

Section: 6 Nutrition: Enteral & Parenteral  
Breast milk fortification and preterm formula  
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Neonatology Clinical Guidelines  
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## BREAST MILK FORTIFICATION AND PRETERM FORMULA

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Breast milk is recommended for infants<sup>1</sup>. Latest ESPGHAN<sup>2</sup> guidelines suggest protein intakes between 3.5 and 4.5 g/kg/d and energy intakes between 110 and 135 kcal/kg/d are necessary for preterm infants to achieve reference growth (weight gain of ~15 g/kg/d). 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 and a protein supplement to assist preterm infants in meeting their nutritional and growth requirements.

Some mineral and vitamin supplementation may also be necessary. [See Nutrition: Enteral and Parenteral: Section 6. Enteral Feeding - Initiation and Progression](#)

**Level 1 (L1) milk fortification** is achieved by fortifying EBM with a multi-component breast milk fortifier and a protein supplement. L1 may be introduced once enteral feeds of 100 mL/kg/d 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/d,**

Further fortification beyond L1 may be required for **fluid-restricted infants ( $\leq 150$  mL/kg/d)** who are growing poorly. **Level 2 (L2) milk fortification** is achieved by fortifying EBM with a multi-component breast milk fortifier and additional protein powder. **Nutritional guideline for protein is met when feeds fortified to L2 are fed at ~150 mL/kg/d** (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  $\leq 32$  weeks gestation +/-1500gms are eligible to receive pasteurised donor human milk, which is usually fed until a corrected age of 32-34 weeks. Refer to: [Perron Rotary Expressed Milk Bank](#)

If not receiving mothers' own or pasteurised donor milk, infants <35 weeks gestation may be fed preterm formula. Older infants ( $\geq 35$  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. [See Nutrition: Enteral and Parenteral: Section 6. Enteral Feeding - Initiation and Progression](#)

\*Assumed macronutrient profile of preterm breast milk<sup>3-6</sup> and assumed micronutrient profile of term breast milk<sup>7</sup>.  
Wyeth SMA HMF: bovine whey protein; maltodextrins

**Table 1. Estimated Composition of Level One Milk Feeds**

	LEVEL ONE					
	EBM	S26 SMA HMF	Beneprotein	Calogen	EBM, HUMAN MILK	
	100 mL	4 g	100 g	100 mL	100 mL/kg	170 mL/kg
<b>PER (g protein:100 kcal)</b>					<b>3.0-3.2</b>	<b>3.0-3.2</b>
Protein (g)	1.10-1.35	1.00	85.7	0.0	2.8	4.3-4.7
Fat (g)	4.2	0.2		50.0	4.4	7.5
Carbohydrate (g)	6.8	2.4		0.0	9.2	15.6
Energy (kcal)	69-70	15	357	450	86.2	145-147
Energy (kJ)	291-295	62	1500	1850	364	612-619
Retinol Activity (Vit A) (µg)	51.5	270.0			321.5	546.6
Cholecalciferol (Vit D) (µg)	0.0	7.5			7.5	12.8
Vitamin E (mg)	0.6	3.0			3.6	6.1
Vitamin K (µg)	0.3	11.0			11.3	19.2
Vitamin C (mg)	10.0	40.0			50.0	85.0
Thiamin (Vit B1) (mg)	0.0	0.2			0.2	0.4
Riboflavin (Vit B2) (mg)	0.1	0.3			0.4	0.6
Niacin (mg)	0.4	3.6			4.0	6.8
Vitamin B6 (µg)	20.0	250.0			270.0	459.0
Folic Acid (µg)	11.0	30.0			41.0	69.7
Vitamin B12 (µg)	0.1	0.3			0.4	0.7
Panthenic Acid (mg)	0.2	0.9			1.1	1.9
Sodium (mg)	18.5	18.0	214.3	7.0	37.6	63.9
Potassium (mg)	47.5	28.0	500.0		78.0	132.6
Calcium (mg)	22.5	90.0	500.0		115.0	195.5
Phosphorus (mg)	13.0	46.0	285.7		60.4	102.7
Magnesium (mg)	3.3	3.0			6.3	10.7
Iron (mg)	0.1	0.0			0.1	0.2
Zinc (mg)	0.2	0.3			0.5	0.8
Iodine (µg)	15.0	0.0			15.0	25.5
Manganese (µg)	0.3	4.6			4.9	8.3
Copper (µg)	30.0	0.0			30.0	51.0
Chloride (mg)	42.5	17.0		0.1	59.5	101.2
Biotin (ug)	0.6	0.0			0.6	1.0

**Table 2. Estimated Composition of Level Two Milk Feeds**

	Human milk	Wyeth SMA S26 (2 x 2 g sachets)	Beneprotein	Calogen	LEVEL TWO	
					EBM, HUMAN MILK FORTIFIER AND PROTEIN	
					100 mL	100 g
<b>PER (g protein:420kJ)</b>					<b>3.4-3.6</b>	3.4-3.6
Protein (g)	1.10-1.35	1.00	85.7	0.0	3.0-3.2	4.4-4.8
Fat (g)	4.2	0.2		50.0	4.4	6.5
Carbohydrate (g)	6.8	2.4		0.0	9.2	13.8
Energy (kcal)	69-70	15	357	450	87-89	131-133
Energy (kJ)	289-295	62	1500	1850	366-378	549-558
Retinol Activity (Vit A) (µg)	51.5	270.0			321.5	482.3
Cholecalciferol (Vit D) (µg)	0	7.5			7.5	11.3
Vitamin E (mg)	0.6	3.0			3.6	5.4
Vitamin K (µg)	0.3	11.0			11.3	17.0
Vitamin C (mg)	10	40.0			50.0	75.0
Thiamin (Vit B1) (mg)	0	0.2			0.2	0.3
Riboflavin (Vit B2) (mg)	0.1	0.3			0.4	0.5
Niacin (mg)	0.4	3.6			4.0	6.0
Vitamin B6 (µg)	20	250.0			270.0	405.0
Folic Acid (µg)	11	30.0			41.0	61.5
Vitamin B12 (µg)	0.1	0.3			0.4	0.6
Panthenic Acid (mg)	0.2	0.9			1.1	1.7
Sodium (mg)	18.5	18.0	214.3	7.0	38.6	58.0
Potassium (mg)	47.5	28.0	500.0		80.5	120.8
Calcium (mg)	22.5	90.0	500.0		117.5	176.3
Phosphorus (mg)	13	46.0	285.7		61.9	92.8
Magnesium (mg)	3.3	3.0			6.3	9.5
Iron (mg)	0.1	0.0			0.1	0.2
Zinc (mg)	0.2	0.3			0.5	0.7
Iodine (µg)	15	0.0			15.0	22.5
Manganese (µg)	0.3	4.6			4.9	7.4
Copper (µg)	30	0.0			30.0	45.0
Chloride (mg)	42.5	17.0		0.1	59.5	89.3
Biotin (ug)	0.6	0.0			0.6	0.9

Table 3. Preterm nutrition guidelines and preterm formula composition.

		Consensus	ESPGHAN	Preterm formula*
		2005	2010	per 100 mL
		per kg/d	per kg/d	
Protein	g	3.8-4.4 (ELBW) 3.4-4.2 (VLBW)	4.0-4.5 (<1 kg body weight) 3.5-4.0 (1-1.8 kg body weight)	2.9
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
	ug	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/H2O			293

\*Preterm formula on 2012 Nutritional Tender

## REFERENCES

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