cultivating your microbiome

gut microbes

We live in a world dominated by microbes. Like all plants and animals, we've developed mutually beneficial relationships with an array of microbial species—bacterial, fungal, viral—that inhabit all our internal and external body surfaces. They are collectively known as our 'microbiome'. The great majority live in the colon, which has a complex ecosystem determined by our dietary habits, ethnic origin, where we live and who we associate with. Our microbiome also varies throughout the life-cycle and can change from day to day, depending on what we eat and our state of health.

The bacteria we cultivate in our colon serve us by extracting additional nutrients from indigestible components of our diet, and by protecting us from hostile invasion by disease-causing organisms ('pathogens'). In return, we provide them with a warm and friendly environment and an ongoing supply of nutrients to support their growth and survival.

Exploring the role of the microbiome in various diseases is a rapidly evolving field of research, but whether changes observed in particular conditions are causal or simply a consequence of associated dietary variations remains uncertain. However, it's becoming clear that there's no such thing as a 'normal' or 'healthy' microbiome; categorising bacteria as 'good' and 'bad' is overly simplistic; and the notion of 'imbalance' (or 'dysbiosis') is questionable.

fibre and fermentation

Complex carbohydrates are variously linked sugar chains, many of which we are unable to digest. These pass through the small intestine into the colon, where they're broken down into component sugars by our resident microbes and used as their primary source of energy.

This fermentation process generates short-chain fatty acid by-products, which for us serve as a source of additional energy, as well as having a range of regulatory effects on our bowel function and metabolism. Fermentation also generates gases (some of which are smelly) and a variety of other chemical by-products.

'Fibre' is an all-encompassing term used to describe a diverse range of non-digestible carbohydrates, but the definition is rather loose and many experts now prefer to call them 'microbiota-accessible carbohydrates' (MACs).

Although standard dietary guidelines categorise fibre as a nutrient, and set recommended intake levels based on population studies, there are no specific deficiency disorders that can be attributed to inadequate fibre intake.

The degree of digestibility—and consequent availability for fermentation—of different types of fibre is influenced by many factors, including how foods are stored, processed and cooked, and even by how well we chew them.

The question of how much, and what type of, fibre should be included in a person's diet is a matter of individual choice. The sensory nerve endings in our bowel wall can react to products of fermentation, and if you have a hypersensitive bowel—with wind, cramps and diarrhoea—you may feel better by reducing your MAC/fibre intake.

fermentable sugars

lactose intolerance Lactose is the natural sugar present in all mammalian milk, including breast milk. It's a compound sugar made up of glucose and galactose, and cannot be absorbed until it has been digested by the enzyme lactase in the lining of the small bowel.

Almost all infants have normal amounts of lactase. In people of Northern European background, the enzyme continues to be produced throughout life, but among other ethnic groups (African, Asian, Mediterranean, Middle Eastern, Indigenous Australian) it fades during childhood. Temporary lactase deficiency can occur in infants who have damage of the small bowel lining due to infection or inflammation.

'Lactose intolerance' is the term used when people develop bowel symptoms because of difficulty digesting lactose. Incompletely digested lactose passes through to the colon, where it is fermented. Many people with absent lactase can tolerate small amounts of milk or yoghurt, but a sudden illness or change of diet can cause a loss of tolerance.

fructose and FODMAP sugars Fructose is the simple sugar present in fruits, some vegetables (for example corn) and honey. It is also present in sucrose (table sugar), which is a compound sugar made up of glucose and fructose.

Fructose itself doesn't require digestion by enzymes and is completely absorbed up to quite high levels (25–50 g) in most people. Absorptive capacity varies from person to person and can be modified by the presence of other sugars. Having large amounts of fruit (especially fruit juice and dried fruit) can lead to incomplete absorption, with fermentation of the excess fructose in the colon.

The term 'FODMAPs' (fermentable oligosaccharides, disaccharides, monosaccharides and polyols) is a broader categorisation of poorly absorbed sugars that can be fermented in the colon. If you get excessive wind, pain and diarrhoea after eating cabbage, brussels sprouts, shallot, leek, garlic or legumes, it's likely that by-products from fermentation of FODMAP sugars in these foods are irritating your bowel. A low FODMAP diet has been widely advocated for symptom relief in people with irritable bowel syndrome.

prebiotics and probiotics

prebiotics are essentially the same thing as MACs—non-digestible carbohydrates that pass through to the colon and are fermented by our gut microbes—and come with the additional claim that they selectively promote the growth of 'beneficial' bacteria. However, recent advances in our understanding of the complexities of the microbiome have cast doubt on the validity of this concept, and it's better to simply think of them as general fodder for our gut microbes.

Human milk oligosaccharides are an important exception. These consist of a large, structurally diverse group of complex non-digestible sugars, unique to breast milk, that shape development of the breast-fed infant's gut microbiome and prevent pathogens from gaining a foothold.

probiotics are defined as 'live micro-organisms that, when given in adequate amounts, are beneficial for health'. Although they have been heavily promoted for use in various conditions, claims of significant benefit have been difficult to confirm and, with a few exceptions, they have not made their way into mainstream medicine. Even where their use seems to make intuitive sense—for example, after the gut bacteria have been depleted by antibiotic treatment—it has been found that probiotics can delay the natural regeneration of the person's own pre-treatment microbial ecosystem.

When it comes to people with food intolerances, our experience has been that while many have tried taking probiotics for relief of stomach and bowel symptoms, few have had lasting benefit; and if they haven't already done so, most people stop taking them once their diet has been appropriately adjusted.