



CLINICAL PRACTICE GUIDELINE

Guideline coverage includes NICU KEMH, NICU PMH and NETS WA

Milk Room: Breast Milk Fortification and Preterm Formula

This document should be read in conjunction with the [Disclaimer](#)

Breast milk is recommended for infants¹. Latest ESPGHAN² guidelines suggest protein intakes between 3.5 and 4.5 g/kg/day and energy intakes between 110 and 135 kcal/kg/day are necessary for preterm infants to achieve reference growth (weight gain of ~15 g/kg/day). These intakes are difficult to achieve with unfortified expressed breast milk (EBM) feeds, especially when fluids are restricted, and therefore EBM is routinely fortified with a multi-component, breast milk fortifier ± a protein supplement to assist preterm infants in meeting their nutritional and growth requirements.

Some mineral and vitamin supplementation may also be necessary. Refer to [Enteral Feeding: Initiation and Progression](#) guideline.

Level 1 (L1) milk fortification is achieved by fortifying EBM with a multi-component human milk fortifier (PreNan HMF). L1 may be introduced once enteral feeds of 100 mL/kg/day are achieved, after which, enteral volumes are increased as tolerated, to promote recommended growth. **It is estimated that nutritional guideline for protein is met when feeds fortified to L1 are fed at ~170 mL/kg/day.**

Further fortification beyond L1 may be required for **fluid-restricted infants (< 150 mL/kg/day)** who are growing poorly. **Level 2 (L2) milk fortification** is achieved by fortifying EBM with a multi-component human milk fortifier (PreNan HMF) and additional protein powder (Beneprotein). **Nutritional guideline for protein is met when feeds fortified to L2 are fed at ~150 mL/kg/day** (see [Table 3](#)).

Level 2 feeds may be needed for infants receiving PDHM.

The difference in osmolality between level 1 and level 2 feeds is minimal.

With parental consent, infants born < 32 weeks gestation +/- 1500 grams are eligible to receive pasteurised donor human milk, which is usually fed until a corrected age of 32-34 weeks. Refer to [Pasteurised Donor Human Milk \(PDHM\)](#) guideline.

If not receiving mothers' own or pasteurised donor milk, infants < 35 weeks gestation may be fed preterm formula, after demonstrating tolerance of a term formula. Older infants (> 35 weeks gestation) are usually fed term formula but if growing poorly, may require preterm or an enriched term formula and referral to a dietitian for close monitoring of their nutrient intakes and growth. Refer to [Enteral Feeding: Initiation and Progression](#) guideline.

*Assumed macronutrient profile of preterm breast milk³⁻⁶ and assumed micronutrient profile of term breast milk⁷.

Wyeth SMA HMF: bovine whey protein; maltodextrins

Table 1 - Estimated Composition of Level One Milk Feeds

	EBM	Level 1
	100 mL	100 mL
Protein (g)	1.27	2.71
Fat (g)	3.46	4.18
Carbohydrate (g)	7.34	8.62
Energy (kcal)	65.58	82.97
Energy (kJ)	274.52	347.28
Vitamin A (ug) (eq)	31.00	363.80
Vitamin A (IU)	103.23	103.23
Cholecalciferol (Vit D) (µg)	0.03	3.55
Cholecalciferol (IU)	1.20	145.20
Vitamin E (mg)	0.49	4.25
Vitamin E (IU)	0.73	6.10
Vitamin K (µg)	0.25	7.77
Vitamin C (mg)	3.00	21.76
Thiamin (Vit B1) (mg)	0.02	0.18
Riboflavin (Vit B2) (mg)	0.04	0.24
Niacin (mg)	0.18	1.58
Vitamin B6 (ug)	13.00	133.00
Folic Acid (µg)	8.50	46.02
Vitamin B12 (µg)	0.04	0.24
Panthenic Acid (mg)	0.22	0.86
Sodium (mg)	16.00	52.80
Sodium (mmol)	0.70	2.30
Potassium (mg)	50.00	98.00
Potassium (mmol)	1.28	2.51
Calcium (mg)	26.40	102.00
Calcium (mmol)	0.66	2.56
Phosphorus (mg)	12.40	56.20
Phosphorus (mmol)	0.41	1.83
Magnesium (mg)	3.40	7.40
Iron (mg)	0.03	1.83
Zinc (mg)	0.25	1.21
Iodine (µg)	11.50	24.18
Manganese (µg)	0.35	6.35
Copper (µg)	25.00	25.04
Chloride (mg)	42.50	74.62
Chloride (mmol)	1.20	2.10
Selenium (ug)	0.02	2.82
Biotin (ug)	0.60	3.80
Choline (mg)	16.00	24.00
Molybdenum (ug)	0.02	0.02
Chromium (ug)	0.03	0.03

*Boyce et al. 2016; NHMRC 2006
#EBM fortified with PreNAN HMF

Table 2 - Estimated Composition of Level Two Milk Feeds

	EBM*	Level 2#
	100 mL	100 mL
Protein (g)	1.27	3.14
Fat (g)	3.46	4.18
Carbohydrate (g)	7.34	8.62
Energy (kcal)	65.58	84.76
Energy (kJ)	274.52	354.75
Vitamin A (ug) (eq)	31.00	363.80
Vitamin A (IU)	103.23	103.23
Cholecalciferol (Vit D) (ug)	0.03	3.55
Cholecalciferol (IU)	1.20	145.20
Vitamin E (mg)	0.49	4.25
Vitamin E (IU)	0.73	6.10
Vitamin K (ug)	0.25	7.77
Vitamin C (mg)	3.00	21.76
Thiamin (Vit B1) (mg)	0.02	0.18
Riboflavin (Vit B2) (mg)	0.04	0.24
Niacin (mg)	0.18	1.58
Vitamin B6 (ug)	13.00	133.00
Folic Acid (ug)	8.50	46.02
Vitamin B12 (ug)	0.04	0.24
Panthenic Acid (mg)	0.22	0.86
Sodium (mg)	16.00	53.87
Sodium (mmol)	0.70	2.34
Potassium (mg)	50.00	100.14
Potassium (mmol)	1.28	2.57
Calcium (mg)	26.40	103.43
Calcium (mmol)	0.66	2.60
Phosphorus (mg)	12.40	56.20
Phosphorus (mmol)	0.41	1.83
Magnesium (mg)	3.40	7.40
Iron (mg)	0.03	1.83
Zinc (mg)	0.25	1.21
Iodine (ug)	11.50	24.18
Manganese (ug)	0.35	6.35
Copper (ug)	25.00	25.04
Chloride (mg)	42.50	74.62
Chloride (mmol)	1.20	2.10
Selenium (ug)	0.02	2.82
Biotin (ug)	0.60	3.80
Choline (mg)	16.00	24.00
Molybdenum (ug)	0.02	0.02
Chromium (ug)	0.03	0.03

*Boyce et al. 2016; NHMRC NRC 2006

#EBM fortified with PreNAN HMF

Table 3 - Preterm Nutrition Guidelines and Preterm Formula Composition

		Consensus	ESPGHAN	Preterm Formula*
		2005	2010	Per 100 mL
		Per kg/day	Per kg/day	
Protein	g	3.8-4.4 (ELBW)	4.0-4.5	2.9
		3.4-4.2 (VLBW)	(<1kg body weight) 3.5-4.0 (1-1.8kg body weight)	
Fat	g	6.2-8.4 (ELBW) 5.3-7.2 (VLBW)	4.8-6.6	4
Carbohydrate	g	9-20 (ELBW) 7-17 (VLBW)	11.6-13.2	8.4
Energy	kcal	130-150 (ELBW) 110-130 (VLBW)	110-135	80
	kJ	545-629 461-545	460-564	335
Vitamin A	IU	700-1500	1322-3330	1233
	µgRE	210-450	400-1000	370
Vitamin D	IU	150-400/day	800-1000/day	148
	µg	3.75-10/day	20-25/day	3.7
Iron	mg	2-4	2-3	1.8
Sodium	mMol	3.0-5.0	3.0-5.0	2.2
	mg	69-115	69-115	50.6
Calcium	mMol	2.5-5.5	3.0-3.5	2.9
	mg	100-220	120-140	116
Phosphorus	mMol	1.9-4.5	1.9-4.5	2.5
	mg	60-140	60-90	78
Osmolality	mOsm/kg/H ₂ O			293

*Preterm formula on 2012 Nutritional Tender


References

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Related WNHS policies, procedures and guidelines

Neonatology Clinical Guidelines - [Enteral Feeding: Initiation and Progression](#)

Neonatology Clinical Guidelines - [Pasteurised Donor Human Milk \(PDHM\)](#)

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