



# **Chapter 10. Nutrition and growth**

Parent educational material for app

Imperial Neonatal Service, Imperial College Healthcare NHS Trust





# **1. Introduction to nutrition and growth on the neonatal unit**

# Aims for this chapter

We would like you as a parent to know and achieve:

- an understanding of how parenteral nutrition (nutrition through the veins) works
- an understanding of how to proceed with enteral nutrition (nutrition through a feeding tube)
- awareness of different types of milk that babies can have and the benefits of each
- what breast milk fortifier (fortifier) is and when and how to use it
- an understanding of vitamins and minerals when, how much and how to give
- how to understand and follow your Baby's growth using a growth chart.
- learn about patterns of growth appropriate for your Baby

# **1.1 Background to nutrition and growth**

Babies that are born early have special nutritional needs and have their own charts to monitor their growth, called 'neonatal and infant close monitoring growth charts'.

Babies born on time also have their own specific nutritional needs and their growth is monitored on 'standard infant growth charts'.

During your stay on the neonatal unit, the nutritional intake and growth of your Baby will be monitored. Your Baby's blood tests will also be reviewed and an individualised feeding plan will be made. Over time, adjustments may be made to this feeding plan with the dietitian, and additions or changes to your Baby's milk may be made (with your permission) to ensure that they are getting everything they need.

Together, our overall aim is to optimise your Baby's nutrition and growth to ensure that their best short-term and longer-term outcomes are achieved. Research shows that babies who receive their mother's breast milk have better neurological outcomes. There may also be some advantage to growing well.

This chapter will guide you through some terminology and explain to you the reasoning behind the nutritional decisions made on the neonatal unit. It is hoped that this will help you to understand what we are doing and guide you to be able to make these decisions for your Baby yourself.





# **1.2 Intravenous nutrition (parenteral nutrition)**

- Babies require nutrition from birth and as such, it is important to provide this as soon as possible to replace what would have been given via the placenta.
- **Parenteral nutrition (PN)** is the intravenous (IV) administration of nutrients. It is the form of nutrition that is given when babies are unable to have milk in their stomachs or when they are only able to have very small volumes of milk in their stomachs.
- PN is given to all babies born less than 31 weeks' gestation and also to those who are anticipated to take some time to tolerate their milk feeds.
- Babies born over 31 weeks' gestation may be given IV dextrose (sugar) while they build up their milk feeds. This is to keep their blood sugar levels stable and to give them some energy.
- There may also be a separate water bag or additional medications running at the same time as the PN.
- PN consists of two components a bag containing amino acids (protein), electrolytes (e.g. sodium) and carbohydrates (sugars) called the Aqueous PN; and a syringe containing fat, vitamins, minerals and trace elements called the lipid PN.Both of these components run over 24 hours. The rate at which each component is given will be determined by your Baby's weight and current clinical condition and will be prescribed by the medical team.
- The PN will slowly be built up to a target rate. Once milk feeds begin to increase the PN will be gradually decreased and then stopped.
- The PN bag will be covered to protect it from light as light can damage the solution inside the bag.
- Please see Chapter 8 'Fluids and nutrition' for the nursing procedure for administering PN.







# **1.3 Enteral feeding**

- **Enteral feeding** is the feeding of **milk in**to the stomach. It is usually necessary to feed your Baby via a tube until they are ready to feed from the breast or from a bottle.
- It is important to start enteral feeding as soon as possible after birth as it has been shown to help stimulate the gut to develop and reduce the risk of feed intolerance. Your own breast milk gives the greatest benefit.
- Even if your Baby is on full PN, the aim will be to give them your first milk (the colostrum) either via a tube or in their mouth. This has been found to be very protective against diseases.
- The type of tube used will depend upon your Baby's condition. It will usually be a nasogastric tube (NGT), which goes from the nose down to the stomach, or it will be an orogastric tube (OGT), which will go from the mouth down to the stomach.
- Please see Chapter 8: Fluids and nutrition for the nursing procedure for passing and caring for these tubes.

ere are guidelines for the starting and progression of enteral feeds, which will be used

Milk being given to a baby via a syringe, which is connected to a nasogastric tube





as a basis to individualise the feeding plan for your Baby.

- Initially your Baby may be on 'trophic feeds', which are very small amounts of milk, usually 1–2ml, given every hour or two, to keep the gut healthy.
- Each baby will have a different degree of tolerance of milk feeds and as such this plan may initially change a few times a day. Once stable, your Baby's feed plan will more likely change around once per week.
- Enteral feeds usually begin in two-hourly increments, stretching to three-hourly once two-hourly feeds are well tolerated and your Baby is more mature. In some cases feeds will be given hourly.



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- Each of these milk feeds will be given as a 'bolus', which means a certain volume of milk will be given followed by a time gap before the next feed. This is in contrast to a 'continuous feed' where the milk runs constantly via a pump.
- Your Baby will be on an allocated volume of milk each day and this is often expressed as millilitres per kilogram body weight or 'ml/kg'. The team will decide on the amount your Baby can tolerate each day.
- You are still able to start to breastfeed while your Baby is being fed through a tube and



the amount of milk given via the tube will slowly decrease as your Baby starts to take more milk from the breast or botlle.Please see **Chapter 14** 'Journey to suck feeding' for more information on establishingsuck feeds.

## **1.4 Milk types**

## Maternal breast milk

- The best milk for babies is their mother's own breast milk.
- We will support you in every possible way to be able to express your colostrum (early milk) as soon as possible following delivery, as this is the best enteral feed for your Baby. On-going support will be also available to help you to establish lactation.
- Please see Chapter 9: Making milk for your baby for more information around lactation.



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### Donor breast milk

- In the absence of your own milk, donor milk may be used from the donor milk bank if required and with your consent.
- During the first few days you may not be able to provide sufficient colostrum or breast milk. However, the neonatal unit has access to donor breast milk from the milk bank and although it is not as beneficial as your own breast milk, it is the second choice of milk on the neonatal unit for your Baby.
- Donors who provide donor breast milk are carefully screened, including with blood tests at the time of donation Then all the donated breast milk is tested and undergoes a special heat treatment to ensure there is no risk of any contamination.



## Formula milk

- If neither the mother's own milk or donor milk are to be given, then formula milk will be used.
- This will be a preterm nutrient-enriched formula if your Baby was born at 35 weeks' gestation or less. Alternatively this will be a normal term formula milk if your Baby was born over 35 weeks' gestation.
- Your Baby may start with donor milk if required and then transition onto your own milk or on to formula.
- If your Baby is on preterm formula milk when they go home then this will be changed to a nutrient enriched post-discharge formula (called Number 2 formula) ready for home.
- Please refer to Chapter 9:
- **'Making milk for your Baby'**, which explains the nutritional and non-nutritional differences between the different milks.







# **1.5 Supplements – breast milk fortifier, protein supplement, vitamins & minerals**

## **Breast milk fortifier (fortifier)**

- Breast milk fortifier (fortifier) is a powder that contains protein and a number of vitamins and minerals. It also contains a small amount of energy.
- It is designed to supplement breast milk to better meet the nutritional needs of some preterm babies.
- In particular it is helpful in meeting preterm babies' high protein, calcium and phosphate needs. These are all vital nutrients for growth and muscle and bone formation.
- It also contains trace elements, needed in very small amounts but vital for good health eg zinc, selenium and iodine.
- It is given to maintain adequate growth and nutritional status while continuing to support and promote breast milk feeding.
- If your Baby was born before 35 weeks' gestation it may be recommended that they have fortifier added into their breast milk. This will be decided by the dietitian, you and the rest of the neonatal team together.
- Fortifier can be added to both your own breast milk and to donor breast milk.
- Fortifier is usually commenced initially at half strength, going to full strength after 24-48 hours.
- While your Baby is being fed through an NGT it will be given evenly throughout the day with every feed.
- Once your Baby transitions onto breastfeeding, the BMF may continue to be given as a 4ml concentrate before 2–4 breastfeeds a day.
- This concentrate can be given via a syringe or from a bottle teat.
- The method of making up the BMF is the same in both situations and this method will be shown to you so that you can learn to assist in making up your Baby's milk feeds.
- Please see Chapter 11 'Medication and drug chart' for more information about how to make up BMF.







## **Protein supplement**

• A protein supplement is a powder that contains protein. It may be added instead of or combined with BMF to add additional protein to your Baby's feeds if required.



## Vitamins and minerals

- In the last trimester of pregnancy there is a huge accretion of vitamins and minerals in the baby from the placenta. Therefore babies born at less than 35 weeks gestation tend to be born with low vitamin stores. Babies born early will also have lower fat stores where some vitamins (fat soluble vitamins such as vitamin A and vitamin D) are stored.
- Babies born early may also have a less developed stomach and bowel and they may not have optimal absorption of the vitamins and minerals provided in their milk.
- Therefore babies born at less than 35 weeks have higher vitamin requirements compared to babies born on time.
- Breast milk is full of many nutrients. However, babies need extra vitamins and also iron to meet their needs.
- Please see Chapter 11 'Medication and drug chart' for more information around medications.

#### Vitamins

- If your Baby is on any amount of breast milk they will have multivitamins added into their breast milk (0.6 ml/day Dalivit and 1 ml/week folic acid) while on the unit.
- Folic acid is given separately, as it is not stable in the multivitamin preparation for long periods.
- Babies on PN, fortifier and breast milk or Nutriprem formula milk will not need extra vitamins as the PN, fortifier and Nutriprem formula contain all the vitamins they need already.





• Dalivit is specifically for use on the neonatal unit. This will be replaced with Healthy Start Vitamins/ Abidec on discharge to ensure a continued provision of multivitamins and vitamin D at home.

#### Vitamin D

- One of the vitamins in the vitamin drops is vitamin D. We may test your Baby's vitamin D levels and add extra vitamin D if their levels are low.
- It is important that you continue to take vitamin D after your baby is born to protect your own stores and to enhance your stores in case of any future pregnancies.
- Even if you take large amounts of vitamin D it will not affect the level in your breast milk so it still needs to be given to your Baby.

#### Iron

- Babies born at less than 35 weeks may be born with low iron stores. These stores will usually start to get even lower around three weeks after birth.
- If your Baby is on any amount of breast milk or fortifier and breast milk, they will get iron supplements (1 ml/day Sytron) once they are three weeks old.

#### Administration of vitamins and iron once home

• If your Baby is on any amount of breast milk when you go home, then the Healthy Start vitamins will continue until your Baby is at least one year old and the iron (Sytron) will continue until your Baby is 1 year old. The folic acid will stop when you go home.

## **1.6 Growth monitoring/appropriate growth**

The growth of your Baby will be monitored while on the neonatal unit and once you are discharged home.

- This is done by measuring your Baby's weight, length and their head circumference.
- These measurements are plotted onto a special chart called a growth chart.
- Every baby will grow at a different rate, therefore it is important not to compare your Baby with others as your Baby will have their own personal growth pattern.
- If your Baby is not growing as expected, they may need a change in their nutritional plan to help them to grow.

#### **Growth Monitoring**

#### Weight

- This is done on special baby scales.
- The frequency of measuring growth will start at twice per week. This may change to once per week in certain circumstances.
- Once you are home your Baby will continue to be weighed weekly via your health visitor.



• The on-going frequency of weighing following this time will be tailored to your Baby's own individual needs, but more frequently is usually not useful. Once a week gives a good idea of growth rate initially.



#### Head circumference

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- Head circumference during your Baby's first year is a good indicator of brain growth.
- It is usually measured weekly, using a tape measure around the largest part of the head.

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#### Length

- Length is an also important indicator of body growth, and is measured weekly.
- Trained personnel are needed to measure length accurately. Usually a Leicester incubator scale is used.





# **1.7 Growth charting**

- A 'growth chart' is a graph of measurements to show the pattern of your Baby's growth. It contains all of the weight, length and head circumference measurements from birth onwards.
- These growth charts have been developed by the World Health Organisation (WHO).
- The curved lines on these charts are called 'centile lines' and they show the average weight and height for babies at different ages. If your child's weight is on the 25th centile, this means that if you lined up 100 children of the same age in order from the lightest to the heaviest, your child would be number 25 and 75 children would be heavier.
- The charts for babies born early (preterm babies) describe the size at birth only and do not describe exactly how preterm infants should grow. Therefore growth along one to two centiles below birth centile is probably acceptable. These are the '**UK-WHO Neonatal & Infant Close Monitoring'** charts (NICM charts).
- The charts for babies born at term (on their due date) are based on the WHO Child Growth Standards, which describe the optimal growth for healthy, breastfed children. These are the **'UK-WHO 0–4 years**' charts. The UK-WHO NICM charts have centiles from term up to two years old which are the same ones as on the UK-WHO 0–4 years charts.
- The likely growth pattern for your Baby can be identified for you individually and you can monitor this using these measurements and charts during your Baby's journey both on the neonatal unit and beyond.





## Growth chart

#### UK-WHO Neonatal & Infant Close Monitoring chart for girls and boys

- Weight, head circumference and length curves are shown on one page.
- The vertical (up and down) axis displays your Baby's weight.
- The horizontal (left to right) axis displays the date.
- The point at which the current weight and current date meet is where a dot is placed on the chart.
- The first chart goes from birth up to two weeks past your due date. Date boxes are weekly.
- The second chart starts at two weeks past your due date and goes up to six months past your due date (this is six months corrected age).Date boxes are fortnightly.
- Once past their due date, your Baby is expected to grow at the same rate as if they were born on time, therefore they are plotted according to their 'corrected' rather than their 'actual' age.

#### UK-WHO 0-4 years

- This chart goes from birth up to four years of age and is not used in the neonatal unit.
- The vertical (up and down) axis similarly displays your Baby's weight.
- The horizontal (left to right) axis similarly displays the date.
- The point at which the current weight and current date meet is where a dot is placed on the chart.

#### How to interpret a growth chart

- Ideally babies will have their weight, length and head circumference on about the same centile line.
- Expect a 1–2 centile line drop in the first postnatal days (six to ten per cent of birth weight) due to water losses.
- We aim for growth (weight and head circumference) a *maximum* of two centile lines below your Baby's birth centile, as the water lost is not expected to be regained.
- Ideally babies will grow along this particular centile line for the rest of their journey but many will start to 'catch up', ie cross centiles upwards. We do not aim to force this to happen but sometimes babies will do it anyway. Very often the head circumference starts catching up before weight or length.
- If there is a deviation from a previous pattern of growth we can look for reasons for this together and find solutions (if required) to help improve this.

















# Key messages and reflection:

After this chapter, you should be able to:

- understand the value of nutrition from birth
- be familiar with parenteral nutrition (nutrition through the veins), enteral nutrition (nutrition through a feeding tube) and the different types of milk that babies can have
- be familiar with breast milk fortifier (fortifier) and understand when and how to use it
- be familiar with vitamins and minerals and understand when, how much and how to give these
- understand how to use a growth chart to plot your Baby's weight and interpret these charts using this app
- be familiar with expectations for growth.

# **Further learning in this topic**

If you wish to know more:

- make sure you ask a neonatal dietitian
- ask our neonatal team at any time
- Ask for one-to-one support from one of our Integrated Family Delivered Care Project nurses
- use this app or your Parent Binder to record notes and questions
- attend small group teaching in topic: **Growth and Nutrition.**

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# Disclaimer

The formula milk products shown in the pictures are merely the particular brand used in our neonatal unit and we can declare that we do not have any conflict of interest with this brand or any other brand of formula milk.

## Resources

Neonatal Formulary, Imperial College Healthcare NHS Trust Breast Milk Fortifier guidelines, Imperial College Healthcare NHS Trust Protein Supplement guidelines, Imperial College Healthcare NHS Trust Initiating enteral feeding, Imperial College Healthcare NHS Trust PN guidelines, Imperial College Healthcare NHS Trust 'UK-WHO Neonatal & Infant Close Monitoring' charts