

# This is icky – but could make you a fortune

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Your microbiome is a big part of who you are. It's the name that's given to all the bacteria and parasites that live on you, and in you.

We've covered it [before in \*Exponential Investor\*](#), for one very simple reason – it's going to be one of the most important areas for medical breakthroughs in coming decades. Already, we're learning how it affects conditions as diverse as asthma and autism. Startups, such as UBiome, are already making waves in this space – and the commercial opportunities are only going to get bigger as the years pass.

It's time to shed some serious light on the subject. Today, I'm interviewing Dr Sheena Cruickshank. She's an immunologist at the University of Manchester. She's currently involved with a citizen science project called Britain Breathing. This involves a massive team of scientists, and is partnered with the British Society for Immunology and the Royal Society of Biology. I met her at the excellent New Scientist Live event.

**AL: In the developed world, are we too clean?**

DC: Not necessarily! If you look back through history, our average lifespan was only about 40 years of age. Children often didn't make it to adulthood. Now, in developed countries such as the UK, most of us can expect to live until we are 70 or 80 – or even older. This change in lifespan is almost certainly due to improvements in hygiene, sanitation and access to drugs and vaccines that treat or prevent disease. Sadly, many countries in the developing world still don't have full access to clean water. They also lack sewage systems to deal with human excrement safely, and they may miss out on drugs and vaccines. In those countries we see that the average lifespan is still around 40. So, it's important to remember that the basic processes of improving hygiene have done us a great deal of good!

**AL: Is being clean always good?**

DC: Being clean is good – but perhaps you can take it too far. The widespread use of anti-bacterial agents in everything from soaps and detergents to laundry solutions is probably not needed. Soap is a pretty effective anti-bacterial agent by itself.

**AL: Do we need to be exposed to germs?**

DC: Researchers have suggested that the human needs early exposure to at least some germs. This may help to train the immune system to act properly. Part of that training is to learn how to distinguish between harmful and harmless bacteria and viruses. Of course, disease-causing bacteria and viruses can be dangerous. But we are surrounded by many others, which are harmless. It's important that the doesn't overreact to these – or even to other foreign material, like pollen. Scientists noticed that people who lived in farms or had big families with lots of siblings were less likely to get allergies, or to develop autoimmune diseases, than people who lived in the city or had small families. Scientists thought that this was because the people from the countryside, or with big families, were much more likely to get exposed to a variety of germs in childhood. This early exposure to germs "educated" the immune system, and stopped it misfiring.

**AL: Do we all need to spend time in the countryside, then?**

DC: Well, it's not as simple as that. The increase in allergies may also be because of the types of infection we get. We evolved to deal with a host of different infections. Importantly, these include parasitic worms. At one time, these worms were commonplace in the UK – and not even the Royal family were safe. King Richard III is now known to have had a roundworm infection in his gut. We have pretty much eradicated most worm infections, from developed countries like the UK. However, our immune system still tries to deal with these now eradicated infections. Perhaps this means the immune system gets out of balance when it doesn't have worms there to keep it in check. Intriguingly, countries that still have high levels of worm infection don't report the high incidences of allergy and autoimmunity we see here in the UK.

**AL: Could we use pig whipworm, and similar treatments, to treat allergies?**

DC: Pig whipworm is certainly interesting. It can live in people, but it can't reproduce in us. This means it gives our a quick exposure to parasites, but without risking a lasting infection. This approach is being researched with trials looking at how we can use pig whipworm and hookworm to treat both allergies and autoimmune diseases – where your 's immune system attacks and damages the 's own cells. The initial trials are promising but there is a lot we don't know yet. I would urge caution, as it seems not all parasitic worms will be appropriate for therapy. It cannot be ignored that worms really do make you unwell – and some people can become very sick indeed. So some researchers, including our team, are looking at the substances worms make and

seeing how those affect the immune response. This is a very exciting area of research. It has shown, for example, that the worms make substances that can dampen down the immune response.

**AL: Are worms the only factor?**

DC: Almost certainly not. We are seeing a huge increase in the numbers of people with allergy and asthma. Our environment has changed drastically and we are exposed to pollutants in the air from industry and car exhausts that are almost certainly damaging our health. We also [grow different crops](#) to our ancestors. These may release pollens that are more likely to trigger allergy. A common example is rapeseed, which can be spotted easily by its bright yellow flowers. That's a relatively modern crop. Also some researchers have shown that pollutants can change pollen structure. This makes the pollen more stimulating to the immune system, and thus likely to cause an allergy. So the increase in allergy incidence is almost certainly down to a variety of factors.

**AL: What can we do to help us understand this?**

DC: To try and pick this complex story apart, we are running a massive experiment, called Britain Breathing, which everyone can take part in. We are asking people to download the free Britain Breathing app to their phone, which allows them to easily report their allergy and asthma symptoms on a daily basis. These data are shared with our research team – so we can create a map of when and where allergy and asthma symptoms occur. So far we have over 18,000 data sets. From these, we can see that there were real peaks – for example, in nose symptoms in April and June. We will then use these data to correlate with information on pollutants, pollens and weather patterns to try and understand what might be causing the allergies. The Britain Breathing project is free for everyone to take part in and more information can be found at the [Britain Breathing website](#).

Please do send me your thoughts on this exciting area of medicine, to [andrew@southbankresearch.com](mailto:andrew@southbankresearch.com).

Best,

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