

The brain in your bowel

There may be good reason to think of the digestive tract as a “second brain”. But studies have shown that illnesses such as ulcers and stomach cancer are not caused by psychological factors and diet alone. A common bacterial invader is also to blame.

By Morné Malan

They're familiar feelings for most of us. The vaguely uncomfortable flutter in the pit of your stomach when you're about to make a speech at a wedding, or those nervous cramps just before an important interview. And it's no wonder that a situation of extreme stress, such as a car accident or a robbery, is often described as “gut-wrenching”. We feel strong emotions in our gut, and if such feelings continue at a low intensity over a long time, they can cause anything from acid reflux to irritable bowel syndrome.

But what exactly is the link between the brain and the digestive tract?

The brain-bowel connection

When Dr Michael Gershon, a professor of anatomy and cell biology in the US, first began calling the digestive tract the “second brain”, it made waves in the media.¹ Is it really possible to *think* with your bowel?

Dr Gershon published both an article and a book on the topic, explaining that the phrase “second brain” doesn't really mean the bowel can solve mathematical problems or write poetry by itself.^{2,3} What it brings to life is the fact that the entire digestive tract, which consists of the oesophagus (the throat-to-stomach passage), the stomach itself, the small intestine and the large intestine, works as a *single* entity. Connecting these parts is an incredibly complex network of nerve cells, supporting cells, proteins and chemical messengers, which send messages back and forth, much like those found in the brain. In fact, the bowel contains about the same amount of nerves as the brain, and far more than the spinal cord.⁴

Even more remarkable is that this network is able to act *independently*, that is, to sense stimuli and to react to them in various ways, without being told to do so by either the brain or the spinal cord. This is the reason why the bowel can continue functioning normally, moving bile through its winding passages with deliberate and regular contractions, and overseeing the absorption of nutrients and the expulsion of waste. It does so even when the rest of the body has been paralysed by severe brain or spinal injury. The only two digestive actions controlled by the brain are swallowing and defecation. Everything else is controlled by the nerve network in the bowel, which is also known as the “enteric nervous system” (ENS).

Blaming the wrong brain

The ENS plays an important role in human happiness and misery, explains Dr Gershon. In doing so, it has opened up a whole new field of medicine, known as “neurogastroenterology”. But before scientists realised just how important it was, people who suffered from ulcers, or continuous stomach ache, without any obvious causes, were told their symptoms were psychological and they were sent off to psychiatrists. The thing is, doctors weren't wrong in ascribing such problems to the brain. They were just blaming the wrong one.

It's also not as simple as shifting the blame to the ENS, because there *is* a link between the brain in your skull and the brain in your bowel. It's called the vagus nerve, but it only consists of a couple of thousand nerve fibres. Nevertheless, the two brains influence each other like Siamese twins: when one gets upset, the other does too. According to Dr Gershon, this is because signals coming from the two brains are often confused.

Chemical confusion

It's important to know that nearly every substance that helps to run and control the brain can be found in the bowel. This includes important chemical messengers like serotonin, dopamine, glutamate, norepinephrine and nitric oxide. Two dozen small brain proteins, called neuropeptides, are in the bowel, as are the major defensive cells of the immune system. Enkephalins, a kind of natural painkiller produced by the body, occur there too, and – most surprisingly – so do natural benzodiazepines, a class of chemicals that are similar to anti-anxiety medicines like Valium and Xanax.

The presence of these chemical messengers would explain why stressful or frightening experiences have such a direct effect on the bowel. When the brain encounters a situation that causes fear or anxiety, it releases stress hormones that prepare the body to fight or flee. Problem is, the bowel also contains the receptor cells that are sensitive to this chemical bombardment, same as those found in the brain. Hence the butterflies in the stomach, the cramps or the diarrhoea that follow. These symptoms indicate that digestion is either being put in overdrive, which causes “the runs”, or that it's being forced to a halt, causing constipation.

Further proof of this is that medicines known to interfere with the brain's chemical messengers, such as antidepressants, have long been associated with digestive side effects like nausea, diarrhoea or constipation – another example of how chemical signals meant for the brain can confuse the bowel.

In light of this, it's little wonder that the main cause of serious stomach and intestinal problems, such as ulcers and stomach cancer, was sought *outside* of the body for so long. But not all people who suffered from these were under unusual stress or harboured suppressed emotions, so the theory of psychological causes didn't quite hold. A small piece of the puzzle was still missing – so small, in fact, that it took a powerful microscope and two Nobel-prize winning researchers to discover its hiding place, deep within the lining of the bowel.

Little spirals

Until quite recently, conventional thought suggested that bacteria simply cannot survive in the stomach's highly acidic environment. This was the thinking, even though German scientists found spiral-shaped bacteria in the lining of the stomach as far back as 1875.⁵ But what these scientists *didn't* manage to do was to grow these bacteria artificially in order to study them under a microscope, so their observations were soon forgotten.

Later, in the 1900s, several small studies also observed “curved rods” in the stomach of many patients with stomach ulcers and stomach cancer.⁶ But interest in this bacteria was crushed when a large study, published in 1954, failed to find the bacteria in 1,180 stomach samples.⁷ That is, until an Australian pathologist, Dr Robin Warren, observed the same bacteria in the late 1970s and, with the help of gastroenterologist Dr Barry Marshall, began looking at them in more detail.

Warren and Marshall soon ran into the same problem as the German scientists: they weren't able to grow the bacteria artificially. But only until 1982, when they unintentionally left laboratory

equipment, in which the bacteria were incubating, unattended for five days. Soon enough, they had live colonies of the organism to study and later came to the startling conclusion that stomach ulcers and gastritis, which is an inflamed stomach lining, were caused by *Helicobacter pylori* (H. pylori), and not by stress or spicy food as was previously thought.⁸ They were awarded the 2005 Nobel Prize in Physiology or Medicine for this ground-breaking discovery.

But what do we know about H. Pylori today?

Common infection

Literally translated, *Helicobacter pylori* means “spiral-shaped gatekeeper bacterium”, referring to the shape of the organism, and to where it occurs: in the lining of the bottom part of the stomach, which contains the “gateway” valve that leads into the small intestine.

More than half of the world’s population is infected by this type of bacteria, and that infections are more common in developing countries.⁹ A sharp decrease of H. Pylori in Western countries has also been noted.

The “helix” or spiral shape of the bacterium is thought to have evolved to help it penetrate the mucus layer of the stomach and imbed itself in the tissue lining beneath it, which is how it manages to avoid the destructive bile juices of the stomach.¹⁰

The problem with H. Pylori is that the majority of people who are infected with it show no symptoms, that is, until an ulcer appears in the stomach lining or small intestine, or until stomach cancer develops.¹¹ This happens because the bacterial infection causes constant, low-level inflammation that damages the stomach lining over a long period and eventually creates these diseases decades later.¹²

But the bacteria isn’t *solely* to blame. Ulcers and cancer sometimes occur in the stomach or small intestine *without* the presence of H. Pylori. More worrying is that the latest studies show that the decline in infections in the West is linked to an *increase* in cancer of the oesophagus and other diseases of this area.¹³ Could it be that H. Pylori is not only a microscopic enemy but, in some ways, also a protector of our health?

This is a question for which science doesn’t have a clear answer. In the meantime, H. Pylori is identified via blood tests, which you could ask your doctor or pathology lab to perform. When identified, it’s treated with antibiotics and considered a risk factor for the possible development of ulcers and stomach cancer later. In fact, studies have shown that the risk is still high even 12 years after the infection has been cleared.¹⁴ So the safest choice is still to eradicate the bacteria and, along with it, eliminate the risks involved in developing ulcers and stomach cancer.

In our quest to live a longer and healthier life, we often forget about the first link in the chain – our digestive system. And it’s only when this “second brain” begins to protest by sending pain and discomfort signals up to the conscious brain, due to either an infection or external factors, that we take action. Luckily, there are steps you could take *before* this happens, to ensure that your digestive tract stays healthy. See our protocol below for the nutrients that can help.

Healthy bowel protocol

<To be supplied>

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