It is now well understood around the world that good nutrition plays a major role in the health of individuals, at all stages of development and life. In recent years, detailed clinical research into the effects of nutrition on growth has brought a wealth of new data that is giving fresh understanding to this key area of development particularly in the first 1000 days of life: appropriate nutrition at this time can program and prepare the body for long-term health status. Poor nutrition can contribute to obesity or stunting and can also have an adverse effect on brain development and cognition.

The 89th Nestlé Nutrition Institute Workshop “Recent Research in Nutrition and Growth” was held on March 26–29, 2017 in Dubai.

To lead the debate, Nestlé brought together an eminent international faculty, chaired by: Professor Michelle Lampl, Director of the Study for Human Health, Emory University, Atlanta; Professor Berthold Koletzko, Professor of Pediatrics, Dr. von Hauner Children’s Hospital, University of Munich Medical Centre; and Professor John Colombo, Professor of Psychology, University of Kansas and Director of the Life Span Institute.

SESSION 1

The first session, opened and chaired by Professor Michelle Lampl, examined the role of the biological systems of the body as contributors to healthy growth, looking at bones, muscles and fat tissues and the optimal nutrition required for dynamic function. The speakers in the session presented the results of recent research into complex cellular growth and how it is influenced by genetic, hormonal, nutritional, environmental, lifestyle and pathological factors.

The causes and consequences of obesity were analyzed, looking at the growth and function of adipose tissue in the body. When nutritional needs are not met, or are over-met, the musculoskeletal system, bone and tissue quality is compromised. While we know that timing is everything in fetal development, the experts concluded that there is still much to discover regarding the timing of growth in children and how best to support that growth nutritionally.

SESSION 2

The second session, chaired by Professor Berthold Koletzko, presented updates on the latest research on dietary interventions in the areas of growth and body composition, looking at both obesity and stunting worldwide. Recent studies have shown that excessive early weight gain in infants can set a pattern for weight gain in adulthood, leading to obesity and disease. New insights into the nutritional impact of metabolic regulation in infants was also reviewed, utilizing modern research techniques which are paving the way for interventions to improve long-term health outcomes.

A breakthrough in research conducted in Germany was discussed, which demonstrates that the quality as well as the quantity of protein provided to babies affects weight and length gain. The importance of the brief complementary feeding period was also reviewed,
underlining the importance of timing, composition of foods, and the mode of feeding in terms of the long-term impact of the nutritional choices made by parents and caregivers for the health and well-being of the child. Stunting is a major issue in many developing countries, and the session looked at the causes of limited lineal growth and successful dietary and educational interventions in pregnancy and early childhood.

The second session concluded with an examination of the role of micronutrients in relation to infant growth, noting that the World Health Organization estimates that over 2 billion people globally are deficient in the vitamins and minerals that are essential for human growth and metabolism.

SESSION 3

The third session with Professor Colombo focused on neurocognitive development in infancy and early childhood and the role of nutrients in supporting brain growth and function. The debate highlighted the interface between cognitive development and nutritional science, emphasizing the need for nutritionists and behavioral scientists to work closely together for the best research outcomes.

Presentations included a detailed look at the standardized measures of neurocognitive development in infancy and early childhood, which are designed to identify children who are at high risk of late developmental delay. The role of neuroimaging research was identified as offering science a richer understanding of the structure, function and behavior of the brain during the rapid and highly sensitive early development period of childhood.

The potential causes for altered neurodevelopment are diverse and vast, and can include environmental factors, genetic influences and early life nutrition and deficiencies. The speakers also presented results of recent trials which looked at the effects of nutrition on the development of higher-order or executive functions, including the long-term benefits of LC-PUFA supplementation in infancy, which demonstrated improved performance on tests of impulsivity and attention control.

Nutrition and early childhood development are closely integrated and this workshop took a multidisciplinary approach, bringing together scientists, nutritionists and psychologists. We very much appreciate the participation of all our distinguished chairs and speakers who highlighted key areas of recent research as well as potential new areas to explore for better support health outcomes for infants around the globe.

We also appreciate all the participants in the audience who contributed to the formal and informal discussion throughout the workshop, as well as the many thousands who participated via the webcast.

We would like to congratulate everyone involved in the organization of the workshop at the global and regional levels.

Dr Natalia Wagemans
Head of Nestlé Nutrition Institute
Switzerland

http://www.nestlenutrition-institute.org/
MICHELLE LAMPL (Emory University, Atlanta, Georgia, USA) opened the workshop by explaining that while human growth is commonly assessed by looking at weight or length/height changes at specific times of development, these measurements fail to capture how the various biological systems of the body contribute in a dynamic way to growth. Weight measurement alone provides information about calorie balance and/or hydration, and height measurement shows how the child is growing amid peers. Recent research has shown that humans do not grow at a steady continual pace, but in discrete time-specific episodes which are closer together in an infant, and with as much as 90–100 days between “growth spurts” in children over 2 years. It is important to reassess how and when growth is measured in intervention studies, to discover what controls the timing of growth. An enhanced understanding of growth biology may help in an understanding of how nutrition can modulate individual growth patterns and thereby inform efforts to support healthy growth into adolescence and adult life. Currently, dietary needs are assessed on the continuum growth model – the next step is to discover if the episodic nature of growth events would be better served by episodic changes in specific nutrients. We already know that timing is everything in fetal development – there is much more to discover regarding the timing of growth in children and how best to support that growth via nutritional intake.

ERNST B HUNZIKER (University Hospital, Bern, Switzerland) gave a detailed presentation on the role that the growth plate plays in the elongation of the long bone as infants grow into adults. The medical profession currently measures height changes from infancy to adolescence by looking at extension patterns in the long bone, so understanding how and why these measurements change helps us to understand more about bodily growth in general. Bones start to grow immediately on fertilization and continue to grow up to around 20 years of age. The growth plate is a disc of cartilage that is found between the two parts of the long bones in which cells dynamically elaborate in a vertical fashion. The mechanism that governs the highly coordinated sequence of events that underlies the growth of the long bones is complex and requires detailed analysis of cellular performance. It is subject to influence by genetic, hormonal, nutritional, environmental and pathological factors.

MARTA FIOROTTO (Baylor College of Medicine, Texas Children’s Hospital, USA) continued the meeting by examining the effects of early growth and nutrition on skeletal muscle mass. Skeletal muscle growth begins in the embryo, much like the beginnings of bone growth examined in the prior session. Muscle progenitor cells proliferate and ultimately fuse to form multinucleated myofibers. From mid-gestation, muscle growth occurs through hypertrophy of these myofibers, with the most rapid growth phase occurring in the first year of life. At no other time does muscle mass grow as much: the muscle mass expands from 25% of lean mass at birth to 45–56% at maturity. Nutrients influence muscle growth at every stage of development, in particular plasma insulin and amino acids. In order to support skeletal muscle growth, a significant proportion of the overall protein intake in the early years of human life will be devoted to this process. As the body matures, the muscle progenitor cells become less active, limiting myonuclear growth of the muscles. Therefore, the early developmental phases represent critical windows for muscle growth which, if interrupted via suboptimal nutrition, can result in muscle mass deficiency.

SESSION 1
A Systems Perspective on Growth
Chairperson: Michelle Lampl

Better knowledge of growth biology could help us understand the effect of nutrition on the human body as it develops into a functional, healthy unit.

Michelle Lampl

Bone can only form when several conditions are fulfilled. A mechanically stable surface is required, provided by the presence of the right minerals and vitamins, particularly vitamin E. Blood vessels need to be surrounded by healthy stem cells and proteins are required, which signal the cells to perform.

Ernst Hunziker

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PETER ARNER (Karolinska Institute, Stockholm, Sweden) gave an overview of recent research and analysis into the causes and consequences of obesity while examining the growth and function of adipose tissue in the human body. Obesity is known to cause complications such as hypertension, insulin resistance, type 2 diabetes and dyslipidemia. Fat cells grow and may eventually cause obesity in two ways – either by multiplying in number or by getting larger in size. From infancy, humans expand their fat mass predominantly by increasing the number of fat cells. Once adolescence is reached and if weight remains reasonably stable, the number of fat cells remains constant. New research has shown that each year, around 10% of adipose cells in adults die and are replaced with new cells, but the overall number remains the same. In those that are obese by the time they reach adulthood, the number of adipose cells is double that of a lean adult. When an adult tries to lose body fat, the number of adipose cells does not decrease, although the size of the cells may shrink. However, if an adult gains significant weight, the number of fat cells has been shown to increase. A major contributor to the renewal of fat cells throughout life is bone marrow, which is most apparent in obesity when around 20% of all fat cells are derived in this way. There is also a rapid turnover of fat cell lipids, which are renewed around 6 times during the life span of a fat cell. Being overweight is associated with decreased lipid turnover due to a high input in combination with a low output of lipids from the fat cells. Recent research has shown that both genetic factors and lifestyle influence fat cell production and size and can also contribute to metabolic disturbances.

THOMAS CLEMENS (Johns Hopkins University, Baltimore, USA) gave a review of recent studies into the different stages of bone development and its links to metabolism. This is a relatively new area of study in the bone field, with research over the past 10 years concentrating on what types of fuel the bone cells use to create a strong skeletal frame. By the time men and women have reached the age of 20–30 years, all the bone of the body has been made, and from this period, bone quality begins to decline very slowly into old age, at which time bones become susceptible to fracture. The sheer size of the total bone cell mass requires a significant proportion of the body’s overall fuel supply, and consequently is in competition with other energy-consuming tissues. Bone forming osteoblasts require a constant supply of fuel bone matrix production. The musculoskeletal system provides a storage site for scarce minerals essential for life and it works with the endocrine networks to coordinate energy expenditure. When nutritional needs are not met, bone quality is compromised. Key nutrients would include fatty acids, insulin and citrate, all of which are needed for bone strength. These new studies suggest a link between bone cells and global metabolism, leading to the identification of hormonal interactions between the skeleton and other tissues. Over the coming years, further study into this area could prove extremely valuable in supporting strong skeletal growth.

Protein intake is vital in the postnatal period to support skeletal muscle growth. When protein needs are not met, skeletal muscle growth will falter and could have a lasting effect that is unlikely to be recoverable.

Marta Fiorotto

Lifestyle and nutrition are major contributors to a propensity to obesity, starting in childhood, when fat cell numbers can rapidly increase. A high turnover of fat cells in early life can set a pattern of adipose remodeling in adult life.

Peter Arner

When nutritional demands are not met, bone quality and strength is compromised. By studying in more depth what happens in the osteoblast and overall energy utilization, we should be able to advance our knowledge of metabolic diseases and ultimately improve the management of patients with diabetes and osteoporosis.

Thomas Clemens
KIM MICHAELSEN (University of Copenhagen, Denmark) opened the second session of the workshop by describing the growth patterns of breastfed infants compared to those fed infant formula, and the effects of breastfeeding on early body composition patterns, stature and the risk of obesity in later life. It is known that breastfeeding has a marked effect on early growth and into childhood. However, most studies are observational and because residual confounding and reverse causality are likely to play important roles, it is difficult to assess the exact effect of breastfeeding. Where the breastfed child is born and the economic situation of the family is also shown to influence growth, with different patterns emerging between low- and middle-income countries. Of interest globally is the effect of breastfeeding on growth-related hormones such as IGF-1, leptin and insulin as well as measuring the BMI in the first year of life. A longer duration of exclusive breastfeeding has recently been associated with an earlier peak in BMI. More data is now emerging regarding body composition, and this is likely to be a focus of much study in the future. There is increasingly strong evidence to suggest that excessive early weight gain in infants can set a pattern for weight gain in adulthood, leading to obesity and disease. Research is currently underway in Denmark, seeking to better understand early appetite regulation and its relation to growth in exclusively breastfed infants.

BERTHOLD KOLETZKO (Dr. von Hauner Children’s Hospital, University of Munich Medical Centre, Munich, Germany) continued the discussion on how nutrition impacts infant growth by looking at metabolic regulation. There are many new insights coming to the fore, utilizing modern research techniques which are allowing for discussions on interventions to improve long-term health outcomes. High protein intake in infancy can induce excessive early weight gain and increased later obesity. Recent new research has started to look at targeted metabolomics profiling of small molecules in biological samples, offering insights into the underlying mechanisms for protein processing. New techniques mean that it is possible to precisely quantify several hundreds of molecules in small volumes of plasma. These studies have shown that high protein supplies with conventional infant formula markedly increase infant plasma concentrations of indispensable amino acids, particularly of branched-chain amino acids (BCAA), which can induce protein and lipid synthesis and excessive growth. High protein supplies also induce increased tyrosine concentrations, which predict insulin resistance in obese children. High protein supplies enhance the secretion of two major growth factors – insulin and IGF-1. Analysis shows a stronger response of insulin to amino acids, and very different effects of individual amino acids. A breakthrough in research conducted in Germany demonstrates that the quality as well as the quantity of protein provided affects the energetic efficiency of infant formula for weight and length gain. More needs to be studied in this area, but it is emerging that a better understanding of early metabolic factors, before and after birth, could lead to helpful nutritional interventions.

VEIT GROTE (Dr. von Hauner Children’s Hospital, Munich, Germany) presented on the next stage of infant nutrition – complementary feeding – by looking at timing, composition of foods and the mode of feeding. This is a complex area, and not one that has been fully explored to gain an understanding of the long-term impact of the nutritional choices made by parents and caregivers on the health and well-being of the infant. The complementary feeding period is short, transitioning the infant from breastfeeding and/or formula feeding into joining regular family food offerings. While WHO recommendations state that complementary feeding should not start until 6 months of age, many factors worldwide do appear to influence the commencement timing of the introduction of solids, depending on ethnicity, country of residence, socio-economic status and secular trends. The major CHOP study, which collected dense data from thousands of feeding protocols across 5 different European countries, has shown that formula-fed infants start complementary feeding approximately 2 weeks earlier than breastfed children and almost 40% of this group start at or before 4 months of age. During the transitional period, fat intake decreases while protein and carbohydrate intakes...
increase. Protein intakes are often proven to exceed European recommendations from 9 months onwards and early solid-introducers have higher energy intakes in the first year of life overall. Whether the introduction of solids takes place before the age of 6 months or afterwards does not seem to have an impact on growth and later obesity risk. However, new research has shown that introducing solids before 4 months does indeed increase the risk of obesity in later life. There is also an indication that too much dairy protein during the complementary feeding period may lead to a higher risk of obesity as the infant grows. Findings are not conclusive and much more study is needed to understand the impact of complementary feeding on short-term growth and later obesity risk.

Robert Black (Bloomberg School of Public Health, Johns Hopkins University, Baltimore, USA) addressed the other side of infant growth – stunting. He spoke about the causes of limited linear growth and successful dietary and educational interventions in pregnancy and early childhood. Stunting is a highly prevalent problem among children of low- and middle-income countries, due to the result of fetal exposure to nutritional deficiencies and infectious diseases. For example, in South Asia and sub-Saharan Africa, nearly half of all births are impacted while around 10% of women of reproductive age in Africa are malnourished. Maternal undernutrition results in fetal growth restriction while infectious diseases in pregnancy can result in preterm delivery. After birth, growth faltering may begin at 3–5 months of life, becoming more prominent at 6–18 months. Frequent exposure during this period to infectious diseases such as diarrhea and other gastro-intestinal organisms can cause growth failure. New research has started to look at the long-term effects of stunting, with reduced cognitive ability by school age now emerging as a clear consequence, as well as early death. The complementary foods received from 6 months to 2 years often offer inadequate nutrients and energy, negatively affecting growth. Research has shown that the “first 1000 days” in the life cycle (from conception to the age of 2) is a critical period affecting growth. During this time, infection control and dietary intervention in the form of supplements for undernourished pregnant and lactating women and their babies can improve healthier growth outcomes for the newborns, with a profound and lasting effect.

Zulfiqar Bhutta (SickKids Center for Global Child Health, Toronto, Canada) concluded the second session by examining the role of micronutrients in relation to infant growth. Vitamins and minerals are essential for human growth and metabolism, but the WHO estimates that over 2 billion people globally are deficient. Most vulnerable to these insufficiencies are pregnant and lactating women, and young children, mainly in low-income populations. Iron, zinc, calcium, folic acid and multiple micronutrient deficiency is prevalent in underweight populations and is linked to poor pregnancy outcomes including impaired growth in both the mother and the child. Supplementation during pregnancy has been found to improve maternal and newborn health outcomes in at-risk populations. While postnatal micronutrient supplementation and fortification studies in childhood have not yet shown consistent effects on growth, apart from zinc on height, recent data on multiple micronutrient supplementation via micronutrient powders are beginning to demonstrate reduced stunting. The administering of small-quantity lipid supplements with complementary food from 6–23 months also appears promising in terms of health, nutrition and developmental outcomes, though research is at an early stage and needs further work.

Micronutrient deficiency can be replenished through supplementation and fortification strategies, leading to a reduction in stunting of infants. Much more research is needed in areas related to preconception and adolescent nutrition to get a full picture of growth through the human life cycle and its effect on the next generation’s growth and development.

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SESSION 3
Nutrition, Brain Function and Cognitive Development
Chairperson: John Colombo

SUSAN CARLSON (Life Span Institute, University of Kansas, USA) set the scene for the final session of the workshop by presenting her views on the interface between cognitive development and nutritional science, emphasizing the need for nutritionists and behavioral scientists to work closely together for the best research outcomes. While nutrition is accepted as key to optimal human development, randomized control trials of specific nutrients that measure developmental outcomes have only taken place relatively recently. Nutritionists do not routinely study the timing of brain development or the appropriate cognitive assessments during specific periods of development. Behavioral assessments used in research are diverse and not easily placed in a meta-analysis. Behavioral scientists understand the importance of targeted assessments undertaken at the appropriate age of development, looking at specific areas such as hearing, vision, attention, memory, inhibition, switching/shifting and rule learning. The presentation went on to point out the importance of establishing prior evidence that a nutritional deficiency exists in a population or group, as well as plausible evidence that the deficiency may compromise cognitive function or cognitive development. Ideally, evidence of a nutrient deficiency in the population should be identified by a biomarker that also responds to supplementation of the nutrient. It cannot be determined if infants other than those in populations where a study with positive outcomes is conducted need these nutrients for optimal cognitive development.

JOHN COLOMBO (Life Span Institute, University of Kansas, USA) continued the discussion by giving a detailed overview of the standardized measures of neurocognitive development in infancy and early childhood – a working knowledge of these tests can help nutritionists choose and interpret appropriate assessments for their field. Standardized tests are not always properly applied in clinical nutritional trials. Standardized neurocognitive tests, some dating back to the 1950s and based on early 20th century research, include the Bayley Scales of Infant Development, the Mullen Early Learning Scales and the Griffiths and Gesell Scales. These are good tests for identifying children who are at high risk of late developmental delay, but the data gleaned from the tests usually comes out with a single score: this means that they lack the sensitivity to measure the specific effects produced by nutrients. Results will often come out as “nil affect”, as the wrong test has been chosen for the trial. Over the past decades, research on clinical nutrition has focused on the effects of macronutrients and micronutrients on cognitive developments such as IQ and language ability. The evaluation and interpretation of the effects of nutrition on brain development outcomes is critically dependent on the proper conceptualization of human cognitive development: the brain is a highly complex organ system, in which different aptitudes develop at different times. Therefore, the use of an appropriate and valid measure for effects of specific nutrients against cognitive abilities is required. Up to now, most nutritional studies have not chosen the measure of cognitive development guided by any theory of measurement or by the hypothesized effect of the nutrient. Rather, such choices tend to be based on convenience (what is available or perhaps the ease of administration) or familiarity with a particular measure. This practice is potentially disadvantageous for the interpretation of studies, as a measurement may have been chosen which could obscure the specific effects of a chosen nutrient or miss particular effects altogether because the appropriate domain was not assessed. Age-appropriate assessments and domains need to be chosen for optimal testing.

SEAN DEONI (Center for Healthy Infant Learning & Development, University of Colorado, USA) explained how neuroimaging research is offering science a richer understanding of the structure, function and behavior of the brain during the rapid and highly sensitive early development period of childhood. The period from conception

"Nutritional studies conducted in the field, often in developing countries, currently rarely use sophisticated behavioral assessments. Thus we may be possibly ignoring the most deficient groups in terms of nutritional input into developmental outcomes."

Susan Carlson

"Granular clinical tests for neurocognitive assessments may be more sensitive to specific nutrient effects. Administering tests at multiple age points allows for tracking the course of developmental outcomes."

John Colombo
to the age of 10 years encompasses the greatest period of brain growth, coinciding with the emergence of nearly all fundamental cognitive and behavioral skills, and potentially as a consequence, also overlaps with the onset of developmental, intellectual and psychiatric disorders. Over the past 40 years, MRI technology has allowed us to closely view anatomical development in a safe and non-invasive way, so we can see how the brain is changing as it develops, thus giving a more objective measure of cognition.

The process of myelination is key to brain development, as it acts to facilitate the rapid transmission of electrical impulses in the brain – it is critical for normal brain messaging and connectivity. There is a close relationship between the pattern of myelination and the onset of new cognitive skills and abilities. It is increasingly accepted that alterations in early brain growth that result in irregular brain structure, function or connectivity can negatively affect cognitive and behavioral outcomes. The potential causes of altered neurodevelopment are diverse and vast, and can include environmental factors, genetic influences and early life nutrition and deficiencies. Recent research has begun to look at whether specific nutrients are involved in myelination and the development of the different areas of the brain, utilizing MRI scanning alongside more traditional research methods. Brain development and maintenance, including supporting the process of myelination, requires the orchestrated delivery of key nutrients including lipids, minerals, vitamins and micronutrients. Studies have looked at both exclusive breastfeeding and various formula types in terms of brain development, as well as examining the nutritional impact on brain development later in childhood. While current research has concentrated on postnatal development, the next step will be to look at the mother’s nutritional profile during pregnancy and the effect that might have on later child development.

We are just getting started in understanding the relationship between nutrition, brain development and cognition; MRI technology is helping us quantify research in a detailed non-invasive way.

Sean Deoni

PETER WILLATTS (School of Social Sciences, University of Dundee, UK) continued the discussion by outlining the effects of nutrition on the development of higher-order cognitive function. Also known as “executive functions”, higher-order functions are involved in the control of goal-directed behavior: planning, inhibition, attention control and working memory. Other complex cognitive skills are included, such as reasoning, language and communications, mathematics and reading. Executive functions are mainly controlled by the prefrontal cortex of the brain. The key nutrients involved in the development of executive function are long-chain polyunsaturated fatty acids (LC-PUFAs), docosahexaenoic acid (DHA) and arachidonic acid (ARA) – these occur in high levels in the brain and play a key role in brain growth and the operation of neurotransmitters from late pregnancy until around the age of 20 years. Infants supplemented with DHA show improved language and communication skills. Several recent studies, including the DIAMOND trial, have found significantly improved means-end problem solving at 9 and 10 months in infants given DHA/ARA-supplemented formula, and similar results were shown for infants whose mothers were supplemented with DHA during pregnancy and breastfeeding. Long-term benefits of LC-PUFA supplementation in infancy have been reported in children aged 3 to 6 years. Follow-up studies of infants given DHA/ARA-supplemented versus control formula have shown better performance on tests of impulsivity and attention control in the supplemented children, with some indication of a dose-response relationship for DHA. Omega-3 supplementation of children with ADHD has shown a modest reduction in symptoms, and children scoring low on tests of reading ability have also shown improvement after supplementation with DHA.

We see a clear window of opportunity: if DHA is provided during pregnancy and for the first 6 weeks of life, there is a proven impact on the development of higher-order functions.

Peter Willatts

MAUREEN BLACK (University of Maryland School of Medicine, Baltimore, USA) closed the final session of the workshop by examining how nutrition and early childhood development are closely integrated. Looking at early growth of both the body and the brain and the impact nutrition has on the process, involves a multidisciplinary approach among scientists, nutritionists, psychologists and even economists. Many aspects need to be taken into consideration by studies seeking to understand the optimal circumstances for appropriate growth, but few research projects to date have taken a holistic view. Children with adequate nutrition and opportunities for early learning alongside responsive caregiving have been proven to have the best chance of thriving. Many studies adjust for socio-economic status but either ignore or adjust for the quality of home environment and caregiver interactions. Studies that do not consider the context or adjust for context may miss the effect of nutritional interventions. An integrated nutrition and responsive caregiving approach can certainly start early in life, at preconception. They can then go on to include breastfeeding and complementary feeding plus home visits, guidance and support from health providers and individual and group parent training.

Among the United Nation’s 17 Sustainable Development goals to transform our world there is a strong focus on both health and well-being plus quality early learning and education: these are targets that bring together several aspects of healthy infant nutrition and growth across the world.

Maureen Black

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The 89th Nestlé Nutrition Institute Workshop, titled “Recent Research in Nutrition and Growth”, highlighted the complex and vital relationship between appropriate nutrition and early physical and cognitive development in infants and young people. An enhanced understanding of growth biology is helping scientists discover how nutrition can modulate individual growth patterns and thereby inform efforts to support healthy growth into adolescence and adult life. Looking at early growth of both the body and brain and the impact nutrition has on the process, involves a multidisciplinary approach among scientists, nutritionists, psychologists and even economists. Growth of the body and the brain are influenced by genetic, hormonal, nutritional, environmental and pathological factors. These influences begin at the preconception stage, and carry through pregnancy, early infancy and childhood. New research is showing more links between nutrition and other influences on early body composition patterns, stature and the risk of obesity or stunting in later life. The early developmental phases represent critical windows for muscle, brain, bone and body systems growth, which, if interrupted via suboptimal nutrition, can result in deficiencies. Stunting is a highly prevalent problem among children of low- and middle-income countries, due to fetal exposure to nutritional deficiencies and infectious diseases. During the first 1000 days of life, infection control and dietary intervention in the form of supplements for undernourished pregnant and lactating women and their babies can improve healthier growth outcomes, with a profound and lasting effect. In terms of understanding how the brain develops and functions, the interface between cognitive development and nutritional science is key – nutritionists and behavioral scientists are now working closely together for the best research outcomes. Among the United Nation’s 17 Sustainable Development goals to transform our world, there is a strong focus on both health and well-being plus early learning and education: these targets, bringing together several aspects of healthy infant nutrition and growth, are influencing much of the new research into nutrition impact across the world.