

## NUTRITION

### Supporting information

#### **At what rate should enteral feeds be increased?**

Approximately 90% of infants developing necrotising enterocolitis (NEC) do so after being fed, with some authorities linking this to rapid incremental rates of enteral feeding (Berseth, 2003). A randomised trial in 141 preterm infants (Berseth, 2003) comparing a minimal (20 mL/kg/d for 10 days) feed group with an advancing (20 mL/kg/d on day 1, increased by 20 mL/kg/d up to 140 mL/kg/d) group was closed early after 7 of the advancing group vs 1 of the minimal group developed NEC.

Other randomised trials have found no difference in incidence of NEC between “fast” and “slow” groups. A prospective randomised trial in 185 infants with birth weight 501-1500g ((Rayyis, 1999) found that a greater than twofold difference in the rate of feed advancement (from 15 cc/kg/d to 35 cc/kg/d) resulted in a 9% incidence of NEC in the “fast” group (n=87) compared to 13% in the “slow” group (n=98). The authors concluded that “Factors other than feed advancement appear to be more important in the pathogenesis or progression of NEC”.

Another randomised trial, in 53 infants <1250g (Salhotra, 2004) compared “slow” (increments of 15 mL/kg/d, n=26) and “fast” (increments of 30 mL/kg/d, n=27) groups, finding that the “fast” group reached full enteral intake (180 mL/Kg/d) considerably earlier (10 +/- 1.8 days) than did the “slow” group (14.8 +/- 1.5 days), without any difference in the incidence of NEC.

Other trials and reviews have also reported better growth with no adverse effects from the use of more “aggressive” enteral feeding programmes (Ziegler, 2002; Evans, 2001; Wilson, 1997).

A Cochrane systematic review (Kennedy, 1999) concluded that more rapid rates of advancing feedings did not increase the risk of NEC (RR = 0.90, 95% CI 0.46-1.77) but that “the ideal rate of advancement remains unclear”.

Berseth CL, Bisquera JA, Paje VU. Prolonging small feeding volumes early in life decreases the incidence of necrotizing enterocolitis in very low birth weight infants. *Pediatrics* 2003;111:529-34

Evans RA, Thureen P. Early feeding strategies in preterm and critically ill neonates. *Neonatal Netw* 2001;20:7-18

Kennedy KA, Tyson JE, Chamnanvanakij S. Rapid versus slow rate of advancement of feedings for promoting growth and preventing necrotizing enterocolitis in parenterally fed low-birth-weight infants. *The Cochrane Database of Systematic Reviews* 1999, Issue 4. Art. No.: CD001241

Rayyis SF, Ambalavanan N, Wright L, et al. Randomized trial of “slow” versus “fast” feed advancements on the incidence of necrotizing enterocolitis in very low birth weight infants. *J Pediatr* 1999;134:293-7

Salhotra A, Ramji S. Slow versus fast enteral feed advancement in very low birth weight infants: a randomized control trial. *Indian Pediatr* 2004;41:435-41

Wilson DC, Cairns P, Halliday HL, et al. Randomised controlled trial of an aggressive nutritional regimen in sick very low birthweight infants. *Ach Dis Child Fetal Neonatal Ed* 1997;77:F4-11

## Evidence Level: I

### Supplements used on neonatal unit

Supplement	Indication for use
Nutriprem BMF (contains whey protein/glucose polymer/vitamins and minerals)	Poor growth and weight gain with EBM
Duocal (contains fat and glucose polymer)	<ul style="list-style-type: none"> <li>• Poor weight gain</li> <li>• Adequate growth on assessment</li> <li>• urea level &gt;1.6</li> </ul>
Maxijul (contains glucose polymer)	<ul style="list-style-type: none"> <li>• Poor weight gain</li> <li>• Adequate growth on assessment</li> <li>• urea level &gt;1.6</li> </ul>
Calogen (contains fat emulsion blended vegetable oils, <b>contact dietitian before using</b> )	<ul style="list-style-type: none"> <li>• Poor weight gain</li> <li>• High blood sugar</li> <li>• Adequate growth on assessment</li> <li>• urea level &gt;1.6</li> </ul>

Volume of pre term formula** or EBM + BMF mL/kg/day	Additive	2.5 mL scoops* with pre term formula	Pre term formula Kcal/kg/day Protein/kg/day
120	Duocal	3	118 Kcal 2.9 g
130	Duocal	2	120 Kcal 3.1 g
140	Duocal	1	120 Kcal 3.4 g

\* When adding Duocal increase by 1 scoop every 24 hr

\*\* Average nutrient = 80kcal per 100ml

## MULTIVITAMIN PREPARATIONS

### Abidec

	Contents per 0.3 mL	Healthy start per 5 drops
Vitamin A	667IU	776 IU
Vitamin D	200 IU	300 IU
Thiamine	0.2 mg	-
Riboflavine	0.4 mg	-
Pyridoxine	0.4 mg	-
Ascorbic Acid	20 mg	20 mg
Nicotinamide	4.0 mg	-

## NUTRITIONAL COMPOSITION OF FEEDS AND SUPPLEMENTS

Nutrients Per 100 mL	Breastmilk mature (*Preterm breast milk 1 <sup>st</sup> two weeks )	Breastmilk Nutriprem BMF (+4.2 g)	Milupa Pre-Aptamil	Pre Nan	Pepti junior 13% (15%)	Cow & Gate Nutriprem 2	Cow & Gate Premium	Nutrica Infatrini
Energy Kcal	70	86 (16)	80	80	67 79	75	67	100
Protein (g)	1.3 (1.8*)	2.1 (0.8)	2.4	2.4	1.8 2.1	2.0	1.4	2.6
Degree on hydrolysis	Whole protein	Whole protein Peptides from BMF	Whole protein	Partial peptides	Extensively hydrolysed	Whole protein	Whole protein	Whole protein
Protein:energy ratio	7.4%	9.8%	12%	12%	10.7%	10.7%	8.4%	10.4%
Fat (g)	4.2 AA/DHA	4.2 AA/DHA	4.4 AA/DHA	4.2 MCT 26% AA/DHA	3.6 4.2 50% MCT no pufa	4.1 AA/DHA	3.5 AA/DHA	5.4 AA/DHA
Carbohydrate (g)	7.4	10 (3)	7.7		6.9 8.2	7.4	7.5	10.3
Lactose	100%	72%	80%	65%	<0.1%	80%	97%	50%
Minerals								
Sodium mmol	0.9 (1.3*)	1.1	1.7	1.4	0.9	1.1	0.8	1.1
Potassium mmol	1.6	1.7	2.3	2.5	1.7	2.0	1.6	2.6
Calcium mmol	0.9	1.6	2.5	2.5	1.4 1.6	2.4	1.4	2.0
Phosphorus mmol	0.48	1.9	1.6	1.7	0.9 1.0	1.6	27	1.3
Ca:P ratio/mg	2.3:1	1.8:1	2.0:1	1.9:1	2.0:1	1.9:1	2:1	2:1
Iron mg	0.076	0.076	0.9	1.2	0.9 1.0	1.1	0.5	1.0
Vitamin A IU	60	190	147	280	78 90	99	84	81
Vitamin D (µg)	0.01	5.01	2.4	2.0	1.3 1.5	1.6	1.4	1.7
Osmolality mOsm/kg H <sub>2</sub> O	265	402	320	325	210 n/a	290	330	325

### Supplements

Contents per 2.5 mL scoop	Kcal	Protein g	CHO g	Fat g	Na mmol	K mmol	PO <sub>4</sub> mmol	Indications
Duocal (1.2 g)	6	nil	0.9	0.3	nil	nil		Poor weight gain
Maxijul (1.3 g)	5	nil	1.2	nil	nil	nil		Low blood sugars Poor weight gain
Calogen (per 1 mL)	4.5	nil	nil	0.5	nil	nil		Poor weight gain with high blood sugars
Nutriprem BMF 2 sachet (4.2 g/100 mL)	16	0.8	3.0		0.4	0.2	1.42	To fortify breast milk only

### Estimating fat concentration and caloric content of human milk

Creatocrit Value %	Fat g/ 100 mL	%calories from fat	kcal/ 100 mL	% Protein: energy EBM**	% Protein: energy EBM + BMF*
3	1.7	31.2	49	10.6	
4	2.3	37	56	9.3	
5	3.0	44	62	8.4	
<b>6</b>	<b>3.7</b>	<b>48</b>	<b>69</b>	<b>7.5</b>	<b>9.9</b>
<b>7</b>	<b>4.4</b>	<b>52.1</b>	<b>76</b>	<b>6.8</b>	<b>9.1</b>
<b>8</b>	<b>5.1</b>	<b>56</b>	<b>82</b>	<b>6.3</b>	<b>8.5</b>
9	5.6	58.2	89	5.8	8.0
10	6.4	60.4	96	5.4	7.5
11	7.1	62.8	102	5.1	7.1
12	7.8	64.4	109	4.8	6.7

\*Breast milk + Nutriprem breast milk fortifier 2.1 g protein/100 mL

\*\*Breast milk protein content approximately 1.3 g/100 mL

**Bold type signifies optimal creatocrit**

# USING BREAST MILK IN PRETERM INFANTS <34/40

- Mother's own unfortified EBM use in order : colostrum - fresh EBM – refrigerated EBM - frozen EBM
- Aim to **increase volume max 200 mL/kg** as tolerated (unfortified >220mL/kg)
- Add vitamins/iron/phosphate when on full volume **min 150 mL/kg** - \*see below
- Add Nutriprem BMF when on full feeds 150 mL/kg but not **before day 14**
- [(Nutriprem breast milk fortifier 1 x (2.1 g) sachet per 50 mL EBM)]

## Vitamins, phosphate and iron \*unfortified EBM

- 0.5 mL 12 hrly Joules phosphate
- 0.6 mL Abidec
- 0.1 mL (50 microgram) Lexpex
- 6 weeks start 1mL sytron once daily

## Vitamins, phosphate and iron \*fortified EBM

- 0.3 mL Abidec
- Review phosphate levels may need extra
- 6 weeks start sytron 1 mL once daily

## Weekly monitoring

### Bloods levels

- Phosphate(1.0–2.3 mmol/L)
- monitor urinary TRP
- Sodium (135 -145 mmol/L)
- Urea (1.9 -6.2 mmol/L)
- Alkaline Phosphatase
- FBC
- Hb-reticulocytes

### Plot on growth chart:

- Head
- Length
- Weight
- Weight gain  
15g-20g/kg/day

Good weight gain and growth continue with fortified EBM plus vitamins phosphate and iron\*

If not meeting requirements for growth

### Consider:

- Increase volume 5 mL/kg increments (max 200 mL/kg)
- If urea level >2mmol/L
- Use hind milk – check creatocrit >7% = 76 kcal/100 mL If urea consistently <1.6mmol/L, refer to dietitian

**Refer to breastfeeding specialist if poor supply of milk or low creatocrit <7% (see estimate fat concentration of human milk chart)**

### Discharge - breast milk

- Over 2.0 kg, stop breast milk fortifier
- If < 2.0 kg, continue with Nutriprem BMF in EBM + 0.3 mL Abidec + 1mL once daily sytron start at 6 weeks
- If breast milk only, give 0.3 mL Abidec or Healthy start children's vitamin drops until 5 yrs
- give 1 ml sytron once daily at 6 weeks until 6 months and weaning with iron rich foods
- If breast milk + supplementary milk given e.g. Nutriprem 2, continue with 0.3 mL Abidec + 1 mL sytron unless fully formula fed

### Milks used on Unit

Type of milk	EBM/breastfeeding	Pre term formula	Nutriprem 2	Term Formula
When to use	All infants	<2.0 kg until 2.0-2.5 kg	>2.0 kg or discharge until 6 months old from term	If Nutriprem 2 not used, start at 2.0 kg-2.5 kg
Volume	Up to 220 mL/kg if tolerated with unfortified milk up to 200 mL/kg fortified and poor growth	Max 180 mL/kg Unless advised by dietitian	Min 150 mL/kg/day feed on demand unless contraindicated	Min 150 mL/kg/day demand unless contraindicated
Vitamins	0.6 mL Abidec <b>0.3 mL with Nutriprem BMF</b>	0.3 mL Abidec od	NIL	0.3 mL Abidec once daily
Iron	1 mL sytron >6 weeks	1 mL sytron once daily >6 weeks	NIL	1 mL sytron once daily >6 weeks
Phosphate	0.5 mL bd review if on Nutriprem BMF	Unless indicated		
Sodium	As needed	Unless indicated		
Discharge	If <2.0 kg and using EBM, continue with Nutriprem BMF+ 0.3mL Abidec Healthy start children's vitamin 5 drops  If breastfeeding only give 0.3 ml Abidec Healthy start children's vitamin 5 drops + Iron - 1mL once daily sytron until 6 months or full weaning with iron containing foods	Healthy start children's vitamins 5 drops/day or 0.3 mL Abidec day + 1 mL once daily sytron	No vitamins needed if taking >150-165 mL/kg/day  Use until 6 months post term	Healthy start children's vitamins 5 drops/day or 0.3 mL Abidec/day 1 mL sytron once daily until weaning
<b>Where to obtain formula</b>	Nutriprem BMF Hospital	Hospital	GP prescription	Chemist/Shop

Last amended September 2007