



PRETERM INFANTS FACE SEVERE HEALTH CHALLENGES AT THEIR START IN LIFE

Every year, 15 million infants around the world are born too early and before completion of the 37th week of pregnancy [1]. These children face substantial challenges that are more severe the earlier the child is born. The first challenge that they, their parents, and the hospital staff are facing is to stay and keep the child alive [1].

HEALTH CHALLENGES OF PREMATURE BIRTH

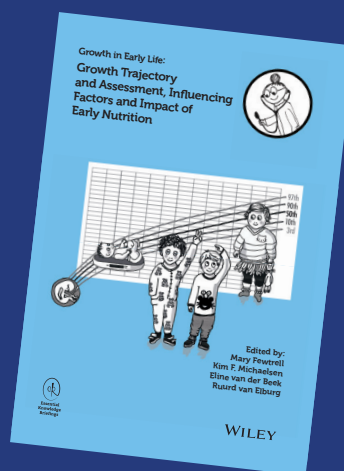
Preterm birth is the number one cause of child mortality and morbidity around the world [1]. The earlier in a pregnancy infants are born, the less prepared their bodies are for the outside world and the more special care they need to stay alive [1]. Preterm infants are at risk of developing disabilities that will affect their entire lives. The extent strongly depends on how early they were born, what medical challenges they have to overcome, the quality of care they received during and around birth, and the period that follows [1].

Key challenges of premature infants are:

- Need for a high growth velocity versus difficulties of enteral food intake [2,3];
- Gastrointestinal & metabolic immaturity [2];
- Immature /compromised immune system [4];
- Use of antibiotics leading to delayed colonisation and compromised microbiota development [4];
- Sensitive phase of brain development [5].

“GROWTH IN EARLY LIFE”

In 2016 the Growth book was published [11]. This “Growth Book” provides an overview of physical growth during the 1st 1000 days of life and factors that influence growth trajectories. The “Growth Book” was edited by external and internal paediatric experts – Prof. Dr. Mary Fewtrell, Prof. Dr. Kim Michaelsen, Prof. Dr. Eline van der Beek and Prof. Dr. Ruurd van Elburg. Chapter 4 discusses growth challenges of preterm infants and was reviewed by Prof. Dr. Hans van Goudoever.



ACHIEVING ADEQUATE GROWTH VELOCITY, A KEY CHALLENGE FOR LONG TERM HEALTH

The aim for preterm infants is to grow and develop at a similar pace outside of the mothers' womb as they would during the same period inside the womb [2,3]. Achieving appropriate growth and nutrient accretion is often difficult because of the special needs of the preterm infant as a result of metabolic and gastrointestinal immaturity [2-4].

HIGH NUTRIENT REQUIREMENT VS COMPROMISED NUTRITIONAL INTAKE

The intrauterine growth rate desired for preterm infants can be about 3-5x higher than that at term [2,6] and therefore the nutritional requirements are increased [2,3,6].

However a limited feeding ability together with a limited stomach volume present a challenge to meet these nutritional requirements enterally [1-3]. This is further compounded by the immature ability to adequately digest and absorb (some)

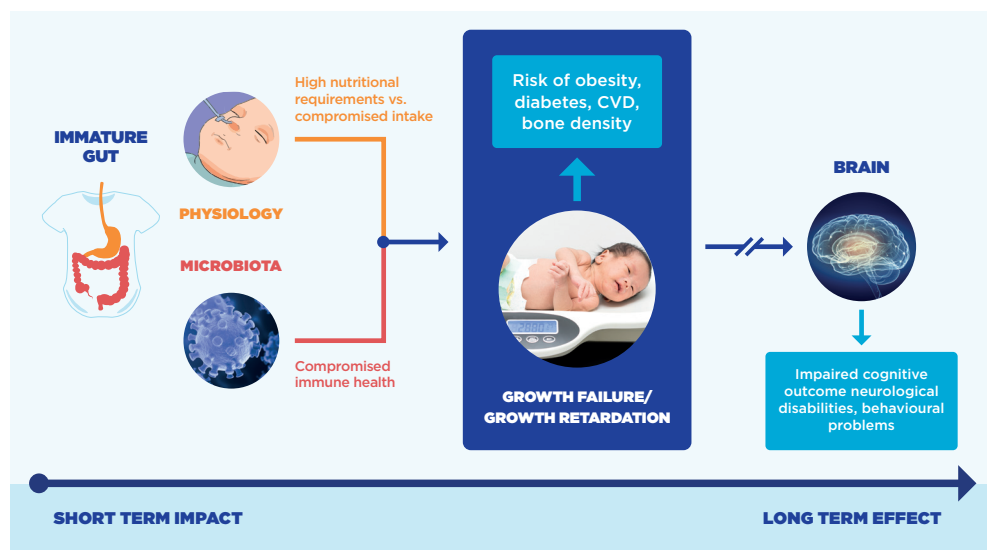
nutrients, limited nutrient reserves and low body fat stores [2,3].

COMPROMISED GUT BARRIER & IMMUNE HEALTH

Infections, necrotizing enterocolitis and sepsis compromise survival and negatively affect the growth rate of the infant [4,7]. Preterm infants are at increased risk of infections because of medical interventions (e.g. feeding intravenously), the hospital environment with potential pathogens, and an immature gut barrier and immune system [4]. Intestinal microbiota play a role in our immune defence [4,8]. Prophylactic use of antibiotics delay colonization and thereby contribute to the increased infection risk and potentially to subsequent growth deficits [4,8].

A SENSITIVE PHASE OF BRAIN DEVELOPMENT

The last trimester up to 2 years of age is a sensitive phase of brain development [5]. If growth deficits occur, functional organ development is compromised – particularly brain development – with potentially severe long-term effects [5,9,10].



Adequate growth is a major challenge for preterm infants. It is affected by an immature gut and metabolic physiology and as a consequence inadequate intake, digestion, uptake and usage of the nutrients. Moreover suboptimal intestinal microbiota and an immature immune system may play a role in the risk of infection and necrotising enterocolitis, further compromising growth. Together the factors/processes leading to growth failure also impact/ compromise brain development.

References

- Howson, Kinney, Lawn (Eds.). (2012) Born Too Soon: The Global Action Report on Preterm Birth. World Health Organisation. Geneva, Switzerland.
- Klein (Ed.). (2002) J Nutr. 132(6 Suppl 1): 1395S-1577S.
- Agostoni et al. (2010) J Pediatr Gastroenterol Nutr. 50(1): 85-91.
- Neu. (2014) 110: 253-263. In: Koletzko-Uauy-Pointdexter (Eds.). Nutritional care of preterm infants: Scientific basis and practical guidelines. Karger, Basel, Switzerland.
- Ramel & Georgieff. (2014) World Rev Nutr Diet. 110: 190-200.
- Clark et al. (2014) Clin Perinatol. 41(2): 295-307.
- Van Den Berg et al. (2016) J Pediatr Gastroenterol Nutr. 63(2): 270-276.
- Jeurink et al. (2013) Am J Clin Nutr. 98(2): 572S-577S.
- Ehrenkranz et al. (2006) Pediatrics. 117(4): 1253-1261.
- Stephens et al. (2009) Pediatrics. 123(5): 1337-1343.
- Fewtrell, Michaelsen, van der Beek, van Elburg (Eds.). (2016) Growth in Early Life: Growth Trajectory and Assessment, Influencing Factors an Impact of Early Nutrition. John Wiley & Sons Australia Ltd, Milton, Queensland, Australia.