



The Infant Gut Health Journey

Helping you understand your baby's gut health and the important role it plays in digestion, immunity and healthy development from the very beginning.

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Introduction

As a nutrition scientist, I have studied the developing immune system and the role that foods may have on gut health. One topic that often comes up is a baby's gut health and what it means for their immune system, digestion and overall well-being. These things are closely connected through a tiny, unseen world inside the gut, known as the gut microbiome.

Dr Caroline Childs

This guide has been created by SMA®, with expert input from Dr. Childs, to help make the science easier to understand and provide practical, trustworthy information you can use in everyday life. The aim is to help you feel informed and confident as you make choices for your baby's health.

In this guide, we explore why gut health matters from the very beginning. You'll learn how the community of tiny organisms living in your baby's gut supports digestion, helps the body absorb nutrients, plays a central role in immune development, and may even influence brain development and allergy risk.

Our goal is to give you a clearer understanding of this important part of your baby's development, along with simple ways to support it. By learning more about your baby's gut health, you can help lay strong foundations for healthy growth, immune support and overall well-being in the years ahead. Welcome to The Infant Gut Health Journey — your guide to supporting a healthy start for your little one.



Chapter 1:

Why Your Baby's Gut Matters

Welcome to the wonderful world inside your baby's digestive system: the gut microbiome, also known as the gut microbiota. The health of a baby's gut can influence their whole body and is closely connected to their immune system.

You can think of it as a busy inner ecosystem made up of tiny living organisms, including beneficial bacteria, sometimes called friendly gut bacteria, as well as yeasts and viruses. This community begins to develop around the time of birth and continues to change during the first few years of life, playing an important role in your baby's overall health from the start.

Understanding this inner world matters because the gut microbiome does much more than support digestion. If you have ever wondered what gut health means, it refers to the balance of microbes in the digestive system and the way they support comfortable digestion, immune function and wider well-being, including:



Helping with digestion and nutrient absorption: The tiny organisms in your baby's gut help break down parts of food that their body cannot digest on its own, including certain carbohydrates and fibres. As they do this, they produce useful substances such as vitamins and short-chain fatty acids. These processes support digestion, help the body absorb nutrients, and provide energy needed for healthy growth. They are also part of what helps the digestive system work effectively in early life.



Building a strong immune system: Much of your baby's immune system is closely linked to the gut, which makes it an important place for immune development. The first microbes that settle there help the immune system learn how to respond to harmful germs while remaining calm around safe substances such as food. Beneficial bacteria in the gut support this process, help protect the gut lining, and contribute to both early immune defence and long-term resilience.



Influencing allergy risk: The gut microbiome also plays a part in how the immune system responds to allergens. When the balance of microbes is disrupted, sometimes called dysbiosis, this has been associated with a higher risk of allergic conditions. Factors such as vaginal birth and breastfeeding help to encourage the establishment of beneficial bacteria, including friendly gut bacteria such as Bifidobacterium, which may in turn support allergy protection.

Your baby's gut microbiome is not only involved in processing food. It also helps support immune development, nutrient absorption and long-term health. Understanding this inner world can help you make informed choices that support strong foundations for your baby's well-being.

Inside Your Baby's Gut



Digestion

Helps break down food, absorb nutrients and support healthy growth.



Immune Support

Supports the development of the immune system and helps protect against harmful germs.



Friendly Bacteria

A community of beneficial microbes that help keep the gut balanced and healthy.



Gut-Brain Connection

Communicates with the brain and may influence mood, behaviour and cognitive development.

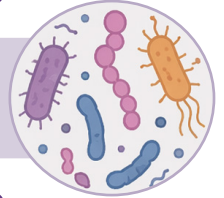
Jargon Buster:

Understanding key gut health terms



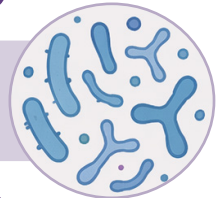
Gut health: Gut health refers to the overall condition of the digestive system and the balance of microbes living within it. A healthy gut supports comfortable digestion and wider aspects of health.

Gut microbiome / microbiota: These terms describe the community of tiny living organisms, including bacteria, yeasts and viruses, that live in the gastrointestinal tract.



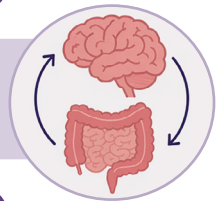
Mycobiome: This refers to the fungal part of the gut microbiome, including yeasts.

Probiotics: Probiotics are live microorganisms that may offer health benefits when used in the right amounts. They are found in some foods and supplements.



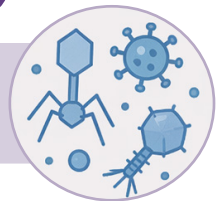
Prebiotics: Prebiotics are fibres or other substances that feed the beneficial bacteria already living in the gut. Human Milk Oligosaccharides (HMOs) in breast milk are a natural example.

Gut-brain axis: This is the two-way communication system linking the gut and the brain. It involves nerves, hormones, immune signals and the gut microbiome.



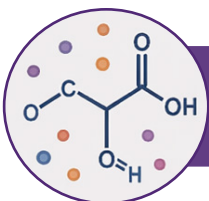
Oral tolerance: This is the process by which the immune system learns not to react to harmless substances taken in through the mouth, such as food proteins.

Virome: This refers to the viral part of the gut microbiome, including viruses that affect bacteria, known as bacteriophages.



Eubiosis: This describes a healthy and balanced gut microbiome.

Dysbiosis: This means there is an imbalance in the gut microbiome. Dysbiosis has been linked with a range of health issues, including digestive symptoms and allergies.



Short-chain fatty acids (SCFAs): These are substances made when gut bacteria break down certain fibres. They help support the gut lining, provide energy for cells in the gut, and play a role in immune function.

Chapter 2:

How Your Baby's Gut Develops

Your baby's gut microbiome begins to take shape during and just after birth. This early period lays the foundations for a complex inner world that will continue to develop throughout early childhood. You may hear this described as **the first 1,000 days** — from conception to around your child's second birthday. It is a particularly important window for gut development, immune education and long-term health, especially for supporting the early development of the microbiome.

Several factors influence how the gut microbiome becomes established and how it grows over time.



How your baby is born: The way your baby enters the world can influence which microbes first begin to settle in the gut.

- **Vaginal birth:** During a vaginal birth, your baby is exposed to microbes from the mother's birth canal and surrounding areas. This early exposure can help beneficial bacteria, including *Lactobacillus*, begin to settle in the gut and supports the early development of the microbiome.
- **C-section birth:** Babies born by C-section are usually first exposed to microbes from the skin and the surrounding environment rather than the birth canal. This can lead to a different pattern of gut colonisation in the early days, sometimes with lower levels of beneficial bacteria such as *Lactobacillus* and *Bifidobacterium*. Over time, many other factors continue to shape the microbiome.

How your baby is fed: Feeding is another important influence on gut development and the balance of bacteria in early life.

- **Breast milk:** Breast milk is more than nourishment. It contains beneficial bacteria, HMOs (Human Milk Oligosaccharides) and immune factors that help support your baby's developing gut. HMOs act as food for beneficial bacteria, especially *Bifidobacterium*, which can help create a gut environment that supports digestion and discourages harmful bacteria. Breast milk also provides immune support while your baby's own defences are still developing.
- **Formula feeding:** When breastfeeding is not possible or not chosen, infant formula provides the nutrients your baby needs for healthy growth and development. Formula-fed babies may develop a different mix of gut bacteria from breastfed babies, but many modern formulas now include ingredients such as prebiotics. These are designed to help support beneficial bacteria and overall gut health.

The wider environment: Your baby's surroundings and early experiences also contribute to the mix of microbes they are exposed to.

- **Antibiotics:** Taking antibiotics as prescribed by a healthcare professional when needed is important, but avoiding unnecessary or excessive use helps protect the developing gut microbiome.
- **Your health during pregnancy:** Before birth, your baby is closely connected to you, and this can contribute to their earliest microbial exposures in simple, natural ways. This is one reason the gut health journey begins before your baby is born.
- **Home life and everyday exposures:** Your baby's environment also matters. Contact with family members, pets and the wider world can contribute to the mix of microbes they are exposed to, which may help support the early development of the microbiome and immune system.
- **Starting solid foods (weaning):** When solid foods are introduced, the gut microbiome begins to change again. Offering a variety of foods, especially plant-based foods that contain fibre, helps provide nourishment for different types of beneficial bacteria, or friendly gut bacteria, and supports the early development of the microbiome.

In short, the first 1,000 days are a particularly active and important time for your baby's gut microbiome. Understanding the factors that shape it can help you make informed choices that support a healthy start.

At a glance:

what shapes your baby's gut microbiome?



Birth

Your baby's first microbial exposures begin around the time of birth and help start the journey of gut development.



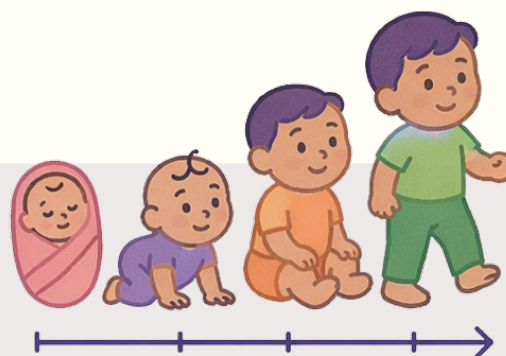
Feeding

Breast milk or formula, and later the introduction of solid foods, all play a role in shaping the balance of bacteria in the gut.



Everyday environment

Home life, contact with others, pets, medicines such as antibiotics, and your baby's wider surroundings can all influence the microbiome.



The first 1,000 days

This early window is especially important because it helps lay the foundations for digestion, immune development and long-term health.

Chapter 3:

The Gut-Brain Connection

Your baby's gut and brain are more closely connected than they might seem. They communicate through a two-way system known as the gut-brain axis, sometimes also described as the gut-brain connection. This connection is especially active during the early years, when both the brain and the gut are developing quickly. In this chapter, we look at how that relationship works and why gut health may support your baby's development and overall well-being.



How your baby's gut and brain communicate:

Your baby's gut and brain are in constant contact through several pathways.

- **The vagus nerve:** The vagus nerve acts as one of the main communication pathways between the brain and the gut. It carries signals in both directions, helping the brain and digestive system stay connected.
- **The “second brain”:** The gut contains its own network of nerves, known as the enteric nervous system or ENS. This system helps manage digestion locally, while also sending information back to the brain about what is happening in the gut. You may also hear it described as part of the gut nervous system.
- **Microbial messengers:** As gut microbes break down food, they produce substances known as metabolites. Some of these can enter the bloodstream and influence how the body and brain function. Gut microbes can also affect the release of hormones and other chemical signals.
- **Mood chemicals:** Many important chemical messengers are linked to both the gut and the brain. For example, much of the body's serotonin, which plays a role in mood, sleep and appetite, is produced in the gut. This helps show how closely the gut and the brain work together.
- **Immune system signals:** The gut microbiome helps shape immune activity, and immune signals can also influence the developing brain. This is one of the ways gut health may affect wider aspects of development beyond digestion alone.





How a healthy gut may support brain development:

A balanced gut microbiome may help support healthy brain development during infancy and early childhood.

- **Thinking and learning:** Research suggests that early patterns in the gut microbiome may be linked with aspects of brain development, including later thinking and language skills. While this research is still developing, it highlights the close connection between gut health and early development.
- **Movement skills:** Some studies have also explored links between the gut microbiome and the development of movement skills in early life. This suggests that gut health may play a broader role in overall development.
- **Overall brain development:** The first few years are a time of rapid brain growth and development. During this period, the signals coming from the gut microbiome may help support healthy brain development as part of the wider gut-brain relationship.

How gut health may influence mood and behaviour:

The gut microbiome may also play a role in emotional regulation, sleep and behaviour as your baby grows.

- **Emotional and social development:** The gut-brain connection may influence emotional regulation, sleep and aspects of social development as children grow. Some studies have found links between gut microbiome patterns and differences in behaviour, although this area of research is still evolving.
- **Stress and emotional well-being:** Early gut health may help shape some of the systems involved in stress responses and emotional well-being later in childhood. While many factors influence mental health, this is another reason why supporting gut health in the early years may be important.

The early years are an important time for establishing a healthy gut microbiome. Because the gut and brain develop so closely together, changes in the balance of gut microbes during this period may influence how this connection matures. Supporting gut health from the start may therefore have benefits that extend beyond digestion, including support for emotional and developmental well-being.

Quick quiz:

The gut-brain connection

What is the gut-brain axis?

- ☐ A) A type of feeding plan
- ☐ B) A two-way communication system between the gut and the brain
- ☐ C) A stage of digestion

Which nerve helps carry messages between the gut and the brain?

- ☐ A) The optic nerve
- ☐ B) The vagus nerve
- ☐ C) The sciatic nerve

Which of these systems may be influenced by gut health in early life?

- ☐ A) Digestion only
- ☐ B) Digestion, immune activity and aspects of development
- ☐ C) Hair colour

Why are the early years especially important for the gut-brain connection?

- ☐ A) Because the gut and brain are both developing quickly
- ☐ B) Because babies do not need sleep
- ☐ C) Because the microbiome stops changing after birth

Answers:

1 = B 3 = B
2 = B 4 = A

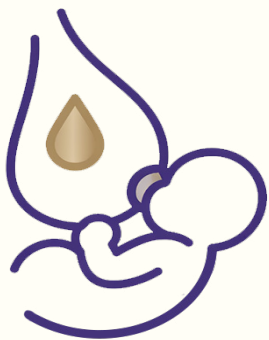
If you answered most of these correctly, you're already building a strong understanding of how your baby's gut health supports wider development.

Chapter 4:

Feeding for a Healthy Gut

What your baby eats supports not only their growth, but also the tiny organisms living in the gut. In this chapter we explore how feeding choices, including breastfeeding and formula feeding, as well as the introduction of solid foods, can influence gut health and help support a balanced microbiome in early life.





Breast milk:

Natural support for gut health: Breast milk contains a unique combination of nutrients, beneficial bacteria and bioactive compounds that help support your baby's developing gut. It also contains Human Milk Oligosaccharides (HMOs) – complex carbohydrates such as 2'-Fucosyllactose (2'FL), Lacto-N-neotetraose (LNnT), 3'-Sialyllactose (3'SL) and 6'-Sialyllactose (6'SL), which act as food for beneficial bacteria such as Bifidobacterium. These bacteria help create an environment in the gut that supports digestion and helps keep harmful bacteria in check. Breast milk also provides immune factors that help protect your baby and support immune development. For these reasons, breastfed babies typically develop a gut microbiome rich in beneficial bacteria. The World Health Organization recommends exclusive breastfeeding for the first six months, followed by continued breastfeeding alongside complementary foods for up to two years and beyond, where possible.



Formula-feeding considerations for gut health development:

Breastfeeding is best for babies, providing the ideal nutrition to support healthy growth and development. When breastfeeding is not possible or not chosen, infant formula is designed to provide the nutrients your baby needs for healthy growth and development. Formula-fed babies may develop a different mix of gut bacteria from breastfed babies, but formula continues to evolve. If you have questions about feeding options, your healthcare professional can help you choose what is right for your baby.



Introducing solid foods and food variety:

Starting solid foods, usually around six months alongside milk feeds, is another important step in your baby's gut health journey. Offering a wide variety of foods helps introduce different fibres and nutrients that feed different types of beneficial bacteria, or friendly gut bacteria. Fruits, vegetables, pulses and wholegrains can all help support the early development of the microbiome and are examples of prebiotic foods and gut-friendly foods. As your baby grows, offering a range of tastes and textures can also help build a positive relationship with food. It is also important to include iron-rich foods when starting solid foods to support healthy growth and development.



How diet supports gut health overall:

Diet is one of the most important ways to support your baby's gut microbiome and digestive health. A balanced diet can help maintain regular digestion, support immune development and contribute to overall well-being. Alongside food choices, good food hygiene also matters, as it helps reduce the risk of infections that can disrupt the gut. Together, these everyday habits can help support a healthy inner environment during this important stage of development. Many parents understandably wonder which foods can help support gut health. In early life, the focus should be on a varied, age-appropriate diet that includes a range of plant foods as solids are introduced.

Chapter 5:

Simple Steps For Parents

As a parent, you play an important role in supporting your baby's gut health. While the science can sound complex, there are many simple, practical things you can do each day to support digestion and overall well-being. This chapter offers clear guidance and everyday tips to help you understand and care for your baby's gut health with confidence.



1

Supporting gut health through everyday feeding: What your baby eats helps shape the balance of microbes in the gut. If you are breastfeeding, your milk provides natural support through beneficial bacteria, HMOs and immune factors. If you are formula-feeding, formulas can include ingredients designed to support gut health. When your baby starts solid foods, aim to offer a wide variety of foods over time, especially plant-based foods such as vegetables, fruit, pulses and wholegrains. These foods can help support beneficial bacteria while also encouraging healthy eating habits as your baby grows.

2

Understanding probiotics and prebiotics: You may come across these terms when reading about gut health. Probiotics are live microorganisms that may offer health benefits when used in the right amounts. They are found in some foods, including fermented foods such as plain yoghurt and kefir, as well as supplements. Prebiotics are fibres that feed the beneficial bacteria already living in the gut, and some are found in foods often described as prebiotic foods. HMOs in breast milk are a natural example of prebiotics. Some probiotic strains have been studied in babies for their potential effects on digestion, immune function and skin health. If you are considering a probiotic supplement for your baby, it is best to speak to your healthcare professional first.

3

Practising good food hygiene: Good food hygiene helps protect your baby from infections and tummy upsets while their immune system is still developing. Wash your hands before preparing food and after handling raw ingredients, bins or pets. Keep kitchen surfaces and utensils clean, cook food thoroughly, and store and reheat food safely. If your baby is under 12 months, sterilise any equipment used for breast or formula milk. These simple habits can help reduce the risk of germs that may upset your baby's gut.

4

Thinking about vaccinations: Vaccinations help protect your baby from serious illnesses, including infections that can affect the digestive system. For example, the rotavirus vaccine helps protect against a common cause of severe diarrhoea in babies and young children. Keeping up with your baby's vaccination schedule is an important part of supporting their overall health.

5

Spotting signs of an unhappy gut: Knowing what is typical for your baby can help you notice when something may not be quite right. A healthy gut often means regular, comfortable bowel movements and no ongoing tummy discomfort. If your baby seems unsettled, you might notice signs such as frequent wind, ongoing fussiness, constipation, diarrhoea, reflux that does not improve, skin flare-ups such as eczema, frequent illness, or slower weight gain. Some parents may also worry about symptoms linked with colic, reflux, milk allergy or lactose intolerance. These symptoms can have different causes, so if they continue or you are concerned, it is always best to speak to your healthcare professional.



Annabel Karmel's tips for happy tummies

For more than 30 years, Annabel Karmel MBE has been the go-to for parents navigating weaning, fussy-eating and early years nutrition. Annabel has published more than 50 cookbooks – including *The Complete Baby and Toddler Meal Planner*, which has sold more than 6 million copies worldwide. As one of the first to champion the link between early years food and nutrition and long-term healthy growth and development in mainstream media, her advice, recipes and meals help parents make feeding choices with confidence.

1. Feed the good bacteria

Once your baby has started solids, include foods that naturally provide prebiotic fibre. Prebiotics act as food for the beneficial bacteria living in the gut, helping them flourish and supporting healthy digestion and immunity.

Good sources include:

- Fruit such as bananas, pears and berries
- Vegetables including peas, asparagus, onions and leeks
- Beans, lentils and chickpeas
- Oats and other wholegrains, alongside white varieties

2. Aim for plenty of plant variety

A varied diet is one of the best ways to support a diverse gut microbiome. As your baby explores solids, try to offer a colourful mix of fruits, vegetables, wholegrains and pulses across the week. Different plant foods provide different types of fibre, helping nourish a wide range of beneficial bacteria.



3. Include fibre-rich foods, but keep it balanced

Fibre is important because it:

- Supports healthy digestion and helps prevent constipation
- Feeds beneficial gut bacteria
- Helps little tummies feel satisfied
- Provides important vitamins and minerals for growth and development

Great fibre-rich foods for babies include:

- Oats and porridge
- Soft fruits such as pears, peaches, berries and bananas
- Beans, lentils and chickpeas
- A mixture of white and wholegrain breads, pasta and rice
- Vegetables such as sweet potato, broccoli, avocado and peas

While fibre is important, babies under two don't need a very high-fibre diet. Too much can fill little tummies before they've had enough energy and nutrients, so aim for balance and variety rather than choosing wholegrain foods all the time.

4. Offer probiotic foods as your baby grows

Some foods naturally contain live or active cultures, often called probiotics. These are beneficial bacteria that can help support a healthy gut microbiome. As part of a balanced diet, babies and toddlers can enjoy probiotic foods such as plain or Greek yoghurt and kefir.

To help these beneficial bacteria thrive, pair them with plenty of fruits, vegetables, beans, pulses and wholegrains. These foods contain prebiotics – special types of fibre that feed the good bacteria already living in the gut. Together, probiotics and prebiotics work hand in hand to support a healthy and balanced gut microbiome.

5. Your simple 6-step formula for happy tummies

- Offer a variety of colourful plant foods
- Include natural sources of prebiotic fibre
- Offer fruit and vegetables every day
- Introduce beans, lentils and pulses regularly
- Aim for balance and variety rather than too much fibre
- Include foods with live cultures, such as natural yoghurt and kefir



Rainbow Veggie Orzo.

The **EASIEST** one pan meal for baby and you.

Packed with FIVE veggies, this is a brilliant boost for baby's gut to support healthy digestion and immunity.



Suitable from 8 months



Makes 4-6 portions



Suitable for freezing



10 Minute Rainbow Veggie Orzo 5 veggies and YUM!

Your little one's gut will thank you for this recipe

Ingredients

- ½ leek, finely diced
- 1 small carrot, peeled and finely diced or grated
- ½ red pepper, finely diced
- 50g sweetcorn, mashed / flattened
- 50g peas, mashed / flattened
- 100g orzo
- 600ml vegetable stock
- 4 tbsp creme fraiche
- 60g Parmesan cheese, grated

Method

1. Add the leek, carrot, red pepper, sweetcorn, peas, & orzo to a saucepan
2. Add the stock and bring to a simmer. Cover with a lid and cook for 12 mins until the orzo is soft and the stock is mostly absorbed
3. Stir in the crème fraiche and grated Parmesan

Conclusion:

A Healthy Gut, A Healthy Future

As we come to the end of The Infant Gut Health Journey, one thing is clear: the tiny world inside your baby's gut plays an important role in overall health and well-being. From supporting digestion and nutrient absorption to helping build the immune system and influencing early development, the gut microbiome is a key part of a healthy start in life. That is why gut health is so important from the very beginning.

We've explored how this inner world begins to develop during the first 1,000 days, and how factors such as birth, feeding and the wider environment all help shape it. We've also looked at the close connection between the gut and the brain, and why supporting beneficial bacteria — the friendly gut bacteria that help keep the gut

environment balanced — can have benefits that reach far beyond digestion alone.

Most importantly, this guide has shared practical ways to support your baby's gut health every day. From feeding choices and food variety to good hygiene habits and knowing when to seek advice, these small steps can make a meaningful difference over time.

By supporting your baby's gut health in these early years, you are helping to build strong foundations for the future. This journey is about feeling informed, making choices with confidence, and giving your little one the best possible start.

List of references / sources:

- <https://pmc.ncbi.nlm.nih.gov/articles/PMC6894937/pdf/EMS84123.pdf>
- Host remodeling of the gut microbiome and metabolic changes during pregnancy - PubMed
- <https://www.uptodate.com/contents/maternal-adaptations-to-pregnancy-gastrointestinal-tract?search=c...>
- <https://pmc.ncbi.nlm.nih.gov/articles/PMC4848870/>
- Role of the gut microbiota in nutrition and health - PubMed
- <https://pmc.ncbi.nlm.nih.gov/articles/PMC9951864/>
- [https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370\(24\)00007-5/fulltext](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00007-5/fulltext)
- Infants' First Solid Foods: Impact on Gut Microbiota Development in Two Intercontinental Cohorts - <https://pmc.ncbi.nlm.nih.gov/articles/PMC8400337/>
- <https://www.sciencedirect.com/science/article/pii/S2590097824000090>
- Effects of Infant Formula With Human Milk Oligosaccharides on Growth and Morbidity: A Randomized Mul...
- <https://onlinelibrary.wiley.com/doi/full/10.1155/ijfo/5567567>