Optimal feeding of premature babies: investing into future health

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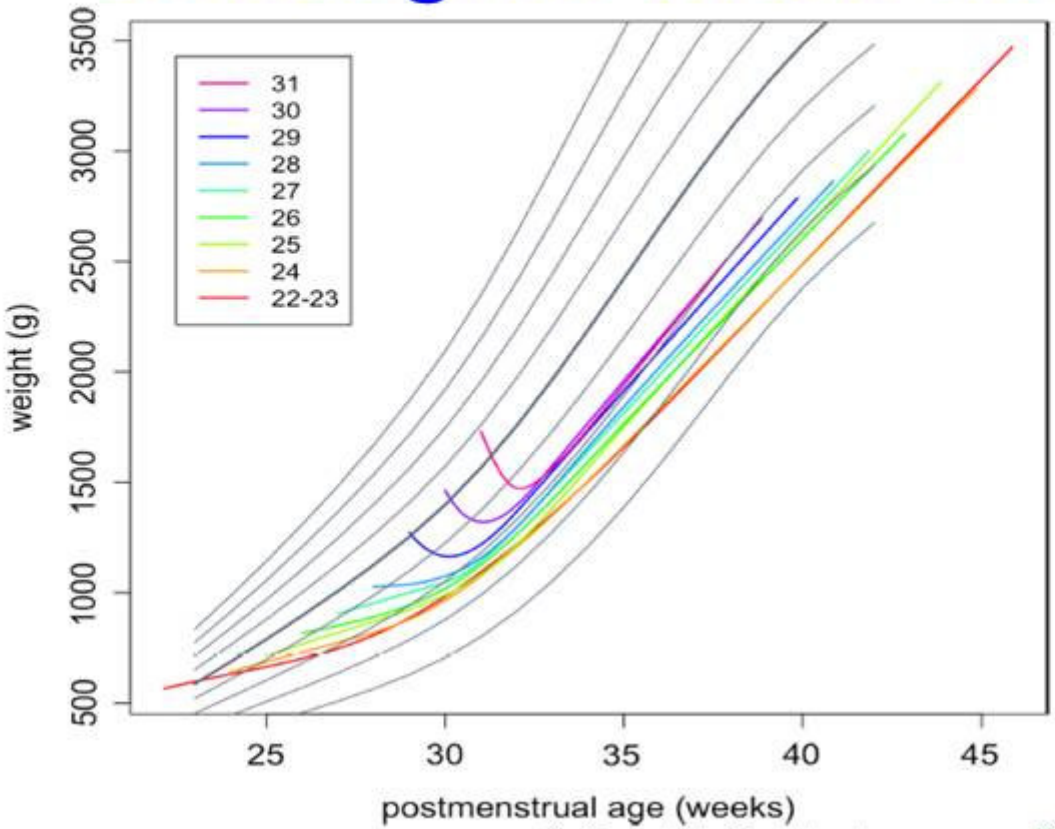
Disclosures

BK is member of the German **National Breastfeeding Committee**, chairs the **Nutrition Committee, German Paediatric Society** and the national programme **Becoming Breastfeeding Friendly** is President Elect, the **Int Soc Research in Human Milk & Lactation** and tends to be biased towards breastfeeding. LMU - Ludwig-Maximilians-Universität Munich and it's employee BK received support for scientific and educational activities from the **European Commission**, FP7 Programme Early Nutrition-289346 and H2020 Programme DYNAHEALTH-633595 und Lifecycle-733206, the **European Research Council** Advanced Grant META-GROWTH ERC-2012-AdG–no.322605, the **Erasmus Plus** Programmes Early Nutrition eAcademy Southeast Asia-573651-EPP-1-2016-1-DE-EPPKA2-CBHE-JP and Capacity Building to Improve Early Nutrition and Health in South Africa-598488-EPP-1-2018-1-DE-EPPKA2-CBHE-JP, the **EU Interreg Programme** Focus in CD-CE111 and the European **Joint Programming Initiative** Project NutriPROGRAM. Further support was provided by **German Ministry of Education and Research**, Berlin (Grant Nr. 01 GI 0825), **German Research Council** (Ko912/12-1), **German Academic Exchange Service**, **German Academic Exchange Service**, **University of Munich Innovation Initiative**, and different healthcare and nutrition **companies**, predominantly as part of publically funded research projects supported by the European Commission or the German government.

Immature premature babies are born at a time when they are not yet ready for normal feeding

Infants born very preterm often do not grow like in the womb



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103,194 weights of 5,009 infants born at 22-31 wks gestation, 40 neonatal units, UK

Cole et al 2014.

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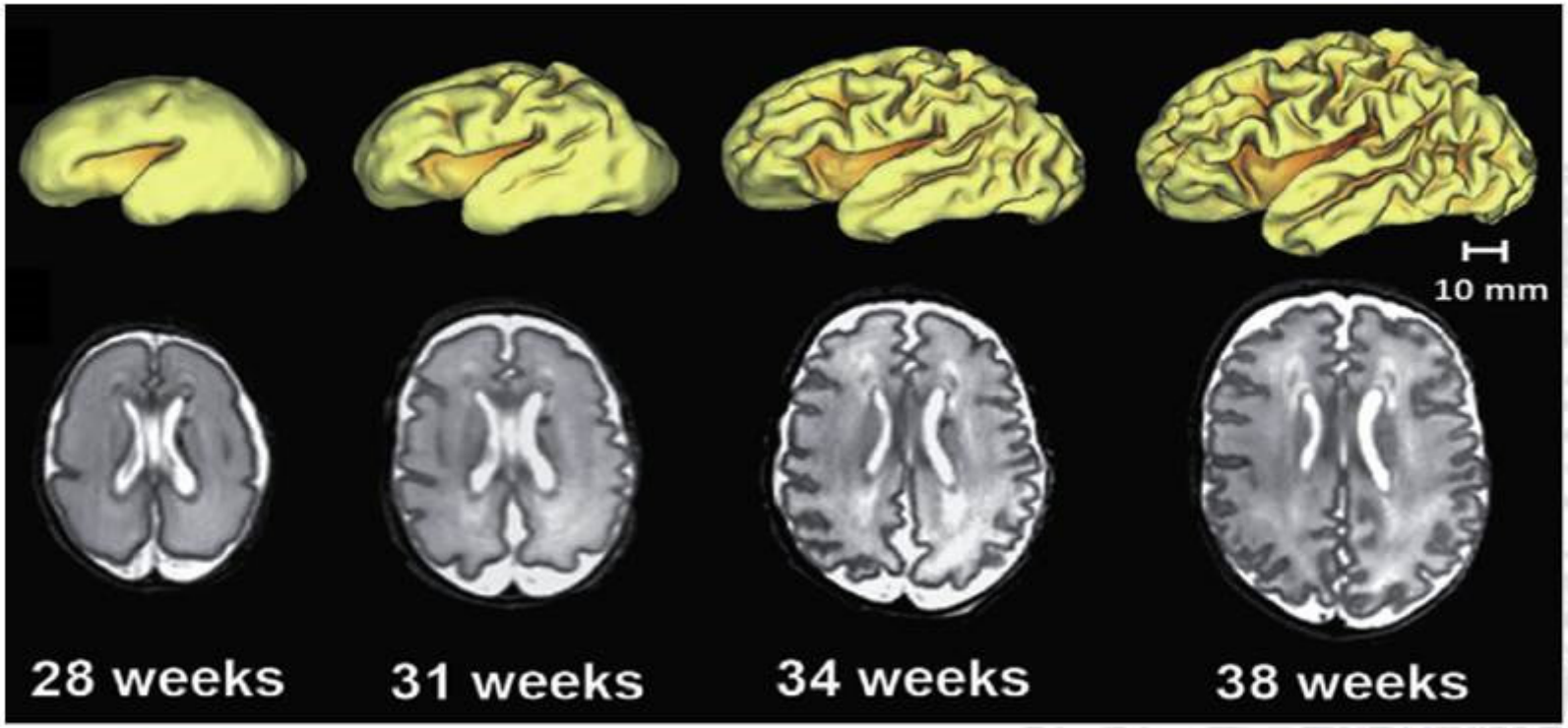
Extremely premature infant: a nutritional emergency

- Premature infant, 24 weeks, 500 g birthweight: ≈90% water, only ≈50 g dry tissue mass
- Even if 1/3 of body protein is utilized for energy, this will barely meet energy needs for 24 h

Brain growth & development need nutrition



≈75 g

≈400 g

botanious.de

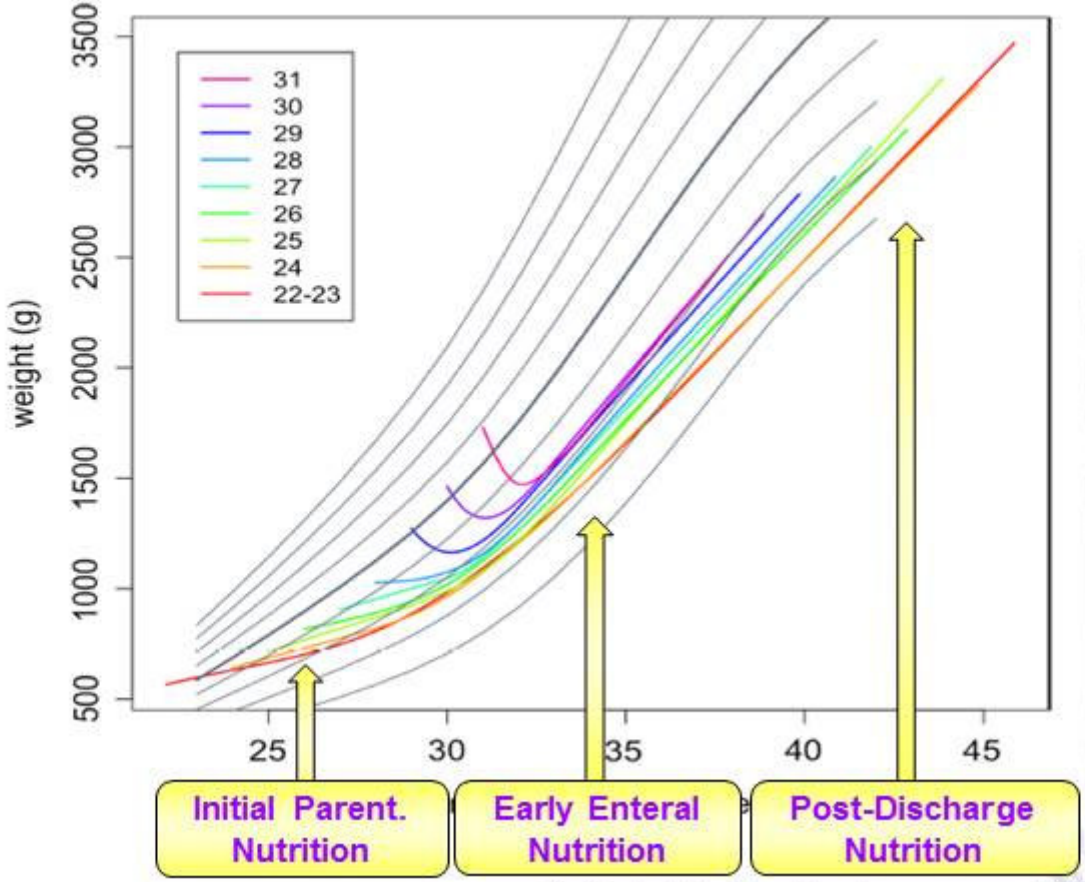
Smyser et al, J Paediatr Child Health 2012.

Poor growth of preterm babies: poor neurodevelopment

490 preterms followed to 18-22 mon corr. age

Modified from Ehrenkranz R, in Koletzko B, Poindexter B, Uauy R (eds.): Nutritional Care of the Premature Infant, 2014

How to improve growth and development?



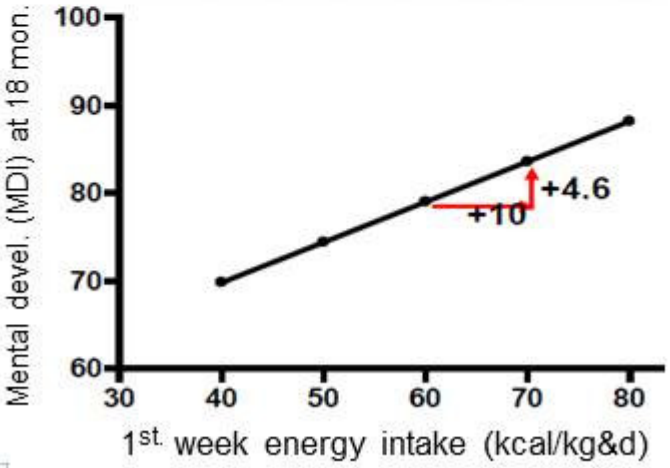
103194 weights of 5009 infants born at 22-31 wks gestation, 40 neonatal units, UK

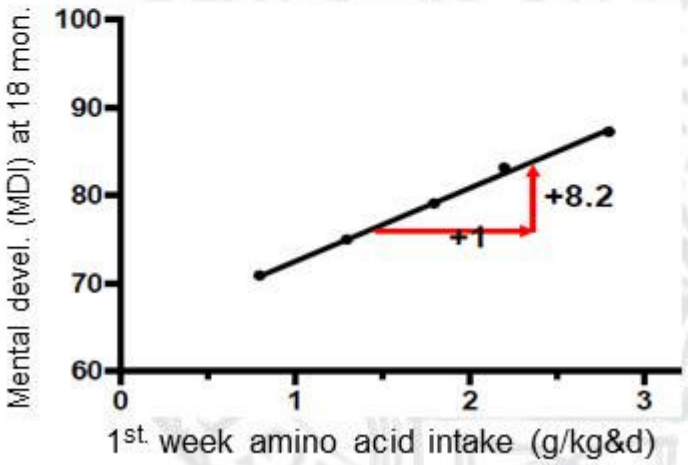
Cole et al 2014.

Energy and protein intake in the first week of life predict later mental development

Week 1 energy & protein intakes in 124 preterm infant born <1000 g and Mental Development at 18 mon.

- plus 10 kcal/kg& d ⇨ ↑ **4.6 points MDI**
- plus 1 g amino acids/kg&d ⇨ ↑ **8.2 points MDI**





Stephens BE et al. Peds. 2009

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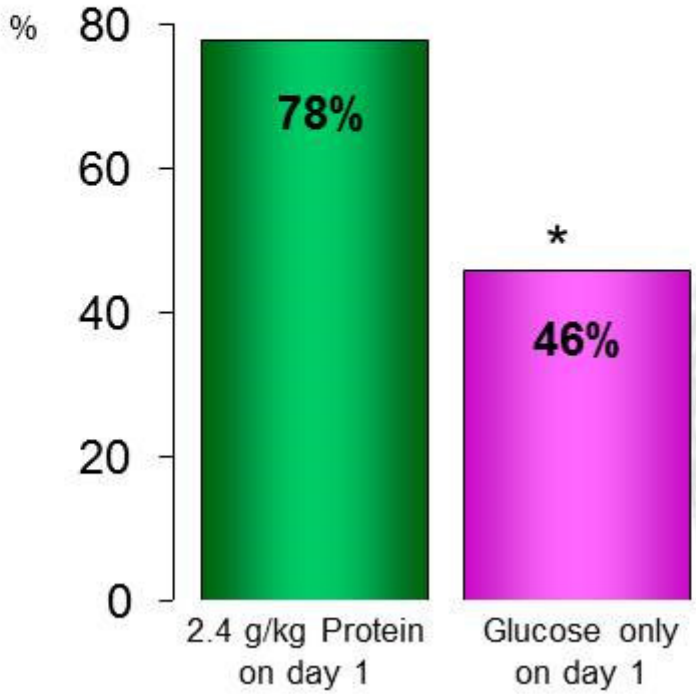
Early intravenous protein supply improves development in boys (RCT)

Former preterm boys alive at 2 y without major disabilities (%)



*adj. OR = 6.2 (adj. f. antenatal steroids, birth weight, gestational age, & 5-minute Apgar scores)

after v Goudoever JB et al, in Koletzko B et al (eds.): Nutritional Care of the Premature Infant, 2014

Benefits of human milk for preterms

Immunity

- ↓ Infections
- ↓ Gut inflammation (Necrotizing Enterocolitis)

Neurodevelopment

- ↑ Long-term cognitive development

Gastrointestinal function

- More rapid gastric emptying, fat digestion
- Faster establishment of enteral nutrition

Modified after Bhatia J, Ann Nutr Metab. 2013;62 Suppl 3:8-14.

Human milk and severe gut inflammation (necrotizing enterocolitis)

Confirmed necrotizing enterocolitis in all infants		
Human milk only	**Formula only**	**P**
1.2% (of n=253)	**7.2%** (of n=236)	**<0.005**
Subgroup of randomized infants		
1% (of n=86)	5% (of n=76)	n.s.

Lucas A et al. Lancet. 1990;336:1519-23.
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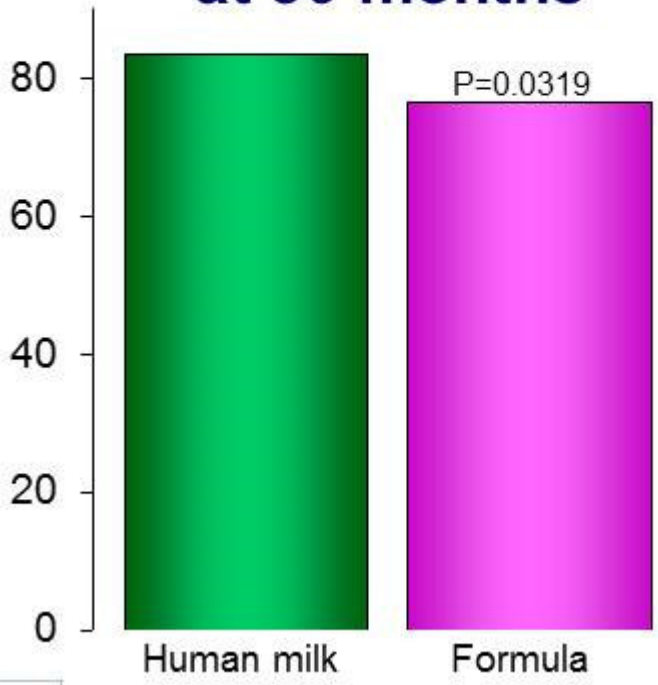
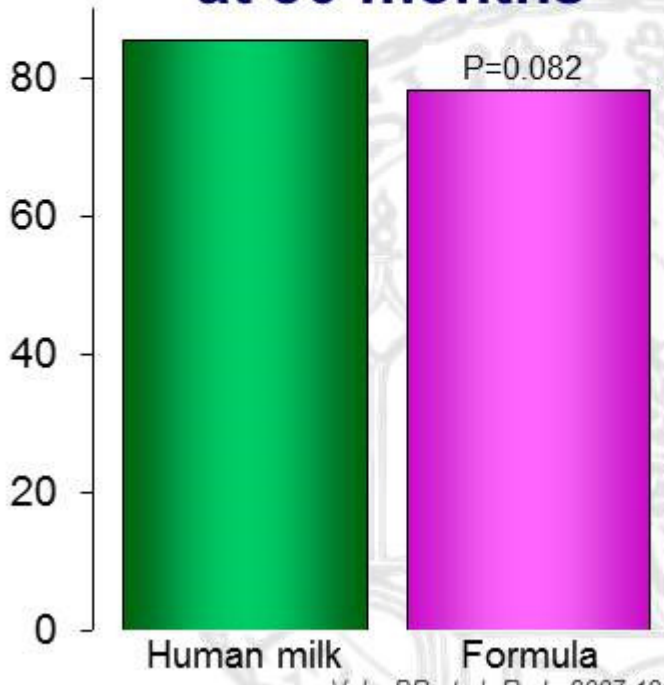
Early human milk: better development

Mental development at 30 months

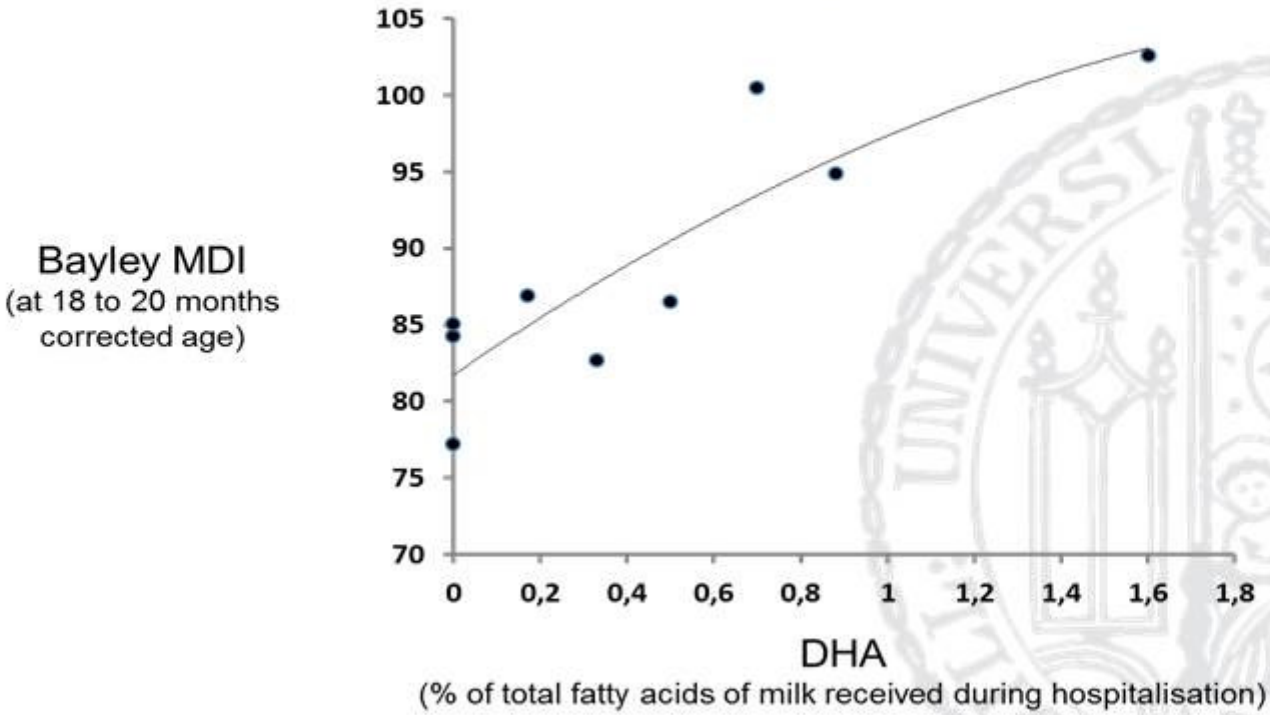


Psychomotor development at 30 months



Vohr BR et al. Peds 2007;120:e953-9.

Supply of omega-3 DHA to preterms: mental development at age 18-20 months



Lapillone A, in Koletzko B, Poindexter B, Uauy R (eds.): Nutritional Care of the Premature Infant, 2014

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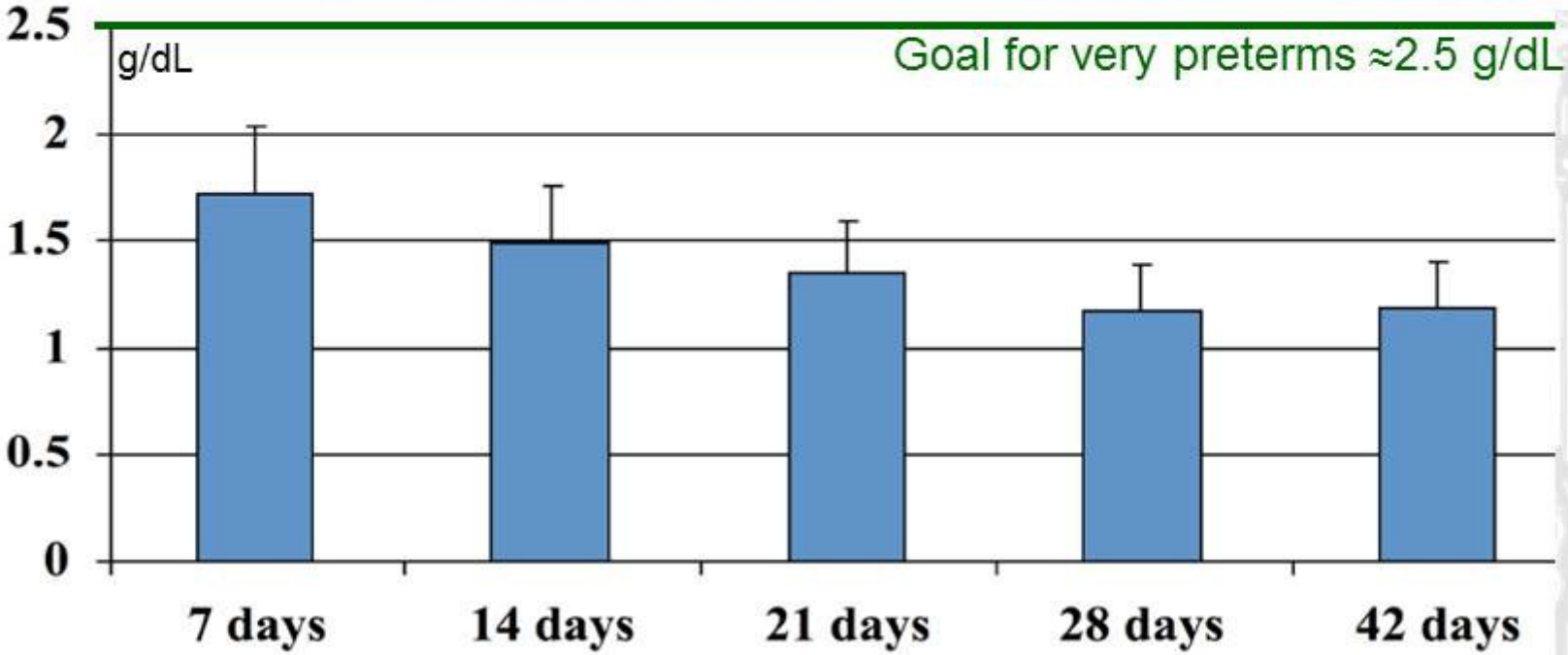
Less protein in human milk than needed for good preterm growth and development ➔ fortification essential



from Ziegler E, based on data by Lemons et al 1982, in Koletzko B et al (eds.): Nutritional Care of the Premature Infant, 2014

Feeding preterms - Key points

- Infants born very preterm = nutritional emergencies
- Very fast weight gain, high nutrient needs/kg, but immature feeding ability and digestive tract functions
- Professional nutritional care of preterm infants is key for healthy growth (whole body, key organs e.g. brain) and long-term health, development, contribution to society, and quality of life

Feeding preterms - Key points

- Infants born very preterm regularly need intravenous and tube feeding in the hospital, and monitoring and nutrition support at home
- Nutritional care practices in Europe vary a lot
- Standards should help improve quality of care
- Each hospital should develop standard protocols on nutrition care, train staff, and audit implementation