DR MEGAN ROSSI

Eat Yourself Healthy

An easy-to-digest guide to health and happiness from the inside out

PHOTOGRAPHY BY EMMA CROMAN

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About the Author

Dr Megan Rossi is a registered dietitian with an award-winning PhD in gut health. A leading Research Fellow at King's College London, Dr Rossi is currently investigating nutrition-based therapies in gut health, including pre- and probiotics, dietary fibres, the low FODMAP diet and food additives as well as leading a gut-health clinic on Harley Street. Most recently, Dr Rossi has created a gut-health menu range for Leon Restaurants and has appeared in *Cosmopolitan* as well as featuring as a guest on Deliciously Ella's hit podcast. Recognized as one of six new 'wellness stars' to watch in 2017 by *Women's Health* UK, *Eat Yourself Healthy* is her first book.

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Introduction

The start of something beautiful …

THE GUT. A simple yet powerful three-letter word and something I have come to think of as beautiful. Yes, I know what you're thinking, it's where poop comes from, for crying out loud! I get it, I used to think the same, but by the time you get to the end of this book, I'm going to have you talking about your gut with a new-found level of admiration and even a dash of excitement. So, let me introduce you …

Say hello to what we nerdy scientists call your gut microbiota (GM). I'm aware it's not the sexiest of terms – let's go with GM moving forward. This wonderful, complex and thriving community is made up of the trillions of microbes that call your intestine home. Your GM is incredibly powerful – in fact, this newly appreciated organ is pretty much essential to whatever your health goal is. It's not only capable of thousands of functions, going well beyond what we could achieve on our own, but it has also been linked with successful weight management, improved fitness levels, healthier skin, boosted immunity and even our happiness.

What really blows my mind is that, unlike our genetic make-up, over which we have no control, we have the ability to shape our GM simply by how we treat it – which means that a big part of our personal health is in our hands. However, as with all landmark scientific discoveries, there are those who will seek to take advantage of people looking for help by twisting the truth and promoting over-hyped, sham, gut-boosting products. But don't let this detract from the fact that the field of gut health is based on real science and has the potential to have a measurable impact on your health and happiness. In this book I want to create a safe place to learn about the gut that's all about keeping it real by sticking with the evidence.

The concept of gut health is really nothing new. You see, our GM is just one part of overall gut health. Other major aspects include its role in our immunity (70 per cent of immune cells live along the gut), as well as in digestion and the absorption of nutrients, which, if not working right, can lead to an array of nutrition deficiencies and negative health consequences. So, clearly, taking the time to understand and look after our gut is one of the best ways we can invest in our future.

There is a growing and frankly concerning trend towards generic, over-simplified, one-size-fits-all gut health recommendations. I'm sure you've all heard it before: 'Eat more probiotics', 'Eat more fermented foods' … and on and on. These messages, although I'm sure they're mostly given with only good intentions, can actually do more harm than good. An example of this is the contradictory message that everyone should be eating more prebiotics if they want good gut health. My research, and research done by others, has clearly demonstrated that adding extra prebiotics into your diet can in fact trigger gut symptoms in around 15–20 per cent of the population, particularly those with irritable bowel syndrome (IBS). Yes, of course increasing prebiotics in your diet can be good for you, but it really does depend on where you are on your gut-health journey.

How do you know what's right for you? In this book, we'll go through several assessments (just as I would in my clinic) to help you determine where your gut health is currently at and then, based on this, we'll explore a range of tools and strategies so that you can formulate your own evidence-based gut health action plan. All assessments in this book can be found on my website, www.TheGutHealthDoctor.com, and your scores recorded in your gut-health action plan on page 283.

I do need to prepare you, though: things are going to get real personal – there's no hiding behind a generic meal plan here. This book is written in a way that I hope not only makes you fall in love with your gut (as I have with mine), but also helps you get the most out of it, whether it's managing existing gut symptoms or maximizing your gut health's impact on other organs, such as your brain. Let's face it, it's the same as most relationships: if you don't give it enough love and attention, things can turn pretty ugly.

My goal in writing this book is to give you a reference guide to your gut – how it works, how to look after it, how to maximize its potential and, importantly, how to manage it with simple steps when it's not functioning quite right. Using the right balance of science, anecdotes, practical strategies and tasty recipes, I will take you on a journey of discovery, leaving you with tangible take-home messages and a step-by-step action plan that will make a meaningful and measurable difference to your everyday life. The book will also equip you with the skills needed to separate the facts from the fiction without getting too 'sciencey' on you – promise.

It's time to get excited: your journey of self-discovery and gut love is about to begin!

Assessment: 'IS MY GUT HEALTHY?'

This has to be the most common question I get asked, and it's one I never give a simple 'yes' or 'no' answer to. There's no single measure we can use to assess our gut health. However, with the right set of tools, you can get a pretty good idea of how healthy your gut is without having to step a foot outside your door. Head to www.TheGutHealthDoctor.com to complete your first assessment, then check back with this book.

My Story

I grew up on a farm just outside of Cairns, Australia, where our lifestyle was inherently supportive of good gut health – we played in the dirt and lived on fresh, home-grown produce – yet my first conscious memory of the gut wasn't a happy one. It was during my nutrition and dietetics undergraduate degree, when my grandma, the most caring soul, was diagnosed with bowel cancer. I remember watching on helplessly as she bravely battled through chemo and surgery – I hated the gut for doing this to her. Grandma fought on as long as she could but lost her battle in 2009, during my final year of university. I still vividly recall sitting in a lecture at university soon after she'd passed, being taught about the early warning signs of bowel cancer and thinking to myself, I wonder, if talking about our bowels wasn't such a socially taboo topic, would my granny have spoken up earlier and still be here today? The statistics suggested yes, she would be.

A few years later, those negative emotions surrounding the gut resurfaced. I was working in a hospital as a dietitian and was struck by the sheer number of patients with kidney disease who were complaining of gut issues. I really struggled to get my head around how, whereas my grandma had her disease in her actual gut, all these patients with their various kidney diseases also suffered with such prominent gut issues. I searched just about every textbook and research paper I could find and still couldn't give my patients a proper answer. I couldn't let it rest. I was determined to get to the bottom of it and, before I knew it, I found myself signing away my early twenties to answer this very question – was there a link between the kidneys and the gut? Fast-forward three years, and it turns out there is! It's something we now call the gut–kidney axis. But my fascination with the subject didn't stop there. I was fortunate to also work with Olympic athletes and a number of company CEOs, and they got me thinking about the link between the gut and the brain (commonly referred to as the gut–brain axis). I noticed that those who were suffering the greatest levels of stress were the ones suffering the most significant gut issues. It also became clear that, by nourishing the gut and caring for it, people could improve their lives in very real and often surprising ways, and I could help them to do this. This was the turning point in my relationship with the gut – my eyes were finally opened to its power and promise.

So why this book? I went into research to make a difference, but a year into my post-doctoral post I became frustrated that, despite the incredible research that was being done, it was the unfounded and potentially dangerous fad nutritional messages that were being almost force-fed to the public. I was seeing extremes in my clinic, with some people essentially starving themselves because they'd had (invalid) food-intolerance tests and were scared to eat anything, while others (and I'm talking really intelligent people) were overdosing on herbal supplements in order to 'boost' their gut health because they'd read about the gut–brain axis and wanted that extra 'edge' at work. Right before my eyes, I was seeing that the very thing I had come to admire – the gut – was being misrepresented and so destroying people's health. It was this injustice that ignited my passion for science communication. This, along with your endless support on social media, continues to drive my mission to help people find inspiration and take the evidence-based steps to a happy, healthy life. But that's quite enough about my story. This book is all about your journey.

So, let's get started!

Understanding your gut

One of the most important and fundamental things you will ever learn about nutrition is this – what actually happens to food once it enters your mouth.

Why is this knowledge so important? For those who suffer with gut issues, it can help you understand the possible causes. This not only helps you become a better detective when we come to try and identify your triggers in Chapter 5, but also, having this improved awareness of what goes on inside us can offer a huge amount of relief. Gut issues aside, by understanding how your body handles food, you're also safeguarding yourself against the many nutrition myths out there, for instance, that sucrose (aka sugar) is bad for your gut microbes. (Spoiler alert: it's absorbed higher up your intestine, so it doesn't reach the majority of them.)

Despite the hype around our gut microbiota (GM), gut health relates to our entire digestive tract. Which means gut health is not just about the microbes but also governs the digestion of food and absorption of nutrients and maintains most of our immune system. In fact, only a small section of our nine-metre-long factory line (aka our digestive tract) contains the bulk of our GM.

Our digestive tract is the barrier between our body and the environment, which means that food doesn't really get into our body until long after we've eaten it and it has passed through our gut lining's defence barrier and into our bloodstream. If you think about it, this is a huge responsibility for our gut, and it explains why it's equipped with an incredible 70 per cent of our body's immune cells.

So, let's take a look at what happens to food as it travels through our body …

In your mouth …

This is where digestion begins. Food is not only physically broken down in our mouth into smaller bits by our teeth; it is also chemically broken down, thanks to special proteins in our saliva known as enzymes. For example, if you keep a piece

of white bread in your mouth for long enough, the enzymes start to break down the complex carbohydrates (starch) and release simple carbohydrates (sugars). As this chemical process happens in your mouth, you will notice that the bread will start to taste sweet – give it a try.

In your oesophagus ...

Once you swallow your chewed food, it slides down your food pipe (aka oesophagus). To stop the food going down your windpipe, which is right next door to the food pipe, when we swallow a special trapdoor known as the epiglottis slams shut over our windpipe. Have you ever tried to speak and swallow at the same time? It's impossible, without choking, and that's all thanks to our epiglottis.

In your stomach ...

As food travels down your food pipe, before it gets into the stomach it needs to pass another delightfully designed circular ring of muscle that acts as a gateway known as the lower oesophageal sphincter. As food moves into each of the next three sections of your digestive tract, it passes through another gateway, or sphincter, at each stage. These sphincters are important, as they keep the different sections separate from each other. Sometimes, however, they don't shut or open properly, which can result in common complaints such as acid reflux and other conditions which we will discuss in Chapter 4.

You can think of the stomach as a kind of washing machine, because it not only physically churns and throws food around like a washing machine does our clothes, but it also releases detergent-like chemicals. They include:

1. **ENZYMES:** to break up our food
2. **ACID:** to kill off microbes trying to invade our body
3. **HORMONES:** which not only trigger the gut muscles to get their act together and start contracting but also let us know when we are full or hungry

It's in your stomach that your once-solid meal will be transformed to have a more smoothie-like consistency (known as chyme). Once formed, this smoothie mix makes its way from the stomach into the next section of our digestive tract: the small intestine.

In your small intestine ...

'Small intestine' is bit of a funny name for it because it's the longest part of our digestive tract, reaching close to seven metres in length when stretched out. If it was laid out flat, it would cover the surface area of nearly half a badminton court! How it achieves this impressive surface area is down to the tiny, carpet-like projections (villi and microvilli) which exist along our small intestine. These projections are vital for nutrient absorption, that is, the movement of nutrients from our gut into our circulation. In scenarios where these finger-like projections are flattened or squashed, such as in undiagnosed coeliac disease, you are likely to suffer from nutrient deficiencies, partly because your small intestine just doesn't have the surface area that is needed to absorb all the nutrients from your

food. Before the smoothie mix can move into our circulation it needs to be broken down further, which is where the pancreas comes in. Our pancreas is another organ that feeds into our small intestine, and acts like a busy factory producing enzymes that help digest our food as well as hormones which help control how much sugar is in your blood.

To further assist with digestion, yet another detergent-like mix, known as bile acids, is made by our liver, and stored in a small pouch known as the gallbladder. Bile is secreted into our small intestine and helps with fat digestion and absorption.

In addition to the enzymes released by our pancreas, the lining of our small intestine also contains enzymes that break down food. For example, lactase, an enzyme that breaks down lactose (a type of sugar found in milk from animals), perches on the lining of your small intestine, waiting to do its job at a moment's notice.

After around two to six hours in your small intestine – depending what and how much you've eaten, as well as how your gut muscles are working – the unabsorbed bits (including my own personal favourite nutrient, dietary fibre) will move through the next gateway (this one is called the ileocaecal valve) and on into the large intestine. As the food passes through this gateway, our large intestine acts a bit like a watchdog and keeps an eye on the sort of things that are passing through. If it starts to notice under-digested food coming through, it pulls the brake on our uppergut movements. This system is known as the ileal brake and is an important feedback system that helps maximize nutrient absorption in the small intestine. One of the side effects of this is decreased appetite, which explains why often, when we have diarrhoea, we also lose our appetite.

In your large intestine ...

THE LARGE INTESTINE IS RESPONSIBLE FOR FOUR MAIN THINGS:

1. **HYDRATION:** Your large intestine reabsorbs fluid and electrolytes. During this process your gut contents turn from liquid to solid and the longer your poop-to-be is in the large intestine, the more water it absorbs and therefore the more solid the poop.

2. **OUR GM RESIDENTS:** Your large intestine houses the trillions of microbes that make up our GM. Although we have microbes scattered throughout our digestive tract, this is where the main bulk of microbes hang out. We'll chat more about this in Chapter 2.

3. **NUTRIENT ABSORPTION:** You know how I said that most of the nutrient absorption occurs in the small intestine? Well, that is indeed true, but the large intestine also plays a pivotal role. This is because our GM rather handily helps digest things that are indigestible to human enzymes, such as fibre. In doing so, our microbes produce messenger molecules that are capable of many things, such as messaging our brain to say, 'Okay, you can stop eating now, thanks, we're full,' as well as reducing gut inflammation, and much more.

4. **WASTE COMPACTOR:** The end of our large intestine – the rectum – stores and compacts the waste produced by the body, including the parts of dead red blood cells which make our poop brown. Once our brain sends a message to give our rectum the all-clear, the accumulated waste is released through our final digestive-tract gateway and out through the muscular opening known as the anus.

Unlike our small intestine, our large intestine plays the slow and steady game. This is why undigested foods take around twelve to thirty hours to move through it, despite the large intestine being around four times shorter than the small intestine.

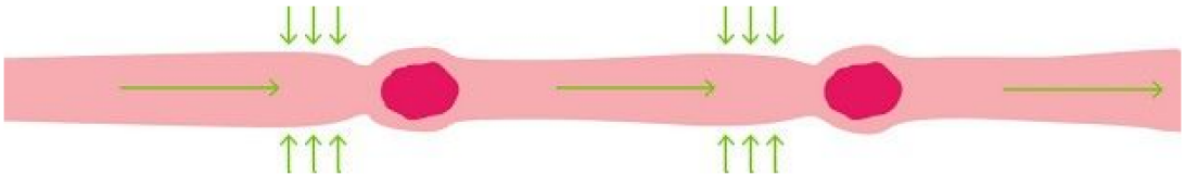
How the gut moves

We've discussed a lot about what happens in each part of the gut, but we haven't yet addressed how food is actually moved through it.

Your first thought might be that it is all down to gravity, but remember, the gut is close to nine metres of folded intestines, which means that sometimes food has to move against gravity. To allow for this, our digestive tract is coated with both long and circular muscles which contract in a symphony of orchestrated patterns to guide food on its extraordinary journey through the gut. This is known as motility.

Several 'programmed' movements are responsible for the transport of food between different parts of the digestive tract, and they differ depending on whether we have eaten or not. One of the two basic types of programmed movements is peristaltic waves, which pump food along the gut; the other is segmentation contractions, which help to mix all the gut contents together, including food and enzymes, like a big pot of warm soup.

Programmed movements may be coordinated into higher-level motility patterns. The best example is the migrating motor complex (MMC), which typically moves from the stomach through the small intestine, essentially sweeping the intestine clean between meals. The MMC is like those trucks that come out to clear up after a major road race or event. It sweeps any leftover bits of rubbish into the large intestine, as well as any microbes that may have crept up unannounced from our large intestine. Next time you hear your belly rumble, don't stress out, it's likely just your intestinal 'housekeeper', aka the MMC, doing its thing. This movement occurs every forty-five minutes to two hours, but only between meals, that is, in the fasted state, and generally when you are sleeping. It's one of the many reasons why sleeping is so important for the gut; we'll touch on this in Chapter 7. Dysfunction of the MMC may also play a role in some types of gut issue, such as small intestinal bacterial overgrowth (SIBO), which we'll discuss on page 156.



Mass movement is another type of programmed movement and occurs between six and ten times a day in the large intestine. This is the final 'kick', so to speak, propelling your formed poop into your rectum, ready for evacuation. One of the main triggers of this mass movement is eating (known as the gastro-colic reflex, that urge to go you often feel after eating). It's also worth noting that different foods are thought to have different effects on this type of movement; for instance, fat and carbohydrate are more likely to stimulate the movement than protein. Gentle exercise, such as going for a walk, particularly after a meal, is also known to activate this type of movement. Mass movements are put on hold overnight but pick up again sharply in the morning, which also explains why many people poop in the morning.

SO ... what makes your gut muscles contract?

Our gut is really pretty impressive in that, unlike any other organ, it can function independently of our brain. This means that our gut can go about its business, digesting and moving food along, without our brain telling it to do so. This high-level function is all thanks to our gut's impressive network of hundreds of millions of nerves, known as the enteric nervous system. This explains why our gut has been dubbed our second brain.

Despite this impressive level of independence, a two-way communication normally occurs between the enteric nervous system and our primary ('big') brain. Much of this communication occurs via our parasympathetic nerves, which is often referred to as the 'rest and digest' response, and our sympathetic nerves, which take over when in 'fight or flight' response. Typically, when our body feels stressed (because our brain is telling it that we are), the parasympathetic nervous system is regulated downwards and so gut function is reduced, because all the blood rushes to our muscles to get them ready to fight (or flee). When we are relaxed, blood goes back into our gut to support digestion. This may explain why some people struggle to poop when they're stressed. Of course, that's not

always the case: for some stress can trigger diarrhoea, and this is because of overactive or hyper-responsive gut-motility programming, as well as secretion of additional fluid into the gut – the gut–brain link is clearly complex!

Defence system

The gut is the reason we're not all bedridden and defeated by infection every time we eat or step outside. Like all powerhouses, our body has two main lines of defence, the front-line defence being our intestinal wall, which acts as a physical barrier to foreign invaders (like a bouncer at the door outside a club), and the second-line defence being the more sophisticated and dynamic immune system (think security cameras, alarms and so on).

The wall of our intestine is made up of a barrier of cells (think of a row of doors) that are effectively secured by tight junctions (club bouncers). Our intestinal wall serves a dual purpose; like the door and the bouncer who guards it, this allows the passage of the good guys (nutrients) and keeps out the bad guys (pathogens). These tight junctions can become weak, or loose, allowing unwanted nasties to sneak across the intestinal wall. Scientists call this intestinal hyperpermeability; a more user-friendly term is 'leaky gut'. Thankfully, even if a pathogen does make it through the first line, our immune system is primed and waiting to pounce, triggering a cascade of events both within and outside our gut to shut down any nasty invasions.

Your immune system is amazingly complex, involving a high-level network of cells, tissues and organs that work together to fight off invaders. The 70 per cent of immune tissue that lies within our gut – our gut-associated lymphoid tissue (GALT) – has a particularly important job, because our digestive tract is the most popular gateway into the body. It's a pretty tough job, really: the team is constantly on patrol, sifting through millions of foreign cells each day (from things we eat and drink, as well as our resident GM), discriminating between harmless (e.g. proteins in foods and friendly microbes) and potentially dangerous ones (e.g. toxins and pathogenic microbes).

The GALT isn't just important for fighting invaders, it also keeps the rest of our cells and GM in check. This includes performance-assessing old cells that have been subject to extensive wear and tear (and deciding which ones should be made to retire), and good microbes which 'act up' and find themselves in the wrong place, that is, crossing the gut barrier.

What happens when things go wrong, when this delicate balance between fighting off the bad guys (immunity) and recognizing the good guys (immune tolerance) is compromised? If the balance tends more towards immunity, conditions such as food allergies (innocent food proteins are mistakenly tagged as a threat) and auto-immune diseases (where it's the body's own tissue that gets tagged) arise. If it tends more towards immune tolerance (often referred to as immune-compromised), as in the case of during certain cancer treatments, e.g. chemotherapy, your body can be more vulnerable to invasion by the bad guys, which may lead to severe infections.

What about your GM? They have a major role in our body's defence system; in fact, without them, our immune system would, frankly, be pretty weak. This is because the microbes train our immune system from birth. This explains the 'hygiene hypothesis', which states that being too clean, particularly in infancy, means that you are exposed to fewer microbes, and so your GM diversity (the number of different types of microbes you house) decreases. As a result, the diversity of the 'coaching' of your immune system is also reduced. This is one explanation for why rates of allergy and auto-immune conditions are reaching epidemic levels in the Western world.

Assessment: LISTENING TO YOUR GUT FEELINGS

Have you ever sat down and had a two-way conversation with your gut? You may be surprised by how much you learn from simply taking the time to listen to your gut.

Although most of us have a sense of when our gut is not functioning quite right, we rarely pinpoint details of the specific symptoms. Doing so can provide invaluable insight and is really worth taking time over. It can not only help you troubleshoot in a more systematic (and therefore helpful) way, but if you do end up needing to see your GP or dietitian, it's a great source of information that you can provide, allowing them more time to carry out a thorough assessment in the short time they have to see you. At the start of all my consultations I get my patients to fill out this questionnaire to help focus our intervention on the areas most important to them.

Head to www.TheGutHealthDoctor.com to complete the *'Listening to Your Gut Feelings'* assessment and *'Checking in with Your Poop'* assessments. Remember to record your results in your gut health action plan on page 283.

Your inner universe of microbes

Microbes have been around for billions of years, humans less than a million. They can multiply in minutes, survive and thrive in every habitat on earth, from volcanic explosions to glaciers; they've killed more people than all wars and human accidents combined (not a stat to be proud of, but relevant, nonetheless). Perhaps most humbling of all, without microbes, we couldn't survive – but, without humans, microbes would do just fine.

Admittedly, this does paint our relationship as a little one-sided, but I can promise you, deep down, your microbes want to see you thrive. As long as you show them some love and appreciation, like all close friends, they will have your back.

When I talk about microbes I'm not just talking about our gut microbiota (GM), which we will cover in detail shortly. Our body is in fact like a mini-ecosystem of different microbial communities. They live in us – in our lungs, our nose, our urinary tract, and so on – and they also live on us, like a second skin. To microbes, our armpits are like a tropical forest, our backs like a wide open field, and distinct communities populate each area.

Skin microbiota

We each have billions of microbes living on our skin. We also emit our own distinct cloud of microbes wherever we go, and this is unique, like a fingerprint. This microbial fingerprint, which can't be hidden from others simply by wearing gloves, has grabbed the attention of criminologists as an exciting new forensic tool to hunt down criminals. Perhaps not surprisingly, our skin microbiota also plays a role in common skin conditions like acne, eczema and certain skin cancers. But before we go getting our hopes up, the ways in which we can manipulate our skin microbes to help prevent and manage those skin conditions are still poorly understood. In terms of preventing eczema in infants, there is supportive evidence that taking probiotics during pregnancy may reduce your baby's risk by up to 50 per cent; however, for treating eczema and acne, studies

that have been carried out to date indicate that probiotics don't seem to help. Instead, what is more promising is topical probiotics, where the bacteria are directly placed on the skin. But it's still only early days, so I'd be a little sceptical for now if you come across companies selling 'probiotic' skincare. Regarding skin cancers, recent studies in mice have suggested that a specific species of bacteria (*Staphylococcus epidermidis*) was able to produce a chemical that protected the mice against developing skin cancer. Although this finding has yet to be replicated in humans, it suggests that a specific skin microbiota may indeed play an important role in protecting against skin cancer. I am hopeful that in the near future there will be evidence-based products targeting the skin microbiota. But in the meantime, it's best to safeguard yourself by asking about the human research that has been done (not test-tube or animal studies) before handing over your hard-earned cash.

Oral microbiota

There is also a community of microbes which claim residence in our mouth. Although notorious for causing bad breath and dental issues, rest assured that this is the doing of only a select few troublemakers; the vast majority of microbes work to support a healthy mouth environment. They not only act as the bodyguard to our GM, they also play several other roles in maintaining our general health. This includes metabolizing specific nutrients such as nitrates from plants like beetroot, which can help manage high blood pressure and support heart health.

So how do we look after these guys? Standard oral hygiene like brushing our teeth properly and regularly and not overdoing it on added sugars – think fizzy drinks and sweets – is a good place to start. One study did report that with each 'intimate' kiss we transfer an average of 80 million bacteria. This suggests that perhaps our partner's diet could also have an impact on our own microbes. I do vividly recall one of my patients, Claire, who was adamant that it was only after her partner started to improve his diet, too, that she started to see results on the scales. Sounds too good to be true? With my scientific hat on, it's more likely that Claire's success was the result of the increased support from her partner and the fewer temptations she was exposed to at home rather than the change in her partner's oral microbes. But that said, the fact that our oral microbiota has been linked to weight gain does pose an interesting thought – and if nothing else, it

may encourage your partner to also add a few extra portions of plants into their diet.

For those of you who haven't yet met, say hello to your GM ...

On the face of it, our gut microbes appear quite simple, really, just living their single cellular existence. However, it's all just an act. They are, in fact, incredibly smart, which is why you'll find them not randomly scattered but instead strategically located along the gut with other like-minded microbes, forming complex and distinct ecosystems adapted to their environment. There are four key concepts about our GM that are worth knowing.

1. THE BASICS: not just bacteria

When I talk about the GM, I'm not just referring to bacteria but also to other types of microbes such as fungi and viruses which live in our gut too. The fungi component is known as our mycobiota, and the virus component as the virome. Although they also play a role in health and disease, our understanding of their function is still at a very early stage, unlike their bacterial counterparts, where more of their functions have been mapped out, giving us a fair idea of how they go about their daily business. What's even more striking is that some parasites (yes, they live in the gut too) are said to be more common in healthy people. Those with gut issues such as irritable bowel syndrome (IBS) and inflammatory bowel disease (IBD) have been shown to have less, suggesting that some parasites may indeed play a protective role.

2. THE BASICS: the goal is diversity

Generally speaking, a higher level of GM diversity is associated with better overall health. The more diverse your GM, the greater the breadth of skills

part, why only a subset of people experience severe diarrhoea following common colon-cancer chemotherapies and gut-lining damage after taking anti-inflammatory drugs such as ibuprofen. Our GM may also explain the variable response to certain types of cancer therapies. Indeed, one study found that a more diverse GM was linked to better response to an immune-system therapy in melanoma patients.

If you take regular medication, you may be wondering at this point which microbes you need to improve your success rates and therefore what diet you should be following. Those are the ultimate questions, and ones which hundreds of researchers around the world, including my research group, are working to answer. In the meantime, nurturing your GM with the strategies outlined in the pages to come is considered the best place to start.

Gut Microbiota's curriculum vitae (CV)

- *Can make vitamins (e.g. vitamin K and B vitamins), amino acids (protein building blocks), hormones (e.g. noradrenaline), chemical messengers (e.g. serotonin) and many others.*
- *Trains our immune system.*
- *Produces important molecules that strengthen the gut barrier and may help balance blood sugar, lower blood fats, regulate appetite, facilitate communication with the brain and ultimately help prevent against many diseases.*
- *Communicates with our other vital organs, including our brain, liver and heart.*
- *Prevents invasion from bad microbes.*
- *Enjoys eating fibre and antioxidants from plants.*
- *Metabolizes drugs and deactivates toxins.*
- *Influences gut movement and function.*

Assessment: HOW DIVERSE IS YOUR GM?

There are many factors known to affect your GM. Some of them we can change, or at least influence, such as diet (a modifiable factor), and others we can't, such as our age (an unmodifiable factor). The empowering thing about our GM is that so much of it is modifiable – in fact, it turns out that our environment has more of an effect on our GM than our genetics. Targeting our diet is one of the most effective ways we can boost our GM diversity. Most of the research done so far has found that people with high-fibre diets from a wide range of plant-based foods have greater diversity. So let's begin by looking at how much fibre, plant-based diversity and additional GM-loving foods you're getting, using the diet assessments at www.TheGutHealthDoctor.com.

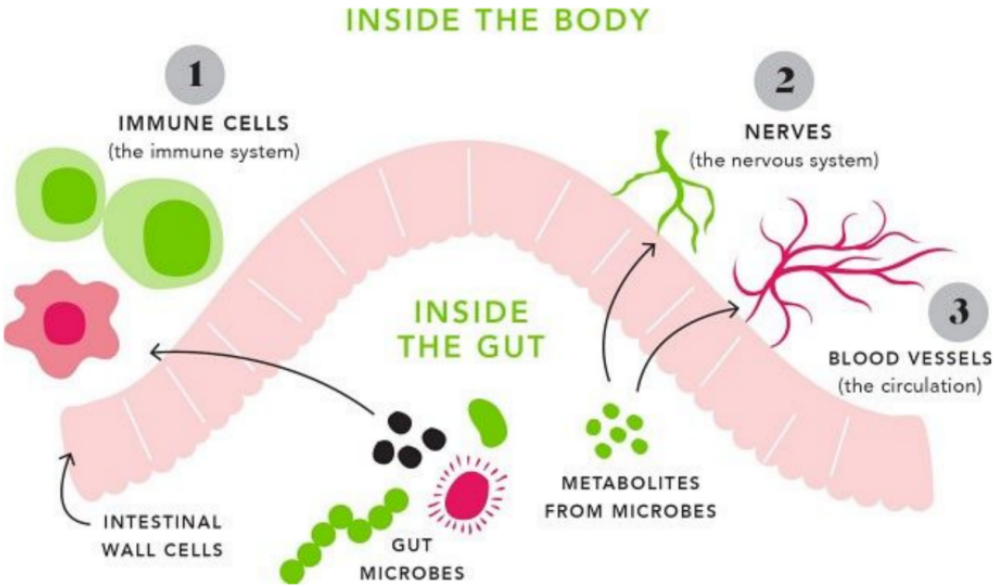
Central to health and well-being

It's easy to understand how our GM can impact the rest of our gut health, given its close proximity. But it's a little harder to visualize how it could possibly impact other organs that are further afield, like our brain. Thankfully, this concept isn't one we simply need to leave to faith (I am a scientist, after all), as there is mounting scientific evidence that demonstrates just how our GM and our other organs interact with each other.

In the past few years we've come to understand, at least in part, three of the communication styles that our GM tends to use:

1. **THE IMMUNE SYSTEM** (think house alarm)
2. **THE NERVOUS SYSTEM** (think mobile phone)
3. **THE CIRCULATION**, that is, the blood and lymphatic system (think postal service)

Our GM makes full use of each of these, depending on the type of message it wants to send and how quickly it wants to send it. For example, if it's something urgent, like a viral invasion, then it's more likely to pick up the mobile or trigger the alarm to alert the rest of the body rather than relying on 'snail mail'. However, if it's something slow and gradual, such as a chronic disease, then sending packages via the postal service is often used. To date, an unbalanced (often called dysbiotic) GM has been linked with over 70 different conditions. But research is still only in its early stages, meaning we still don't know whether the altered GM contributes to disease (GM is the driver, disease is the passenger) or whether it's the other way around.



Despite this, after ten years working as a clinician, I'm convinced that everyone can benefit from looking after their GM, whether it directly or indirectly impacts on a specific condition or not. So, even if you're suffering from a condition where the evidence is still limited in terms of the role of the GM, which is indeed most areas, why not give some of the simple, cost-effective diet strategies in Chapter 3 a go (alongside any necessary medical treatment, of course)? It's best to try out the diet strategies for a four-week period and then assess whether you notice an improvement. What do you have to lose?

Gut–brain axis

The constant, two-way communication that occurs between our gut and our brain is referred to as the gut–brain axis. The latest evidence suggests that tapping into our gut–brain axis could play a pivotal role in our mental health. With one in four of us predicted to experience a mental-health event this year alone, our gut health really is something more of us should be taking into consideration.

Although the science behind the gut–brain axis (particularly how our GM is involved) is relatively new, the 'gut feeling' phenomenon is something we've all experienced. In fact, long before science connected the two, we were using gut functions to describe our feelings and emotions: 'I've got butterflies in my stomach'; 'You don't have the guts for it'; 'I can't stomach that behaviour' … clearly our ancestors were on to something.

Our understanding of the connection between our brain and our GM is still in the early stages, but there is some promising evidence building. Trials have shown not only that our GM is implicated in our mental health but that by modifying our GM with the simple diet strategies discussed in Chapter 3 and the recipes in Chapter 8, we can help manage mental-health conditions such as depression (alongside medication and therapy, as needed). What's more, by nourishing our GM with both the diet and non-diet strategies discussed in the chapters to come, we may even be able to prevent some cases of depression and anxiety.

> In my practice I have witnessed the powerful role diet can play in the management of some people's mental health, including that of twenty-four-year-old Paul. When Paul first walked into my room at the clinic, his shoulders were hunched, his head down, his voice soft and his words mumbled; it was clear he was going through a tough time. As Paul and I got talking, he opened up about his history of depression, which first started after moving away for university at the age of twenty-one. He described himself as having been very sociable before that – he'd been captain of the football team and dated his high-school sweetheart – but by the age of twenty-two, he explained, 'I'd lost all interest in life.' He'd stopped playing sport, broken up with his girlfriend and distanced himself from his close friends. He saw his family GP three times over the summer and was prescribed an antidepressant. Although initially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metformin) has recently been shown to benefit our GM. This discovery is thought to be a new mechanism by which metformin improves millions of patients' blood-sugar regulation. And it's likely not alone, with several other medications suspected to target the GM in order to exert their medicinal benefit.

2. Sleep

Sleep disturbance, including both shift work and jet lag, is another major factor shown to disrupt our GM. This is because, like us, our GM exhibits a sleep–wake cycle, known as the circadian rhythm. Interestingly, the negative impact of sleep disturbance on our GM may explain, at least in part, the increased risk of weight gain and diabetes in people with disturbed sleep. Further still, research suggests that this relationship is bidirectional. This means that a disturbed GM may also lead to disturbed sleep. There is some good news, however. One study showed that a type of probiotic improved sleep in a group of students, compared to placebo (a fake probiotic). In my practice, I've also found that simple dietary changes to boost our GM have helped many shift-workers improve their sleep quality. In turn, working on your sleep hygiene may also be worth a thought to ensure that not just you but your GM, too, get the most out of pillow time.

For those frequent fliers, particularly on long-haul flights, and who also suffer with gut issues, check out page 149 for some pre-flight nutrition tips for your gut.

3. Dieting

What about that crazy diet you may have tried last summer – did that impact your GM? Interestingly, although our GM can change within days of being on an extreme diet, the overall changes that occur to the microbes following a short-term diet are not as extreme as you may think. What does happen, however, is that it alters the function of these microbes, that is, what the microbes actually do and what they produce (the metabolome). Animal research suggests that the rapid weight-regain phenomenon that occurs with 'yo-yo' dieting (you know, when you seem to regain the weight in half the time it took you to lose it) may in fact be down to our GM. The study not only demonstrated that mice with a


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Checklist for looking after your GM

- ◯ PLANT-BASED DIET DIVERSITY (SEE PAGE 60)
- ◯ SPEND MORE TIME OUTDOORS AMONG NATURE
- ◯ MOVE YOUR BODY OFTEN (SEE PAGE 180)
- ◯ OPT FOR A PROBIOTIC IN SPECIFIC CASES (SEE PAGE 54)
- ◯ CONSIDER A FURRY PET (CONDITIONS APPLY[fn1])
- ◯ AVOID YO-YO DIETING
- ◯ DON'T IGNORE GUT SYMPTOMS (SEE PAGE 81)
- ◯ BOOST YOUR SLEEP QUALITY (SEE PAGE 164)
- ◯ REDUCE YOUR STRESS LEVELS (SEE PAGE 168)
- ◯ AVOID UNNECESSARY MEDICATIONS AND DON'T SMOKE
- ◯ TRY FERMENTED FOODS (SEE PAGE 56)
- ◯ BE SENSIBLE WITH ALCOHOL (NO MORE THAN TWO STANDARD DRINKS A DAY)


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Dietary fibre

Unlike the other types of carbohydrates (yes, fibre is a type of carbohydrate), fibre isn't broken down in the small intestine. This is because humans don't make the enzymes needed to digest it, as we touched on in Chapter 1. Instead, dietary fibre continues on its merry way down the digestive tract into the large intestine, where our hungry GM eagerly awaits. I think of dietary fibre as Mother Nature's unique gift to our GM, but don't worry, we're not missing out; we get our share of the presents, as it's a mutually beneficial 'transaction'. Our helpful gut microbes have the skillset to break down many different fibres, found in food, producing a range of beneficial compounds known as short-chain fatty acids (SCFA). There are three main SCFAs you may come across: acetate, propionate and butyrate. These SCFAs are like an overachieving friend – just hearing about all the things they get up to makes you feel tired. As well as providing fuel for our gut lining, they help 'get things moving' in the large intestine, contribute to the balance of blood sugars (they can trigger cells lining the intestine to make glucose, which, essentially, tells our brain that we are full), they can stimulate our immune system and the release of gut hormones, and are also known to directly impact fat tissue, the liver and even our brain!

The benefits of fibre don't stop there: it goes beyond simply feeding our microbes. It uses its unique physical properties to: a) contribute to bulking out our poop – remember, from the 'Checking in with your poop' assessment in Chapter 1, a bulky poop is a good thing; b) thicken the contents of our gut, giving the gut muscles more to work with and regulating our pooping habits; and c) bind to other compounds, which can help prevent blood-sugar spikes and lower cholesterol levels.

Where do we find it?

It's certainly no coincidence that fibre is found in the foods associated with the best health outcomes – that is, fibre is essentially the backbone of plant-based foods. Each plant-based food group (i.e. wholegrains, legumes, vegetables, fruits, nuts and seeds) contains different types of fibres – in fact there are thought to be over 100 different types. This explains why getting fibre from different foods within each of these groups is associated with the best overall health outcomes – yet another example of why diversity is key. But what if you're

considering cutting out one of these groups, by going grain-free, for instance? Remember: One of my key rules is that your dietary choices are completely yours – no judgement to be found in the pages of this book. But I do want to share with you an unbiased view of the science, because a choice is only a real choice if it is an informed one.

When it comes to fibre from wholegrains, there is some pretty convincing evidence for its role not just in gut health but also in reducing your chances of developing several diseases, including diabetes, heart disease and several cancers. In fact, according to one study involving close to 16,000 women, fibre from wholegrains was linked with a lower risk of breast cancer, whereas fibre from vegetables and fruit didn't seem to have this benefit. This enhanced protection linked with wholegrain fibre, in contrast to other fibre sources, has also been suggested in other diseases, such as colon cancer. Further, another study, this time with over 400,000 participants, found that those with the highest consumption of wholegrains, compared to the lowest, had a reduced risk of heart issues of over 20 per cent. Now, this certainly doesn't mean you should be prioritizing wholegrain fibre above all else, because plant-based foods are more than just fibre, they're densely packed with vitamins, minerals, polyphenols and other bioactive components. However, what it does highlight is that getting fibre from each food group is worth giving some serious thought to.

How much do you need?

As a general guide, when it comes to getting in your gut-boosting fibres, the evidence suggests that adults should be aiming for at least two pieces of fruit, five portions of vegetables, three portions of wholegrains and one to two portions from nuts, seeds or legumes each day. For those into number-crunching, this will generally deliver around 30 grams of fibre, which is in line with most national fibre recommendations for adults. I know this may sound like a lot, particularly with vegetables, but as you'll see in Chapter 8, we've got it covered, with most of the main meal recipes providing three portions of vegetable and close to 10 grams of fibre per portion. For those wanting to up their fibre intake even further, please go right ahead. There is research that supports that going beyond 30 grams per day further lowers your risks of chronic disease like type 2 diabetes, heart disease and depression; the SMILES trial from Chapter 2 provided 50g/day. But before you get too heavy-handed with your fibre portions, check out my tips for the best way to increase your fibre intake on pages 50–51.