



CLINICAL GUIDELINE

Milk Room: Breast Milk Fortification and Preterm Formula

Scope (Staff):	Nursing and Medical Staff
Scope (Area):	NICU KEMH, NICU PCH, NETS WA
Child Safe Organisation Statement of Commitment	
<p>The Child and Adolescent Health Service (CAHS) commits to being a child safe organisation by meeting the National Child Safe Principles and National Child Safe Standards. This is a commitment to a strong culture supported by robust policies and procedures to ensure the safety and wellbeing of children at CAHS.</p>	

This document should be read in conjunction with this [DISCLAIMER](#)

Breast milk is recommended for infants¹. When mothers own milk is unavailable, infants born < 32 weeks gestation and/or ≤ 1500 grams are eligible to receive pasteurised donor human milk (PDHM), which is fed until a corrected age of 34 weeks. Refer to [Pasteurised Donor Human Milk \(PDHM\) guideline](#).

Latest nutrition guidelines^{2,3} suggest protein intakes between 3.5-4.5 g/kg/day and energy intakes between 110-135 kcal (460-565 kJ)/kg/day are necessary for preterm infants to achieve reference growth (weight gain of ~18-20 g/kg/day). Expressed breast milk (EBM) is routinely fortified with a multi-component breast milk fortifier ± a protein supplement to assist in meeting preterm nutrition recommendations (See Tables 1 and 2).

Sick term infants may also require higher protein and energy intakes than can be provided by native breast milk and fortifying expressed breast milk with age-appropriate fortifiers can assist in meeting term nutrient reference values (See Tables 1 and 3).

If not receiving mothers' own or pasteurised donor milk, infants < 36 wk gestation are fed preterm formula, after demonstrating tolerance to a term formula. Older infants ≥36 wk gestation) are fed term formula but if growing poorly, may require an enriched term formula – recommend referral to a dietitian.

Table 1. Fortified Breast Milk and Formula Feeds

Feed	Fortification	Target population	Start fortification	Target volume	Protein at target volume	Energy at target volume
					g/kg	kcal (kJ)/kg
PRETERM FEEDS						
EBM/PDHM PRETERM 1	EBM + Human milk fortifier	<36 wk GA	≥100 mL/kg	170	4.6	141 (590)
EBM/PDHM PRETERM 2	EBM + Human milk fortifier + protein powder	<36 wk GA	Fluid restricted , after tolerating EBM PRETERM 1	≤150	4.6	127 (529)
PTF	Nil	<36 wk GA	After tolerating TF	≤150	4.0	120 (503)
TERM FEEDS						

Milk Room: Breast Milk Fortification and Preterm Formula

EBM/PDHM 3.5 kJ	EBM + TF	≥36 wk GA	After tolerating EBM	170	2.3	142 (594)
EBM/PDHM 3.85 kJ	EBM + TF	≥36 wk GA	Fluid restricted, after tolerating EBM 3.5 kJ	≤150	2.3	138 (576)
TF 3.5 kJ	TF 16.0%	≥36 wk GA	After tolerating TF (>35 wks) or PTF (<35 wks)	170	2.7	141 (594)
TF 3.85 kJ	TF 17.7%	≥36 wk GA	Fluid restricted, after tolerating TF 3.5 kJ	≤150	2.7	138 (579)

*Milk composition is variable between mothers; higher feed volumes may be required for infants growing poorly on PDHM; alternative formulas or other modular feeds may be needed to manage specific medical conditions or to improve growth – refer to dietitian.

Table 2 - Estimated Composition of Standardised Preterm EBM and Preterm Formula Feeds

	Preterm EBM	EBM PRETERM 1	EBM PRETERM 1	EBM PRETERM 2	EBM PRETERM 2	Allula S26 LBW Preterm Formula	Allula S26 LBW Preterm Formula
water	100 mL	100 mL	170 mL/kg	100 mL	150 mL/kg	100 mL	150 mL/kg
Protein (g)	1.27	2.71	4.61	3.05	4.58	2.69	4.04
Fat (g)	3.46	4.18	7.11	4.18	6.27	3.80	5.70
Carbohydrate (g)	7.34	8.62	14.65	8.62	12.93	8.76	13.14
Energy (kcal)	66	83	141	84	127	80	120
Energy (kJ)	274	347	590	353	529	335	503
Vitamin A (ug) (eq)	14	347	590	347	521	360	540
Vitamin A (IU)	48	1157	1967	1157	1736	1200	1800
Cholecalciferol (Vit D) (ug)	0.0	3.5	6.0	3.5	5.3	3.4	5.1
Cholecalciferol (IU)	8.0	148.8	253.0	148.8	223.2	136.0	204.0
Vitamin E (mg)	0.3	4.0	6.8	4.0	6.0	3.3	4.9
Vitamin E (IU)	0.4	6.0	10.2	6.0	9.0	4.9	7.4
Vitamin K (ug)	2.0	9.5	16.2	9.5	14.3	6.3	9.5
Vitamin C (mg)	4.4	23.2	39.4	23.2	34.7	15.0	22.5
Thiamin (Vit B1) (mg)	0.0	0.1	0.3	0.1	0.2	0.1	0.2
Riboflavin (Vit B2) (mg)	0.0	0.2	0.4	0.2	0.3	0.2	0.3
Niacin (mg)	0.2	1.6	2.7	1.6	2.4	2.4	3.6
Vitamin B6 (ug)	6.2	130.2	221.3	130.2	195.3	123.0	184.5
Folic Acid (ug)	3.1	40.6	69.1	40.6	60.9	35.0	52.5
Vitamin B12 (ug)	0.0	0.2	0.4	0.2	0.3	0.3	0.4
Panthenic Acid (mg)	0.2	0.9	1.5	0.9	1.3	1.0	1.5
Sodium (mg)	28.0	64.7	110.0	65.6	98.4	54.0	81.0
Sodium (mmol)	1.2	2.8	4.8	2.9	4.3	2.3	3.5
Potassium (mg)	50.0	98.4	167.3	100.1	150.2	74.1	111.2
Potassium (mmol)	1.3	2.5	4.3	2.6	3.8	1.9	2.9
Calcium (mg)	25.0	100.6	171.0	101.7	152.6	101.0	151.5
Calcium (mmol)	0.6	2.5	4.3	2.5	3.8	2.5	3.8
Phosphorus (mg)	14.5	58.3	99.1	58.3	87.5	52.0	78.0
Phosphorus (mmol)	0.5	1.6	2.7	1.6	2.4	1.7	2.5
Magnesium (mg)	3.3	7.3	12.4	7.3	11.0	8.2	12.3
Iron (mg)	0.1	1.9	3.2	1.9	2.8	1.8	2.6
Zinc (mg)	0.4	1.3	2.3	1.3	2.0	1.2	1.8
Iodine (ug)	17.8	30.5	51.8	30.5	45.7	20.0	30.0
Manganese (ug)	0.4	6.4	10.9	6.4	9.7	7.5	11.3
Copper (ug)	38.0	90.0	153.0	90.0	135.0	89.0	133.5
Chloride (mg)	58.0	90.1	153.2	90.1	135.2	86.0	129.0
Chloride (mmol)	1.6	2.5	4.3	2.5	3.8	2.4	3.6
Selenium (ug)	2.4	5.2	8.8	5.2	7.8	4.5	6.8
Taurine (mg)	4.0	5.9	10.0	5.9	8.8	5.7	8.6
Inositol (mg)	n/s	4.3	7.3	4.3	6.5	21.0	31.5
Biotin (ug)	0.5	3.8	6.5	3.8	5.7	2.4	3.6
Choline (mg)	16.0	24.1	40.9	24.1	36.1	15.0	22.5
Carnitine (mg)	0.7	3.2	5.4	3.2	4.8	0.00	0.00
Molybdenum (ug)	0.02	0.02	0.03	0.02	0.03	0.00	0.00
Chromium (ug)	0.03	0.03	0.04	0.03	0.04	0.00	0.00

Estimated preterm milk composition: *Boyce et al. 2016⁴; Koletzko et al. 2014²

Table 3 - Estimated Composition of Standardised Term EBM and Term Formula Feeds

	Term Breast Milk	EBM 3.5 kJ	Term EBM 3.5 kJ	EBM 3.85 kJ	EBM 3.85 kJ	Nestle Optipro Gold 1 RTF	Term Formula 3.5 kJ	Term Formula 3.5 kJ	Term Formula 3.85 kJ	Term Formula 3.85 kJ
	100 mL	100 mL	170 mL/kg	100 mL	150 mL/kg	100 mL	100 mL	170 mL/kg	100 mL	150 mL/kg
Protein (g)	1.00	1.34	2.28	1.50	2.26	1.30	1.61	2.74	1.78	2.68
Fat (g)	3.46	4.42	7.52	4.88	7.32	3.60	4.54	7.71	5.02	7.53
Carbohydrate (g)	7.66	9.58	16.29	10.49	15.73	7.40	9.05	15.38	10.01	15.01
Energy (kcal)	66	83	142	92	138	67	83	141	92	138
Energy (kJ)	275	349	594	384	576	280	349	594	386	579
Vitamin A (ug) (eq)	31	47	80	55	82	68	76	129	84	125
Vitamin A (IU)	103	159	270	185	278	226	262	445	290	435
Cholecalciferol (Vit D) (ug)	ns	0.3	0.5	0.5	0.7	0.9	1.5	2.6	1.7	2.5
Cholecalciferol (IU)	ns	12.9	21.8	18.9	28.3	36.0	60.5	102.8	66.9	100.3
Vitamin E (mg)	0.5	0.7	1.2	0.8	1.2	1.1	0.9	1.6	1.0	1.5
Vitamin E (IU)	0.7	1.0	1.7	1.2	1.7	1.6	1.4	2.4	1.5	2.3
Vitamin K (ug)	0.3	2.0	3.5	2.9	4.3	5.6	8.4	14.3	9.3	14.0
Vitamin C (mg)	3.0	5.4	9.2	6.5	9.8	11.0	11.3	19.3	12.5	18.8
Thiamin (Vit B1) (mg)	0.02	0.05	0.08	0.06	0.09	0.08	0.13	0.21	0.14	0.21
Riboflavin (Vit B2) (mg)	0.04	0.06	0.11	0.08	0.12	0.14	0.14	0.24	0.15	0.23
Niacin (mg)	0.2	0.3	0.5	0.4	0.6	0.6	0.6	1.1	0.7	1.0
Vitamin B6 (ug)	13.0	27.7	47.1	34.7	52.0	52.0	69.3	117.8	76.7	115.0
Folic Acid (ug)	8.5	11.4	19.5	12.8	19.2	10.3	13.9	23.6	15.3	23.0
Vitamin B12 (ug)	0.0	0.1	0.2	0.1	0.2	0.2	0.2	0.4	0.3	0.4
Panthenic Acid (mg)	0.2	0.3	0.5	0.4	0.5	0.6	0.4	0.7	0.5	0.7
Sodium (mg)	16.0	20.3	34.5	22.3	33.4	17.0	20.2	34.3	22.3	33.4
Sodium (mmol)	0.7	0.9	1.5	1.0	1.5	0.7	0.9	1.5	1.0	1.5
Potassium (mg)	50.0	67.9	115.5	76.4	114.6	68.0	84.4	143.5	93.4	140.1
Potassium (mmol)	1.3	1.7	3.0	2.0	2.9	1.7	2.2	3.7	2.4	3.6
Calcium (mg)	26.4	38.4	65.4	44.1	66.2	43.0	56.7	96.4	62.7	94.1
Calcium (mmol)	0.7	1.0	1.6	1.1	1.7	1.1	1.4	2.4	1.6	2.4
Phosphorus (mg)	12.4	19.4	32.9	22.6	34.0	24.0	32.8	55.7	36.2	54.4
Phosphorus (mmol)	0.4	0.6	1.1	0.7	1.1	0.8	1.0	1.8	1.2	1.7
Magnesium (mg)	3.4	4.7	8.1	5.4	8.1	1.7	6.3	10.7	7.0	10.5
Iron (mg)	0.03	0.24	0.41	0.34	0.51	0.70	1.01	1.71	1.11	1.67
Zinc (mg)	0.3	0.4	0.7	0.5	0.7	0.7	0.8	1.3	0.8	1.3
Iodine (ug)	11.5	15.5	26.4	17.4	26.1	13.0	18.9	32.1	20.9	31.4
Manganese (ug)	0.4	1.7	2.9	2.3	3.5	15.0	6.3	10.7	7.0	10.5
Copper (ug)	25.0	37.3	63.4	43.1	64.7	52.0	58.0	98.5	64.1	96.2
Chloride (mg)	ns	11.5	19.5	16.9	25.3	47.0	54.0	91.8	59.7	89.6
Chloride (mmol)	ns	0.3	0.6	0.5	0.7	1.3	1.5	2.6	1.7	2.5
Selenium (ug)	0.0	0.6	0.9	0.8	1.2	1.8	2.5	4.3	2.8	4.2
Taurine (mg)	ns	1.3	2.1	1.9	2.8	5.1	5.9	10.1	6.6	9.8
Inositol (mg)	ns	1.2	2.0	1.8	2.7	10.0	5.7	9.6	6.3	9.4
Biotin (ug)	0.6	1.1	1.9	1.4	2.1	1.5	2.5	4.3	2.8	4.2
Choline (mg)	16.0	18.7	31.8	19.9	29.9	12.0	12.6	21.4	13.9	20.9
Carnitine (mg)	ns	0.0	0.0	0.0	0.0	1.0	0.0		0.0	0.0
Molybdenum (ug)	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0
Chromium (ug)	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0

Estimated term milk composition: Gidrewicz et al. 2014⁵; Saarela et al 2005⁶; NHMRC NRV 2006⁷; Koletzko et al. 2014². Please note NHMRC NRV's for term infants 0-6 months were set by multiplying together the average intake of breast milk (0.78 L/d) and the average concentration of a nutrient in breast milk, expressed as amount per day (except for protein).



Related CAHS internal policies, procedures and guidelines

- Neonatology
- [Enteral Feeding: Initiation and Progression](#)
 - [Pasteurised Donor Human Milk \(PDHM\)](#)

References and related external legislation, policies, and guidelines

1. Eidelman AI, RJ S. American Academy of Pediatrics. Policy Statement. Breastfeeding and the Use of Human Milk. *Pediatrics* 2012; **129**.
2. Koletzko B, Poindexter B, Uauy R. Nutritional care of preterm infants. Scientific basis and practical guidelines. Basel, Switzerland: Karger; 2014.
3. Agostoni C, Buonocore G, Carnielli VP, et al. Enteral nutrient supply for preterm infants: commentary from the European Society of Paediatric Gastroenterology, Hepatology and Nutrition Committee on Nutrition. *J Pediatr Gastroenterol Nutr* 2010; **50**(1): 85-91.
4. Boyce C, Watson M, Lazidis G, et al. Preterm human milk composition: a systematic literature review. *Br J Nutr* 2016; **116**(6): 1033-45.
5. Gidrewicz DA, Fenton TR. A systematic review and meta-analysis of the nutrient content of preterm and term breast milk. *BMC pediatrics* 2014; **14**: 216.
6. Saarela T, Kokkonen J, Koivisto M. Macronutrient and energy contents of human milk fractions during the first six months of lactation. *Acta Paediatr* 2005; **94**(9): 1176-81.
7. National Health and Medical Research Council. Nutrient reference values for Australia and New Zealand including Recommended Dietary Intakes. Canberra: Commonwealth of Australia; 2006.

This document can be made available in alternative formats on request for a person with a disability.

Document Owner:	Neonatology		
Reviewer / Team:	Neonatal Coordinating Group		
Date First Issued:	June 2006	Last Reviewed:	16 th October 2019
Amendment Dates:	October 2020	Next Review Date:	16 th October 2022
Approved by:	Neonatal Coordinating Group	Date:	22 nd October 2019
Endorsed by:	Neonatal Coordinating Group	Date:	
Standards Applicable:	NSQHS Standards:   Child Safe Standards: 1,10		

Printed or personally saved electronic copies of this document are considered uncontrolled



Healthy kids, healthy communities

Compassion Excellence Collaboration Accountability Equity Respect

Neonatology | Community Health | Mental Health | Perth Children's Hospital