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Nourishing the Growing Brain: Early Nutrition for Preterm Infants

1 out of 10 infants are born preterm (before 37 weeks of gestation).[1]

Preterm infants are at a higher risk of adverse **neurodevelopmental outcomes.**[2]

Pregnancy **270** days + Year 1 **365** days + Year 2 **365** days = Year 2 **1000** days

Critical window of brain growth and development[3]

Preterm infants miss the period of brain development during the third trimester of pregnancy.[4]

Neurodevelopmental delays may have a direct effect on the cognitive development, and social–emotional competence in later stages of life.[5]

Nutrients that support neurocognitive development in preterm infants

Adequate nutrition in preterm infants is associated with[6,7]

- Healthy brain development
- Reduced risk of cognitive, behavioural, and neurodevelopmental outcomes

1. Key role of macro-and micronutrients

Protein

- A safe and effective dose of protein supports neurodevelopment in preterm infants: **3–4 g/kg/day.**
- **Glutamine supplementation:** Helps increase brain volume in preterm infants in later stages of life.[7]

LCPUFAs

- Docosahexaenoic acid (DHA) and essential fatty acid (essential for brain development) accretion is compromised in preterm infants during the third trimester of pregnancy.[8–10]
- **0.3% DHA and 0.6% ARA in infant feeds** have been shown to support healthy brain development (clinical study).[11]

Iron

- Preterm infants are at a higher risk of iron deficiency due to compromised accretion of iron in the third trimester of pregnancy.[7]
- Iron concentration in feeds supports neurodevelopmental outcomes in preterm infants: **1–2 mg/kg/day.**[7]

Zinc

- Zinc plays a key role in brain growth and development.[12,13]
- Preterm infants miss the critical period of *in-utero* zinc accretion. Thus, they are at higher risk of zinc deficiency.[12,13]

Preterm infants → High risk of folate and iodine deficiency[14,15] → Adverse neurodevelopmental outcomes[14,15]

2. Role of SM in improving neurodevelopment outcome

8 weeks

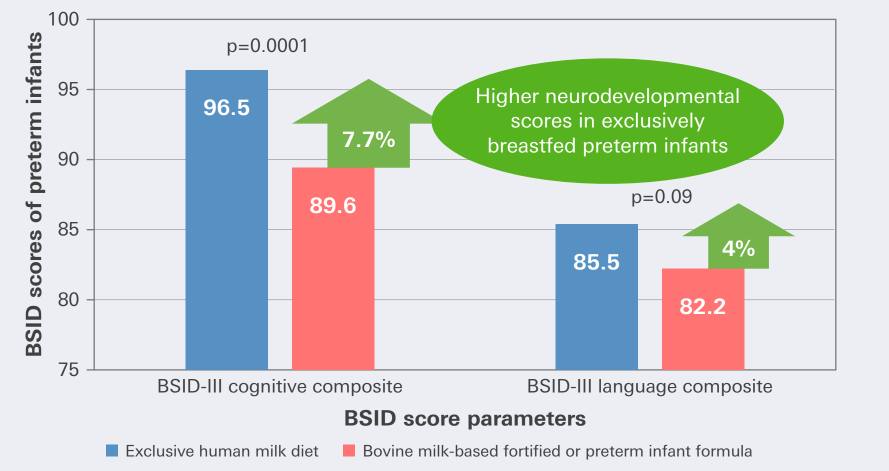
Intervention after birth in very preterm infants (pilot study)[7]

Results →

Formula containing 20% SM from milk phospholipids showed improved neurodevelopmental outcomes in **intellectual abilities, sustained attention, and behaviour** compared to the formula containing 13% SM from egg phospholipids.[7]

Role of exclusive breastfeeding to enhance brain function

Impact of exclusive human milk diet vs. preterm infant formula on the brain development of preterm infants: Neurodevelopmental outcomes at 18–22 months of age.[16]



Prolonged breastfeeding in infancy is positively associated with

- Cognitive abilities[7,16,17]
- Brain executive functions[17]

Enteral and parenteral nutrition to support preterm brain development

Optimisation of enteral and parenteral nutrition[7] → Goal: To reduce energy and nutrient deficits → May improve brain growth, brain maturation, and neurodevelopment[7]

Key messages

- Adequate intake of nutrients such as protein, LCPUFAs, iron, zinc, and SMs has shown promising neurodevelopmental and cognitive benefits in preterm infants.
- Exclusive and prolonged breastfeeding is associated with positive neurodevelopmental outcomes in preterm infants.
- Improving early parenteral and enteral nutrition can potentially reduce energy and nutrient deficits, leading to improved brain growth, brain maturation, and neurodevelopment in preterm infants.

ARA: Arachidonic acid; BSID: Bayley Scales of Infant Development; DHA: Docosahexaenoic acid; LCPUFA: Long Chain Polyunsaturated fatty acid; SM: Sphingomyelins.

References

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