

South West Midlands Neonatal Network Parenteral Nutrition Guideline

May 2017

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1. Introduction

Growth failure on the neonatal unit is associated with longer term growth failure and/or neurological deficit. Parenteral nutrition (PN) is an important component of neonatal care where gastrointestinal immaturity or disease prevents these nutritional needs being met by the enteral route.

The National Confidential Enquiry into Patient Outcome and Death (NCEPOD) enquiry published in 2010⁴ indicated that only 24% of neonates included in the survey were judged to have parenteral nutrition care that was considered good practice. The components of this guideline have been written to try and ensure that the local practices meet the NCEPOD definitions of 'good practice' in relation to parenteral nutrition care.

The British Association of Perinatal Medicine (BAPM) published 'The Provision of Parenteral Nutrition within Neonatal Services A Framework for Practice' in April 2016 with the aim of describing best practice for the administration of neonatal PN. The paucity of evidence is acknowledged within this document and many of the recommendations are based on expert evaluation of the limited evidence.

Neonatal parenteral nutrition typically comprises of 2 components, vamin and lipid, which are designed to run simultaneously as separate infusions. The vamin component (containing carbohydrate, protein, electrolytes +/-trace elements) has been carefully formulated as 'standard' bags designed for use in units across the Southern West Midlands Newborn Network (SWMNN).

There are 2 different lipid preparations formulated as 'standard' syringes, containing lipid and vitamins, designed for the SWMNN. These utilise Intralipid 20% and SMOFlipid®. Intralipid 20% is derived from soya beans and is primarily made up of omega-6 polyunsaturated fatty acids, which are pro-inflammatory and can result in the production of free radicals, which in turn can cause oxidative damage to cells. It also contains phytosterols which are directly hepatotoxic. It is thought that it is these properties of the lipid that contribute to parenteral nutrition associated liver disease (PNALD).

SMOFlipid® is a blend of soybean oil, medium chain triglycerides, olive oil and fish oils. Fish oil contains primarily omega-3 polyunsaturated fatty acids, which are anti-inflammatory and potentially hepatoprotective, and no phytosterols. SMOFlipid® has been shown to be safe to use in preterm infants, but currently there is no evidence to suggest any benefits of its routine use over Intralipid 20%^{6,7} in non-cholestatic infants (direct bilirubin <50 µmol/L). There is a recent study showing that the use of SMOFlipid® improves the liver function tests in those with cholestasis, but does not prevent the development of PNALD. SMOFlipid® should only be considered in babies with a direct bilirubin >50 µmol/L and rising trend.

Cycling -infusing the total daily dose of lipid over 20 hours, rather than 24 hours, in cholestatic infants may be considered hepatoprotective.

Indications for Use

- all babies ≤ 30 weeks gestation and all babies ≤ 1000 g should be commenced on PN as soon as possible after birth but certainly within 24 hours of birth/ admission
- babies who are 1001g – 1500g should commence PN if it is anticipated that they will not achieve enteral feeds of at least 100mls/kg/day by day 5 of life
- all babies receiving conservative treatment for Necrotising Enterocolitis
- all babies who have undergone surgery for a congenital abnormality or acquired gut anomaly should receive PN whilst establishing enteral feeds
- all babies likely to be fasted for more than any 5 day period for any medical or surgical reason

Mode of Delivery

Peripheral PN

It is recommended that all PN is run centrally. In the absence of central access Start Up Vamin (electrolyte free and comprising 10% glucose and amino acids) may be run peripherally, for example on day of birth or when central access is temporarily unavailable in a baby already established on PN. There is some evidence to suggest running lipid peripherally in addition to the Vamin component may prolong the life of the peripheral cannula.⁹

Central PN

Central access should be sought as soon as possible

All Parenteral Nutrition (glucose $>10\%$) should be administered centrally via an umbilical venous catheter (UVC), percutaneous long line or surgically inserted central venous catheter in view of the high concentration of glucose and calcium. Due to the increasing reports of PN extravasation when administered via a UVC, prolonged infusion via a UVC is not recommended¹⁰

PN must always be infused via a dedicated lumen. The only exceptions are a continuous vancomycin infusion, or sodium or potassium chloride infusions which may be administered simultaneously with the PN providing they do not exceed a maximum concentration 200mmol/L- including amounts provided by amino acid, trace element solutions and lipid emulsions. In exceptional circumstances where the baby has a single lumen line but requires additional infusions/ drugs and obtaining additional access is impossible, discuss with your unit pharmacist. Note that calcium, magnesium and phosphate containing fluids must never be administered simultaneously with PN.

PN Preparations

The SWMNN PN formulations have been developed to provide adequate **nutrition** at the maximum prescription rate (see appendix).

Vamin Bags

There are 4 types of standard vamin bags specifically formulated for Southern West Midlands Newborn Network (SWMNN). A bag may be infused for a maximum of 48hours. Please see appendix 1 and 2 for compositions.

Start Up – Use as initial infusion fluid for up to 24 hours of life. Can also be given peripherally if central access is temporarily unavailable in a baby already established on PN, or by either route if electrolyte free PN is required.

Preterm Maintenance 12 - initial maintenance PN to be infused for at least 48 hours; when glucose tolerance established move to Preterm Maintenance 15 (see below). Prolonged use may be required in infants with glucose intolerance or acidosis (contains acetate). Please note this does not provide adequate nutrition for long term growth.

Preterm Maintenance 15 - standard maintenance PN for all preterm infants.

Term Baby – for use in preterm infants over 2.5kg and/or infants born from 37 weeks onwards.

If Parenteral Nutrition is being commenced after a baby has previously tolerated enteral feeds they do not require a start up bag and should commence on the appropriate maintenance bag of vamin. They can start at maximum volume of lipid.

For infants likely to require PN for longer than 14 days- consider ordering bags with Peditrace (a mixture of trace elements. The addition of these reduce fridge life to 7 days) to ensure recommended micronutrient intakes are met. Discuss with Nutrition Lead, Pharmacist or Dietitian.

Lipid Types

Intralipid 20%

This is commercially available in bags with a 24 month manufacturer expiry.

Intralipid syringes formulated for SWMNN contain intralipid 20% with added fat and water soluble vitamins. These syringes have a 7 day expiry from the date of manufacture. Intralipid syringes, with added vitamins, should be used in preference to bags whenever possible. A syringe may be infused for a maximum of 24 hours. Where it is necessary to infuse an intralipid bag, this should be directly from the bag via a syringe pump; intralipid 20% should never be withdrawn from the bag into a syringe at ward level.

SMOFlipid®

SMOFlipid® syringes formulated for SWMNN contain SMOFlipid® with added fat and water soluble vitamins. These syringes also have a 7 day expiry from the date of manufacture. A syringe may be infused for a maximum of 24 hours. To prevent wastage, in the event of excess stock, SMOFlipid® syringes may be prescribed for any baby requiring lipid.

Note the slight difference in dose when prescribing an intralipid / SMOFlipid® syringe or intralipid 20% bag due to added vitamin component in the syringes

	g fat/kg/d	Intralipid syringe dose (inc vitamins)	SMOFlipid® syringe dose (inc vitamins)	Intralipid 20% bag dose (no vitamins)
1st day PN	2g	12mls/kg/day	12mls/kg/day	10mls/kg/day
2nd day PN	3g	18mls/kg/day	18mls/kg/day	15mls/kg/day
3rd day PN	3.4g	20mls/kg/day	20mls/kg/day	17mls/kg/day

The total volume in an intralipid / SMOFlipid® syringe is 50mls. In a baby weighing more than 2.5kg, where the lipid infusion rate exceeds 2.1mls/hr, prescribe only one syringe per 24 hour period to prevent excessive vitamin administration. An intralipid 20% bag should be prescribed to administer the remaining lipid requirement for the 24 hour period.

If you are in any doubt which is the most suitable choice of PN, please discuss with the unit Nutrition Lead/ Pharmacist or the Dietitian if available.

Prescribing and Administration

All maintenance PN should be prescribed on a dedicated prescription chart (see example in appendix). Birth weight should be used for the calculations of PN until birth weight is regained. Thereafter, the most recent weight or working weight as appropriate should be used.

SWMNN maintenance PN delivered at maximum rate will provide 120-130ml/kg/day (dependant on Vamin bag) this may not provide adequate **fluid**, particularly in the first week of life. It may be necessary to provide extra fluid, which can be given alongside the parenteral nutrition as clinically necessary (see Mode of Delivery).

Prior to administering any infusion of parenteral nutrition, 2 registered practitioners should independently ensure that:

- The prescription is legal and clinically correct
- The type of vamin bag and lipid obtained are the same as that prescribed
- The product will not expire for at least 24 hours (note if vamin expiry <48 hours bag will need replacing sooner than usual)
- The vamin bag has reached room temperature. (During warming small gas bubbles form, which then dissipate when the bags reach room temperature. Whilst they are reportedly not large enough to cause any harm to the patient they may set off pump alarms. In addition patients may get cold shock from infusion of chilled fluid)
- The calculated infusion rates are correct and do not exceed maximum allowed
- The batch number for both the vamin bag and lipid syringe/bag are documented in the baby's paperwork as per unit policy.
- An independent log (separate to the baby's notes) is made of the product/ batch number to be administered to baby (see appendix.)
- A dedicated lumen of a central line is available and designated for PN (see mode of delivery)
- PN infusions are administered via a rate controlled syringe pump
- Vamin is administered via a 0.2 micron filter. It is not mandatory to filter lipid solutions. Refer to unit policy.

Weaning PN

Enteral feeds should be commenced as soon as possible and increased as per SWMNN Enteral Feeding Guideline.

To ensure the provision of adequate nutrition during the introduction of enteral feeds the volume of parenteral nutrition delivered should not be reduced until the baby is receiving a total volume of 180mls/kg/day (Enteral and Parenteral)(unless fluid restricted). Once this volume is reached the vamin and lipid components of the parenteral nutrition should be weaned in proportion to ensure the ratio of calorie provision by fat and carbohydrate remains appropriate.

For every 1ml/hr increase in enteral feeds Preterm maintenance 15 Vamin should be reduced by 0.85ml/hr and Lipid syringe by 0.15ml/hr and Preterm maintenance 12 Vamin and Term baby should be reduced by 0.83ml/hr and Lipid syringe by 0.17ml/hr

Example calculation:

1100g baby on Preterm Maintenance 15 + Lipid syringe and increasing enteral feeds of MEBM

Total fluids 180ml/kg/day = 198ml/day = 8.25ml/hr x 24 hours

EN = 80ml/kg/day = 7.3ml 2 hourly

PN = @ 100ml/kg/day

Calculate total PN hourly rate = $100 \times 1.1 = 110\text{ml/day} = 4.58\text{ml/hr}$

Preterm Maintenance 15 Vamin rate = $0.85 \times 4.58\text{ml/hr} = 3.90\text{ml/hr}$

Lipid syringe rate = $0.15 \times 4.58\text{ml/hr} = 0.69\text{ml/hr}$

For detailed tables showing PN /EN volume intakes and nutritional intake as enteral feeds increase and PN decreases see appendix 4a-e

Enteral vitamins (if required) should be commenced when the lipid infusion is running at less than 10mls/kg/day (see SWMNN vitamin and mineral guideline)

Monitoring and Review

All babies who are receiving parenteral nutrition should:

- Be reviewed by the local Nutrition Team weekly (ideally comprising as a minimum of a doctor, dietician, pharmacist and nurse).
- Be weighed at least three times a week and plotted on a neonatal and infant close monitoring growth chart.
- Have length and head circumference measured weekly and plotted on a neonatal and infant close monitoring growth chart.

NB: In the event an infant is too unstable to be weighed for periods of over 5 consecutive days consider adopting the 'working weight' as the calculated 'weight for age' from the appropriate growth chart, assuming the the infant is following their previous centile line. This will ensure adequate parenteral nutrition is administered according to infant's likely weight. Reinstate routine weighing once infant is stable enough to tolerate the procedure.

- Have daily U+Es and glucose monitoring for the first 7 days. Clinical judgement should determine further monitoring of these parameters in the subsequent weeks. Liver function tests, including split bilirubin/bone profile should be done weekly for the duration of PN.
- Have nutrition bloods performed 4 weekly. Stop the lipid infusion 4 hours prior to taking the bloods
 - These include:
 - Triglycerides
 - Fat soluble vitamins A D E
 - Zinc

- Copper
- Manganese
- Selenium
- B12 and folate
- Ferritin

Note that ferritin and copper levels may be elevated in the presence of infection, and vitamin A, zinc and selenium may be lowered.

Ordering of PN

Ordering procedures need to be determined locally.

Storage

Vamin bags and lipid syringes should be refrigerated immediately after delivery. Intact Intralipid 20% bags can be stored at room temperature.

Vamin and the lipid syringes should be refrigerated between 2 – 8°C. The temperature of the fridge should be checked daily and documented according to local policy.

Review, Monitoring, and Revision Arrangements

Regular audit should be conducted to ensure all the aspects of PN administration are being adhered to

Appendix 1

Nutritional Composition of PN bags

Appendix 2

Example of PN log

Appendix 3

Example of PN prescription sheet

Appendix 4a-e

Combined nutritional intake – enteral and parenteral

9. References

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Composition (ml)	Start up	Preterm Maintenance 12	Preterm Maintenance 15	Term baby	Preterm Maintenance 12 + peditrace	Preterm Maintenance 15 + peditrace	Term baby + peditrace
Vaminolact	158.1	240.86	240.86	316.13	240.86	240.86	316.13
Glucose 50%	54	96	120	180	96	120	180
WFI	57.9	11.19	27.87	42.08	8.65	24.53	37.07
Calcium gluconate 10%		36.65	36.65	41.36	36.65	36.65	41.36
Potassium phosphate 13.6% (1mmol/ml PO4 and K)		1.6			1.6		
NaAc 30% (2.2mmol/ml Na and Ac)		3.28			3.28		
MgSO4 50% (2mmol/ml)		0.4	0.4	0.6	0.4	0.4	0.6
ZnSO4 100micromol/ml		0.16	0.16	0.24			
Sodium glycerophosphate 21.6% (2mmol/ml Na and 1mmol/ml PO4)		6	7.6	9	6	7.6	9
Sodium selenite 0.2micromol/ml		0.5	0.5	0.75			
Sodium chloride 30%		0.16	0.96	2.34	0.16	0.96	2.34
Potassium chloride 15%		3.2	5	7.5	3.2	5	7.5
Peditrace					3.2	4	6
Total volume	270	400	440	600	400	440	600
Stability	90 days	90 days	90 days	90 days	7 days	7 days	7 days

Composition (ml)	Start up		Preterm Maintenance 12	Preterm Maintenance 15	Term baby	Preterm Maintenance 12 + peditrace	Preterm Maintenance 15 + peditrace	Term baby + peditrace
	Pervolume (ml)/kg	90	100	100	110	100	100	110
Nitrogen (g)	0.49	0.54	0.56	0.56	0.49	0.56	0.56	0.49
Protein(g)	3.06	3.40	3.49	3.49	3.06	3.49	3.49	3.06
Glucose (g)	9	10	12	15	15	12	15	15
Nitrogen calories (Kcal)	13	13.58	14	14	13	14	14	13
Non-nitrogen calories (Kcal)	36	40	48	60	60	48	60	60
Total calories (Kcal)	49	53.58	62	74	73	62	74	73
Sodium (mmol)			5	5	4.95	5	5	4.95
Potassium (mmol)			2	2.5	2.5	2	2.5	2.5
Calcium (mmol)			2.02	2.02	1.52	2.02	2.02	1.52
Magnesium (mmol)			0.2	0.2	0.2	0.2	0.2	0.2
Phosphate (mmol)			1.9	1.9	1.5	1.9	1.9	1.5
Acetate (mmol)			1.8			1.8		
Chloride (mmol)			1.8	3.7	4.45	1.8	3.7	4.45
Zinc (micromol)			4	4	4	3.06	3.83	3.83
Selenium (nanomol)			25	25	25	20.24	25.3	25.3
Copper (micromol)						0.25	0.32	0.32
Manganese (nmol)						14.56	18.2	18.2
Fluoride (micromol)						2.4	3	3
Iodide (nmol)						6.3	7.88	7.88
Max Peditrace in Neo 12 =0.8ml/kg/day						peditrace ltd by vaminolact amount*		

NEONATAL PARENTERAL NUTRITION RECORD SHEET

- Check expiry date of the **PN bag** that you are using alongside others of the same type in the fridge – use the one with the shortest expiry date.
- If any **Preterm maintenance 12 / 15 or Term baby + Peditrace** is due to expire within the next **3 days**, please use in place of Preterm maintenance 12 / 15 or Term baby in babies on these corresponding bags where possible.
- Check expiry dates of all **intralipid syringes**, and use the one with the shortest expiry date first.
- If there are no intralipid syringes, use **SMOFLipid® syringe**
- Only use **intralipid 20% bags** if there are no lipid syringes that are in date.

PLEASE ENSURE RECORDS ARE IN CHRONOLOGICAL ORDER WHERE POSSIBLE

Date Given	Baby's Hospital No.	Baby Surname	Nutrition product utilised*	Batch No.	Expiry	Name of nurse (Please print)	If bag not used, please specify here (including reason)
	BW						
	BW						
	BW						
	BW						
	BW						
	BW						
	BW						
	BW						
	BW						
	BW						
	BW						
	BW						

* Please specify type of product from this list:

Start-up Vamin	Preterm maintenance 12	Preterm maintenance 15	Term baby	Preterm maintenance 12 + Peditrace	Preterm maintenance 15 + Peditrace	Term baby. + Peditrace	Intralipid syringe	SMOFLipid® syringe	Intralipid 20% bag
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Appendix 4a.. Table showing contribution to nutritional intake from Preterm Maintenance 12 PN & MEBM

Parenteral Nutrition - Preterm Maintenance 12						Enteral Nutrition MEBM				Combined Parenteral and Enteral Nutrition			
volume	vamin	lipid syringe	energy	protein	sodium	volume	energy	protein	sodium	volume	energy	protein	sodium
ml/kg/d	ml/kg/d	ml/kg/d	kcal/kg/d	g/kg/d	mmol/kg/d	ml/kg/d	kcal/kgd	g/kg/d	mmol/kg/d	ml/kg/d	kcal/kg/d	g/kg/d	mmol/kg/d
120	100	20	96	3.49	5	0	0	0.0	0	120	96	3.49	5.0
120	100	20	96	3.49	5	20	13.2	0.3	0.14	140	110	3.79	5.1
120	100	20	96	3.49	5	30	19.8	0.4	0.20	150	116	3.88	5.2
120	100	20	96	3.49	5	40	26.4	0.5	0.27	160	123	4.01	5.3
120	100	20	96	3.49	5	50	33	0.7	0.34	170	129	4.14	5.3
120	100	20	96	3.5	5	60	39.6	0.8	0.41	180	136	4.3	5.4
110	91.3	18.7	89	3.2	4.6	70	46.2	0.9	0.48	180	135	4.1	5.0
100	83	17	81	2.9	4.2	80	52.8	1.0	0.54	180	133	3.9	4.7
90	74.7	15.3	73	2.6	3.7	90	59.4	1.2	0.61	180	132	3.8	4.3
80	66.4	13.6	65	2.3	3.3	100	66	1.3	0.68	180	131	3.6	4.0
70	58.1	11.9	56	2.0	2.9	110	72.6	1.4	0.75	180	129	3.5	3.7
60	49.8	10.2	48	1.7	2.5	120	79.2	1.6	0.82	180	128	3.3	3.3
50	41.5	8.5	40	1.4	2.1	130	85.8	1.7	0.88	180	126	3.1	3.0
40	33.2	6.8	32	1.2	1.7	140	92.4	1.8	0.95	180	125	3.0	2.6
30	24.9	5.1	24	0.9	1.2	150	99	2.0	1.02	180	123	2.8	2.3
				0.0	0.0			add BMF					
20	16.6	3.4	16	0.6	0.8	160	128	4.2	4.67	180	144	4.7	5.5
10	8.3	1.7	8	0.3	0.4	170	136	4.4	4.96	180	144	4.7	5.4
0	0	0	0	0.0	0.0	180	144	4.7	5.26	180	144	4.7	5.3

Appendix 4b.. Table showing contribution to nutritional intake from Preterm Maintenance 12 PN & Nutriprem 1

Parenteral Nutrition - Preterm Maintenance 12						Enteral Nutrition Nutriprem 1				Combined Parenteral and Enteral Nutrition			
volume	vamin	lipid syringe	energy	protein	sodium	volume	energy	protein	sodium	volume	energy	protein	sodium
ml/kg/d	ml/kg/d	ml/kg/d	kcal/kg/d	g/kg/d	mmol/kg/d	ml/kg/d	kcal/kg/d	g/kg/d	mmol/kg/d	ml/kg/d	kcal/kg/d	g/kg/d	mmol/kg/d
120	100	20	96	3.49	5	0	0	0.0	0	120	96	3.49	5.0
120	100	20	96	3.49	5	20	16	0.5	0.6	140	112	4.0	5.6
120	100	20	96	3.49	5	30	24	0.8	0.9	150	120	4.3	5.9
120	100	20	96	3.49	5	40	32	1.0	1.2	160	128	4.5	6.2
120	100	20	96	3.49	5	50	40	1.3	1.5	170	136	4.8	6.5
120	100	20	96	3.5	5	60	48	1.6	1.8	180	144	5.1	6.8
110	91.3	18.7	89	3.2	4.6	70	56	1.8	2.1	180	145	5.0	6.7
100	83	17	81	2.9	4.2	80	64	2.1	2.4	180	145	5.0	6.6
90	74.7	15.3	73	2.6	3.7	90	72	2.3	2.7	180	145	4.9	6.4
80	66.4	13.6	65	2.3	3.3	100	80	2.6	3.0	180	145	4.9	6.3
70	58.1	11.9	56	2.0	2.9	110	88	2.9	3.3	180	144	4.9	6.2
60	49.8	10.2	48	1.7	2.5	120	96	3.1	3.6	180	144	4.9	6.1
50	41.5	8.5	40	1.4	2.1	130	104	3.4	3.9	180	144	4.8	6.0
40	33.2	6.8	32	1.2	1.7	140	112	3.6	4.2	180	144	4.8	5.9
30	24.9	5.1	24	0.9	1.2	150	120	3.9	4.5	180	144	4.8	5.8
20	16.6	3.4	16	0.6	0.8	160	128	4.2	4.8	180	144	4.7	5.6
10	8.3	1.7	8	0.3	0.4	170	136	4.4	5.1	180	144	4.7	5.5
0	0	0	0	0.0	0.0	180	144	4.7	5.4	180	144	4.7	5.4

Appendix 4c.. Table showing contribution to nutritional intake from Preterm Maintenance 15 PN & MEBM

Parenteral Nutrition - Preterm Maintenance 15						Enteral Nutrition MEBM				Combined Parenteral and Enteral Nutrition			
volume	vamin	lipid syringe	energy	protein	sodium	volume	energy	protein	sodium	volume	energy	protein	sodium
ml/kg/d	ml/kg/d	ml/kg/d	kcal/kg/d	g/kg/d	mmol/kg/d	ml/kg/d	kcal/kgd	g/kg/d	mmol/kg/d	ml/kg/d	kcal/kg/d	g/kg/d	mmol/kg/d
130	110	20	108	3.49	5	0	0	0.0	0	130	108	3.49	5.0
130	110	20	108	3.49	5	20	13.2	0.3	0.14	150	122	3.75	5.1
130	110	20	108	3.49	5	30	19.8	0.4	0.20	160	128	3.88	5.2
130	110	20	108	3.49	5	40	26.4	0.5	0.27	170	135	4.01	5.3
130	110	20	108	3.49	5	50	33	0.7	0.34	180	141	4.14	5.3
120	102	18	100	3.2	4.6	60	39.6	0.8	0.41	180	139	4.0	5.0
110	93.5	16.5	91	3.0	4.3	70	46.2	0.9	0.48	180	137	3.9	4.7
100	85	15	83	2.7	3.9	80	52.8	1.0	0.54	180	136	3.7	4.4
90	76.5	13.5	75	2.4	3.5	90	59.4	1.2	0.61	180	134	3.6	4.1
80	68	12	66	2.2	3.1	100	66	1.3	0.68	180	132	3.5	3.8
70	59.5	10.5	58	1.9	2.7	110	72.6	1.4	0.75	180	131	3.3	3.5
60	51	9	50	1.6	2.3	120	79.2	1.6	0.82	180	129	3.2	3.1
50	42.5	7.5	41	1.3	1.9	130	85.8	1.7	0.88	180	127	3.0	2.8
40	34	6	33	1.1	1.5	140	92.4	1.8	0.95	180	126	2.9	2.5
								add BMF					
30	25.5	4.5	25	0.8	1.2	150	120	3.9	4.4	180	145	4.7	5.5
20	17	3	17	0.5	0.8	160	128	4.2	4.7	180	145	4.7	5.4
10	8.5	1.5	8	0.3	0.4	170	136	4.4	5.0	180	144	4.7	5.4
0	0	0	0	0.0	0.0	180	144	4.7	5.3	180	144	4.7	5.3

Appendix 4d. Table showing contribution to nutritional intake from Preterm Maintenance 15 PN & Nutriprem 1

Parenteral Nutrition - Preterm Maintenance 15						Enteral Nutrition Nutriprem 1				Combined Parenteral and Enteral Nutrition			
volume	vamin	lipid syringe	energy	protein	sodium	volume	energy	protein	sodium	volume	energy	protein	sodium
ml/kg/d	ml/kg/d	ml/kg/d	kcal/kg/d	g/kg/d	mmol/kg/d	ml/kg/d	kcal/kgd	g/kg/d	mmol/kg/d	ml/kg/d	kcal/kg/d	g/kg/d	mmol/kg/d
130	110	20	108	3.49	5	0	0	0.0	0	130	108	3.49	5.0
130	110	20	108	3.49	5	20	16	0.5	0.6	150	124	4.01	5.6
130	110	20	108	3.49	5	30	24	0.8	0.9	160	132	4.27	5.9
130	110	20	108	3.49	5	40	32	1.0	1.2	170	140	4.53	6.2
130	110	20	108	3.49	5	50	40	1.3	1.5	180	148	4.79	6.5
120	102	18	100	3.2	4.6	60	48	1.6	1.8	180	148	4.8	6.4
110	93.5	16.5	91	3.0	4.3	70	56	1.8	2.1	180	147	4.8	6.4
100	85	15	83	2.7	3.9	80	64	2.1	2.4	180	147	4.8	6.3
90	76.5	13.5	75	2.4	3.5	90	72	2.3	2.7	180	147	4.8	6.2
80	68	12	66	2.2	3.1	100	80	2.6	3.0	180	146	4.8	6.1
70	59.5	10.5	58	1.9	2.7	110	88	2.9	3.3	180	146	4.7	6.0
60	51	9	50	1.6	2.3	120	96	3.1	3.6	180	146	4.7	5.9
50	42.5	7.5	41	1.3	1.9	130	104	3.4	3.9	180	145	4.7	5.8
40	34	6	33	1.1	1.5	140	112	3.6	4.2	180	145	4.7	5.8
30	25.5	4.5	25	0.8	1.2	150	120	3.9	4.5	180	145	4.7	5.7
20	17	3	17	0.5	0.8	160	128	4.2	4.8	180	145	4.7	5.6
10	8.5	1.5	8	0.3	0.4	170	136	4.4	5.1	180	144	4.7	5.5
0	0	0	0	0.0	0.0	180	144	4.7	5.4	180	144	4.7	5.4

Appendix 4e.. Table showing contribution to nutritional intake from Term Baby PN & MEBM /Infant Formula

Parenteral Nutrition - Term Baby						Enteral Nutrition MEBM/Term formula				Combined Parenteral and Enteral Nutrition			
volume	vamin	lipid syringe	energy	protein	sodium	volume	energy	protein	sodium	volume	energy	protein	sodium
ml/kg/d	ml/kg/d	ml/kg/d	kcal/kg/d	g/kg/d	mmol/kg/d	ml/kg/d	kcal/kg/d	g/kg/d	mmol/kg/d	ml/kg/d	kcal/kg/d	g/kg/d	mmol/kg/d
120	100	20	107	3.06	4.95	0	0	0.0	0.0	120	107	3.06	5.0
120	100	20	107	3.06	4.95	20	13	0.3	0.1	140	120	3.32	5.1
120	100	20	107	3.06	4.95	30	20	0.4	0.2	150	126	3.45	5.2
120	100	20	107	3.06	4.95	40	26	0.5	0.3	160	133	3.58	5.2
120	100	20	107	3.06	4.95	50	33	0.7	0.3	170	140	3.71	5.3
120	100	20	107	2.78	4.5	60	40	0.8	0.4	180	146	3.56	4.9
110	91.3	18.7	98	2.54	4.1	70	46	0.9	0.5	180	144	3.45	4.6
100	83	17	89	2.31	3.7	80	53	1.0	0.5	180	142	3.35	4.3
90	74.7	15.3	80	2.08	3.4	90	59	1.2	0.6	180	140	3.25	4.0
80	66.4	13.6	71	1.85	3.0	100	66	1.3	0.7	180	137	3.15	3.7
70	58.1	11.9	62	1.62	2.6	110	73	1.4	0.7	180	135	3.05	3.4
60	49.8	10.2	54	1.39	2.2	120	79	1.6	0.8	180	133	2.95	3.1
50	41.5	8.5	45	1.15	1.9	130	86	1.7	0.9	180	130	2.84	2.8
40	33.2	6.8	36	0.92	1.5	140	92	1.8	1.0	180	128	2.74	2.4
30	24.9	5.1	27	0.69	1.1	150	99	2.0	1.0	180	126	2.64	2.1
20	16.6	3.4	18	0.46	0.7	160	106	2.1	1.1	180	123	2.54	1.8
10	8.3	1.7	9	0.23	0.4	170	112	2.2	1.2	180	121	2.44	1.5
0	0	0	0	0.00	0.0	180	119	2.3	1.2	180	119	2.34	1.2