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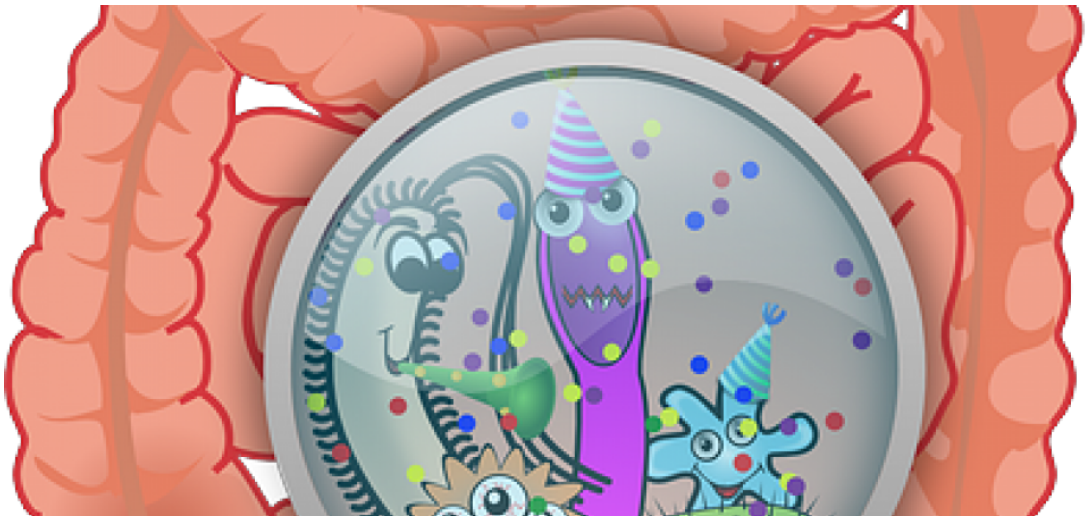

You are not alone. Ever. Trillions of microbes, mainly bacteria, have set up home inside your body, existing in little communities in your gut, nostrils, mouth and on your skin. You have more microbes than human cells. In the gut, they can together weigh 1-2kg, about the same weight as your brain. Each microbe may be microscopic but together they can have mega effects.

Not all bugs are bad

Most members of your gut microbiota (the name given to the microbe community, whilst the more commonly used term 'microbiome' actually refers to the genetic material therein) are crucial to your health, helping with the breakdown of food, the manufacture of vitamins and providing protection against harmful bacteria.

In fact, you and your bacteria are mutually co-dependent for survival.

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Diversity counts

The make-up of your microbiota matters: changes in its composition (and particularly reductions in its rich diversity) are associated with diseases as diverse as diabetes, allergies and irritable bowel syndrome.

Scientists at the British Gut Project [5] want to work out ways to maximise health through modifying the microbe content of the gut, promoting diversity in its makeup.

Disrupted diversity

Antibiotics, stress and diet deplete the diversity of microbes found in your gut. Professor Tim Spector, head of the

British Gut Project, showed the dramatic effects of diet on gut microbes when he asked his son Tom to eat junk food [6] for ten days. Nearly half (about 1400) of the bacterial species in Tom's gut were wiped out.

Disturbed microbiomes are associated with weight gain (yes, your expanding waistline may be down to your gut bacteria).

If the remaining bacteria are those which are more efficient at absorbing energy from the food you eat, you're more likely to put on weight as the excess energy will be stored as fat.

Depression

A lot has been written about the link between your gut and your brain. Amazingly, it seems that modifications to your microbiota can affect your mental health – for better or for worse.

This idea is not new. In 1910, Dr George Porter Philips improved depressive symptoms in his patients by administering live bacteria (fix your gut, fix your brain?). More recently, it has been noted that mood disorders affect more than half of all patients with irritable bowel syndrome [7] – further evidence of the gut-brain connection?

Fix your gut, fix your brain?

The way in which your gut communicates with your brain is complex, but gut microbes may affect levels of mood-altering brain chemicals such as serotonin, dopamine and GABA. Microbes may also trigger chronic inflammation in your body - and depression is now thought to be linked to bodily inflammation [8] (with anti-inflammatory drugs being considered as new antidepressants).

Diarrhoea

There's a bacterium called *Clostridium difficile* that thrives in your gut when other more helpful microbes are killed off through antibiotic use. *C diff* results in severe diarrhoea and can recur time and again.

Drug response

Ever wondered why some drugs work better on other people? Gut microbes metabolise medications, making them more - or less - active. Whether you respond to certain chemotherapy [9] and cardiac drugs [10] may be down to your gut microbes.

Defending diversity/manipulating your microbiome

When bacterial diversity has been depleted in your gut and you're suffering from relentless diarrhoea, you can 'reset' your disturbed microbiota by – yes you heard correctly – receiving faeces (containing a richer mix of bacteria) from a healthy donor…under medical supervision, that is.

Known as faecal microbiota transplant (or donor faeces infusion), scientists are wondering whether its use could be extended beyond treating *C diff* diarrhoea, perhaps turning drug non responders into responders. And what about a role in weight loss? As an antidepressant? Transplant of gut bacteria from obese to lean mice has been shown to cause weight gain. Whether the reverse is true – and whether it works (and is accepted) in humans – remains to be seen.

Other ways to boost your biome include careful use of the correct antibiotics and avoiding stress. Prebiotic foods and probiotic drinks may help populate your gut with bacteria (though clinical trials are needed). Oh, and red wine and chocolate [5] also seem to be good for your gut bacteria.

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