultimately contribute to growth and final height, is still controversially discussed.

Aim: to study the impact of war, starvation, and different political systems on male body height.
Subjects and Methods: We report on military height of more than 14 million German men born 1865-1975. Height was referred to living conditions: GDP, meat and milk consumption, infant mortality, births per woman, income inequality, household wealth share, number of students, and population density.

Results: Height of German men increased from 165.8 (SD 6.51) cm to 180.1 (6.96) cm. Absolute height correlated with absolute values of living conditions, but not with their dynamics. Trends in height corresponded to the rate at which living conditions changed: The faster they change, the greater the height trends. Fastest trends were observed in 1916-1933 (2.2mm/year: political instability, famine, hyperinflation, economic failure, political radicalization); in 1947-1973 (2.2mm/year: post-war social rearrangements, foreign occupation, formation of two new German countries); and in East Germany in 1991-1995 (4mm/year, following the German reunification). Contrary to the common perception that the first 1,000 days are crucial for a child's later development, the war-related famine periods of 1916-1919 had negligible effects on mean adult height (minus 1.5 cm), and the post-war famine period of 1945-1947 had neither an effect on adult height nor on lifetime earnings (doi: 10.1111/apa.13945).

Conclusion: The dynamics of political and social restructuring, the abandonment of established social bonds, competition, and the prospect of individual social and

economic success, favor upward secular height trends independent of the economic and almost independent of the nutritional situation. Community effects within peer groups provide an explanation for the narrowness of the height SD over time.

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IS021 / #52

PARALLEL SESSION 06: WHAT MAKES CHILDREN GROW? PART II – BEYOND THE 1ST 1000 DAYS HYPOTHESIS
21-02-2025 15:10 - 16:10

WEIGHT AND BMI DISTRIBUTIONS IN NATURAL OR 'NON-MODERN' POPULATIONS

Christiane Scheffler
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Background: Body weight and body mass index (BMI) are usually taken as indicators of health status. It is currently agreed that in a healthy population, both variables are skewed to the right, i.e., the number of obese people and the extent of obesity exceed number and extent of slim people. Modern growth charts, e.g., WHO charts, show this skewness in all data sets. On the other hand, historical data on 19th century malnourished infants from affluent backgrounds suggest that even severe wasting in the first 1000 days, is not associated with significant disadvantage in further child development (https://doi.org/10.52905/hbph2022.2.42).

Sample and Methods: We analysed the skewness of BMI and weight distribution (Shapiro-Wilk-Test) of more than 25 child and adolescent data sets collected since the early 20th century from Germany, Hungary, India, South Africa, and Indonesia.

Results: Modern weight and BMI distributions are skewed, e.g., in German children since the 1980s. This is different in historic populations and in modern rural populations of developing countries, e.g., in Indonesia. In these populations, body weight and BMI show basically symmetric Gaussian distributions. Transition patterns are visible in South Africa (1980s) and urban Indonesia.

Conclusion: Modern references are inherently affected by the obesity pandemic with major weight and BMI skewness that is not evident in healthy traditional societies. Modern references grossly underestimate the true prevalence of obesity, and overestimate the prevalence and the clinical relevance of wasting.

IS022 / #55

PARALLEL SESSION 07: INEQUITIES, INJUSTICE, AND DEVELOPMENT DISADVANTAGES: GROWING AS ADOLESCENTS IN LATIN AMERICA
21-02-2025 16:40 - 17:55

REGIONAL NUTRITION AND HEALTH PROBLEMS: OBESITY, SEDENTARISM, MICRONUTRIENT INADEQUATE INTAKE, DIET DIVERSITY. RESULTS OF THE ELANS STUDY

Georgina Gómez Salas
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According to the World Health Organization, Latin America faces the doble burden of malnutrition, with a prevalence of overweight and obesity ranging 15% to 25%, alongside moderate to severe underweight affecting less than 10% of population. The Latin American Nutrition and Health Study (ELANS) aimed to study and evaluate the nutritional status, diet quality and physical activity in a representative sample of urban population from eight Latin American countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Perú y Venezuela). The analysis focuses on data from 671 adolescents (mean age 15.9 ±0.8 years), of whom 58% were boys and 41% belong to low socioeconomic level. The prevalence of underweight (12.3%) exceeded the prevalence of obesity (7.6%), and 7.5% of participants exhibited stunting (low height-for-age). Diet quality assessment show that 52.8% of participants reported a diverse diet (dietary diversity score ≥5). However, only 16.4 % met the recommended daily intake of five key food groups: fruits, vegetables, pulses, nuts or seeds, animal-source foods and starchy staples. Based on the Global Dietary Recommendation Score, which measures dietary risk and protective factors against non-communicable diseases on a scale from 0 to 18, the mean score was 8.0 ± 2.1 points. Notably, Argentina had the lowest score (6.9 ± 2.2) while Brazil achieved the highest (9.1± 1.4, $p<0.001$). Micronutrients adequacy ratio was evaluated for 13 vitamins and minerals, the results revealed that vitamin D (0.37), Calcium (0.61), and Vitamin E (0.03) had adequacy bellow the threshold of 0.7, indicating a high prevalence of inadequacy for these nutrients. Finally, 41.7% of participants reported engaging in low physical activity. The findings of this study indicate that adolescents in Latin America face malnutrition challenges, characterized by poor diet quality diets and micronutrients inadequacy. Policymakers must recognize adolescence as a critical life stage for shaping future health. Efforts should be focus on improvement of eating habits, creating less obesogenic environments and support daily physical activity.

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IS023 / #56

PARALLEL SESSION 07: INEQUITIES, INJUSTICE, AND DEVELOPMENT DISADVANTAGES: GROWING AS ADOLESCENTS IN LATIN AMERICA
21-02-2025 16:40 - 17:55

REFRAMING FOOD INSECURITY AND ANTI-POVERTY POLICIES WHERE A CULTURE OF PEACE IS NEEDED

Marianella Herrera De Franco[1,2]
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Violent, food-insecure, and impoverished environments significantly increase the risk of perpetuating cycles of poverty, malnutrition, and poor health. Evidence shows that poverty and food insecurity shape individuals' lives, particularly in early childhood, and these disadvantages often persist throughout the first 8,000 days of life for those living in such conditions. Latin America is a region characterized by profound inequalities and inequities, which disproportionately affect adolescents. These young individuals face limited opportunities, which exacerbates their likelihood of engaging in risky behaviors and activities that hinder the pursuit of an optimal and fulfilling life trajectory. In 2024, mild progress in addressing food insecurity was observed in Latin America and the Caribbean, as reported by the FAO-SOFI report. However, significant challenges remain unresolved. Nutritional issues, such as anemia among women of childbearing age—including adolescents—persist despite some improvements. In 2023, anemia prevalence stood at 17.3% in South America and 14.6% in Mesoamerica. High rates of adolescent pregnancies further compound these issues; among women aged 15-19, adolescent pregnancies accounted for 16% of total fertility rates. Such pregnancies create substantial barriers to achieving a fulfilling and productive life, not only for the adolescent parents but also for their children. Achieving Sustainable Development Goals (SDGs) 1, 2, and 3 is essential to meeting the basic needs that enable individuals to develop their potential and focus on building a meaningful life project. When adolescents live in environments affected by violence, food insecurity, and poverty, policies should be reframed to emphasize a culture of peace, education on human and health rights, and mental health protection. These policies must integrate individual agency, gender equality, inclusion, and health promotion. Evidence shows that such integrated approaches can improve outcomes for adolescents, including reductions in unplanned pregnancies, improvements in mental and physical health, nutritional status, and decreases in risky behaviors

IS024 / #59

PARALLEL SESSION 08: MICROBIOTA & MICROBIAL THERAPIES
21-02-2025 16:40 - 17:55

PROBIOTICS, PREBIOTICS, AND POSTBIOTICS

Hania Szajewska
Medical University of Warsaw, Department Of Paediatrics, Warsaw, Poland

The composition and function of gut microbiota, particularly during early life, play a crucial role in health and disease. As research progresses, the microbiota has become a key therapeutic target for improving outcomes in individuals at risk of, or affected by, various conditions. This presentation will review the latest evidence and ongoing controversies surrounding probiotics in pediatric care. Additionally, it will explore emerging data on prebiotics - defined as substrates selectively utilized by host microorganisms to confer health benefits - including updated criteria for their classification. It will also address the growing interest in human milk oligosaccharides and their role in pediatric nutrition. Finally, the presentation will discuss evolving research and debates on postbiotics - defined as preparations of inanimate microorganisms and/or their components that provide health benefits to the host. A thorough understanding of the microbiota's role in health and disease is essential for developing next-generation microbiota-based therapies, which must be tested in rigorously designed randomized controlled trials with clinically meaningful outcomes.

IS025 / #60

PARALLEL SESSION 08: MICROBIOTA & MICROBIAL THERAPIES
21-02-2025 16:40 - 17:55

LIVE BIOTHERAPEUTICS

Bruno Daniel Pot
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Following a draft guidance from 2010, in 2012, the FDA was the first authority to define Live Biotherapeutic Products (LBPs) as “biological products that: 1) contain live organisms; 2) are applicable to the treatment, prevention or cure of a disease, and; 3) are not a vaccine” and to publish a guidance document for the industry on “Early Clinical Trials with LBPs: Chemistry, Manufacturing, and Control Information” (updated in 2016). Eleven years later, the FDA approved the first two commercial LB Products for fighting recurrent *C. difficile* infections. As these products were based on Faecal Microbial Transplants, they also published a 3 page guidance for industry on the “Enforcement Policy Regarding Investigational New Drug Requirements for Use of Faecal Microbiota for Transplantation to Treat *Clostridioides difficile* Infection Not Responsive to Standard Therapies” (https://www.fda.gov/media/86440/download). In Europe regulatory was only established in 2018 when the EDQM set quality requirements for LBPs for human use, officialised by the European Pharmacopeia Commission in a 2019 through publication in the “General monograph on live biotherapeutic products for human use”. European legislation requires LBPs to moreover comply with regulations on biological medicinal products and follow the ICH E6 rules on Good Clinical Practice. Before being admitted on the market, final quality, safety and efficacy need to be authorised by the European Medicines Agency's Committee for Medicinal Products for Human Use (CHMP). From this regulatory requirements, it is already clear that LBPs are different from (functional) foods. The main difference is the “intended use". While LBPs are intended to prevent, treat or cure disease, foods are intended to support or maintain health. Clinical trials on foods to support *health or nurtrition claims* can only be done on healthy or at-risk people, trials for *medical claims* should be performed on diseased people. Second important difference relates to the manufacturing requirements: LBPs need to be GMP level, foods need to follow normal food safety regulations (HACCP requirements). When discussing LBP applications most often the human microbiota of the gut, skin and vagina are envisaged. However there are many more applications that may fall under this umbrella. Phage therapy or faecal transplants are generally also considered within this

category, although the “live” nature of phages can be disputed. During the presentation some recent developments in the European SOHO regulation, relevant for the development of new LBPs starting from Substances Of Human Origin will be further discussed.

IS026 / #61

PARALLEL SESSION 08: MICROBIOTA & MICROBIAL THERAPIES
21-02-2025 16:40 - 17:55

ANAEROBIC NEXT-GENERATION PROBIOTICS

Lorenzo Morelli
Università Cattolica Italy, Distas- Sustainable Food Technologies, Piacenza, Italy

Anaerobic next-generation probiotics. Lorenzo Morelli Università Cattolica – Cremona (Italy) *lorenzo.morelli@unicatt.it* In the beginning of the probiotic era there were lactobacilli and bifidobacteria, with the latter more demanding in terms of anaerobic conditions. It is to note that bifidobacteria are still of particular interest for the regulation of the intestinal microbiota of newborns. Composition of the intestinal microbiota, obtained by culture-dependent techniques, suggested that oxygen-tolerant bacteria were dominant in this ecological niche but, over the course of a century of research, the large presence of anaerobic and highly anaerobic bacteria in the human intestine was established. The "culturomics" approach is now providing new information about human intestinal microbiota: updated results suggest that bacterial species inhabiting the human gut are more than 3000, of which about 60% culturable in normal lab conditions. Strictly anaerobic eubacteria such as *Bacteroides, Lachnospiraceae, Eubacterium* seem to be dominant, but several studies also highlight the role of the so-called "underdogs", in establishing healthy conditions for the human gut microbiota. Furthermore, it is to note the role of *Archaea*, bacteria belonging to a specific taxonomic Domain; they include methanogenic bacteria, whose presence has been detected in the human gut since the very first days of life. In this new ecological scenario, where strictly anaerobic bacteria (tolerating less than 0.5% of oxygen) appear to have a major role in managing the gut microbiota, recent studies have unravelled many potential next generation anaerobic probiotics, non-belonging to the lactic acid bacteria group, such as *Akkermansia muciniphila*, *Faecalibacterium prausnitzii*, *Christensenella minuta, Oxalobacter formigenes*, etc. Dealing with Weaknesses and Threats of these newcomers of the probiotic scenario we must say that: A long history of safe use of these bacteria is missing; none of them has been used in food production and their body of knowledge is scarce. It means that they must be clinically tested to be approved by regulatory agencies. The technology for their industrial use is still at the beginning and improvements are necessary for both the reproduction conditions and the preservation of a viable biomass during commercialization. As an example: *Akkermansia muciniphila* is a colonizer of the intestinal mucus layer and it has been shown to exert

positive effects in human clinical trials, but EFSA has denied to this species the QPS status. Therefore, it is impossible (in the European Union) to use it in food/food supplement in its viable form. On the other hand, the non-viable cells of *Akkermansia* obtained European approval as a novel food and are on the market as food supplement to support a slimming diet. On the other hand, from the Opportunities and Strengths point of view it is possible to list: New beneficial effects, not supported by LAB-based probiotics, such as the treatment or prevention of cardiometabolic disease; the next generation probiotics will be more targeted on specific beneficial aims The ecological management of the anaerobic component (the dominant one) of the intestinal microbiota. Obviously, due to the above, the new generation probiotics will be classified as “biotherapeutics” and not as “food related probiotics”. Their characteristics have to include understanding of targeted diseases as well as underlying meliorative mechanisms. Just as an example: the term “archaebiotics” has been coined to identify the use of methanogenic bacteria to reduce the intestinal content of Trimethylamine and its oxide TMAO, which are related to the occurrence of cardio-vascular diseases. On the other hand Methanogenic bacteria have been investigated as causative agents of a range of pathological conditions; we may conclude that we are facing the beginning of a new challenging but exciting era of research.

IS027 / #64

PARALLEL SESSION 09: NUTRITION IN PRETERM INFANTS
22-02-2025 8:15 - 9:45

DIFFERENT MILK PROCESSING METHODS AND (EXPECTED) CLINICAL OUTCOMES

Aleksandra Wesołowska
Medical University of Warsaw, Laboratory Of Human Milk And Lactation Research, Departament Of Medical Biology, Warsaw, Poland

Donor human milk is increasingly recognized as the preferred option for preterm infants when maternal milk is either unavailable or insufficient. To maintain the highest safety standards and quality, donor milk should be processed by a human milk bank. The widely used method is Holder pasteurization (HP), which involves heating the milk to 65.5°C for 30 minutes. Clinical trials have shown some positive outcomes from using pasteurized donor milk, particularly in preventing necrotizing enterocolitis (NEC); however, many of the anticipated benefits have not yet been proofed (diminished of mortality and morbidity, improved of feeding tolerance, optimal somatic growth, less nutrient deficientness, better neurodevelopment). This may be attributed to the potential loss of bioactive components during the Holder pasteurization process. To address these challenges, researchers are exploring alternative pasteurization methods, including high-pressure pasteurization (HPP) ultraviolet-C irradiation (UV-C), microwave radiation (MR) and thermoultrasonication (TUS). By addressing the challenges and providing evidence for these innovative approaches, we can improve the availability and effectiveness of donor milk for preterm infants. Selected innovative techniques should be tested in real working conditions rather than only through pilot studies. They need to be efficient, cost-effective, and scalable for use in human milk bank settings. Ultimately, the health outcomes of feeding babies by donor milk processed by alternatives methods must be confirmed by well-designed clinical trials that compare them with holder pasteurization.

IS028 / #63

PARALLEL SESSION 09: NUTRITION IN PRETERM INFANTS
22-02-2025 8:15 - 9:45

WHAT IS THE EVIDENCE FOR USING DONOR HUMAN MILK

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What is the evidence for using donor human milk? When there is a shortfall in the supply of Mother's Own Milk (MOM) for preterm infants the choice is between using a bovine-based preterm milk formula (PTF) or donated human milk (DHM). Studies conducted in the 1980s showed clear benefits from using MOM, but also an apparent lower rate of necrotising enterocolitis (NEC) where DHM was used in preference to formula. However, many of these early studies of DHM were under-powered, non-blinded or observational and were conducted before the widespread use of antenatal steroids and surfactant when mortality rates were substantially higher. Definitions of NEC varied, and in many cases the diagnosis may not have been robust, for example coding focal intestinal perforations as NEC. Nevertheless, professional bodies such as the WHO, ESPGHAN and the AAP strongly support the use of DHM which has become increasingly common globally despite the lack of a robust evidence base. In the US, formula milk companies, and physicians, are now being subject to class-action litigation with pay outs to affected families of babies suffering NEC in excess of USD $60 million per baby, where formula milk was used in preference to DHM. In the last 20 years there have only been six trials of DHM versus formula to make up for a shortfall in MOM. Where NEC rates are around 5-10% a trial would need to recruit over 1000 infants to have sufficient power to demonstrate a believable reduction in NEC. Only three trials recruited over 200 infants each: a trial from the Netherlands showed no impact on NEC, whereas one trial each from Canada and USA showed less NEC. Two further industry-sponsored trials of commercialised human-milk-derived fortifier or ready-to-feed formula showed less NEC although those trials of so-called 'exclusive human milk diets' did not determine the independent effect of human-milk used for shortfall. Two trials of human-milk derived versus cow-milk based fortifiers added to MOM or DHM failed to show higher rates of NEC from exposure to cow-milk products. There has never been a single controlled trial of DHM powered on a reduction in NEC as the primary outcome; a dismal testament to the neonatal community's inability to collaborate on one of the most important questions in neonatology. Surprisingly, the Cochrane meta-analysis, whilst showing a significantly lower rate of NEC, shows no impact on all-cause

mortality. Furthermore, there is no benefit to neurodevelopment. This lack of effect on mortality stands in stark contrast to the mortality reduction observed in trials of probiotics to prevent NEC, and combined with slower growth and higher costs argues for further carefully designed trials of DHM. Finally, the use of DHM should be seen as a 'complex intervention' impacting more widely on belief and behaviour of both healthcare professionals and families, and where a single biological outcome such as lower NEC may not be considered of sole importance. Future trials need to be adequately powered, more nuanced, and designed with parents to ensure broad equipoise and widespread generalisability to improve the evidence base for one of the most important interventions in neonatal medicine. In answer to the question posed by the title of this talk "what is the evidence", the answer is "not good enough!".

IS029 / #66

PARALLEL SESSION 09: NUTRITION IN PRETERM INFANTS
22-02-2025 8:15 - 9:45

COMPLEMENTARY FEEDING IN PRETERM INFANTS. TIMING & GUIDELINES

Nadja Haiden
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Advancements in neonatal intensive care unit practices have significantly decreased postnatal growth restriction and improved survival rates among extremely low birthweight infants. However, despite higher survival rates, many preterm infants are discharged with poor nutritional status and needs distinct from those of term infants. In light of emerging evidence, the Committee of Nutrition recently updated the outdated 2006 ESPGHAN (European Society of Pediatric Gastroenterology, Hepatology and Nutrition) guidelines on post-discharge nutritional management for preterm infants, emphasizing individualized nutritional care and continuous growth monitoring. Effective post-discharge management involves regular assessments of growth, including weight, length, and head circumference, to detect early signs of undernutrition or growth faltering. Weight-for-length z-scores should be routinely evaluated at term-equivalent age to prevent disproportionate growth patterns. Infants exhibiting significant post-discharge declines in weight or length, defined as a loss exceeding -2 standard deviations, require tailored nutritional interventions to support catch-up growth and recovery. Breastfeeding remains the preferred feeding method for preterm infants, with supplementation through human milk fortifiers recommended for those requiring enhanced nutritional support. In cases where breastfeeding is not feasible, preterm infants should receive formula with an adequate protein-to-energy ratio, along with appropriate levels of minerals and trace elements to facilitate optimal growth. Data on the timing of solid food introduction indicate that introducing solids between the 10th week and 6 months of corrected age does not impact growth during the first year of life in preterm infants. However, evidence on the safety and efficacy of baby-led weaning for preterm infants remains insufficient. Therefore, the introduction of complementary foods should prioritize safety and be individualized based on the infant's developmental milestones. Vitamin D and iron supplementation play critical roles in the post-discharge care of preterm infants. It is recommended that all preterm infants receive iron supplementation tailored according to their birth weight and post-discharge growth trajectory, with adjustments based on ferritin levels during the first 6–12 months of corrected age. Similarly, vitamin D supplementation of 400 IU/day is recommended for all preterm infants, in line with guidelines for term infants, with a maximum intake of

1000 IU/day. For preterm infants at high risk of vitamin D deficiency, such as ELBW infants or those predisposed to metabolic bone disease, vitamin D levels should be regularly monitored. In such cases, supplementation may be increased to 800–1000 IU/day to maintain adequate serum levels of 25-hydroxyvitamin D above 20 ng/mL (50 nmol/L). In conclusion, individualized post-discharge nutritional support and close monitoring are crucial for improving long-term outcomes in preterm infants. Infants at high risk for growth faltering should either be referred to specialized pediatric nutritional care centers or managed by trained pediatricians with expertise in post-discharge nutrition. Ensuring adequate intake of key nutrients such as protein, iron, and vitamin D, alongside timely introduction of solid foods, is essential to support the healthy growth and development of this vulnerable population. Further research is needed to fill existing gaps, particularly regarding the safety of alternative weaning methods such as baby-led weaning in preterm infants.

IS030 / #70

PARALLEL SESSION 10: THE MATERNAL, INFANT AND LACTATION QUALITY (MILQ) STUDY
22-02-2025 8:15 - 9:45

GENERATING REFERENCE VALUES FOR HUMAN MILK MICRONUTRIENTS: THE MATERNAL, INFANT AND LACTATION QUALITY (MILQ) STUDY – PROTOCOL AND CHALLENGES

Gilberto Kac
The Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil

The title of this talk is G*enerating reference values for human milk micronutrients: The Maternal, Infant and Lactation Quality (MILQ) Study – Protocol and Challenges* and will be delivered by Professor Gilberto Kac from the Federal University of Rio de Janeiro, Brazil. The Early Mothers, Infants and Lactation Quality (E-MILQ) and The Mothers, Infants and Lactation Quality study (MILQ) are the first to establish reference values for nutrient concentrations in human milk through 8.5 months across lactation and accompanied by measures of milk volume enabling to calculate total intakes by infants, thus improving nutrient intake recommendations for infants and, lactating women. The study was conducted in Bangladesh (BD), Brazil (BR), Denmark (DK), and The Gambia (GM). Three hundred thirteen mother-infant dyads participated in the E-MILQ (E), and 919 mother-infant dyads participated in the MILQ (M). The study design comprised the colostrum (C), 4-17 d (E1), 18-31 d (E2), 1-3.49 mo (M1), 3.5-5.9 mo (M2), and 6-8.5 mo (M3). Data and biological samples were collected at the antenatal (AN) and postpartum visits, including maternal anthropometry (AN, E1-2, M1-3); infant anthropometry (C, E1-2, M1-3); maternal and infant body composition (E2, M1-3); dietary intake FFQ (AN) and 24-h dietary recalls (AN, E1-2, M1-3); milk and milk volume (E1-2, M1-3); maternal blood (AN, E2, M1-3), stool (M1-3) and urine (E1-2, M1-3); and infant blood, urine, and stool (M1-3); maternal and infant dried blood spot (M1-M3), and infant morbidity (E1-2, M1-3). Maternal inclusion criteria were: age 18-40 y; BMI 18.5-29.9 kg/m^2 pre-pregnancy (BR and DK) or < 2 wk postpartum (BD and GM); mid-upper arm circumference 23-33 cm (GM) or 21-33 cm (BD); height ≥ 150 cm (>145 cm in BR); hemoglobin ≥100 g/L; no relevant past or current medical problems; alcohol intake <50 mL/d in DK, <30 g/wk in BR; 0 in BD, and GM; non-smoking; non-vegan or macrobiotic diet; no multi-micronutrient supplementation except iron and folic acid (all sites) and calcium and vitamin D (BD and DK); low habitual intake of fortified foods except iodized salt; uncomplicated singleton pregnancy; and delivery at 37-42 wk gestation. Maternal diet quality was assessed at screening using a dietary diversity questionnaire (except in DK).

Infant inclusion criteria at birth were birthweight 2,500-4,200 g and absence of congenital abnormalities interfering with feeding, growth or development. At E1-2 and M1-3, mother-infant dyads were excluded for cessation of breastfeeding (if not EBF through visit M1, and if not partially breastfeeding through visit M3); serious maternal or infant illness; maternal consumption of micronutrient supplements other than iron and folic acid (or vitamin D and calcium in BD and DK); or infant undernutrition (Z-score <-2 for length-for-age, weight-for-age, or weight-for-length - WLZ). Estimated percentile curves were constructed using generalized additive models for location, scale, and shape (GAMLSS), with age (in d) as the only explanatory variable. The goal was to find the simplest model to create smooth curves across time while retaining a good fit. Pre-specified 5th, 10th, 25th, 50th, 75th, 90^{th,} and 95th percentiles were extracted by age in days for plotting and by month for reference tables. The main challenges varied between countries: BD interviewers needed multiple visits to build a good relationship before enrolment; BR had to deal with intense COVID-19 and low rates of exclusive breastfeeding; DK infants were longer than WHO standards, which automatically lowers their weight for length Z-scores, leading to the exclusion of some healthy, thriving infants; and GM had losses of follow-up due to working women finding clinic visits too lengthy besides difficulties with maternal stool collection.

IS031 / #68

PARALLEL SESSION 10: THE MATERNAL, INFANT AND LACTATION QUALITY (MILQ) STUDY
22-02-2025 8:15 - 9:45

HOW MILQ REFERENCE VALUES FOR NUTRIENTS IN HUMAN MILK COMPARE TO CURRENT ESTIMATES AND INFORM EFFICACY OF MATERNAL SUPPLEMENTATION

Lindsay H Allen
USDA, ARS, Western Human Nutrition Research Center, Davis, United States of America

The design of the Mothers, Infants and Lactation Quality (MILQ) study has been described by the previous speaker, as well as the challenges to its implementation. In this presentation we describe what was known about the concentration of nutrients in human milk prior to the study, and what we have learned from the results. Prior to designing the study, we conducted reviews of existing data to support the need for further research. This review confirmed that the concentrations of most micronutrients in human milk was lower when mothers had poorer quality diets and nutritional status, and that vitamins were most affected than most minerals. It was also clear that the amount of available data was very poor; prior to the availability of mass spectrometric methods, it was an intimidating task to validate methods for all the nutrients including vitamers. We conducted a study that showed that when the milk was sampled during a feed was not an important factor affecting nurient concentrations, nor was diurnal variation. The MLQ study has produced Reference Values for macronutrients, vitamins and minerals, and measured milk volume using deuterated water at the same time milk was collected to enable the total intake by the infant to be calculated. The design of the study - collection of samples across 8.5 months - enabled the changes in each nutrient concentration during lactation to be seen. Comparison with the previously published values for milk concentrations used by the Insitute of Medicine to set the Adequate Intake recommendations for infants revealed that most of the MILQ values were lower, and some substantially so. The main differences were seen for vitamins. The implication is that current recommendations for infant nutrient requirements should be reviewed. The concentrations in the MILQ study are reported in percentiles of the overall distribution so that values from other studies can be readily compared at any time postpartum. Additionally, baseline values and changes in concentration due to nutrition interventions such as maternal supplementation or food fortification can now be expressed as percentiles of the Reference Values - preliminary examples will be

provided. This will be valuable for both determing the need for maternal interventions and evaluating their efficacy and effectiveness.

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IS032 / #69

PARALLEL SESSION 10: THE MATERNAL, INFANT AND LACTATION QUALITY (MILQ) STUDY
22-02-2025 8:15 - 9:45

HOW TO USE HUMAN MILK REFERENCE VALUES IN MATERNAL AND CHILD NUTRITION AND GROWTH RESEARCH

Sophie E Moore[1,2]
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How to use Human Milk Reference Values in Maternal and Child Nutrition and Growth Research The World Health Organisation recommends Exclusive Breastfeeding for the first six-months of life, and human milk is the optimal form of nutrition to support infant health, growth and development. In contexts where diets are poor, the concentration of many micronutrients in human milk are much lower, impacting on infant supply. However, understanding when lower values indicate the need for interventions and then evaluating the impact of interventions on maternal nutritional status and milk nutrient concentrations has been challenged by the absence of Reference Values (RVs) for nutrient concentrations in human milk. The multicentre Maternal Infant and Lactation Quality (MILQ) study was developed to establish globally relevant RVs for human milk nutrients. In this presentation, the potential utility of these RVs as an international reference for use in maternal and child nutrition and growth research will be presented and discussed. Considered will be the utility of the MILQ RVs for (i) setting nutrient requirements, (ii) evaluating the success of nutrition interventions, programmes and policies and (iii) assessing population-based micronutrient status.

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IS033 / #73

PLENARY SESSION 03: DIAGNOSIS AND PREVENTION OF COW'S MILK ALLERGY IN INFANTS PREVENTION, DIAGNOSIS, TREATMENT DIFFICULTIES
22-02-2025 10:15 - 11:15

PREVENTION OF COW'S MILK ALLERGY

Idit Lachover- Roth[1,2]
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Food allergies are an increasing health concern, with cow's milk allergy (CMA) being the most common food allergy globally. The estimated prevalence of IgE-mediated CMA is around 1%. Currently, the only effective treatment for food allergies is strict avoidance and carrying an adrenaline autoinjector. Consequently, there is significant effort to find ways to prevent the development of food allergies in infancy. The landmark LEAP study, published in 2015, demonstrated that early exposure to peanut protein from a few months of age significantly reduces the risk of developing peanut allergy compared to avoidance. Similar results were shown for egg allergy two years later. Regarding CMA, Katz et al. (2010) found that infants exposed to cow's milk formula within the first 15 days of life had a lower incidence of CMA compared to those who started routine exposure after six months of age. In the following years few studies were conducted in order to establish the timing and effect of early exposure to cow's milk formula on the development of CMA. The COMEET study tracked nearly 2,000 infants from birth to 12 months of age. Infants routinely exposed to cow's milk formula from birth were protected from developing CMA. Conversely, those exposed to small amounts of cow's milk formula during the first two months of life had the highest risk of developing CMA, with a prevalence of 3.2% compared to 0.9% in the total cohort. These findings have led major societies, such as the European Academy of Allergy and Clinical Immunology (EAACI) and the European Society of Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHN), to recommend avoiding cow's milk formula during the first days of life. The Canadian Society of Allergy and Clinical Immunology and the Canadian Pediatric Society jointly recommend that if small amounts of cow's milk formula are introduced, regular exposure should continue to reduce the risk of developing CMA. The optimal amount of cow's milk formula needed to prevent CMA still requires further evaluation.

IS034 / #74

PLENARY SESSION 03: DIAGNOSIS AND PREVENTION OF COW'S MILK ALLERGY IN INFANTS PREVENTION, DIAGNOSIS, TREATMENT DIFFICULTIES
22-02-2025 10:15 - 11:15

TREATMENT CHALLENGES IN COW'S MILK ALLERGY

Rosan Meyer
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Cow's milk allergy (CMA) can be Immunoglobulin E (IgE), non-IgE or mixed IgE and non-IgE mediated. Overall prevalence data have primarily focused on IgE mediated CMA, which ranged from 1.8%-7.5% between 1973-2008, but in 2015, the EuroPrevall birth cohort based on 12,049 children, published the incidence of CMA across Europe for all types of CMA at 0.54%, but there was large variation in non-IgE mediated CMA. The latter highlights the ongoing challenge with the recognition of non-IgE mediated allergies. The European Society for Paediatric Gastroenterology Hepatology and Nutrition (ESPGHAN), World Allergy Association initiative, Diagnosis and Rationale for Action against Cow's Milk Allergy (DRACMA) and the European Society for Allergy and Clinical Immunology (EAACI) have recognised the ongoing challenges not only in the diagnosis, but in the treatment of CMA and over the last 3 years published together more than 15 guideline documents to support healthcare professionals (HCPs) in their clinical practice. Whilst prevention of CMA, does not fall under the definition of "treatment" this does pose the first challenge when considering CMA and should be recognised in clinical practice. The mainstay of treatment includes the elimination of cow's milk and its derivatives. Whilst this principle is not being challenges as treatment modality for CMA, the support for breastfeeding in children with CMA, the choice of a formula suitable for the management of CMA, the level of cow's milk avoidance and milk ladders/oral immunotherapy can be challenging and, in some cases, also controversial. All associations support breastfeeding as the best source of nutrition in children with CMA and highlight the fact, that presentation of symptoms whilst exclusively breastfeeding is not common. There has been a concern of unwarranted maternal dietary elimination leading to reduced breastfeeding and increases support of formulas for CMA, which HCPs need to be aware of and need to avoid. There are specific DRACMA and EAACI guidelines for breast fed infants with practical considerations for HCPs. When breastmilk is insufficient or unavailable, a suitable formula with not only evidence of tolerance in CMA but also growth is indicated. Guidelines, provide evidence-based support for HCP to make the best choice for the clinical presentation. In addition to the well-known amino acid, extensively hydrolysed

whey/casein-based formulas, many countries now have hydrolysed rice formulas and there are more plant-based formulas developed with the increased awareness on carbon emissions from animal-based products. Above the above 1 year of age there are an increasing number of plant-based beverages available. Whilst non-organic versions of these plant-based beverages are mostly fortified with calcium (and some with other micronutrients including iodine and vitamin D), there is still concern about often low macronutrient content (i.e low in protein, outside of soy-based beverages) and the ultra-processed nature of these beverages. A much more active approach has emerged in the treatment of CMA with the earlier introduction of cow's milk using a variety of modalities including baked milk following a supervised challenges in IgE CMA and milk ladders for non-IgE mediated CMA and more recently also for IgE mediated CMA. Whilst there is a positive trend towards earlier tolerance, the early introduction of cow's milk does require more specialist knowledge and support structures to guide parents. Both DRACMA and EAACI guidelines provide also support for oral immunotherapy for children with IgE-mediated CMA, with promising results on sustained unresponsiveness. Trials are also being performed using epicutaneous immunotherapy using a milk patch that have been shown to be successful for peanut allergy. Overall, there has been great advances in the treatment of CMA, but many treatment modalities remain challenging and require not only further research but guidance on clinical implementation.

IS035 / #76

PARALLEL SESSION 11: WHEN NUTRITIONAL SUPPORT BECOMES COMPLEX BUT MATTERS
22-02-2025 11:20 - 12:35

NUTRITIONAL THERAPY IN INFLAMMATORY BOWEL DISEASE-PAST, PRESENT AND FUTURE

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In active and pre-surgical Crohn's disease (CD), exclusive enteral nutrition (EEN) is a highly effective therapy, but it is a treatment that is difficult to adhere to and is therefore unsuitable for long-term disease maintenance. EEN improves disease activity, inflammatory markers and induces mucosal healing in a larger proportion of patients than treatment with oral steroids. With the advent of novel advanced therapies, like biologics, there is a decrease in the use of EEN as an induction therapy for children with CD. However, as there is a therapeutic ceiling with the efficacy of these new advanced therapies, there are studies which show that combination treatment with biological therapies and EEN or PEN can enhance overall disease management. Use of EEN has attracted a lot of interest in pre-surgical patients with CD too. Retrospective data show that pre-surgical use of EEN can rescue patients from gut surgery in approximately up to 20% of cases, but also those patients who end up having a major gut operation experience fewer post-operative complications, including anastomotic leaks, stoma formation and wound infections. Another area of research and clinical practice in the area of nutritional therapy in CD is the use of high volume partial enteral nutrition to prevent disease flare in patients who entered in remission with medical, nutritional or surgical therapies. Finally, use of partial enteral nutrition with solid-food based therapies, like the CD exclusion diet, have attracted significant interest in CD management. Use of EEN is not well documented in the management of UC, and most likely ineffective. A recent study showed that adjunct therapy with EEN for 7 days in patients with acute severe ulcerative colitis receiving standard of care intravenous steroids produced better outcomes than patients receiving only the latter treatment.

IS036 / #77

PARALLEL SESSION 11: WHEN NUTRITIONAL SUPPORT BECOMES COMPLEX BUT MATTERS
22-02-2025 11:20 - 12:35

NUTRITIONAL CARE IN CRITICALLY ILL CHILDREN-CAN FOOD SAVE LIVES?

Koen Joosten
ErasmusMC-Sophia Children's Hospital, Department Of Neonatal And Pediatric Intensive Care, Division Of Pediatric Intensive Care, Rotterdam, Netherlands

Critically ill children are vulnerable to become undernourished, which has been associated with increased mortality, prolonged hospital stay, as well as neurological and psychological development disorders. However, feeding a critically ill child is a challenge and nutritional targets are often not achieved. In the absence of methodologically sound randomized controlled trials (RCTs) recommendations for timing and amount of EN in critically ill children are based upon large observational studies which showed associations between early achievement of nutritional goals and improved outcome. For example, in an international prospective cohort study of 500 consecutive children (ages 1 month to 18 yrs) requiring mechanical ventilation longer than 48 hours, meeting approximately an enteral intake of two-thirds or more of the caloric target over 10 days was associated with lower 60-day. However, the observational design of these studies calls for cautiousness in assuming a causal relationship between higher EN intake and improved outcomes, as children who tolerate EN might be less critically ill and inherently have a better outcome. Concerning the use of parenteral nutrition in the acute phase of disease it has been shown that withholding parenteral nutrition during the first week of admission resulted in improved short and long-term outcome, but not on mortality. Analyses showed markedly harmful effects from increasing amounts of amino acid supplementation and beneficial effects from an early ketogenic response. In neonates, a particularly vulnerable population, delayed parenteral nutrition also reduced complications without compromising growth or development. In undernourished patients, similar benefits were observed, highlighting that even in those at higher nutritional risk, the strategy of delaying PN could be advantageous. In low and middle income countries RUTF (ready to use therapeutic foods) has been shown te be a life-saving essential supply that treats severe wasting in children under 5 years old.

IS037 / #78

PARALLEL SESSION 11: WHEN NUTRITIONAL SUPPORT BECOMES COMPLEX BUT MATTERS
22-02-2025 11:20 - 12:35

NUTRITIONAL CARE IN CHILDREN WITHOUT GUTS!

Jessie M Hulst
The Hospital for Sick Children/University of Toronto, Gastroenterology, Hepatology & Nutrition, Toronto, Canada

Short bowel syndrome (SBS), which is characterized by a spectrum of malabsorption that occurs after surgical resection of a significant portion of the intestine for congenital or acquired lesions, is the leading cause of intestinal failure in children. It can be defined by the need for parenteral nutrition (PN) for >60 days after intestinal resection or a bowel length of less than 25% of expected. SBS is classified into three types based on the remaining bowel anatomy: type I (enterostomy), type II (jejuno-colic), and type III (jejuno-ileocolic). In children, the most common conditions leading to extensive small bowel resections include necrotizing enterocolitis (NEC), midgut volvulus, gastroschisis, intestinal atresia, and extensive aganglionosis. The severity of clinical presentation and prognosis for intestinal adaptation, which invariably follows resection, are influenced by the length, type and functional integrity of the residual bowel, the presence of ileocecal valve and the colon, and the age at resection. The primary nutrition goal in managing SBS is to promote intestinal adaptation and achieve intestinal autonomy, i.e., weaning off PN while maintaining growth and development. Intestinal adaptation is a compensatory physiological process involving a complex series of coordinated mucosal, endocrine and secretory events following a sudden loss of mucosal surface area. This process enhances both the structure and function of the residual bowel to allow for an increase in nutrient absorption. In children, intestinal adaptation begins quickly after surgery and may continue for up to two years or more. The presence of nutrients in the gut is crucial for stimulating bowel adaptation. Generally, food is introduced in small, trophic amounts as soon as possible after resection and advanced to the maximal volume and concentration tolerated without worsening the clinical presentation, while avoiding overfeeding. The advancement and choice of type and route of enteral nutrition are individualized based on the remnant bowel anatomy, stool output, and oral/enteral feeding tolerance. The use of PN is essential for all patients with SBS, with some requiring lifelong PN support. Therefore, preventing complications such as catheter-related bloodstream infections, loss of venous access, intestinal failure-associated liver disease (IFALD), inappropriate growth,

metabolic bone disease, and micronutrient deficiencies is paramount. This is achieved through strict aseptic central catheter techniques, cyclical PN, and a multidisciplinary approach within specialized intestinal rehabilitation programs. Centralized multidisciplinary care in these specialized institutions has significantly reduced morbidity and mortality rates in children with SBS. Teduglutide, a GLP-2 analogue, has emerged as a promising treatment, demonstrating safety and efficacy in reducing PN requirements and enhancing enteral autonomy in pediatric SBS patients. Intestinal transplantation is a life-saving procedure reserved for patients who have failed to achieve enteral autonomy, and at the same time have developed life-threatening complications. In conclusion, advancements in the management of SBS, including early nutritional intervention, prevention of complications, and novel therapies, have significantly improved outcomes for pediatric patients.

IS038 / #79

PARALLEL SESSION 11: WHEN NUTRITIONAL SUPPORT BECOMES COMPLEX BUT MATTERS
22-02-2025 11:20 - 12:35

LIVING WITH PARENTERAL NUTRITION AT HOME; WHAT, WHEN AND FOR WHOM?

Koen Huysentruyt
UZ Brussel, Vrije Universiteit Brussel (VUB), Brussels Centre For Intestinal Rehabilitation In Children (bcirc), Brussels, Belgium

This presentation will focus on the practical considerations when preparing children and their caregivers for providing parenteral nutrition at home. The importance of installing proper teaching and family support before discharge. The talk will also handle issues regarding line care and venous access concerns and possible complications. Finally, the role of new therapies such as GLP2-analogues and intestinal rehabilitation units will discussed as well as the importance of timely referral for intestinal transplantation.

IS039 / #83

PLENARY SESSION 04: CLIMATE CHANGE, FOODS AND DISEASE
22-02-2025 13:30 - 14:45

COULD CLIMATE CHANGE INCREASE THE SPREAD OF INFECTIONS IN CHILDREN?

Tindara Scirocco
Università Cattolica del Sacro Cuore, Department Of Life Sciences And Public Health, Rome, Italy

Climate change (CC) is the most significant global health challenge of the 21st century. CC is already influencing the epidemiology of infectious as well as cardiovascular, respiratory, and mental diseases, with profound consequences for Public Health. In fact, it is estimated that 3.6 billion people already live in areas that are highly susceptible to CC and that between 2030 and 2050 about 250,000 additional deaths per year will be caused by CC. The adverse effects of CC are expected to be most acutely felt by low- and middle-income countries (LMICs), particularly among their most vulnerable populations, including women, the elderly, and children. Infectious diseases represent some of the most relevant health-related consequences associated with CC. Children suffer from heightened vulnerability to infections due to immature immune systems. This susceptibility is further compounded by temperature and humidity fluctuations, phenomena that are increasingly prevalent in the context of CC. Additionally, CC exacerbates environmental pollution, which has been shown to compromise immune system function by inducing airway inflammation, thereby increasing children's risk of pulmonary and upper respiratory infections. Global warming fosters microbial persistence in the environment, leading to shifts in traditional patterns of disease epidemiology. The tropicalization of the climate has enabled mosquito and tick vectors to expand into temperate regions. Because of this phenomenon, the incidence of diseases such as Zika, Dengue, and Malaria, which pose significant health risks to children, is expected to increase in the coming years. Furthermore, the extension of hot and humid seasons has lengthened transmission periods, amplifying the impact of these diseases. Another critical consequence of CC is the rise in extreme weather events, ranging from prolonged droughts to raging floods. Droughts increase the risk of undernutrition, as reduced micronutrient intake further weakens children’s fragile immune system thus favouring infections. Floods disrupt health security and environmental hygiene by forcing communities into overcrowded refugee camps with poor sanitation, leading to a surge in waterborne diseases such as cholera. Extreme weather events often lead to massive migration, further amplifying health risks for children. Migration exposes them to unfamiliar pathogens in new

environments, a risk that is exacerbated by the fact that migrant families frequently reside in impoverished areas or camps, where access to healthcare is limited. This often results in suboptimal vaccination coverage, leaving children even more vulnerable to communicable diseases. Despite the substantial knowledge of the mechanisms linking CC to children's infectious health risks, there is a paucity of systematic studies specifically addressing pediatric vulnerability. From a public health perspective, it is critical to conduct new research using a "glocal" approach, recognizing that while CC is a global phenomenon that requires internationally coordinated mitigation efforts, its impact varies from region to region and must be studied considering the specificities of populations at the local level. Health professionals have a critical role in addressing this urgent challenge with a focus on intergenerational sustainability. By taking proactive measures, we can help to ensure the health and well-being of children and, by extension, future generations.

IS040 / #84

PLENARY SESSION 04: CLIMATE CHANGE, FOODS AND DISEASE
22-02-2025 13:30 - 14:45

CLIMATE CHANGE AND EARLY DEVELOPMENT OF NON-COMMUNICABLE DISORDERS

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Climate change (CC) and non-communicable diseases (NCDs) represent the two major global threats of our time, harming disproportionately disadvantaged populations. Driven by forces including rapid unplanned urbanization and globalization of unhealthy lifestyles, NCDs are the dominant cause of death and morbidity worldwide, mostly in low- and middle-income countries (LMICs). Despite NCDs have multifactorial and complex causes, most NCD-related deaths are attributable to environmental risks. NCDs are increasingly affecting people under 20 years (more than 2.1 billion) with serious lifespan implications (over 1 million deaths; 174 million years lived with disability). Mental health disorders, respiratory diseases, and neoplasms are the most impacting. Nearly two-thirds of the antecedents to NCDs emerge during childhood and adolescence. Exposures in utero and/or in early-life can shape growth, physiology, and metabolism, through epigenetic and developmental programming mechanisms, impacting health and disease trajectories. CC, with fossil fuel combustion being the major source of climate-warming greenhouse gases (GHG) and air pollution, poses serious risks to public health by jeopardizing human lives and the basics of health and well-being, i.e., clean air, safe drinking water, adequate nutrition, secure shelter, access to health system and education. Warming and escalating extreme weather events (heatwaves, storms, floods, wildfires, drought, cyclones, hurricanes), sea-level rise, oceans' acidification, air pollution, ecosystem/community/infrastructure disruption, and changed vector-borne patterns exert harmful effects extending beyond the immediate risk. Approximately 250,000 additional annual deaths are expected between 2030 and 2050. In 2019, the global number of NCD-related deaths and disability-adjusted life years attributable to high temperature was 150,000 and 3.4 million. CC may trigger the NCD onset through a variety of pathways. Among the main CC drivers, the current agri-food system and urbanization ultimately act as environmental risk-factors for NCDs. Owing to their physiology and social/developmental needs, pediatric populations are the most vulnerable to the detrimental and potentially long-term effects of CC, which contribute to amplifying existing inequities and creating an

intergenerational cycle. This is worry considering that they face a combination of overlapping hazards that reinforce and magnify each other and nearly half of them live in “extremely high-risk” countries for CC impacts. To date, there is limited published literature on pediatric climate change-related NCDs. Climate-related disasters (storms, floods, wildfires) are associated with mental health illness, i.e., posttraumatic-stress disorders, depression, and anxiety. CC-related heat, wildfire smoke, dust storms, and aeroallergens, cause or intensify air pollution-related negative health outcomes: impaired lung functioning, airways’ constriction, allergic disorders and chronic respiratory illnesses; increased risk of mental and cognitive disorders; increased oxidative stress, systemic inflammation, immune and endocrine dysregulation, potentially damaging body systems and organs. Morbidity from heatwaves includes heatstroke, electrolyte imbalance, dehydration, kidney-associated diseases, and respiratory diseases; hot is linked to impaired cognitive function and sedentariness. By altering food systems, GHG and CC may increase the risk of undernutrition (stunting, wasting, and micronutrient deficiencies) with implications for NCDs. Importantly, any disturbance of CC with child growth, brain development, lung functioning, and endocrine and immune-systems maturation occurring in the womb or early-life may have a wide range of health implications during the subsequent life periods, namely childhood or adulthood, with adverse birth outcomes being themselves risk-factors for the (early) NCDs’ onset. To tackle simultaneously the multiple components of these pandemics, comprehensive multi-sectoral interventions must be implemented to favor appropriate behaviors throughout the life-course. Special consideration must be given to vulnerable populations’ needs. Early-life nutrition, sustainable food environments, empowerment of women, urban design and land use, geopolitical and socioeconomic factors must be the basis. Governments must create resilient sustainable environments/systems and help drive people’s choices. Several stakeholders must be engaged and work cooperatively to improve global sustainability, health, and equity.