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Gut microbiome: meet *E coli* – the infamous bacteria with an unfair reputation

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E coli are one of the first bacteria to live in a baby's intestines. fusebulb/ Shutterstock

Escherichia coli (which most of us know better as *E coli*) has a bit of a bad reputation. Many know it as the harmful bug that can cause a stomach illness, urinary tract infections, kidney failure and even death. But this reputation is slightly unfair. There are many types of *E coli* – and many play an important role in a healthy gut microbiome.

E coli was discovered nearly 140 years ago when it was isolated from the poop of a German baby. Since then, it's become the most studied species of bacteria – and arguably the most studied species of all life – on Earth.

This bacteria has many different strains, most of which are friendly. So why does *E coli* have a bad reputation?

Most strains of *E coli* play an important role in the healthy human gut microbiome. They're one of the first bacteria to live in the intestine of babies, paving the way for other good bacteria to join them.

In a healthy adult gut, friendly *E coli* work tirelessly to produce vitamin K (which helps clot blood and supports wound healing) and prevent disease-causing bacteria from taking hold. The strain *E coli Nissle* is actually a probiotic – meaning its presence in the gut prevents infections. This strain was first identified in 1917 after it was isolated from the poop of a German man who had not been affected by a diarrhoea outbreak that had infected many of his fellow soldiers.

But sometimes, these friendly strains find themselves in the wrong place at the wrong time. For example, even though between 80-95% of urinary tract infections are caused by *E coli*, this is often merely because of the proximity of the anus and the entrance of the urinary tract, which allows the bacteria to physically move from one area to the other.

This means strains that are well behaved in the gut cause an infection in the urethra.



A woman sitting on a couch holds her stomach in pain.

The harmful strain *E coli* 0157 can cause stomach pain – among other symptoms. Prostock-studio/Shutterstock

But other strains of *E coli*, which do not normally live in our gut and are unwelcome guests, are perhaps more deserving of the bacteria's bad reputation. The strain *E coli* 0157 is one such strain, and can be found in the gut of cows, sheep and goats.

When it infects humans, it causes abdominal pain, bloody diarrhoea, kidney disease – and, in some tragic cases, death. It arrives in the human gut through contaminated foods, direct contact with animals or their environments. This serves as a reminder for all of us to keep a clean kitchen, cook meat well and wash our hands after touching or being around livestock.

A healthy gut

Each person's microbiome is different, so the amount of *E coli* you have living there – and what strains – will vary. Sometimes, these differences are due to dysregulation – where the gut's microbial community becomes imbalanced. This can have a number of implications for health.

In inflammatory bowel diseases – including irritable bowel syndrome, Crohn's disease and ulcerative colitis – the number of *E coli* is often higher than in a healthy gut. But we don't currently know if increased numbers of *E coli* in the gut microbiome drive inflammatory bowel disease, or if the disease makes the gut less inhabitable for other species of bacteria – leading to an increase in the amount of specific strains of *E coli*.

Colorectal cancer and gut microbiome dysregulation are also correlated – again with a higher amount of *E coli* in the diseased gut. This may be due to a group of nasty *E coli* strains that make molecules called cyclomodulins and then excrete them near human cells.

Cyclomodulins are carcinogenic, altering how the human cells grow and develop, implying that some *E coli* strains may increase the likelihood of their human host developing cancer.

But while *E coli* may have a bad reputation, not all strains are actually bad for us – and remain an important part of a health gut microbiome.

This article is part of Meet Your Gut Microbes, a series about the rich constellation of bacteria, viruses, archaea and fungi that live in people’s digestive tracts. Scientists are increasingly realising their importance in shaping our health – both physical and mental. Each week we will look at a different microbe and bring you the most up-to-date research on them.
