



# 120 CLINICIANS TRAINED TO TEACH PRETERM NUTRITION

## NEONATAL TOTAL NUTRITION THERAPY (NEO-TNT) TRAINING IN PARIS, FRANCE



- What nutrition risks are associated with preterm birth, and what monitoring methods of growth, biochemical, clinical, and nutrient intake status are best to identify unmet needs? P2.
- Optimal growth in a preterm infant depends on adequate supplies of protein, but how much is enough? How does the protein requirement for a preterm infant compare with that for a term infant or that for an adult? P3.
- Human milk is the best nutrition for infants, but how is human milk feeding possible for a preterm baby who is too tiny to breastfeed? P3.
- Does your neonatal intensive care unit (NICU) have a feeding protocol? What practices are usually included in a preterm feeding protocol? P4.



Dr Larry Williams, Global Medical Director, Abbott Nutrition (USA) welcomed 120 clinicians from 20 countries to take part in the new Neonatal Total Nutrition Therapy (TNT) training program.

Speakers from the training session are shown at the top of the page, from left to right: Nicholas Embleton, MD, FRCPCH; Sharon Groh-Wargo, PhD, RD, LD; Oscar Hincapié Reyes, MD; Richard Schanler, MD, FAAP.

## BEST-PRACTICE NUTRITION CARE FOR PREMATURE INFANTS

Dr Larry Williams (Abbott Nutrition, USA) welcomed participants to the global Neo-TNT Program (28 Feb 2018), a train-the-trainer program on nutrition care for preterm infants. This all-new Neo-TNT training was scheduled to correspond with the 5th International Conference on Nutrition & Growth, which took place 1-3 Mar 2018, in Paris, France.

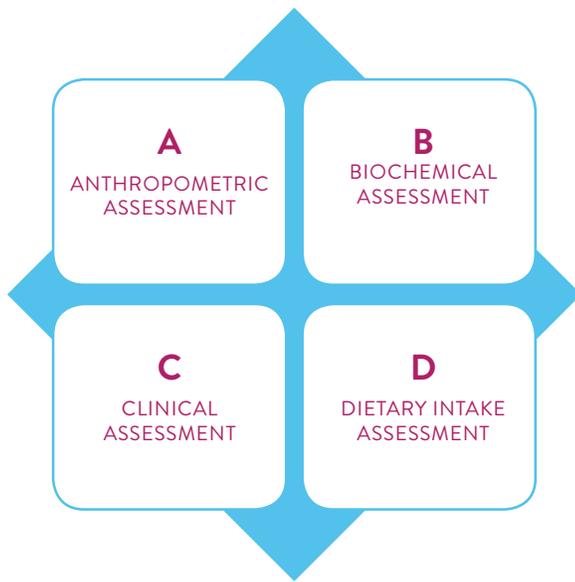
Dr Williams began, “Each year more than 1 in 10 infants around the world are born prematurely—for a total of 15 million preterm babies.”<sup>1</sup> We know that all newborns are vulnerable, but preterm infants are at particular risk for infection, sepsis, and other serious conditions. Many require special care to survive. Of those who survive, many thrive, but some face a lifetime of complications related to early growth delays and impaired development of learning, vision, or hearing. Such risks are a clarion call to neonatal care professionals to

adopt strategies that can improve outcomes for these born-too-soon babies.

Since optimal nutrition is a key component of effective care, Abbott Nutrition assembled world-renowned nutrition care experts to review contemporary practices for preterm infant feeding—**Nicholas Embleton, MD (UK)**; **Sharon Groh-Wargo, PhD, RD, LD (USA)**; **Oscar Hincapié Reyes, MD (Colombia)**; and **Richard Schanler, MD (USA)**. Together, this educational team worked to build 3 lectures and a workshop, including case studies. These teaching modules covered a wide range of nutrition-related topics, including training on how to monitor growth and development in the NICU and beyond, early decision-making about enteral nutrition, and how to incorporate human milk into a nutrition plan for a preterm infant.



# PRETERM GROWTH AND NUTRITION ASSESSMENT



*Dr Groh-Wargo advised, “Always treat the patient, not the laboratory value.”*

When it comes to assessing the growth and nutrition status of preterm infants, **Dr Sharon Groh-Wargo (USA)** is an expert. She is a Professor of Nutrition and Pediatrics at Case Western Reserve University School of Medicine who has written papers, guides, and care manuals on neonatal nutrition. At her training session in Paris, Dr Groh-Wargo provided new insights on the classic ABCD components for assessing infant nutritional status—*Anthropometric, Biochemical, Clinical, and Dietary*.

For all newborns, *Anthropometric* assessment includes determination of size-for-age and post-birth growth velocity. To use these measures for assessing preterm infant growth status, gender-appropriate Fenton growth charts for weight, length, head circumference, and growth velocity are available online (<http://www.ucalgary.ca/fenton/2013chart>). These charts are based on expected intrauterine growth for fetuses. Infants whose birth weight is less than the 10th percentile for their gestational age are labeled *Small for Gestational Age (SGA)*. Such a classification can help guide or anticipate clinical care needs (eg, high protein requirements to support growth in SGA infants). Growth velocity is also recognized as an important tool to monitor catch-up growth in SGA infants.<sup>2,3</sup> As well, new growth charts for weight/length ratios have been developed by the International Fetal and Newborn Growth Consortium for the 21st Century (INTERGROWTH-21st).<sup>4</sup> These growth standards are based on a global cohort of breastfed preterm infants from healthy moms who had optimal nutrition and perinatal care. These favorable conditions resulted in fewer—and later—preterm births than would

be seen in a general population. Although this limited the data for chart generation, some experts advise that these charts be used for assessment of preterm infant growth.<sup>4,5</sup>

*Biochemical* assessments commonly measure (1) electrolytes to monitor risk for or recovery from fluid imbalance; (2) nutrients that reflect bone density to identify osteopenia of prematurity; and (3) indicators of iron deficiency to detect and avert risk for abnormal brain growth and development due to iron deficiency.<sup>6</sup> Other biochemical measures are used when specific conditions are suspected. Dr Groh-Wargo recognized the importance of considering such measures and addressing abnormalities, yet she advised, “Always treat the patient, not the laboratory value.”

*Clinical* assessment of a preterm infant involves checking medical records for APGAR score (Appearance, Pulse, Grimace, Activity, Respiration) and routinely monitoring body temperature, respiratory rate, and heart rate.<sup>7</sup> Low APGAR scores are associated with distress, which may contraindicate early enteral feeding. Cold stress and high heart rates increase energy expenditure, in turn increasing energy needs.

The purpose of assessing *Dietary intake* is to determine whether an infant’s nutrient needs are being met by feeding. Nutrient intake by a preterm infant includes parenteral, enteral, or oral intake or combinations of these feedings.

Taken together, preterm infants have high nutrient needs, and ABCD assessments help guide informed feeding decisions.

# HOW MUCH PROTEIN DOES A PRETERM INFANT NEED?

According to expert **Dr Nicholas Embleton (UK)**, infants require protein to meet metabolic needs, provide for accretion of lean body mass, and account for urinary losses. Dr Embleton is a Consultant Neonatal Pediatrician in Newcastle, and he coordinates the Newcastle Preterm Birth Growth Study. Dr Embleton emphasized that protein needs differ according to the gestational age, weight, and clinical status of each preterm infant.<sup>8,9</sup> For example, 3.5 to 4.0 g protein/kg/day is appropriate for a preterm baby weighing 1000 to 1800 g, while 4.0 to 4.5 g protein/kg/day is usually needed by an infant weighing less than 1000 g. In contrast, a normal-weight term infant needs about 1.0 to 1.5 g protein/kg/day.<sup>10,11</sup>

A preterm baby weighing 1000 to 1800 g needs 3.5 to 4.0 g protein/kg/day, while an infant weighing less than 1000 g needs 4.0 to 4.5 g/kg/day. In contrast, a term infant born at weight appropriate for gestational age needs about 1.0 to 1.5 g protein/kg/day.

He also emphasized that adequate energy is needed to support protein-related growth. Without sufficient energy, ingested protein will be broken down for energy rather than promote lean mass accretion. To put this in perspective, preterm infants in the NICU require 20 to 30% more energy per kg body weight per day than a cyclist competing in the Tour de France. By number, cyclists need approximately 7000 kcal/day, which is roughly 100 kcal per kg body weight per day. In comparison, preterm infants have an energy need of 120 to 130 kcal/kg/day, and more than 50% of this energy expenditure is for the developing brain.

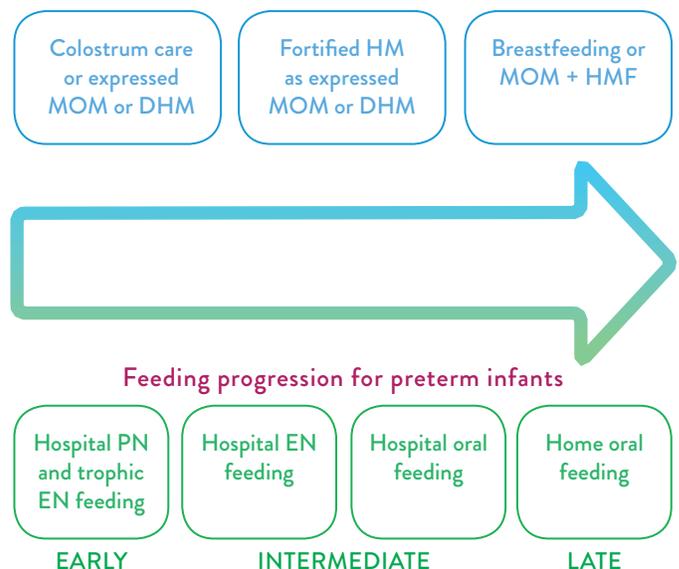
If a preterm infant does not get needed nutrients, consequences can be serious. Studies have shown that malnutrition in early periods of brain development—conception up to 2 years—was associated with a decreased number of brain cells as well as deficits in behavior, learning, and memory.<sup>12,13</sup> In a remarkable study of very low birthweight infants (<1000 g), week 1 nutrient intake was found to affect Mental Development Index (MDI) at age 18 months.<sup>14</sup> Specifically, each 10 kcal energy intake/kg/day was associated with a 4.6-point increase in the MDI, and each 1 g protein intake/kg/day was associated with an 8.2-point increase in the MDI score. Beyond brain development, infants especially need protein for normal growth in most tissues in the body—neurons, muscle, liver, lungs, heart, gastrointestinal tract, and bones.<sup>13</sup>

Dr Embleton noted that breast milk is best for infants.<sup>15</sup> But for preterm infants, human milk must be expressed and fortified with energy, protein, minerals, and other nutrients in order to meet high needs for growth and development.

## HUMAN MILK FEEDINGS IN THE NICU & BEYOND

**Dr Richard Schanler (USA)** is the Director of Neonatal Services at Cohen Children's Medical Center and Northwell Health in Long Island, New York. He is a renowned research investigator and a Diplomat of the American Board of Pediatrics. His recent professional work has focused on how to incorporate human milk feeding into progressive stages of care for preterm infants who begin life in the NICU. Progressive feeding can be staged as early, intermediate, and late phases; human milk can be fed at all stages.<sup>16-19</sup> At the early stage, colostrum care introduces very small amounts of Mother's Own Milk (MOM) as colostrum or Donor Human Milk (DHM) onto the mucous membranes in the infant's mouth. Dr Schanler advises that next in the early phase, trophic enteral feeding of MOM or DHM be used along with parenteral nutrition (PN). In the intermediate feeding stages, he advises full enteral nutrition (EN) of MOM or DHM, expressed and fortified with added protein, energy, and bone-health nutrients such as calcium and phosphorus. The next transition is to oral feeding of fortified MOM or DHM based on readiness of each infant to suck and swallow. For late stages, he advises continued oral feeding with human milk fortifier (HMF), eventually transitioning to breastfeeding when the infant can consume a volume large enough to meet needs.

### How to incorporate use of human milk across feeding stages





Dr Oscar Hincapié Reyes, Professor of Pediatrics, Nueva Granada Military University (Bogotá, Colombia) spoke about the challenges of implementing a NICU feeding protocol and identified key implementation criteria.

## DOES YOUR NICU HAVE A FEEDING PROTOCOL?

While it has long been known that early and aggressive feeding of preterm infants can improve survival and growth,<sup>20-22</sup> there are considerable differences in practices and outcomes in different NICU sites.<sup>23</sup> Over the past year, **Dr Oscar Hincapié Reyes (Colombia)**, a Professor of Pediatrics in Bogotá (Nueva Granada Military University), visited dozens of NICUs throughout Colombia where he conducted workshops on use of preterm infant feeding protocols.

Nutritional delivery for tiny preterm infants is uniquely challenging and complex, requiring frequent adjustment of feeding variables such as nutrient content, balance, density, and delivery method, all the while adapting to each infant's comorbidities and to available local resources. In a lively discussion with workshop attendees from 20 different countries, Dr Hincapié used infant case studies to highlight variation in practice. There is no single "perfect" feeding protocol, but each NICU team worldwide is challenged to build a feeding protocol that facilitates best infant nutrition care in its setting.

Based on his experiences, Dr Hincapié advised how to tackle the challenge of creating and implementing a NICU feeding protocol. The first steps are to identify a multidisciplinary team of NICU care champions, review the medical literature on best-feeding practices, and create a feeding protocol based on local needs and resources. Key elements of a feeding protocol are (1) when and how to feed; (2) what to feed; (3) how much to feed; and (4) how and when to advance feeding. The next step is to train staff members to use the feeding protocol and to give them tracking tools to facilitate its use. As a follow-up, the outcome data collected can be used to gain insights on how to improve the feeding protocol over time.

## REFERENCES

1. World Health Organization. <http://www.who.int/en/news-room/fact-sheets/detail/preterm-birth>. Published February 19, 2018. Accessed May 10, 2018.
2. Fenton TR, et al. *Pediatrics*. 2017;139(3):e20162045.
3. Fenton TR, et al. *J Pediatr*. 2018;196:77-83.
4. Villar J, et al. *Pediatrics*. 2018;141(2):e20172467.
5. Tuzun F, et al [published online June 30, 2017]. *J Matern Fetal Neonatal Med*. 2018;31(17). doi:10.1080/14767058.2017.1339270
6. Groh-Wargo S, et al, eds. *Pocket Guide to Neonatal Nutrition*. 2nd ed. Academy of Nutrition and Dietetics; 2016.
7. Knobel RB. *Newborn Infant Nurs Rev*. 2014;14:72-76.
8. Hay WW, et al. *J Perinatol*. 2016;36(7):500-502.
9. Kim MJ. *Korean J Pediatr*. 2016;59(12):466-470.
10. Agostoni C, et al. *J Pediatr Gastroenterol Nutr*. 2010;50(1):85-91.
11. Food and Nutrition Board, Institute of Medicine, National Academies. <http://www.nationalacademies.org/hmd/~media/Files/Activity%20Files/Nutrition/DRI-Tables/5Summary%20TableTables%2014.pdf?la=en>. Accessed May 15, 2018.
12. Cusick SE, et al. *J Pediatr*. 2016;175:16-21.
13. Su BH. *Pediatr Neonatol*. 2014;55(1):5-13.
14. Stephens BE, et al. *Pediatrics*. 2009;123(5):1337-1343.
15. Bhatia J. *Ann Nutr Metab*. 2013;62(suppl 3):8-14.
16. Maffei D, et al. *Semin Perinatol*. 2017;41(1):36-40.
17. Snyder R, et al. *Pediatr Neonatol*. 2017;58(6):534-540.
18. Colaizy TT. *Curr Opin Pediatr*. 2015;27(2):172-176.
19. Schanler RJ, et al. *Pediatrics*. 2005;116(2):400-406.
20. Bloom BT, et al. *Pediatrics*. 2003;112(1):8-14.
21. Ehrenkranz RA. *Semin Perinatol*. 2007;31(2):48-55.
22. Uhing MR, et al. *Clin Perinatol*. 2009;36(1):165-176.
23. Olsen IE, et al. *Pediatrics*. 2002;110(6):1125-1132.

### IMPORTANT NOTICE

Breastfeeding is best for babies and is recommended for as long as possible during infancy. Human milk should be fortified for very low birthweight infants.

### ANHI NEWSLETTER

#### Medical Writer:

Cecilia Hofmann, PhD

#### Editor in chief:

Sean Garvey, PhD

### VIDEOS AVAILABLE AT ANHI.ORG

