

Gut Bacteria

The living flora of our gut (called the microbiome) has become an area of intense scientific interest. **We know it is crucial for our health.**

If the microbiome gets sick, we get sick and we don't fully recover until it recovers. In fact, it is possible to predict health by looking at the microbiome. **To be healthy we need to have enough friendly bacteria and to have a high enough diversity of bacteria. Unfortunately much of modern life, including aspects of modern medicine, damage our microbiome.**

But why are these microbes so important? **Firstly it is responsible for 85% of our immunity.** Secondly there are a lot of these bacteria (about 100 trillion) and there are about 10,000 species. Our own cells are greatly outnumbered by microbial cells and our DNA is also greatly outnumbered by bacterial DNA. This microbiome acts like a complex organ within our body. **In fact 38% of the compounds circulating in our blood stream originate in the microbiome.**

If the balance is right we stay healthy and well. The microbiome produces useful vitamins like Vitamin K which protect against heart disease, valuable neurotransmitters like serotonin which protect against depression, and short-chain fatty acids like butyric acid which protect against colon cancer. It can also aid digestion, regulate the immune system and detoxify chemicals, taking the strain off our livers. Indolepropionic acid produced by beneficial bacteria helps us produce insulin and helps prevent diabetes.

But it can be a friend or foe. When the microbiome is out of balance it can produce inflammatory cytokines and dangerous short-chain fatty acids like propionic acid, known to be highly toxic to the brain. Changing our microbiome can improve our health and, as we shall see, can even change our personality and our weight.

There are also microbiomes on the skin, the vagina and the mouth and these are also in a state of balance. For this reason it is important not to kill off good bacteria with antiseptics, douches etc.

In a landmark study, Dr Nieuwdorp from the University of Amsterdam was able to reverse the metabolic markers of diabetes in 250 patients by using faecal microbial transplants from donors without diabetes. Now this is an entirely new way to treat chronic illness and diabetes is just one of the diseases that respond in this way. Clearly our bacterial flora have a profound influence on our health.

The major proportion of the microbiome is made up of bacteroidetes and firmicutes, representing 90% of the total. The ratio of these is critical and the higher the ratio of bacteroidetes to firmicutes the better. Firmicutes are characteristically higher in obesity. Also crucial for health is having a wide diversity of microbes.

We know that the microbiome of those living on a western diet differs from the microbiome of rural Africans. The western diet produces a less diverse range of bacteria with, in particular, more firmicutes.

Perhaps the greatest danger from an unhealthy microbiome is inflammation of the gut wall, sometimes known as a leaky gut. This increased intestinal permeability allows inflammatory chemicals (particularly a highly inflammatory chemical called lipopolysaccharide or LPs) and bacteria to escape into our blood stream (which can trigger an auto-immune reaction) and hence into the rest of our body, putting us at risk of inflammation anywhere in the body.

But what can we do to promote a healthy microbiome? We can add probiotics (combinations of beneficial bacteria are now widely available at health food stores and supermarkets but be aware that many of the live yoghurts containing probiotics are high in sugar). Probiotics give useful benefits but no preparation contains bacteroidetes and the effect of probiotics on the microbiome can be short-lived unless the right foods are taken with them.

However taking probiotics is a waste of time and money unless you feed them. They live on fibre, especially fibre from vegetables but also from some fruits (such as the pectin in apples and pears), nuts and seeds. Other foods damage our friendly bacteria, notably sugar but also refined carbohydrates, gluten, fizzy drinks, chlorinated water, alcohol and processed foods. Fermented foods (kefir, sauerkraut, cider vinegar, sourdough, pickled foods, unpasteurized cheeses) also deliver friendly bacteria (**see Probiotic leaflet**).

Exercise increases bacteroidetes and reduced firmicutes. **Drugs, notably steroids and antibiotics, but also acid-blocking drugs, non-steroidal anti-inflammatories (NSAIDs) and the contraceptive pill damage the microbiome.** Chlorine in tap water and pesticides in food also damage the microbiome. Caesarian sections have a negative effect as the infant loses the beneficial seeding with health bacteria. Breast feeding promotes healthy microbes. In the past we ingested small amounts of useful bacteria from the soil. Research from Canada has found that owning pets, perhaps surprisingly, reduces the risk of allergies and asthma. The likely reason is that these pet owners have double the levels of beneficial gut bacteria. So changing our diet and reducing our chemical load can help as can fasting.

Another way to influence the microbiome is by giving high quantities of probiotics through an enema. Dr David Perlmutter, in his book Brain Maker, states that this has been one of the most powerful interventions he has used in thirty years of practice (also see his website).

Perhaps the most exciting development is that of faecal microbial transplantation (FMT). This has produced exceptional results. It is an accepted treatment for severe and sometimes life-threatening infections with clostridia difficile: this usually rapidly resolves it within two treatments with a 94% success rate. The method has been pioneered by Dr Thomas Borody and there is a clinic in the UK which offers this treatment. The method has been used for other serious chronic diseases. It has reversed inflammatory bowel disorders like Crohn's disease and

ulcerative colitis. Dr Perlmutter has recorded near miraculous recoveries in MS and autism (in the Brain Maker) and has had success with other neurological patients who at one time he would have considered untreatable. This inexpensive treatment has huge potential but research is in the very early stages but could prove to be a game-changer in a multitude of chronic diseases. It is still early days and FMT is not yet widely available and finding the right clinic and right donor needs care. Like receiving blood transfusions there are risks when body fluids are exchanged.

Our gut also influences our personality and can either protect us from anxiety and depression or make us worse. For instance, a study published in Gastroenterology in 2011 found that researchers could change the personality of mice by altering their gut bacteria. Timid and adventurous mice had their gut bacteria swapped. The result was a reversal of their behaviour with the timid mice becoming adventurous and the adventurous mice becoming timid. This extraordinary result was no isolated example. In another study mice that received gut microbes from depressed patients became depressed whereas those receiving microbes from non-depressed patients did not. But how could this happen? How can gut bacteria alter behavior? One explanation is that many of the neurotransmitters which have a fundamental influence on behaviour are produced by our gut bacteria. And it is not only behaviour that changes. In a study done at Washington University, St Louis in 2013, mice eating the same amount of food, received intestinal bacteria from either an obese woman or her lean twin. Those receiving the bacteria from the obese woman grew fatter whereas those receiving bacteria from her twin stayed lean.