



## Nutrition and the microbiome

How does our nutrition influence our microbiome  
(and what can we do about it)?

From your skin to your gut, the human body is home to a whole community of microorganisms, known as the microbiome, which play a significant role in keeping us healthy. Through studying the microbiome, scientists are beginning to understand how our nutrition affects the microorganisms inside us and how we can harness this knowledge for improvements in our health. The growing interest in the area is apparent in patent filings, with over 130 new patent applications covering drugs containing bacteria published by the EPO alone in 2019. In this article we consider the significance of the microbiome for developments in health and the challenges of patenting microbiome-based therapies.

### What is the microbiome?

From birth, the human body is colonised by a huge consortium of microorganisms, including bacteria, fungi, protozoa and viruses. The gut alone is home to around 100 trillion microorganisms, expressing over 3 million genes ([Valdes et al., 2018](#)). The microbiome is the collective term for the genomes of this community of microorganisms.

### How does nutrition impact our microbiome?

The microbiome can be readily influenced by changes to the environment. For our gut microbiome, this means nutrition is key.

The bacterial community adapts to changes in our diet, such as changes in meat or fibre consumption, or the presence of food additives. For example, alterations in the abundance of different bacterial species were seen within four days when study participants moved to an entirely animal- or plant-based diet ([David et al., 2014](#)).

Some seemingly healthy choices can have a negative impact on the microbiome. For example, the artificial sweeteners in low-calorie drinks have been shown to negatively disrupt the gut microbiome in animal studies ([Valdes et al., 2018](#)). Similarly, the adoption of a gluten-free diet by healthy participants, without gluten sensitivity, led to a decrease in the abundance of beneficial bacterial species ([Valdes et al., 2018](#)). Over time, more studies will help us to understand what nutritional choices benefit the health of our microbiome.

### What did the microbiome ever do for us?

While our nutrition impacts our microbiome, our microbiome can also influence our nutrition. The bacteria in our gut aid digestion, influence energy metabolism and produce essential vitamins ([Mills et al., 2019](#)). For example, the gut microbiome can produce B vitamins that the human body is unable to synthesise. A healthy gut microbiome can therefore help to prevent nutritional deficiencies, which can otherwise cause a range of symptoms including fatigue, muscle weakness and psychological disorders.

As well as influencing our nutrition, it has become clear that these trillions of microorganisms can have a major influence on other aspects of our health.



For example, the microbiome can help to prevent infections by pathogenic species, by maintaining the integrity of the mucosal barrier in our gut ([Mills \*et al.\*, 2019](#)). Several bacterial strains have also been shown to influence inflammatory processes and functions of the immune system. Some bacteria can even produce neurotransmitters, and potentially influence our moods.

### **When things go wrong: the microbiome and disease**

While our microbiome can have a positive impact on our health, changes in the composition of the community are associated with disease. For example, a decrease in bacterial diversity in the gut has been linked to a range of disorders including inflammatory bowel disease, cancer and obesity, as well as neurological conditions such as depression, anxiety and even autism ([Mills \*et al.\*, 2019](#); [Grochowska \*et al.\*, 2018](#)).

There is some evidence that imbalances in the gut microbiome can directly contribute to the development of health conditions, such as obesity. For example, mice given faecal transplants from overweight humans gained more weight than mice given the gut microbiome of humans of healthy weight ([Goodrich \*et al.\*, 2014](#)). Therefore, the balance of bacteria in our gut, and even the abundance of particular species of bacteria, can have a direct impact on our health.

### **Intellectual property and the microbiome**

Our growing understanding of the importance of our gut microbiome has spurred on innovation in the area. Hundreds of clinical trials are currently ongoing, evaluating the effect of bacteria on a range of diseases. This is reflected in the dramatic rise in the number of patent filings in this sector year on year, as innovators seek to protect investment and innovation in an increasingly competitive environment

The novelty of the field can create challenges for the prosecution of microbiome patents, because in some jurisdictions applications are often reviewed by examiners with little experience in the technology.

Also, many patent offices take a very critical view of the therapeutic use of bacteria, as the bacteria *per se* often do not differ from those occurring naturally. The Nutrition and Life Sciences teams at Carpmiels & Ransford have been at the forefront of obtaining patent protection in the microbiome field, and handles a wide portfolio of microbiome-related patents. The microbiome can influence our health and wellbeing, and offers an exciting new avenue for therapeutic interventions for a range of diseases. Please get in touch to find out how we can help protect innovations in the area.

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